

**SECTION 00 01 01
PROJECT TITLE PAGE
PORT OF TACOMA
TACOMA, WASHINGTON
PIER 4 PHASE 2 RECONFIGURATION**

**PROJECT NO. 091251
CONTRACT NO. 070136**

VOLUME 1 OF 3 - PROJECT MANUAL

**Thais Howard, P.E.
Director, Engineering**

**Trevor Thornsley
Sr. Project Manager**

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PROCUREMENT AND CONTRACTING REQUIREMENTS

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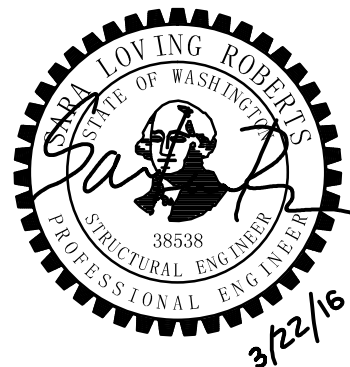
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The undersigned Engineer of Record hereby certifies that the Technical Specifications for the following portions of this project for the Bid Submittal of the Port of Tacoma Pier 4 Phase 2 Reconfiguration Project were written by me, or under my direct supervision, and that I am duly registered under the laws of the State of Washington, and hereby affix my Professional Seal and signature. Those sections prepared under my direct supervision and being certified by my seal and signature below are as follows:

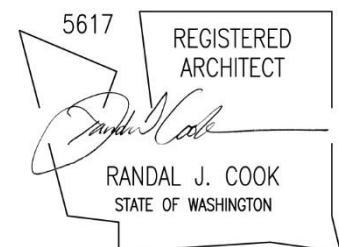
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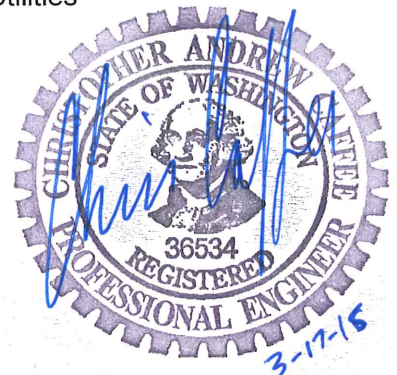
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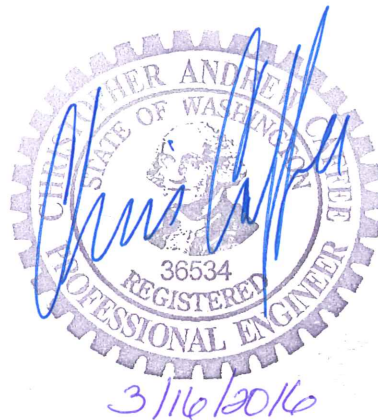
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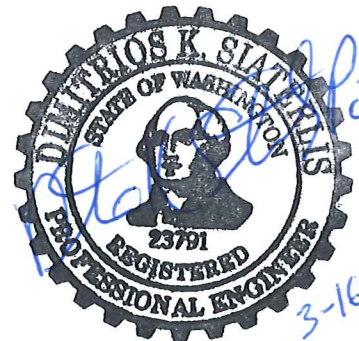


3/16/2016

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- 33 44 19.19 – Utility Oil/Water Separators
- 33 44 19.23 – Off-Line Utility Storm Water Filters



PART 1 - GENERAL

1.01 SUMMARY

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58	C4.3	GRADING AND PAVING PLAN - SHEET 3
59	C4.4	GRADING AND PAVING PLAN - SHEET 4
60	C4.5	GRADING AND PAVING SECTIONS - SHEET 1
61	C4.6	GRADING AND PAVING SECTIONS - SHEET 2
62	C4.7	GRADING AND PAVING SECTIONS - SHEET 3
63	C4.8	GRADING AND PAVING DETAILS - SHEET 1
64	C4.9	GRADING AND PAVING DETAILS - SHEET 2
65	C4.10	GRADING AND PAVING DETAILS - SHEET 3
66	C4.11	GRADING AND PAVING DETAILS - SHEET 4

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68	C4.13	RESTROOM BUILDING DETAILS - SHEET 1
69	C4.14	RESTROOM BUILDING DETAILS - SHEET 2
70	C4.15	RESTROOM BUILDING DETAILS - SHEET 3
71	C4.16	RESTROOM BUILDING DETAILS - SHEET 4
72	C4.17	MARINE BUILDING ENLARGED GRADING PLAN
73	C4.18	MARINE BLDG GRADING AND PAVING SECTIONS - SHEET 1
74	C4.19	MARINE BLDG GRADING AND PAVING SECTIONS - SHEET 2
75	C4.20	MARINE BLDG GRADING AND PAVING DETAILS
76	C5.1	DRAINAGE PLAN - SHEET 1
77	C5.2	DRAINAGE PLAN - SHEET 2
78	C5.3	DRAINAGE PLAN - SHEET 3
79	C5.4	DRAINAGE STRUCTURE SCHEDULE
80	C5.5	DRAINAGE PROFILES - SHEET 1
81	C5.6	DRAINAGE PROFILES - SHEET 2
82	C5.7	DRAINAGE PROFILES - SHEET 3
83	C5.8	DRAINAGE DETAILS - SHEET 1
84	C5.9	DRAINAGE DETAILS - SHEET 2
85	C5.10	DRAINAGE DETAILS - SHEET 3
86	C5.11	DRAINAGE DETAILS - SHEET 4
87	C5.12	DRAINAGE DETAILS - SHEET 5
88	C6.1	UTILITY PLAN - SHEET 1
89	C6.2	UTILITY PLAN - SHEET 2
90	C6.3	UTILITY PLAN - SHEET 3
91	C6.4	UTILITY PLAN - SHEET 4
92	C6.5	HYDRANT SCHEDULE AND ENLARGED PLAN
93	C6.6	WATER LINE PROFILES - SHEET 1
94	C6.7	WATER LINE PROFILES - SHEET 2
95	C6.8	WATER LINE PROFILES - SHEET 3
96	C6.9	UTILITY DETAILS - SHEET 1
97	C6.10	UTILITY DETAILS - SHEET 2
98	C6.11	UTILITY DETAILS - SHEET 3
99	C6.12	UTILITY DETAILS - SHEET 4
100	C6.13	UTILITY DETAILS - SHEET 5
101	C6.14	UTILITY DETAILS - SHEET 6

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103	C6.16	UTILITY DETAILS - SHEET 7
104	C6.17	MARINE BUILDING ENLARGED UTILITY PLAN
105	C6.18	MARINE BUILDING SEWER PROFILE
106	C6.19	TYPICAL ELECTRICAL DUCTBANK PROFILE - SHEET 1
107	C6.20	TYPICAL ELECTRICAL DUCTBANK PROFILE - SHEET 2
108	C6.21	TYPICAL ELECTRICAL DUCTBANK PROFILE - SHEET 3
109	C6.22	UTILITY DETAILS - SHEET 8
110	C6.23	SANITARY SEWER LIFT STATION PLAN AND SECTION
111	C7.1	STRIPING AND FENCING PLAN - SHEET 1
112	C7.2	STRIPING AND FENCING PLAN - SHEET 2
113	C7.3	STRIPING AND FENCING PLAN - SHEET 3
114	C7.4	ENLARGED FENCING PLANS - SHEET 1
115	C7.5	STRIPING AND FENCING DETAILS - SHEET 1
116	C7.6	STRIPING AND FENCING DETAILS - SHEET 2
117	C7.7	STRIPING AND FENCING DETAILS - SHEET 3
118	C7.8	STRIPING AND FENCING DETAILS - SHEET 4
119	E1.1	ELECTRICAL SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES
120	E2.1	SITE ELECTRICAL DEMOLITION PLAN
121	E2.2	SITE ELECTRICAL DEMOLITION KEY PLAN
122	E2.3	ELECTRICAL DEMOLITION PLAN - SHEET 1
123	E2.4	ELECTRICAL DEMOLITION PLAN - SHEET 2
124	E2.5	ELECTRICAL DEMOLITION PLAN - SHEET 3
125	E2.6	ENLARGED ELECTRICAL DEMOLITION PLAN - SUBSTATION #8410
126	E2.7	ENLARGED ELECTRICAL DEMOLITION PLAN - MARINE BUILDING
127	E3.1	SITE ELECTRICAL PLAN
128	E3.2	SITE ELECTRICAL KEY PLAN
129	E3.3	ELECTRICAL PLAN - SHEET 1
130	E3.4	ELECTRICAL PLAN - SHEET 2
131	E3.5	ELECTRICAL PLAN - SHEET 3
132	E3.6	ENLARGED ELECTRICAL PLAN - SUBSTATION #8410
133	E3.7	SUBSTATION #8410 GROUND GRID
134	E3.8	ENLARGED ELECTRICAL PLAN - YARD ELECTRICAL DISTRIBUTION
135	E3.9	RESTROOM BUILDING ELECTRICAL PLAN
136	E3.10	PARTIAL SITE TEMPORARY LIGHTING PLAN

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138	E5.2	YARD ELECTRICAL ONE-LINE DIAGRAM
139	E5.3	PARTIAL SITE ONE-LINE DIAGRAM
140	E6.1	ELECTRICAL DETAILS
141	E6.2	ELECTRICAL DETAILS
142	E6.3	DUCTBANK SECTIONS
143	E6.4	DUCTBANK SECTIONS
144	E6.5	ELECTRICAL DETAILS
145	E6.6	PIER 4 YARD LIGHTING CONTROL PANEL
146	E6.7	ELECTRICAL DETAILS
147	E6.8	ELECTRICAL DETAILS
148	E6.9	PARTIAL ELECTRICAL WHARF PLAN - SHEET 1
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150	E6.11	PARTIAL ELECTRICAL WHARF PLAN - SHEET 3
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152	E6.13	PARTIAL ELECTRICAL WHARF PLAN - SHEET 5
153	E6.14	ENLARGED VAULT AND UTILITY TRENCH PLANS
154	E6.15	ENLARGED VAULT AND UTILITY TRENCH PLANS
155	E6.16	ENLARGED VAULT AND UTILITY TRENCH PLANS
156	E6.17	ENLARGED VAULT AND UTILITY TRENCH PLANS
157	E6.18	UTILITY TRENCH/ PILE CAP SECTIONS
158	E6.19	LIGHTING CONTROL DIAGRAMS
159	E6.20	VAULTS AND HANDHOLE SCHEDULE
160	E6.21	MANHOLE/ VAULT DETAILS
161	E6.22	BENT SECTIONS
162	E6.23	BENT SECTIONS
163	E7.1	PANEL SCHEDULE P42 AND RESTROOM BUILDING
164	E7.2	PANEL SCHEDULE MPZ-WYL03 & MPZ-YL05
165	E8.1	CONDUIT AND CONDUCTOR SCHEDULE
166	E8.2	CONDUIT AND CONDUCTOR SCHEDULE
167	E8.3	CONDUIT AND CONDUCTOR SCHEDULE
168	E8.4	CONDUIT AND CONDUCTOR SCHEDULE
169	E8.5	CONDUIT AND CONDUCTOR SCHEDULE
170	E8.6	CONDUIT AND CONDUCTOR SCHEDULE
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174	S1.2	PIER STRUCTURAL NOTES - SHEET 2
175	S1.3	PIER STRUCTURAL NOTES - SHEET 3
176	S2.1	PIER PLAN
177	S3.1	PIER SURFACE FEATURES PLAN - SHEET 1
178	S3.2	PIER SURFACE FEATURES PLAN - SHEET 2
179	S4.1	PILE AND PILE CAP PLAN - SHEET 1
180	S4.2	PILE AND PILE CAP PLAN - SHEET 2
181	S4.3	PILE AND PILE CAP PLAN - SHEET 3
182	S4.4	PILE AND PILE CAP PLAN - SHEET 4
183	S4.5	PILE AND PILE CAP PLAN - SHEET 5
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187	S5.4	PIER DECK PLAN - SHEET 4
188	S5.5	PIER DECK PLAN - SHEET 5
189	S5.6	PIER PARTIAL PLANS AT PIER 3/4 JOINT
190	S6.1	OVERALL PIER CROSS SECTION AT PIER 3 BENT 67.6
191	S6.2	OVERALL PIER CROSS SECTION AT BENT 3
192	S6.3	OVERALL PIER CROSS SECTION AT BENT 9
193	S6.4	OVERALL PIER CROSS SECTION AT BENT 20
194	S6.5	OVERALL PIER CROSS SECTION AT BENT 25
195	S6.6	OVERALL PIER CROSS SECTION AT BENTS 29 TO 71
196	S6.7	PIER SECTIONS - SHEET 1
197	S6.8	PIER SECTIONS - SHEET 2
198	S6.9	PIER SECTIONS - SHEET 3
199	S6.10	PIER SECTIONS - SHEET 4
200	S6.11	PIER SECTIONS - SHEET 5
201	S6.12	PIER SECTIONS - SHEET 6
202	S6.13	PIER SECTIONS - SHEET 7
203	S6.14	PIER SECTIONS - SHEET 8
204	S6.15	PIER SECTIONS - SHEET 9
205	S6.16	PIER SECTIONS - SHEET 10
206	S6.17	PIER SECTIONS - SHEET 11

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210	S8.1	PILE CONNECTION DETAILS
211	S8.2	PILE CONNECTION DETAILS
212	S9.1	PILE CAP REINFORCING ELEVATIONS - SHEET 1
213	S9.2	PILE CAP REINFORCING ELEVATIONS - SHEET 2
214	S9.3	PILE CAP REINFORCING ELEVATIONS - SHEET 3
215	S9.4	PILE CAP REINFORCING ELEVATIONS - SHEET 4
216	S9.5	PILE CAP REINFORCING ELEVATIONS - SHEET 5
217	S9.6	PILE CAP REINFORCING ELEVATIONS - SHEET 6
218	S9.7	PILE CAP REINFORCING ELEVATIONS - SHEET 7
219	S9.8	PILE CAP REINFORCING ELEVATIONS - SHEET 8
220	S9.9	PILE CAP REINFORCING ELEVATIONS - SHEET 9
221	S9.10	PILE CAP REINFORCING ELEVATIONS - SHEET 10
222	S9.11	PILE CAP REINFORCING ELEVATIONS - SHEET 11
223	S9.12	PILE CAP REINFORCING ELEVATIONS - SHEET 12
224	S9.13	PILE CAP REINFORCING ELEVATIONS - SHEET 13
225	S9.14	PILE CAP REINFORCING ELEVATIONS - SHEET 14
226	S9.15	PILE CAP REINFORCING ELEVATIONS - SHEET 15
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228	S10.1	PILE CAP SECTIONS AND DETAILS - SHEET 1
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230	S10.3	PILE CAP SECTIONS AND DETAILS - SHEET 3
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232	S10.5	PILE CAP SECTIONS AND DETAILS - SHEET 5
233	S10.6	PILE CAP SECTIONS AND DETAILS - SHEET 6
234	S10.7	PILE CAP SECTIONS AND DETAILS - SHEET 7
235	S10.8	PILE CAP SECTIONS AND DETAILS - SHEET 8
236	S10.9	PILE CAP SECTIONS AND DETAILS - SHEET 9
237	S10.10	PILE CAP SECTIONS AND DETAILS - SHEET 10
238	S10.11	PILE CAP SECTIONS AND DETAILS - SHEET 11
239	S10.12	PILE CAP SECTIONS AND DETAILS - SHEET 12
240	S10.13	PILE CAP SECTIONS AND DETAILS - SHEET 13
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243	S11.1	PONY BENT ELEVATIONS AND SECTIONS - SHEET 1
244	S11.2	PONY BENT ELEVATIONS AND SECTIONS - SHEET 2
245	S11.3	PONY BENT ELEVATIONS AND SECTIONS - SHEET 3
246	S11.4	PONY BENT ELEVATIONS AND SECTIONS - SHEET 4
247	S11.5	PONY BENT ELEVATIONS AND SECTIONS - SHEET 5
248	S11.6	PONY BENT ELEVATIONS AND SECTIONS - SHEET 6
249	S11.7	BATTER PILE SUBCAP PLAN AND SECTION
250	S11.8	BATTER PILE SUBCAP PLANS
251	S11.9	BATTER PILE SUBCAP SECTIONS AND DETAIL
252	S12.1	SHEET PILE WALL CAP BEAM ELEVATIONS
253	S13.1	SHEET PILE WALL CAP BEAM SECTIONS AND DETAILS
254	S14.1	LANDSIDE CRANE BEAM ELEVATIONS - SHEET 1
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257	S15.1	LANDSIDE CRANE BEAM SECTIONS AND DETAILS - SHEET 1
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260	S16.1	WATERSIDE CRANE BEAM ELEVATIONS - SHEET 1
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263	S16.4	WATERSIDE CRANE BEAM ELEVATIONS - SHEET 4
264	S17.1	WATERSIDE CRANE BEAM SECTIONS AND DETAILS - SHEET 1
265	S17.2	WATERSIDE CRANE BEAM SECTIONS AND DETAILS - SHEET 2
266	S18.1	BULLRAIL PLAN
267	S18.2	BULLRAIL ELEVATIONS - SHEET 1
268	S18.3	BULLRAIL ELEVATIONS - SHEET 2
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270	S19.1	BULLRAIL SECTIONS AND DETAILS
271	S20.1	PIER ISOLATION JOINT PARTIAL PLANS - SHEET 1
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273	S21.1	PIER ISOLATION JOINT DETAILS - SHEET 1
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278	S22.1	CAST-IN-PLACE DECK PLANS
279	S22.2	CAST-IN-PLACE DECK SECTION
280	S22.3	CAST-IN-PLACE TOPPING SLAB - SHEET 1
281	S22.4	CAST-IN-PLACE TOPPING SLAB - SHEET 2
282	S22.5	CAST-IN-PLACE TOPPING SLAB - SHEET 3
283	S23.1	CAST-IN-PLACE CONCRETE DETAILS AT SHORE POWER VAULT
284	S24.1	CAST-IN-PLACE CONCRETE DETAILS AT CRANE POWER VAULT
285	S25.1	CAST-IN-PLACE CONCRETE DETAILS AT BULLRAIL UTILITY VAULT
286	S26.1	DECK PANEL SCHEDULE - SHEET 1
287	S26.2	DECK PANEL SCHEDULE - SHEET 2
288	S26.3	DECK PANEL SCHEDULE - SHEET 3
289	S26.4	DECK PANEL SCHEDULE - SHEET 4
290	S26.5	DECK PANEL SCHEDULE - SHEET 5
291	S27.1	DECK PANEL DETAILS - SHEET 1
292	S27.2	DECK PANEL DETAILS - SHEET 2
293	S27.3	DECK PANEL DETAILS - SHEET 3
294	S27.4	DECK PANEL DETAILS - SHEET 4
295	S27.5	DECK PANEL DETAILS - SHEET 5
296	S27.6	DECK PANEL DETAILS - SHEET 6
297	S27.6A	DECK PANEL DETAILS - SHEET 6A
298	S27.7	DECK PANEL DETAILS - SHEET 7
299	S27.7A	DECK PANEL DETAILS - SHEET 7A
300	S27.7B	DECK PANEL DETAILS - SHEET 7B
301	S27.8	DECK PANEL DETAILS - SHEET 8
302	S27.9	DECK PANEL DETAILS - SHEET 9
303	S27.10	DECK PANEL DETAILS - SHEET 10
304	S27.11	DECK PANEL DETAILS - SHEET 11
305	S27.12	DECK PANEL DETAILS - SHEET 12
306	S27.13	DECK PANEL DETAILS - SHEET 13
307	S27.14	DECK PANEL DETAILS - SHEET 14
308	S27.15	DECK PANEL DETAILS - SHEET 15
309	S27.16	DECK PANEL DETAILS - SHEET 16
310	S27.16A	DECK PANEL DETAILS - SHEET 16A
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313	S27.19	DECK PANEL DETAILS - SHEET 19
314	S27.20	DECK PANEL DETAILS - SHEET 20
315	S27.21	DECK PANEL DETAILS - SHEET 21
316	S27.22	DECK PANEL DETAILS - SHEET 22
317	S27.23	DECK PANEL DETAILS - SHEET 23
318	S27.23A	DECK PANEL DETAILS - SHEET 23A
319	S27.24	DECK PANEL DETAILS - SHEET 24
320	S27.25	DECK PANEL DETAILS - SHEET 25
321	S27.26	DECK PANEL DETAILS - SHEET 26
322	S27.27	DECK PANEL DETAILS - SHEET 27
323	S27.28	DECK PANEL DETAILS - SHEET 28
324	S27.29	DECK PANEL DETAILS - SHEET 29
325	S27.30	DECK PANEL DETAILS - SHEET 30
326	S27.31	DECK PANEL DETAILS - SHEET 31
327	S27.32	DECK PANEL DETAILS - SHEET 32
328	S27.33	DECK PANEL DETAILS - SHEET 33
329	S27.34	DECK PANEL DETAILS - SHEET 34
330	S27.35	DECK PANEL DETAILS - SHEET 35
331	S27.36	DECK PANEL DETAILS - SHEET 36
332	S27.37	DECK PANEL DETAILS - SHEET 37
333	S27.38	DECK PANEL DETAILS - SHEET 38
334	S27.39	DECK PANEL DETAILS - SHEET 39
335	S27.40	DECK PANEL DETAILS - SHEET 40
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337	S27.42	DECK PANEL DETAILS - SHEET 42
338	S27.43	DECK PANEL DETAILS - SHEET 43
339	S27.44	DECK PANEL DETAILS - SHEET 44
340	S27.45	DECK PANEL DETAILS - SHEET 45
341	S27.46	DECK PANEL DETAILS - SHEET 46
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343	S27.48	DECK PANEL DETAILS - SHEET 48
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345	S27.50	DECK PANEL DETAILS - SHEET 50
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348	S27.53	DECK PANEL DETAILS - SHEET 53
349	S27.54	DECK PANEL DETAILS - SHEET 54
350	S27.55	DECK PANEL DETAILS - SHEET 55
351	S27.56	DECK PANEL DETAILS - SHEET 56
352	S28.1	CRANE RAIL ISOLATION JOINT DETAILS - SHEET 1
353	S28.2	CRANE RAIL ISOLATION JOINT DETAILS - SHEET 2
354	S29.1	WATER VAULT AT PIER 3 TO PIER 4 TRANSITION
355	S30.1	SHORE POWER VAULT DETAILS - SHEET 1
356	S30.2	SHORE POWER VAULT DETAILS - SHEET 2
357	S31.1	CRANE POWER VAULT DETAILS - SHEET 1
358	S31.2	CRANE POWER VAULT DETAILS - SHEET 2
359	S31.3	CRANE POWER VAULT DETAILS - SHEET 3
360	S31.4	CRANE POWER VAULT DETAILS - SHEET 4
361	S31.5	CRANE POWER VAULT DETAILS - SHEET 5
362	S31.6	CRANE POWER VAULT DETAILS - SHEET 6
363	S31.7	FIBER OPTIC VAULT DETAILS
364	S32.1	CRANE CABLE SLOT DETAILS
365	S33.1	BULLRAIL UTILITY VAULT DETAILS
366	S34.1	CRANE PIN SOCKET DETAILS
367	S35.1	CRANE TIE-DOWN DETAILS - SHEET 1
368	S35.2	CRANE TIE-DOWN DETAILS - SHEET 2
369	S36.1	CRANE STOP DETAILS
370	S37.1	MISCELLANEOUS STEEL DETAILS
371	S37.2	LEAD RUBBER BEARING DETAILS
372	S38.1	BOLLARD DETAILS - PIER BOLLARD TYPE 1
373	S38.2	BOLLARD DETAILS - PIER BOLLARD TYPE 2
374	S38.3	BOLLARD DETAILS - PIER DOUBLE BITT BOLLARD
375	S38.4	BOLLARD DETAILS - MOORING DOLPHIN BOLLARD
376	S39.1	FENDER SYSTEM DETAILS
377	S40.1	CRANE RAIL DETAILS - SHEET 1
378	S40.2	CRANE RAIL DETAILS - SHEET 2
379	S41.1	STEEL SHEET PILE DETAILS
380	S42.1	MOORING DOLPHIN DETAILS
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383	S43.3	GANGWAY PLATFORM DETAILS
384	S44.1	STRUCTURAL REPAIR PLANS - SHEET 1
385	S44.2	STRUCTURAL REPAIR PLANS - SHEET 2
386	S44.3	STRUCTURAL REPAIR DETAILS
387	S45.1	HIGH-MAST LIGHT POLE FOUNDATION DETAILS
MARINE BUILDING PLANS		
388	G1.00	COVER SHEET
389	G2.00	SHEET INDEX
390	G2.01	GENERAL NOTES AND SYMBOLS
391	G2.02	ABBREVIATIONS
392	G2.03	MOUNTING HEIGHT NOTES
393	G3.01	OCCUPANCY TYPES AND LOADS
394	G3.02	BUILDING CODE, FIRE AND LIFE SAFETY SUMMARY
395	G3.03	BUILDING CODE, FIRE AND LIFE SAFETY SUMMARY
396	G3.04	BUILDING CODE, FIRE AND LIFE SAFETY SUMMARY
397	G3.05	BUILDING CODE, FIRE AND LIFE SAFETY SUMMARY
398	G4.01	3D VIEWS
399	A1.01	ENLARGED ARCHITECTURAL / CODE SITE PLAN
400	A2.01	FLOOR PLANS
401	A2.02	DIMENSION PLANS
402	A2.10	ENLARGED FLOOR PLANS
403	A3.01	ROOF PLAN
404	A4.01	REFLECTED CEILING PLANS
405	A5.01	EXTERIOR ELEVATIONS
406	A6.01	BUILDING SECTIONS
407	A6.10	WALL SECTIONS
408	A6.11	WALL SECTIONS
409	A6.12	WALL SECTIONS
410	A7.00	VERTICAL CIRCULATION
411	A7.01	VERTICAL CIRCULATION
412	A8.01	INTERIOR ELEVATIONS
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417	A21.00	FLOOR TYPES AND FLOOR DETAILS
418	A30.00	WALL TYPE NOTES
419	A31.00	WALL TYPES
420	A31.01	EXTERIOR WALL DETAILS
421	A31.02	EXTERIOR WALL DETAILS
422	A31.03	EXTERIOR WALL DETAILS
423	A31.04	EXTERIOR WALL DETAILS
424	A40.01	ROOF DETAILS AND ROOF TYPES
425	A40.02	ROOF DETAILS
426	A40.03	ROOF DETAILS
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428	A40.05	ROOF DETAILS
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430	A50.00	VERTICAL CIRCULATION DETAILS
431	A50.01	VERTICAL CIRCULATION DETAILS
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433	A50.03	VERTICAL CIRCULATION
434	A60.00	LOUVER, DOOR, FRAME, AND GLAZING NOTES
435	A61.00	DOOR TYPES AND SCHEDULES
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446	S1.01	STRUCTURAL NOTES AND DRAWING LIST
447	S1.02	STRUCTURAL NOTES, DRAWING SYMBOLS AND ABBREVIATIONS
448	S1.03	STATEMENT OF STRUCTURAL SPECIAL INSPECTIONS AND TESTING
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DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS
SECTION 00 01 15 - LIST OF DRAWING SHEETS

Sheet No.	Drawing No.	SHEET TITLE
451	S1.06	STATEMENT OF STRUCTURAL SPECIAL INSPECTIONS AND TESTING
452	S1.07	LOAD MAP
453	S2.01	FOUNDATION AND LEVEL 1 FLOOR PLAN
454	S2.02	LEVEL 2 FLOOR PLAN
455	S2.03	ROOF PLAN
456	S3.01	BUILDING ELEVATIONS
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459	S3.12	BRACE FRAME DETAILS
460	S3.13	BRACE FRAME DETAILS
461	S4.01	CONCRETE DETAILS
462	S5.01	TYPICAL STEEL DETAILS
463	S5.02	TYPICAL STEEL DETAILS
464	S5.03	TYPICAL STEEL DETAILS
465	S5.04	TYPICAL STEEL DETAILS
466	S5.05	STEEL DETAILS
467	S5.06	STEEL DETAILS
468	S5.07	STEEL DETAILS
469	S6.01	TYPICAL WOOD DETAILS
470	M1.01	SCHEDULES
471	M1.02	SCHEDULES
472	M2.01	LEVEL 1 UNDERGROUND PLUMBING PLAN
473	M3.01	LEVEL 1 AND 2 PLUMBING PLAN
474	M4.01	MECHANICAL HVAC PLANS
475	M4.02	REFLECTED CEILING AND HVAC PLAN
476	M4.03	ROOFTOP MECHANICAL HVAC PLAN
477	M6.01	MECHANICAL DETAILS
478	M6.02	MECHANICAL DETAILS
479	M7.01	MECHANICAL CONTROLS
480	FX0.01	FIRE PROTECTION LEGEND, DESIGN CRITERIA AND FLOW TEST INFORMATION
481	FX0.02	FIRE PROTECTION FLOOR PLAN CONST., GENERAL, AND SPECIAL NOTES
482	FX0.03	FIRE PROTECTION FLOOR PLAN CONST., GENERAL, AND SPECIAL NOTES

Sheet No.	Drawing No.	SHEET TITLE
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484	FA0.01	FIRE ALARM LEGEND AND NOTES
485	FA0.02	LEVEL 1 AND LEVEL 2 FIRE ALARM FLOOR PLAN
486	FA2.01	LEVEL 1 AND LEVEL 2 FIRE ALARM FLOOR PLAN
487	E0.01	ELECTRICAL LEGEND
488	E1.00	ELECTRICAL FIXTURE SCHEDULE AND MECHANICAL CONNECTION SCHEDULE
489	E2.01	LEVEL 1 AND LEVEL 2 LIGHTING PLAN
490	E3.01	LEVEL 1 AND LEVEL 2 POWER PLAN
491	E3.02	ROOF POWER PLAN
492	E4.01	LEVEL 1 AND LEVEL 2 SYSTEMS PLAN
493	E4.02	ROOF SYSTEMS PLAN
494	E5.01	ELECTRICAL DETAILS
495	E5.02	ELECTRICAL DETAILS
496	E5.03	ELECTRICAL DETAILS
497	E5.04	ELECTRICAL DETAILS
498	E6.01	POWER RISER DIAGRAM
499	E6.02	POWER RISER SCHEDULE

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF LIST OF DRAWINGS

**THE PORT OF TACOMA IS CURRENTLY ACCEPTING SEALED BIDS FOR CONSTRUCTION OF
THE FOLLOWING:**

**PIER 4 PHASE 2 RECONFIGURATION
PROJECT NO. 091251 | CONTRACT NO. 070136**

Scope of Work:	The work required for this project includes but is not limited to: selective pier, pavement, building and utility demolition; stone column installation; dredging and open water disposal of approximately 465,000 cubic yards of material; slope protection installation; construct wharf (approximate 1750 feet) including concrete piles, steel sheet piles, concrete deck, crane rail, ship and crane utility services and appurtenances, and fender panels; installation of upland sanitary sewer, water, and communication utilities; electrical site work including a new substation, light poles and duct banks; asphalt paving and striping, and construction of a two story (~7000 sf) marine building.
Bid Estimate:	Estimated cost range is \$83,300,000 to \$91,990,000, plus Washington State Sales Tax (WSST).
Sealed Bid Date/Time/ Location:	Bids will be received at the Front Reception Desk, Port Administration Office, One Sitcum Plaza, Tacoma, Washington until 2:30 P.M. on May 17, 2016 , at which time they will be publicly opened and read aloud.
Pre-bid Conference and Site Tour:	A pre-bid conference and site visit have been set for April 20, 2016 at 10:30 A.M. The site visit will convene at the Fabulich Center, located at 3600 Port of Tacoma Road, Conference Room 104.
Bidding Security:	Each bid must be accompanied by a Certified Check or Bid Security Bond in an amount equal to five (5%) percent of the bid.
Contact Information:	All questions are to be put into writing to Jana Prince, Procurement at Port at procurement@portoftacoma.com . No oral answers will be binding by the Port.
Bidding Documents:	Plans, Specifications, Addenda, and Plan Holders List for this project are available on-line through The Port of Tacoma's Website www.portoftacoma.com. Click on "Contracts"; "Procurement", and then the Procurement Number (070136). Bidders must subscribe to the Holder's List on the right hand side of the screen in order to receive automatic email notification of future addenda and to be placed on the Holder's List. Contact Jana Prince at procurement@portoftacoma.com with questions. Holder's Lists will be updated regularly. Additional Instructions available in 00 21 00 - Instructions to Bidders.

END OF SECTION

PART 1 - SUMMARY

1.01 DEFINITIONS

All definitions set forth in the Agreement, the General Conditions of the Contract for Construction and in other Contract Documents are applicable to the Bidding Documents.

- A. "Addenda" are written or graphic instruments issued prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections. The contents of an Addendum are issued in no particular order and therefore should be carefully and completely reviewed.
- B. "Award" means the formal decision by the Port of Tacoma ("Port") notifying a Responsible Bidder with the lowest responsive Bid of the Port's acceptance of the Bid and intent to enter into a Contract with the Bidder.
- C. The "Award Requirements" include the statutory requirements as a condition precedent to Award.
- D. The "Base Bid" is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base to which work may be added or from which work may be deleted for sums stated in Alternate Bids.
- E. A "Bid" is a complete and properly signed proposal to do the Work, submitted in accordance with the Bidding Documents, for the sums therein stipulated and supported by any data called for by the Bidding Documents.
- F. The "Bid Date" is the day and hour specified in the Bidding Documents, as may be changed through an Addendum, by which Bidders are required to submit Bids to the Port.
- G. The "Bid Form" is the form(s) included with the Bidding Documents, with Specification Section 00 41 00, through which a Bidder submits a Bid.
- H. A "Bidder" is a person or entity who submits a Bid.
- I. The "Bidding Documents" include the Advertisement or Invitation to Bid, Instructions to Bidders, the Bid Form, any other sample bidding and contract forms, the Bid Bond, and the proposed Contract Documents, including any Addenda issued prior to the Bid Date.
- J. The "Contract Documents" proposed for the Work consist of the Agreement, the General Conditions of the Contract (as well as any Supplemental, Special or other Conditions included in the project manual), the Drawings, the Specifications, and all Addenda issued prior to, and all modifications issued after, execution of the Contract.
- K. The "Schedule of Unit Prices" is a separate schedule on the Bid Form for Unit Pricing as an all-inclusive price per unit of measurement for materials, equipment or services as described in the Bidding Documents or in the proposed Contract Documents for the optional use of the Port. Quantities are not predictions of amounts anticipated. The Port may but is not obligated to accept a Schedule of Unit Price if it accepts the Base Bid. The Schedule of Unit Prices are not factored into the evaluation of determining the low bid amount and are not included as part of the bid award amount.
- L. A "Sub-Bidder" is a person or entity of any tier who submits a bid or proposal to or through the Bidder for materials, equipment or labor for a portion of the Work.

1.02 BIDDER'S REPRESENTATIONS

By making its Bid, each Bidder represents that:

- A. BIDDING DOCUMENTS. The Bidder has read and understands the Bidding Documents, and its Bid is made in accordance with them.
- B. PRE-BID MEETING. The Bidder has attended pre-Bid meeting(s) required by the Bidding Documents. Attendance at a mandatory meeting or training session means that, in the sole opinion of the Port, a Project representative of a prospective Bidder has attended all or substantially all of such meeting or session.
- C. BASIS. Its Bid is based upon the materials, systems, services, and equipment required by the Bidding Documents, and is made without exception.
- D. EXAMINATION. The Bidder has carefully examined and understands the Bidding Documents, the Contract Documents (including, but not limited to, any liquidated damages and insurance provisions), and the Project site, including any existing buildings, it has familiarized itself with the local conditions under which the Work is to be performed and has correlated its observations with the requirements of the proposed Contract Documents and it has satisfied itself as to the nature, location, character, quality and quantity of the Work, the labor, materials, equipment, goods, supplies, work, services and other items to be furnished, and all other requirements of the Contract Documents. The Bidder has also satisfied itself as to the conditions and other matters that may be encountered at the Project site or affect performance of the Work or the cost or difficulty thereof, including but not limited to those conditions and matters affecting: transportation, access, disposal, handling and storage of materials, equipment and other items; availability and quality of labor, water, electric power and utilities; availability and condition of roads; climatic conditions and seasons; physical conditions at the Project site and the surrounding locality; topography and ground surface conditions; and equipment and facilities needed preliminary to and at all times during the performance of the Work. The failure of the Bidder fully to acquaint itself with any applicable condition or matter shall not in any way relieve the Bidder from the responsibility for performing the Work in accordance with, and for the Contract Sum and within the Contract Time provided for in, the Contract Documents.
- E. PROJECT MANUAL. The Bidder has checked its copies of the project manual (if any) with the table of contents bound therein to ensure the project manual is complete.
- F. SEPARATE WORK. The Bidder has examined and coordinated all Drawings, Contract Documents, and Specifications with any other contracts to be awarded separately from, but in connection with, the Work being Bid upon, so that the Bidder is fully informed as to conditions affecting the Work under the Contract being Bid upon.
- G. LICENSE REQUIREMENTS. Bidders and Sub-Bidders shall be registered and shall hold such licenses as may be required by the laws of Washington, including a certificate of registration in compliance with RCW 18.27, for the performance of the Work specified in the Contract Documents.
- H. NO EXCEPTIONS. Bids must be based upon the materials, systems and equipment described and required by the Bidding Documents, without exception.

1.03 BIDDING DOCUMENTS

A. COPIES

1. Bidding Documents. Bidders may obtain complete sets of the Bidding Documents from the Port's website at www.portoftacoma.com then 'Contracts' 'Procurement' and then find the project number and title.

2. Holder's List. Subscribe to the Holder's List for this procurement by clicking on the 'Holder's List' icon then typing in the contact email address to receive updates and clicking 'Submit'. Following the Submit, a screen will come up to verify subscription. From there, select 'Subscriber Preferences' and then 'Questions' (the 3rd tab). Fill out all information in the questions section and then select 'Submit' and this will complete the registration to the Port's Holder's List for this procurement. Step by Step directions are available at: <http://portoftacoma.com/contracts/procurement>.
3. Complete Sets. Bidders shall use complete sets of Bidding Documents in preparing Bids and are solely responsible for obtaining updated information. The Port does not assume any responsibility for errors or misinterpretations resulting from the use of incomplete and/or superseded sets of Bidding Documents.
4. Conditions. The Port makes copies of the Bidding Documents available only for the purpose of obtaining Bids on the Work and does not confer a license or grant permission for any other use.
5. Legible Documents. To the extent any Drawings, Specifications, or other Bidding Documents are not legible, it is the Bidder's responsibility to obtain legible documents.

B. INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

1. Format. The Contract Documents are divided into parts, divisions, and sections for convenient organization and reference. Generally, there has been no attempt to divide the Specification sections into Work performed by the various building trades, any Work by separate contractors, or any Work required for separate facilities in or phases of the Project.
2. Duty to Notify. Bidders shall promptly notify the Port in writing of any ambiguity, inconsistency, or error that they may discover upon examination of the Bidding Documents or of the site and local conditions.
3. Products and Installation. All Bidders shall thoroughly familiarize themselves with specified products and installation procedures and submit to the Port any objections (in writing) no later than seven (7) days prior to the Bid Date. The submittal of the Bid constitutes acceptance of products and procedures specified as sufficient, adequate, and satisfactory for completion of the Contract.
4. Written Request. Bidders requiring clarification or interpretation of the Bidding Documents shall make a written email request to procurement@portoftacoma.com at least **seven (7) days prior to the Bid Date**.
5. **Request to Modify Responsibility Criteria.** No later than **ten (10) days** prior to the Bid Date, a potential Bidder may request in writing that the Port modify the Responsibility Criteria. The Port will evaluate the information submitted by the potential Bidder and respond before the Bid Date. If the evaluation results in a change of the Criteria, the Port will issue an Addendum identifying the new Criteria.
6. Addenda. The Bidder shall not rely on oral information provided at any pre-Bid meetings or during site visits. Verbal statements made by representatives of the Port are for informational purposes only. Any interpretation, correction or change of the Bidding Documents will be made solely by written Addendum. Interpretations, corrections or changes of the Bidding Documents made in any manner other than by written Addendum, including but not limited to oral statements, will not be binding, and Bidders shall not rely upon such statements, interpretations, corrections or changes. The Port is not responsible for explanations or interpretations of the Bidding Documents other than in a written Addendum.

7. Site Visits. Any site visits are provided as a courtesy to potential Bidders to assist them in becoming familiar with the Project site conditions. However, only the Bidding Documents, including any issued Addenda, may be relied upon by Bidders. Work areas to be examined during the site visit may contain hazardous materials or conditions. Attendees should review the information and safety precautions set forth in the Contract Documents to determine for themselves appropriate protective clothing or equipment. Attendees further agree to indemnify and hold the Port harmless from any and all claims of personal injury arising from their participation in the site visit.
8. Singular References. Reference in the singular to an article, device, or piece of equipment shall include as many of such articles, devices, or pieces as are indicated in the Contract Documents or as are required to complete the installation.
9. Utilities and Runs. The Bidder should assume that the exact locations of any underground or hidden utilities, underground fuel tanks, and plumbing and electrical runs may be somewhat different from any location indicated in the surveys or Contract Documents.

C. SUBSTITUTIONS

1. For substitutions during bidding, refer to Section 00 26 00 – Substitution Procedures During Bidding.

D. ADDENDA

1. Distribution. All Addenda will be written and will be posted to the Port's project website for this bid: www.portoftacoma.com, then under 'Contracts', 'Procurement' and then select the Contract Number (070136). **Only those who have signed up for the Holder's List through the Port's website will get the automatic emails when new project information is posted for this procurement.**
2. Copies. Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.
3. Verification and Acknowledgment of Receipt. Prior to submitting a Bid, each Bidder shall ascertain that it has received all Addenda issued. Each Bidder shall acknowledge its receipt and consideration of all Addenda in its Bid.

1.04 BIDDING PROCEDURE

A. FORM AND STYLE OF BIDS

1. Form. Bids (including required attachments) shall be submitted on forms identical to the Bid Form included with the Bidding Documents. No oral, email, or telephonic responses or modifications will be considered.
2. Entries on the Bid Form. All blanks on the Bid Form shall be filled in by typewriter, printer, or manually in ink.
3. Figures. All sums shall be expressed in figures, not words. Portions of the Bid Form may require the addition or multiplication of components bids to a total or the identification of component amounts within a total. In case of discrepancy between unit prices listed and their sum(s), the unit prices listed shall govern (rather than the sum).
4. Initial Changes. Any interlineation, alteration or erasure shall be initialed by an authorized representative of the Bidder.
5. Bid Breakdown. The Bid Form may contain, for the Port's accounting purposes only, a breakdown of some or all of the components included in the Base Bid.
 - a. For lump sum bids the total Contract Sum shall be submitted.

- b. For unit price bids a price shall be submitted for each item of the Work, an extension thereof, and, if requested, the total Contract Sum.
6. No Conditions. The Bidder shall make no conditions or stipulations on the Bid Form nor qualify its Bid in any manner.
7. Identity of Bidder. The Bidder shall include in the specified location on the Bid Form the legal name of the Bidder and, if requested, a description of the Bidder as a sole proprietor, a partnership, a joint venture, a corporation, or another described form of legal entity. The Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. The Port verifies signature authority on the Labor and Industries website <https://fortress.wa.gov/lni/bbip/Search.aspx> under the contractor registration business owner information. If the business owner information is not current the bidder shall show proof of authority to sign at the request of the Port. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder
8. Bid Amounts Do Not Include Sales Tax. The Work to be performed constitutes a "retail sale" as this term is defined in RCW 82.04.050. Thus, the Base Bid amount shall include in the sum stated all taxes imposed by law, EXCEPT WASHINGTON STATE AND LOCAL SALES TAX. The engaged Contractor will pay retail sales tax on all consumables used during the performance of the Work and on all items that are not incorporated into the final Work; this tax shall be included in the Base Bid price and in any other prices set forth on the Bid Form. The Port will pay state and local retail sales tax on each progress payment and final payment to the engaged Contractor for transmittal by the Contractor to the Washington State Department of Revenue or to the applicable local government.

B. POTENTIAL LISTING OF SUB-BIDDERS (SUBCONTRACTORS)

1. Procedure. On certain projects of the Port, the Bid Form includes a requirement that certain Sub-Bidders be listed, in which case the Bidder must complete the required list. In these circumstances, and regardless of the anticipated cost of the Project, the Bidder must name the Sub-Bidder or Sub-Bidders with whom the Bidder, if Awarded the Contract, will subcontract directly (i.e., not lower-tier Sub-Bidders) for performance of the Work of:
 - a. HVAC (heating, ventilation and air conditioning) Work,
 - b. plumbing Work as described in RCW 18.106,
 - c. electrical Work as described in RCW 19.28, and
 - d. any other categories of Work listed on the Sub-Bidder listing form and/or Bid Form.
 - 1) SELF-PERFORMANCE: If the Bidder intends to self-perform any of these categories of Work, it must name itself for each such category of Work.
 - 2) MULTIPLE ENTRIES: The Bidder shall not list more than one (1) entity for a particular category of Work identified, unless a Sub-Bidder will vary based on an Alternate Bid, in which case the Bidder shall identify the Sub-Bidder to be used for the Alternate and the affected portion of the Work.
2. Failure to Submit. In accordance with RCW 39.30.060, failure of a Bidder to submit as part of the Bid the names of such proposed HVAC, plumbing, and electrical Sub-Bidders or to name itself to perform such Work or the naming of two or more Sub-Bidders to perform the same Work shall render the Bidder's Bid non-responsive and, therefore, void.
3. Requirement to Subcontract. The Bidder, if Awarded the Contract, will subcontract with the listed Sub-Bidders for performance of the portion of the Work designated on the Bid Form, subject to the provisions of the Contract for Construction and RCW 39.30.060. The Bidder shall not substitute a listed Sub-Bidder in furtherance of bid shopping or bid peddling.

4. Sub-Bidder Qualification. Listed Sub-Bidders may be required to provide evidence of their qualifications, including a statement of experience and references, prior to Award, or at any time during the Contract Time. Such information shall be provided within 24 hours of request. This evidence shall demonstrate that the Sub-Bidder meets or exceeds all requirements for experience, qualifications, manufacturer's certifications, or any other requirements specified in any of the technical sections of the Contract Documents for which the Sub-Bidder proposes to perform Work.
5. Replacement. If a listed Sub-Bidder fails to provide adequate evidence of qualifications, is unable to comply with any bonding requirements of the Bidding Documents or with other requirements of the Contract or Bidding Documents, is not properly licensed, or fails to meet the Responsibility Criteria of the Bidding Documents, the Port may require the Bidder to replace the Sub-Bidder with another subcontractor reasonably acceptable to the Port at no change in the Contract Sum or Contract Time.
6. Sub-Bidder Standards. Sub-Bidders shall meet contractual and technical qualification standards, and provide specialized certification, licensing, and/or payment and performance bonding, if required.
7. Small business participation encouraged. The Port's policy is to encourage the Contractor to solicit and document participation, and to provide and promote the maximum lawful, practicable opportunity for increased participation, by small business enterprises.

C. BID SECURITY

1. Purpose and Procedure. Each Bid shall be accompanied by Bid security payable to the Port in the form required by the Bidding Documents and equal to five percent (5%) of the Base Bid only (i.e., not including any Alternates or Unit Prices). The Bid security constitutes a pledge by the Bidder to the Port that the Bidder will enter into the Contract with the Port in the form provided, in a timely manner, and on the terms stated in its Bid, and will furnish in a timely manner the payment and performance bonds, certificates of insurance, and all other documents required in the Contract Documents. Should the Bidder fail or refuse to enter into the Contract or fail to furnish such documents, the amount of the Bid security shall be forfeited to the Port as liquidated damages, not as a penalty. By submitting a Bid, each Bidder represents and agrees that the Bid security, if forfeited, is a reasonable prediction on the Bid Date of future damages to the Port.
2. Form. The Bid security shall be in the form of a certified or bank cashier's check payable to the Port or a Bid bond executed by a bonding company reasonably acceptable to the Port licensed in the State of Washington, registered with the Washington State Insurance Commissioner, possess and A.M. Best rating of "A minus, Fiscal Size Category (FSC) (6) or better and be authorized by the U.S. Department of the Treasury. The Bid security shall be signed by the person or persons legally authorized to bind the Bidder. Bid bonds shall be submitted using the form included with the Bidding Documents.
3. Retaining Bid Security. The Port will have the right to retain the Bid security of Bidders to whom an Award is being considered until the earliest of either (a) mutual execution of the Contract, and the Port's receipt of payment and performance bonds, or (b) the specified time has elapsed so that Bids may be withdrawn, or (c) when all Bids have been rejected.
4. Return of Bid Security. Within sixty (60) days after the Bid Date, the Port will release or return Bid securities to Bidders who's Bids are not to be further considered in Awarding the Contract. Bid securities of the three apparent low Bidders will be held until the Contract has been finally executed, after which all unforfeited Bid securities will be returned. Bid security may be returned in the form provided or by separate payment.

D. SUBMISSION OF BIDS

1. Procedure. The Bid, the Bid security, and other documents required to be submitted with the Bid shall be enclosed in a sealed envelope identified with the Project name and number and the Bidder's name and address. If the Bid is sent by mail the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face of the mailing envelope.
 - a. If a Bid is mailed, it shall be addressed to the Port of Tacoma, Contracts Department, One Sitcum Plaza, Tacoma, WA 98421.
 - b. If a Bid is delivered, it shall be delivered to the Front Reception Desk, Port of Tacoma, One Sitcum Plaza, Tacoma, WA 98421.
 - c. The time stamp clock at the Front Reception Desk at One Sitcum Plaza is the Port's official clock.
2. Deposit. Bids shall be deposited at the designated location prior to the Bid Date indicated in the Advertisement or Invitation to Bid, or any extension thereof made by Addendum. Bids received after the Bid Date and time specified shall be returned without consideration at the discretion of the Port or rejected at the time of receipt.
3. Delivery. The Bidder assumes full responsibility for timely delivery at the location designated for receipt of Bids.
4. Form. Oral, facsimile, telephonic, electronic, or email Bids are invalid and will not be considered.

E. MODIFICATION OR WITHDRAWAL OF BID

1. After the Bid Date. A Bid may not be modified, withdrawn or canceled by the Bidder during a sixty (60) day period following the Bid Date, and each Bidder so agrees by virtue of submitting its Bid.
2. Before the Bid Date. Prior to the Bid Date, any Bid submitted may be modified or withdrawn only by notice to the party receiving Bids at the place designated for receipt of Bids. The notice shall be in writing with the signature of the Bidder and shall be worded so as not to reveal the amount of the original Bid. Email notice will not be accepted. It shall be the Bidder's sole responsibility to verify that the notice has been received by the Port in time to be withdrawn before the Bid opening.
3. Resubmittal. Withdrawn Bids may be resubmitted up to the time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.
4. Bid Security with Resubmission. Bid security shall be in an amount sufficient for the Bid as modified or resubmitted.

F. COMMUNICATIONS

1. Communications from a Bidder related to these Instructions to Bidders must be in writing to procurement@portoftacoma.com. Communications, including but not limited to notices and requests, by Sub-Bidders shall be made through the Bidder and not directly by a Sub-Bidder to the Port.

1.05 CONSIDERATION OF BIDS

- A. OPENING OF BIDS: Unless stated otherwise in the Advertisement or Invitation to Bid or an Addendum, the properly identified Bids received on time will be opened publicly and will be read aloud. An abstract of the Base Bids and any Alternate Bids will promptly (and generally within 24 hours) be made available to Bidders and other interested parties.

- B. REJECTION OF BIDS: The Port shall have the right but not the obligation to reject any or all Bids for any reason or for no reason, to reject a Bid not accompanied by the required Bid security, or to reject a Bid which is in any way incomplete or irregular.
- C. BIDDING MISTAKES: The Port will not be obligated to consider notice of claimed Bid mistakes received more than 24 hours after the Bid Date. In accordance with Washington law, a low Bidder that claims error and fails to enter into the Contract is prohibited from Bidding on the Project if a subsequent call for Bids is made for the Project.
- D. ACCEPTANCE OF BID (AWARD)
 - 1. Intent to Accept. The Port intends (but is not bound) to Award a Contract to the Responsible Bidder with the lowest responsive Bid, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Port has the right to waive any informality or irregularity in any Bid(s) received and to accept the Bid which, in its judgment, is in its own best interests.
 - 2. Requirements for Award. Before the Award, the lowest responsive Bidder must be deemed Responsible by the Port and must satisfy all Award Requirements.
- E. BID PROTEST PROCEDURES
 - 1. Procedure. A Bidder protesting for any reason the Bidding Documents, a Bidding procedure, the Port's objection to a Bidder or a person or entity proposed by the Bidder, including but not limited to a finding of non-Responsibility, the Award of the Contract or any other aspect arising from or relating in any way to the Bidding shall cause a written protest to be filed with the Port within two (2) business days of the event giving rise to the protest. (Intermediate Saturdays, Sundays, and legal holidays are not counted as business days.) The written protest shall include the name of the protesting Bidder, the bid solicitation number and title under which the protest is submitted, a detailed description of the specific factual and legal grounds for the protest, copies of all supporting documents, evidence that the apparent low bidder has been given notice of the protest, and the specific relief requested. The written protest shall be sent by email to procurement@portoftacoma.com.
 - 2. Consideration. Upon receipt of the written protest, the Port will consider the protest. The Port may, within three (3) business days of the Port's receipt of the protest, provide any other affected Bidder(s) the opportunity to respond in writing to the protest. If the protest is not resolved by mutual agreement of the protesting Bidder and the Port, the Contracts Director of the Port or his or her designee will review the issues and promptly furnish a final and binding written decision to the protesting Bidder and any other affected Bidder(s) within six (6) business days of the Port's receipt of the protest. (If more than one (1) protest is filed, the Port's decision will be provided within six (6) business days of the Port's receipt of the last protest.) If no reply is received from the Port during the six (6) business-day period, the protest will be deemed rejected.
 - 3. Waiver. Failure to comply with these protest procedures will render a protest waived.
 - 4. Condition Precedent. Timely and proper compliance with and exhaustion of these protest procedures shall be a condition precedent to any otherwise permissible judicial consideration of a protest.

1.06 POST BID INFORMATION

- A. THE LOWEST RESPONSIVE BIDDER SHALL:

1. Responsibility Detail Form. Within 24 hours of the Low Responsive Bidder Selection Notification, the apparent low Bidder shall submit to the Port the Responsibility Detail Form (Section 00 45 13) executed by an authorized company officer with all accompanied attachments as noted in the form. As requested from the Port, the low, responsive Bidder shall provide written confirmation that the person signing the Bid on behalf of the Bidder was duly authorized at the time of bid, a detailed breakdown of the Bid in a form acceptable to the Port, and other information required by the Port.
2. Within ten (10) days after the Port's Notice of Award of the Contract, the apparent low Bidder shall also submit to the Port, if requested:
 - a. additional information regarding the use of the Bidder's own forces and the use of subcontractors and suppliers;
 - b. the names of the persons or entities (including a designation of the Work to be performed with the Bidder's own forces, and the names of those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the Work (i.e., either a listed Sub-Bidder or a Sub-Bidder performing Work valued at least ten percent (10%) of the Base Bid), consistent with the listing required with the Bid; and
 - c. the proprietary names and the suppliers of the principal items or systems of materials and equipment proposed for the Work.
3. Failure to provide any of the above information in a timely manner will constitute an event of breach permitting forfeiture of the Bid security.
4. Bidder Responsibility. The Bidder will be required to establish to the satisfaction of the Port the reliability and Responsibility of itself and the persons or entities proposed to furnish and perform the Work described in the Bidding Documents. Within two days, upon request, the Bidder shall meet with the Port to discuss the Bid, including any pricing, the Bid components, and any assumptions made by the Bidder.
5. Sub-Bidder Responsibility. The Responsibility of the Bidder may be judged in part by the Responsibility of Sub-Bidders. Bidders must verify the Responsibility Criteria for each first-tier Sub-Bidder. A Sub-Bidder of any tier that hires other Sub-Bidders must verify Responsibility Criteria for each of its lower-tier Sub-Bidders. The verification shall include a representation that each Sub-Bidders, at the time of subcontract execution, is Responsible and possesses required licenses.
6. Objection. Prior to an Award of the Contract, the Port will notify the Bidder in writing if the Port, after due investigation, has reasonable objection to the Bidder or a person or entity proposed by the Bidder. Upon receiving such objection, the Bidder may, at Bidder's option, (1) withdraw their Bid, (2) submit an acceptable substitute person or entity with no change in the Contract Time and no adjustment in the Base Bid or any Alternate Bid, even if there is a cost to the Bidder occasioned by such substitution, or (3) file a protest in accordance with the Bidding Documents.
7. Change. Persons and entities proposed by the Bidder to whom the Port has made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Port.
8. Right to Terminate. The Bidder's representations concerning its qualifications will be construed as a covenant under the Contract. If a Bidder makes a material misrepresentation on a Qualification Statement, the Port has the right to terminate the Contract for cause and may then pursue any remedies that exist under the Contract or that are otherwise available.

- B. INFORMATION FROM OTHER BIDDERS: All other Bidders designated by the Port as under consideration for Award of a Contract shall also provide a properly executed Qualification Statement, if so requested by the Port.

1.07 PERFORMANCE BOND, LABOR AND MATERIAL PAYMENT BOND, AND INSURANCE

- A. BOND REQUIREMENTS: Within ten (10) days after the Port's Notice of Award of the Contract, the successful Bidder shall obtain and furnish statutory bonds pursuant to RCW 39.08 covering the faithful performance of the Contract and the payment of all obligations arising thereunder in the form and amount prescribed in the Contract Documents. The cost of such bonds shall be included in the Base Bid.
- B. TIME OF DELIVERY AND FORM OF BONDS: The successful Bidder shall deliver an original copy of the required bonds to the Port, 1 Sitcum Plaza, Tacoma, WA 98421, within the time specified in the Contract Documents.
- C. INSURANCE: a certificate of insurance from the Bidder's insurance company that meets or exceeds all requirements of the Contract Documents;
- D. GOVERNMENTAL REQUIREMENTS: Notwithstanding anything in the Bidding or Contract Documents to the contrary, the Bidder shall provide all bonding, insurance and permit documentation as required by governmental authorities having jurisdiction for any portions of the Project.

1.08 FORM OF AGREEMENT

- A. FORM TO BE USED: The Contract for the Work will be written on the form(s) contained in the Bidding Documents, including any General, Supplemental or Special Conditions, and the other Contract Documents included with the project manual.
- B. CONFLICTS: In case of conflict between the provisions of these Instructions and any other Bidding Document, these Instructions shall govern. In case of conflict between the provisions of the Bidding Documents and the Contract Documents, the Contract Documents shall govern.
- C. CONTRACT DELIVERY. Within ten (10) days after Notice of Award, the Bidder shall submit a signed Contract to the Port in the form tendered to the Bidder and without modification.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Supplementary Conditions, and Division 0 and 1 Specifications sections shall apply to all sections of the Contract Documents, including specifications, drawings, addenda, or other changes of documents issued for bidding.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions during bidding.

1.03 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- B. The bidding documents include performance specifications for products and equipment which meet project requirements. In those cases where a representative item or manufacturer is named in the specification, it is provided for the sole purpose of identifying a product meeting the required functional performance, and where the words "or equal" are used, a substitution request as further described, is not required.
- C. Where non-competitive or sole source products or manufacturers are explicitly specified with the words "or approved equal", or "Engineer approved equal", or "as approved by the Engineer" are used, they shall be taken to mean "or approved equal". In these cases a substitution request as further described in this section, is required.

1.04 SUBMITTALS

- A. Pre-Bid Substitution Requests: Submit one PDF of the substitution request form along with all supporting documentation for consideration of each request. Identify product or fabrication or installation method to be replaced. Include Drawing numbers and titles. Substitution requests prior to bid date may originate directly from a prime bidder, or from a prospective supplier or subcontractor.
 - 1. Substitution Request Form: Use copy of form located in Section 00 43 25.
 - 2. Documentation: Show compliance with requirements for substitutions with the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work that will be necessary to accommodate proposed substitution.
 - c. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - d. Samples, where applicable or requested.
 - e. Certificates and qualification data, where applicable or requested.
 - f. Research reports evidencing compliance with building code in effect for project
 - 3. Engineer's Action: Engineer will review substitution requests if received electronically to procurement@portoftacoma.com at least 7 days prior to the bid opening date set forth in these documents. Substitution requests received after this time will not be reviewed.

- a. Forms of Acceptance: Substitution requests will be formally accepted via written addendum prior to the bid opening date. Bidders shall not rely upon approvals made in any other manner.
 - b. Use product originally specified if Engineer does not issue a decision on use of a proposed substitution within time allocated.
 - c. The Port's decision of approval or disapproval of a proposed substitution shall be final.
- B. Substitutions will not be considered when:
1. Indicated or implied on shop drawings or product data submittals without formal request submitted in accordance with this Section.
 2. Acceptance will require substantial revision of Contract Documents or other items of the Work.
 3. Submittal for substitution request does not include point-by-point comparison of proposed substitution with specified product.

1.05 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 EXISTING CONDITIONS

- A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of the Contract Documents.
- B. The reference documents and reports are available at <https://webftp.portoftacoma.com/>
Username: pier4phase2
Password: PortPier4!
- C. The recommendations described within the reference documents noted below shall not be constructed as a requirement of this Contract, unless specifically referenced in the Contract Documents.
- D. Reference Plans
 - 1. Entitled Pier 4 Extension, dated September 1983
 - 2. Entitled Pier 4 Crane Rail Modifications, dated March 1986
 - 3. Entitled Terminal 3 and 4 Wharf Construction, dated July 1987
 - 4. Entitled Terminal 4 Wharf Crane Rail Upgrade, dated September 1992
 - 5. Entitled Terminal 3 and 4 Redevelopment Record Drawings, dated April 2006
 - 6. Entitled Pier 3 Upgrade, dated July 2013
 - 7. Entitled Pier 4 Phase 1 Removal Action Project Record Drawings, dated April 1, 2016
 - 8. Entitled Pier 4 Bulkhead Construction, dated February 1966
 - 9. Entitled Modification of Pier 4 Fender System, dated March 1988
 - 10. Entitled Blair Waterway Widening Bridge Reach and Inner Reach Phase 2, dated April 2005
 - 11. Entitled Blair Waterway Widening Bridge Reach and Inner Reach Phase 3, dated April 2008
- E. Geotechnical Reports:
 - 1. Entitled Geotechnical Data Report Pier 4 Reconfiguration dated September 18, 2014.
 - a. The Geotechnical Data Report presents the results of subsurface explorations and laboratory tests for the geotechnical engineering design of the Pier 4 Reconfiguration project. The report contains the geotechnical subsurface data collected and evaluated for the project and interpretation of the subsurface conditions at the site. Some of the information in the report includes the following:
 - 1) A discussion of the soil types, densities, consistencies, classifications, etc., as observed in a series of subsurface borings and cone penetrometer tests.
 - 2) Logs showing soil descriptions at various depths and the corresponding standard penetration test and cone penetration results.
 - 3) Laboratory results of samples including grain size analyses.
 - 4) A generalized cross-section showing the existing subsurface conditions as interpreted for purposes of design.

- 5) Selected historical exploration logs from previous geotechnical studies performed at the site.
2. Entitled Geotechnical Engineering Design Report dated July 21, 2015.
 - a. The Geotechnical Engineering Design Report presents an assessment of subsurface conditions, documentation of geotechnical and seismic analysis, and geotechnical recommendations for design and construction of the project. The geotechnical data used for the assessments and analyses are in the Geotechnical Data Report dated September 18, 2014. More specifically, this design report includes:
 - 1) A discussion of the soil types, densities, consistencies, classifications, etc., and groundwater conditions as observed in a series of subsurface borings and cone penetrometer tests.
 - 2) Seismic considerations including assessment of the seismic hazard, design response spectra, liquefaction potential, post-liquefaction vertical settlement estimates, and surface fault rupture and tsunami hazards.
 - 3) Geotechnical engineering conclusions and recommendations for slope stability, ground improvement, vertical and lateral pile analysis, pile driveability, bulkhead design, light pole foundations, and marine operations building foundation design.
 - 4) Construction considerations regarding pile installation, structural backfill and compaction requirements, and underground utilities.
 - b. The accuracy of the report information is subject to the limitations of scope and generally accepted practices in the field of geotechnical engineering at the time the report was prepared.
 - c. The Contractor may review the reports and further investigate, interpret, and evaluate, as necessary, the subsurface conditions in order to determine and assess the required means and methods of excavation, shoring, groundwater control, dredging, dewatering, demolition, pile removal, and other activities.
3. Entitled Memorandum: Marine Operations Building Recommendations, Port of Tacoma Pier 4, dated September 18, 2015.
 - a. This design memorandum includes supplemental information regarding recommendations for the design and construction of the foundation system for the Marine Building based on additional subsurface exploration performed at the south end of the project site. The memorandum is an addendum to the Geotechnical Engineering Design Report, dated July 21, 2015.
4. Entitled Memorandum: Port of Tacoma Pier 4 Reconfiguration, Test Pile Program Results and Interpretation, dated January 8, 2016.
 - a. This memorandum includes the results of the test pile program performed as part of Phase 1 of the Pier 4 Reconfiguration project to evaluate requirements for installation of the 24-inch octagonal precast concrete piles to be installed in Phase 2. The memo summarizes the test pile program, discusses the results of dynamic pile testing, and provides updated pile design and construction recommendations based on the test pile program results.
5. The Contractor may review the reports and further investigate, interpret, and evaluate, as necessary, the subsurface conditions in order to determine and assess the required means and methods of excavation, shoring, groundwater control, dredging, dewatering, demolition, pile removal and installation, stone column ground improvement, foundation preparation, and other activities.

F. Existing Conditions Report:

1. Entitled Pier 4 Reconfiguration Condition Assessment Report, dated September 19, 2014.
 - a. This report identifies conditions of existing construction prepared primarily for the use of Engineer in establishing the remaining life of the structure and necessary repairs.
 - b. This survey includes a photographic record of existing conditions visible.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section provides the notification required for disclosure of asbestos, lead-containing or other hazardous materials.

1.02 HAZARDOUS MATERIALS NOTICE

- A. Contractor is notified that certain portion of the Work area are known to contain lead or asbestos-containing materials (ACM), as detailed in the Pier 4 Regulated Building Materials Inspection, dated October 31, 2014. A copy of the assessment is included in the Appendix.
- B. Contractor is notified that certain portions of the Work area are known to contain universal wastes associated with fluorescent bulbs and ballast, as detailed in the Pier 4 Marine Building and Substation Regulated Building Materials Inspection dated June 8, 2015. A copy of this report is in the Appendix.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

BIDDER'S NAME: _____

PROJECT TITLE: **PIER 4 PHASE 2 RECONFIGURATION**

The undersigned Bidder declares that it has read the specifications, understands the conditions, has examined the site, and has determined for itself all situations affecting the work herein bid upon. Bidder proposes and agrees, if this bid is accepted, to provide at Bidder's own expense, all labor, machinery, tools, materials, etc., including all work incidental to, or described or implied as incidental to such items, according to the bidding documents, and that the Bidder will complete the work within the time stated, and that Bidder will accept in full payment therefore the lump sums and unit prices set forth below.

Proposed Bid Price. (Note: Show prices in figures only.) Complete Installation:

ITEM NO.	DESCRIPTION OF ITEM	QTY	UOM	UNIT PRICE	EXTENDED PRICE
1	Mobilization and Demobilization	1	LS		
2	Project Administration	1	LS		
3	Field Engineering	1	LS		
4	Demolition	1	LS		
5	Exploratory Excavation	1,160	CY		
6	Removal of Buried Timber Bulkhead Wall	700	LF		
7	Stone Columns	69,171	LF		
8	Riprap and Debris Removal and Disposal	1	LS		
9	Dredging and Disposal	465,000	CY		
10	Filter Blanket	14,800	TON		
11	Light Rock Riprap	32,200	TON		
12	Heavy Rock Riprap	36,000	TON		
13	Furnish 24-inch Concrete Pile	174,121	LF		
14	Install 24-inch Concrete Pile - Wharf Plumb Piles	1,197	EA		
15	Install 24-inch Concrete Pile - Wharf Batter Piles	36	EA		
16	Install 24-inch Concrete Piles - Mooring Dolphin Piles	8	EA		
17	Dynamic Pile Driving Analysis	20	EA		

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS
SECTION 00 41 00 - BID FORM

ITEM NO.	DESCRIPTION OF ITEM	QTY	UOM	UNIT PRICE	EXTENDED PRICE
18	Re-strike Concrete Piles	50	EA		
19	Pile Cut-offs (lengths greater than 10 feet)	50	EA		
20	Concrete Pile Build-ups	40	EA		
21	Furnish and Install Sheet Piles	1,308	LF		
22	Construct Mooring Dolphin	1	LS		
23	Wharf Construction	1	LS		
24	Wharf Fender System	1	LS		
25	Furnish and Install Crane Rail	1	LS		
26	Concrete Spall Repairs to Existing Pier 4	118	SF		
27	Storm Drain, Water and Sanitary Sewer Systems	1	LS		
28	Electrical and Communications Site Work	1	LS		
29	Electrical Substation	1	LS		
30	Ballast and Base Course for Asphalt Paving	17,940	TON		
31	Asphalt Paving	22,220	TON		
32	Marine Building	1	LS		
33	All Other Work	1	LS		
34	Stone Column Obstructions Allowance	1	LS	\$50,000	\$50,000
35	Unforeseen Dredging Debris Removal Allowance	1	LS	\$100,000	\$100,000
36	Unforeseen Conditions Allowance	1	LS	\$100,000	\$100,000
37	Screened Dredging Premium Allowance	300	HR		
BASE BID SUBTOTAL					

Evaluation of Bids. In accordance with the provisions of these Contract Documents, Bids will be evaluated to determine the lowest Base Bid Subtotal offered by a responsible Bidder submitting a responsive bid.

Addenda. Bidder acknowledges review of all Addenda through No. _____

Trench Excavation Safety Provision. If the bid amount contains work which requires trenching exceeding a depth of 4 feet, all costs for trench safety shall be included in the Base Bid and indicated below for adequate trench safety systems in compliance with RCW 39.04 and WAC 296-155-650. Bidder shall include a lump sum amount, excluding Washington State Sales Tax. If trench excavation safety provisions do not pertain to the Work, the Bidder should enter "N.A." or "Not Applicable" in the blank on the Bid Form.

Trench Excavation Safety: _____ (Total in Written Figures Only)

Principal Subcontractors/Suppliers. The bidder shall list below the name of each subcontractor or supplier to whom the bidder proposes to subcontract the portions of the work listed below, or name itself for the work.

Work to be Performed	Name of Firm
HVAC (Heating, Ventilation and Air Conditioning) Work	
Plumbing Work as described in RCW 18.106	
Electrical Work as described in RCW 19.28	

[Remainder of Page Left Intentionally Blank; Signature Page Immediately Follows]

Noncollusion. The undersigned declares under penalty of perjury that the bid submitted is a genuine and not a sham or collusive bid, or made in the interest or on behalf of any person or firm not therein named; and further says that the said bidder has not directly or indirectly induced or solicited any bidder on the above work or supplies to put in a sham bid, or any other person or corporation to refrain from bidding; and that said bidder has not in any manner sought by collusion to secure to the bidder an advantage over any other bidder or bidder.

Name of Firm

Date

Signature

Print Name, Title

Mailing Address

City, State, Zip Code

Telephone Number

Email Address

WA State Contractor's License No.

Date of Issue

Expiration Date

Unified Business Identifier (UBI) No.

Employment Security Department No.

Identification of Contractor as a sole proprietor, a partnership, a joint venture, a corporation or another described form of legal entity

END OF SECTION

KNOW ALL MEN BY THESE PRESENTS:

That we, _____, as Principal, and _____, as Surety, are held and firmly bound unto the PORT OF TACOMA as Obligee, in the penal sum of _____ Dollars, for the payment of which the Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigned, jointly and severally, by these present.

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

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

BY _____
Principal

BY _____
Surety

Agent and Address

Note: Bidder may submit Surety's bid bond form, provided it is similar in substance, made out in the name of the Port of Tacoma, and that the agent's name and address appear as specified. Bonds containing riders limiting responsibility for toxic waste or limiting the term of responsibility will be rejected.

END OF SECTION

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS
SECTION 00 43 25 – SUBSTITUTION REQUEST FORM – DURING BIDDING

Project Title _____

Project No. _____

Submitted By: _____

Contract No. _____

Prime/Sub/Supplier: _____

Date: _____

Specification Title: _____

Section No. _____

Description: _____

Paragraph: _____

Page No. _____

Proposed Substitution: _____

Trade Name: _____

Model No.: _____

Manufacturer: _____

Address: _____

Phone No.: _____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted By: _____

Signed By: _____ Firm: _____

Address: _____

Telephone: _____ Email: _____

Supporting Data Attached:

☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ Other _____

ENGINEER'S REVIEW AND ACTION

- ☐ Substitution approved
- ☐ Substitution approved as noted
- ☐ Substitution rejected - Use specified materials.
- ☐ Substitution Request received too late - Use specified materials.

Signed by: _____ Date: _____

The low responsive Bidder shall be required to complete this Responsibility Detail Form as specified in Section 00 21 00 – Instructions to Bidders. **This completed Responsibility Detail Form shall be submitted electronically (pdf) via email to the Contact(s) identified in the Low Responsive Bidder Selection Notification. THIS IS NOT TO BE SUBMITTED WITH A BID.**

Bidder's Company Name: _____

For the below Mandatory Bidder Responsibility Criteria, please check the appropriate box.

1.0 MANDATORY BIDDER RESPONSIBILITY CRITERIA

A. The Bidder shall meet the following mandatory responsibility criteria as described in RCW 39.04.350(1). The Bidder shall be rejected as not responsible if any answer to questions 1 through 5 is "No" or any answer to questions 6 through 8 is "Yes".

1. Does the Bidder have a Certificate of Registration in compliance with RCW 18.27?
☐ Yes ☐ No
2. Does the Bidder have a current Washington State Unified Business Identifier number?
☐ Yes ☐ No
3. Does the Bidder have Industrial Insurance Coverage for the Bidder's employees working in Washington State as required in RCW 51?
☐ Yes ☐ No
4. Does the Bidder have an Employment Security Department number as required in RCW 50? ****Attach*** letter dated within 6 months of bid opening date from publicworks@esd.wa.gov.
☐ Yes ☐ No
5. Does the Bidder have a Washington State Excise Tax Registration number as required in RCW 82?
☐ Yes ☐ No
6. Has the Bidder been disqualified from bidding on any public works project under RCW 39.06.010 or 39.12.065(3)?
☐ Yes ☐ No
7. Has the Bidder violated RCW 39.04.370 more than one time as determined by the Washington State Department of Labor and Industries?
☐ Yes ☐ No
8. Has the Bidder ever been found to be out of compliance with Apprenticeship Utilization requirements of RCW 39.04.320?
☐ Yes ☐ No

If any answer to questions 1 through 5 is "No" or any answer to questions 6 through 8 is "Yes" - STOP HERE and contact the Contract Administrator. The Bidder is not responsible for this Work. Otherwise proceed to 1.1. Provide attached to this completed form documentation to confirm responsibility criteria.

For remaining criteria below, check or fill-out the appropriate box. Based upon the answer provided by the Bidder, the Port may request additional information or seek further explanation. As needed, provide backup documentation for any explanations listed below.

1.1 CONTRACT AND REGULATORY HISTORY

A. The Port will evaluate whether the Bidder's contract and regulatory history demonstrates an acceptable record of past project performance and consistent responsibility. The Bidder shall answer the following questions. The Bidder may be rejected as not responsible if any answer to questions 1 through 5 below is "Yes".

1. Has the Bidder had a contract terminated for cause or default, in the last 5 years?

☐ Yes ☐ No **If YES, explain below.**

2. Has the Bidder required a Surety to take over all, or a portion of, a project to cure or respond to an asserted default or material breach of contract on the part of the Bidder on any public works project, in the last 5 years?

☐ Yes ☐ No **If YES, explain below.**

3. Have the Bidder and major Sub-Bidders been in bankruptcy, reorganization and/or receivership on any public works project, in the last 5 years?

☐ Yes ☐ No **If YES, explain below.**

4. Have the Bidder and major Sub-Bidders been disqualified by any state or local agency from being awarded and/or participating on any public works project, in the last 5 years?

☐ Yes ☐ No **If YES, explain below.**

5. Are the Bidder and major Sub-Bidders currently a party to a formal dispute resolution process with the Port—i.e., a pending mediation, arbitration or litigation.

☐ Yes ☐ No **If YES, explain below.**

1.2 ACCIDENT/INJURY EXPERIENCE

- A. The Port will evaluate the Bidder's accident/injury Experience Modification Factor ("EMF") from the Washington State Department of Labor and Industries to assess whether the Bidder has an acceptable safety record preventing personal injuries on projects.
- B. List the Bidder's accident/injury EMF for the last five (5) years. An experience factor is calculated annually by the Washington State Department of Labor and Industries.

Year	Effective Year	Experience Factor
1		
2		
3		
4		
5		

If the Bidder has received an EMF of greater than 1.0 for any year, explain the cause(s) of the designation and what remedial steps were taken to correct the EMF. The Bidder may be rejected as not responsible if the Bidder's EMF is greater than 1.0 and sufficient remedial steps have not been implemented.

1.3 WORK PERFORMED BY BIDDER

- A. The Bidder shall state the amount of the Contract Work, as an equivalent to the Total Bid Price, excluding taxes, insurance and bonding, the Bidder will execute with its own forces.

_____ %

1.4 PROJECT EXAMPLE SHEETS

- A. As part of completing this Responsibility Detail Form, **submit the following information with the completed Responsibility Detail Form:**
1. Bidder's recent job resume including a list of similar projects performed and contact information for the similar project Owner(s).
 2. Resumes of bidder's proposed project manager and job superintendent.
- B. The Bidder's failure to provide the required project information may result in a determination of the Bidder being declared non-responsible by the Port.
- C. The Bidder shall submit this completed, **SIGNED** Responsibility Detail Form electronically (PDF), with all requested backup documentation, via email to the Contact(s) noted on the Low Responsive Bidder Selection Notification.

PROJECT: _____

PROJECT NO. _____

CONTRACT NO. _____

Responsibility Certification Form

The Low responsive Bidder shall complete the Responsibility Detail Form, attach all documentation and submit to the Port within 24 hours following receipt of the Low, Responsive Bidder Selection Notification. All forms shall be submitted electronically (PDF) via email to the contact(s) listed on the Selection Notice. Note, the same project may be used to demonstrate experience across multiple categories if applicable.

By completing and signing this Responsibility Detail Form, the Bidder is certifying that the information contained within the form, and the backup documentation, and any additional information requested by the Port is true and complete. The Bidder's failure to disclose the required information or the submittal of false or misleading information may result in the rejection of the Bidder's bid, revocation of award or contract termination.

The information provided herein is true and complete.

Signature of Authorized Representative

Date

Print Name and Title

AGREEMENT BETWEEN PORT AND CONTRACTOR

THIS **AGREEMENT** is made and entered into by and between the **PORT OF TACOMA**, a State of Washington municipal corporation, hereinafter designated as the "**Port**," and:

The "Contractor": _____ (Legal Name)
 _____ (Address)
 _____ (Address 2)
 _____ (Phone No.)

The “Project” is:	Pier 4 Phase 2 Reconfiguration	(Title)
	091251 070136	(Project &Contract No)
	1101 Port of Tacoma Road	(Project Address)
	Tacoma, WA. 98421	(Project Address 2)

The “Engineer” is:

Thais Howard, P.E.	(Engineer)
Director of Engineering	(Title)
	(Email)
	(Phone No.)

The “Contractor’s representative” is: _____ (Representative)
 _____ (Title)
 _____ (Email)
 _____ (Phone No.)

BACKGROUND AND REPRESENTATIONS:

The Port has caused Drawings, Specifications, and other Contract Documents to be prepared for the performance of Work on the Project.

The Port publicly solicited bids on the Contract Documents. The Contractor submitted a bid to the Port on the day of, 20 to perform the Work.

The Contractor represents that it has the personnel, experience, qualifications, capabilities, and means to accomplish the Work in strict accordance with the Contract Documents, within the Contract Time and for the Contract Price, and that it and its Subcontractors satisfy the responsibility criteria set forth in the Contract Documents, including any supplemental responsibility criteria.

The Contractor further represents that it has carefully examined and is fully familiar with all provisions of the Contract Documents, including any Addenda, that it has fully satisfied itself as to the nature, location, difficulty, character, quality, and quantity of the Work required by the Contract Documents and the conditions and other matters that may be encountered at or near the Project site(s), or that may affect performance of the Work or the cost or difficulty thereof including all applicable safety and site responsibilities, and that it understands and can satisfy all scheduling and coordination requirements and interim milestones.

AGREEMENT:

The Port and the Contractor agree as follows:

1.0 CONTRACTOR TO FULLY PERFORM THE WORK

The Contractor shall fully execute and complete the entire Work described in the Contract Documents, except to the extent specifically indicated in the Agreement, the General Conditions of the Contract (as well as any Supplemental, Special or other Conditions included in the project manual), the Drawings, the Specifications, and all Addenda issued prior to, and all modifications issued after, execution of the Contract.

2.0 DATE OF COMMENCEMENT

The date of commencement of the Work, which is the date from which the Contract Time is measured, shall be fixed as the date this agreement is executed.

3.0 CONTRACT TIME AND LIQUIDATED DAMAGES

This Contract will have two Substantial Completion milestones; one for the Area 1; and one for Area 2 as described in Section 01 10 00 Summary. The Contractor shall achieve these milestones as set forth in the Contract Documents and Substantial Completion of the Area 1 not later than **540 calendar days** from contract execution; and for Area 2 not later than **690 calendar days** from contract execution, subject to adjustments of this Contract Time as provided in the Contract Documents. The Contractor shall achieve Final Completion of the Work within 30 calendar days of the date on which Substantial Completion is achieved for both milestones.

Provisions for liquidated damages as a reasonable estimate of future loss, as of the date of this Agreement, are included in the Contract Documents. The parties agree that the stated liquidated damages are not penalties individually or cumulatively.

The liquidated damages for failure to achieve Substantial Completion by the prescribed date for Area 1 shall be \$3,000 per calendar day.

The liquidated damages for failure to achieve Substantial Completion by the prescribed date for Area 2 shall be \$3,000 per calendar day. After the prescribed Final Completion date, the liquidated damages for failure to achieve Final Completion shall be \$300 per calendar day.

Liquidated damages assessed by the Port will be deducted from monies due to the Contractor, or from monies that will become due to the Contractor. The liquidated damages, as specified and calculated herein, shall be levied for each and every calendar day that Substantial Completion and/or Final Completion of the work is delayed beyond the prescribed completion dates, or the completion dates modified by the Port for extensions of the contract time.

4.0 CONTRACT PRICE

In accordance with the Contractor's bid dated [], the Port shall pay the Contractor in current funds for the Contractor's performance of the Contract the Contract Price of _____ **dollars (\$)**, subject to additions and deductions as provided in the Contract Documents. State and local sales tax is not included in the Contract Price but will be due and paid by the Port with each progress payment.

5.0 INSURANCE AND BONDS

The Contractor shall purchase and maintain insurance and provide bonds as set forth in the Contract Documents.

This Agreement is entered into as of the execution date written below:

CONTRACTOR

PORT OF TACOMA

By: _____

By: _____

Title: _____

Title: _____

Date _____

Execution
Date _____

END OF SECTION

PERFORMANCE BOND # _____

CONTRACTOR (NAME AND ADDRESS)

SURETY (NAME AND PRINCIPLE PLACE OF BUSINESS)

OWNER (NAME AND ADDRESS)

AGENT OR BROKER (FOR INFORMATION ONLY)

PORT OF TACOMA

P.O. BOX 1837

TACOMA, WA 98401-1837

KNOW ALL MEN BY THESE PRESENTS:

That _____ as Principal, hereinafter called Contractor, and _____ as Surety, hereinafter called Surety, are held and firmly bound unto the Port of Tacoma as Obligee, hereinafter called the Port, in the amount of _____ Dollars (\$_____) for the payment whereof Contractor and Surety bind themselves, their executors, administrators, legal representatives, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS:

Contractor has executed an agreement with the Port dated _____ for _____ a copy of which Contract is by reference made a part hereof (the term "Contract" as used herein to include the aforesaid agreement together with all the Contract Documents, addenda, modifications, all alterations, additions thereto, deletions therefrom and any other document or provision incorporated into the Contract) and is hereinafter referred to as the Contract.

This bond is executed and issued pursuant to the provisions of Chapter 39.08 Revised Code of Washington.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

FURTHER:

- A. Surety hereby waives notice of any alterations, change orders, modifications or extensions of time made by the Port.
- B. Surety recognizes that the Contract includes provisions for additions, deletions and modifications to the work or Contract Time and the amounts payable to the Contractor. Subject to the limitations contained in (A) above, Surety agrees that no such addition, deletion, or modification, or any combination thereof, shall avoid or impair Surety's obligation hereunder.
- C. Whenever Contractor has been declared by the Port to be in default, and the Port has given Surety notice of the Port's determination of such default, Surety shall promptly (in no event more than fifteen (15) days following receipt of such notice) advise the Port of its intended action to:
 1. Remedy the default within fifteen (15) days following its advice to the Port as set forth above, or

2. Assume within fifteen (15) days, following its advice to the Port as set forth above, completion of the Contract in accordance with the Contract Documents and become entitled to payment of the balance of the Contract Sum, or
 3. Pay the Port upon completion of the Contract, in cash, the cost of completion together with all other reasonable costs and expenses incurred by the Port as a result of the Contractor's default, including but not limited to, those reasonable costs and expenses incurred by the Port in its efforts to mitigate its losses, which may include but are not limited to, attorney's fees and efforts to complete the Work prior to the Surety exercising the options available to it as set forth herein.
- D. If the Port shall commence suit and obtain judgment against the Surety for recovery hereunder, then the Surety, in addition to such judgment, shall pay all costs and attorney's fees incurred by the Port in enforcement of its rights hereunder. Venue for any action arising out of or in connection with this bond shall be in Pierce County, Washington.
- E. No right or action shall accrue on this bond to or for the use of any person or corporation other than the Port of Tacoma.

Signed and Sealed the _____ day of _____, 20____.

IMPORTANT: Surety companies executing bonds must have an A.M. Best Rating of A- FSC of (6) or higher, have an underwriting limitation of not less than the Contract Sum, and be authorized to transact business in the State of Washington.

SURETY

CONTRACTOR

Signature

Signature

Printed Name and Title

Printed Name and Title

Power of Attorney attached.

END OF SECTION

LABOR AND MATERIAL PAYMENT BOND # _____

CONTRACTOR (NAME AND ADDRESS)

SURETY (NAME AND PRINCIPLE PLACE OF BUSINESS)

OWNER (NAME AND ADDRESS)

PORT OF TACOMA

P.O. BOX 1837

TACOMA, WA 98401-1837

AGENT OR BROKER (FOR INFORMATION ONLY)

KNOW ALL MEN BY THESE PRESENTS:

That _____ as Principal, hereinafter called Contractor, and _____ as Surety, hereinafter called Surety, are held and firmly bound unto the Port of Tacoma as Obligee, hereinafter called the Port, and all others entitled to recovery hereunder, in the amount of _____ Dollars (\$_____) for the payment whereof Contractor and Surety bind themselves, their executors, administrators, legal representatives, successors and assigns, jointly and severally firmly by these presents.

WHEREAS:

Contractor shall executed an agreement with the Port dated _____ for _____ a copy of which Contract is be reference made a part hereof (the term "Contract" as used herein to include the aforesaid agreement together with all the Contract Documents, addenda, modifications, alterations, additions thereto, deletions therefrom and any other documents or provisions incorporated into the Contract) and is hereinafter referred to as the Contract.

This bond is executed pursuant to the provisions of Chapter 39.08 Revised Code of Washington.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if Contractor shall promptly make payment to all claimants, as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract and shall indemnify and save the Port harmless from all cost and damage by reason of Contractor's default, then this obligation shall be null and void; otherwise it shall remain in full force and effect, subject to the following conditions:

- A. The Surety hereby waives notice of any alterations, change orders, modifications or extensions of time made by the Port.
- B. Surety recognizes that the Contract includes provisions for additions, deletions and modifications to the Work or Contract Time and the amounts payable to the Contractor. Surety agrees that no such addition, deletion, or modification, or any combination thereof, shall avoid or impair Surety's obligation hereunder.

- C. Surety hereby agrees that every person protected under the provisions of RCW 39.08.010 who has not been paid as provided under the Contract and pursuant to RCW 39.08.010, less any amounts withheld pursuant to statute, and less retainage withheld pursuant to RCW 60.28, after the expiration of a period of thirty (30) days after the date on which the completion of the Contract in accordance with RCW 39.08, may sue on this bond, prosecute the suit to final judgment as may be due claimant, and have execution thereon including recovery of reasonable costs and attorney's fees as provided by RCW 39.08. The Port shall not be liable for the payment of any costs or expenses of any such suit.
- D. No suit or action shall be commenced hereunder by any claimant unless claimant shall have given the written notices to the Port, and where required, the Contractor, in accordance with RCW 39.08.030.
- E. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of claims which may be properly filed in accordance with RCW 39.08 whether or not suit is commenced under and against this bond.
- F. If any Claimant shall commence suit and obtain judgment against the Surety for recovery hereunder, then the Surety, in addition to such judgment and attorney fees as provided by RCW 39.08.030, shall also pay such costs and attorney fees as may be incurred by the Port as a result of such suit. Venue for any action arising out of or in connection with this bond shall be in Pierce County, Washington.

Signed and Sealed this _____ day of _____, 20____.

IMPORTANT: Surety companies executing bonds must have an A.M. Best Rating of A- FSC of (6) or higher, have an underwriting limitation of not less than the Contract Sum, and be authorized to transact business in the State of Washington.

SURETY

CONTRACTOR

Signature

Signature

Printed Name and Title

Printed Name and Title

Power of Attorney attached.

END OF SECTION

Bond No. _____

Project Title: _____

Project No.: _____

Contract No. _____

KNOW ALL MEN BY THESE PRESENTS: That we _____,
a corporation existing under and by virtue of the laws of the State of Washington and authorized to do
business in the State of Washington, as Principal, and
_____, a corporation organized and existing under the
laws of the State of _____ and authorized to transact the business of
surety in the State of Washington, as Surety, are jointly and severally held and bound unto the PORT OF
TACOMA, hereinafter called Port, as Obligee, and are similarly held and bound unto the beneficiaries of
the trust fund created by RCW 60.28 as their heirs, executors, administrators, successors and assigns in
the penal sum of _____
(_____) plus 5% of any increases in the contract amount that have occurred or may occur,
due to change orders, increases in the quantities or the addition of any new item of work.

WHEREAS, on the _____ day of _____, the said Principal herein executed Contract No.
_____ with the Port for _____.

WHEREAS, said contract and RCW 60.28 require the Port to withhold from the Principal the sum of
5% from monies earned by the Principal on estimates during the progress of the work, hereinafter
referred to as earned retained funds.

WHEREAS, the Principal has requested that the Port accept a bond in lieu of earned retained funds as
allowed under Chapter 60.28 RCW.

NOW THEREFORE, this obligation is such that the Surety, its successors, and assigns are held and
bound unto the Port and unto all beneficiaries of the trust fund created by RCW 60.28.011(1) in the
aforesaid sum. This bond, including any proceeds therefrom, is subject to all claims and liens and in the
same manner and priority as set forth for retained percentages in Chapter 60.28 RCW. The condition of
this obligation is also that if the Principal shall satisfy all payment obligations to persons who may lawfully
claim under the trust fund created pursuant to Chapter 60.28 RCW, to the Port, and indemnify and hold
the Port harmless from any and all loss, costs, and damages that the Port may sustain by release of said
retainage to Principal, then this obligation shall be null and void, provided the Surety is notified by the
Port that the requirements of RCW 60.28.021 have been satisfied and the obligation is duly released by
the Port.

IT IS HEREBY DECLARED AND AGREED that the Surety shall be liable under this obligation as Principal. The Surety will not be discharged or released from liability for any act, omission or defenses of any kind or nature that would not also discharge the Principal.

IT IS HEREBY FURTHER DECLARED AND AGREED that this obligation shall be binding upon and inure to the benefit of the Principal, the Surety, the Port, the beneficiaries of the trust fund created by Chapter 60.28 Revised Code of Washington (RCW) and their respective heirs, executors, administrators, successors and assigns.

IN WITNESS WHEREOF, said Principal and said Surety have caused these presents to be duly signed and sealed this _____ day of _____, 201__.

By: _____
Principal

Address: _____

City/ST/Zip: _____

Phone: _____

Surety Name _____

By: _____
Attorney-In-Fact

Address: _____

City/ST/Zip: _____

Phone: _____

IMPORTANT: Surety companies executing bonds must have an A.M. Best Rating of A- FSC of (6) or higher, and be authorized to transact business in the State of Washington.

To:	Bank Name, Address, Phone	Escrow Account No:	
		Contract No:	Port fills in
		Project No:	Port fills in
Agency:	Port of Tacoma PO Box 1837 Tacoma, WA 98401-1837	Project Title:	Port fills in

The Undersigned _____, (Contractor Name and Address) hereinafter referred to as the Contractor, has directed the Port of Tacoma, hereinafter referred to as the Port, to deliver to _____ (Name of Bank), hereinafter referred to as "You", its checks for retainage under the Contract which shall be payable to You and the Contractor jointly, and which shall be held and disposed of by You in accordance with the following instructions and upon the terms and conditions hereinafter set forth.

ESCROW INSTRUCTIONS:

1. Checks made payable to You and the Contractor jointly upon delivery to You shall be endorsed by the Contractor and by You and then forwarded for collection by You. The moneys will then be used by You to purchase, as directed by the Contractor, bonds or other securities (hereinafter collectively referred to as "Securities") chosen by the Contractor and approved by the Port. Attached is a list of Securities approved by the Port. Other Securities, except stocks, may be selected by the Contractor, subject to express prior written approval of the Port, in its sole and absolute discretion. The purchase of Securities shall be in a form which shall allow You alone to reconvert such Securities into money if You are required to do so by the Port as provided in Paragraph 4 of this Escrow Agreement.
2. When and as interest on the Securities held by You pursuant to this Agreement accrues and is paid, You shall collect such interest and forward it to the Contractor at its address designated in the first paragraph unless otherwise directed by the Contractor.
3. You are not authorized to deliver to the Contractor all or any part of the checks or moneys received by You or the Securities held by You pursuant to this Agreement (or moneys derived from the sale of such Securities, or the negotiation of the Port's checks) except in accordance with written instructions from the Port's Sr. Contract Administrator. Compliance with such instructions shall relieve You of any further liability related thereto. The estimated final completion date on the Contract underlying this Agreement is _____.
4. In the event the Port orders You to do so in writing, You shall, within ten (10) days of receipt of such order, reconvert into money some or all of the Securities held by You pursuant to this Agreement, as required to satisfy the Port's order, and return such money, together with any other moneys held by You hereunder and required to satisfy the Port's order, to the Port. Consent of Contractor shall not be required for payment to the Port hereunder, and objection or other communication from Contractor shall not prevent, delay, or otherwise affect payment to the Port forthwith in accordance with the Port's order and this Agreement.
5. The Contractor agrees to pay You as compensation for Your services hereunder as follows: Payment of all fees shall be the sole responsibility of the Contractor and shall not be deducted from any checks, moneys, Securities, or other property placed with You or held by you pursuant to this Agreement until and unless the Port directs the release thereof to the Contractor, whereupon You shall be granted a first lien upon such property released and shall be entitled to reimburse Yourself from such property for the entire amount of Your fees as provided for hereinabove. In the event that You

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

6. This Agreement shall not be binding until executed by Contractor and Port, and accepted by You.
7. This instrument contains the entire agreement between You, the Contractor, and the Port with respect to this escrow. There are no terms, obligations, covenants, or conditions regarding this escrow other than those contained herein, and You are not a party to nor bound by any instrument or agreement regarding this escrow other than this Agreement. You shall not be required to take notice of any default or any other matter under the Contract nor be bound by nor required to give notice or demand under the Contract, nor required to take any action whatsoever except as herein expressly provided. You shall not be liable for any loss or damage not caused by Your own negligence or wilful misconduct.
8. The foregoing provisions shall be binding upon the assigns, successors, personal representatives and heirs of the parties hereto.
9. The Contractor's Federal Income Tax Identification number is _____.

The undersigned have read and hereby approve the instructions as given above governing the administration of this escrow and do hereby execute this Agreement this ____ day of _____, 20__.

Contractor:

Port of Tacoma

Signature

Signature

Name/Title

Name/ Port Treasurer or Deputy Treasurer

Date

Date

The above escrow instructions received and accepted this ____ day of _____, 20__.

Bank:

By _____
(Signature of Authorized Bank Officer)

Name: _____
Title: _____

SECURITIES AUTHORIZED BY THE PORT:

1. FDIC insured time deposits and time deposits in commercial banks authorized by the Washington State Public Deposit Protection Commission.
2. Savings account deposits in commercial banks authorized by the Washington State Public Deposit Protection Commission.
3. Bills, certificates, notes or bonds of the United States;
4. Other obligations of the United States or its agencies; and
5. Obligation of any corporation wholly-owned by the government of the United States;

INSTRUCTIONS FOR RETAINAGE ESCROW AGREEMENTS:

Whenever possible, use the Port of Tacoma (Port) approved Escrow Agreement. The Port, at its discretion, may or may not accept an agreement form from another source.

Please return all three (3) originals of the Agreement, with completed contractor and bank information and signatures, and the escrow account number. The Port will review and sign the Agreement and distribute copies. One (1) original will go directly to the Bank, one (1) original will be returned to the Contractor.

Fill in the following on the Escrow Agreement:

- 1) Page 1 – Escrow Account Number
- 2) Page 1 – Name, address, and phone number of the Bank
- 3) Page 2 – Signature, typed/printed name, date, and the title of the Contractor Signatory.
- 4) Page 2 – Signature, typed/printed name, date, and the title of the Authorized Bank Officer signatory.

Do not fill in the date in the paragraph directly following paragraph 9. The Port will fill in this date once the document has been fully executed by the Port.

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS
SECTION 00 63 25 – SUBSTITUTION REQUEST FORM DURING CONSTRUCTION

Project Title _____

Project No. _____

Submitted By: _____

Contract No. _____

Contractor: _____

Date: _____

Specification Title: _____

Section No. _____

Description: _____

Paragraph: _____

Page No. _____

Proposed Substitution: _____

Trade Name: _____

Model No.: _____

Manufacturer: _____

Address: _____

Phone No.: _____

Installer: _____

Address: _____

Phone No.: _____

History:

☐ New product ☐ 1-4 years old ☐ 5-10 years old ☐ More than 10 years old ☐ Other _____

Differences between proposed substitution and specified product: _____

☐ Point-by-point comparative data attached - REQUIRED

Reason for not providing specified item: _____

Similar Installation:

Project: _____ A/E _____

Address: _____

Owner: _____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____

Savings to Port for accepting substitution: \$ _____

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ # of days.

Supporting Data Attached: _____

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS
SECTION 00 63 25 – SUBSTITUTION REQUEST FORM DURING CONSTRUCTION

☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ Other _____

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
 - Same warranty will be furnished for proposed substitution as for specified product.
 - Same maintenance service and source of replacement parts, as applicable, is available.
 - Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
 - Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
 - Proposed substitution does not affect dimensions and functional clearances.
 - Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
 - Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.
-

Submitted By: _____

Signed By: _____ Firm: _____

Address: _____

Telephone: _____ Email: _____

Attachments: _____

A/E's REVIEW AND RECOMMENDATION

- ☐ Approve Substitution
- ☐ Approve Substitution as noted
- ☐ Reject Substitution - Use specified materials.
- ☐ Substitution Request received too late - Use specified materials.

Signed by: _____ Date: _____

ENGINEER'S REVIEW AND ACTION

- ☐ Substitution approved - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures. Prepare Change Order.
- ☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures. Prepare Change Order.
- ☐ Substitution rejected - Use specified materials.

Signed by: _____ Date: _____

END OF SECTION

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ARTICLE 1 THE CONTRACT DOCUMENTS

1.01 General

- A. Contract Documents form the Contract. The Contract Documents are enumerated in the Agreement between the Port and Contractor ("Agreement"). Together, the Contract Documents form the Contract. The Contract represents the entire integrated agreement between the parties and supersedes all prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only in writing and only as set forth in the Contract Documents.
- B. Headings only for convenience. The titles or headings of the sections, divisions, parts, articles, paragraphs, and subparagraphs of the Contract Documents are intended only for convenience.

1.02 Definitions

- A. "Contractor" means the person or entity contracting to perform the Work under these Contract Documents. The term Contractor includes the Contractor's authorized representative for purposes of identifying obligations and responsibilities under the Contract Documents, including the ability to receive notice and direction from the Port.
- B. "Drawings" are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, including plans, elevations, sections, details, and diagrams.
- C. "Engineer" is the Port employee generally tasked with administering the Project on the Port's behalf and the person with overall responsibility for managing, for the Port, the Project scope, budget, and schedule. To the extent empowered, the Engineer may delegate to others at the Port (such as a Project Manager or Inspector) the responsibility for performing delegated responsibilities of the Engineer's under this Contract.
- D. "Port" means the Port of Tacoma. The Port will designate in writing a representative (usually the Engineer) who shall have the authority to act on the Port's behalf related to the Project. The "Port" does not include staff, maintenance or safety workers, or other Port employees or consultants that may contact the Contractor or be present at the Project site.
- E. "Project" is identified in the Agreement and is the total construction to be performed by or through the Port, of which the Work performed under the Contract Documents may be only a part.
- F. "Specifications" are those portions of the Contract Documents that specify the written requirements for materials, equipment, systems, standards and workmanship for the Work and for the performance of related services.
- G. "Subcontractor" means a person or entity that contracts directly with the Contractor to perform any Work under the Contract Documents. "Subcontractor of any tier" includes Subcontractors as well as any other person or entity, including suppliers, that contracts with a Subcontractor or a lower-tier Subcontractor (also referred to as "Sub-subcontractors") to perform any of the Work.
- H. "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all labor, tools, equipment, materials, services and incidentals necessary to complete all obligations under the Contract Documents. The Work may constitute only a part of the Project, and may interface and need to be coordinated with the work of others.

1.03 Intent of the Contract Documents

- A. Intent of Contract Documents. The intent of the Contract Documents is to describe the complete Work and to include all items necessary for the proper execution and completion of the Work by the Contractor.

- B. Contract Documents are complementary. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor is required to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.
- C. No third party contract rights. The Contract Documents shall not create a contractual relationship of any kind (1) between the Port and a Subcontractor of any tier (although the Port does not waive any third-party beneficiary rights it may otherwise have as to Subcontractors of any tier), (2) between the Contractor and the Engineer or other Port employees or consultants, or (3) between any persons or entities other than the Port and Contractor.

1.04 Correlation of the Contract Documents

- A. Precedence. In the event of a conflict or discrepancy between or among the Contract Documents, the conflict or discrepancy will be resolved by the following order of precedence: with an addendum or Change Order having precedence over an earlier document, and computed dimensions having precedence over scaled dimensions and large scale drawings take precedence over small scale drawings:
 - 1. The signed Agreement
 - 2. Supplemental Conditions
 - 3. General Conditions
 - 4. Division 01 General Requirements of Specifications
 - 5. All other Specifications, including all remaining divisions, material and system schedules and attachments, and Drawings
 - 6. All other sections in Division 00 not specifically identified herein by Section.
- B. Inconsistency between or among Contract Documents. If there is any inconsistency between the Drawings, schedules, or Specifications, or any attachments, the Contractor will make an inquiry to the Engineer to determine how to proceed, and, unless otherwise directed, the Contractor will provide the better quality or greater quantity of any work or materials, as reasonably interpreted by the Port, at no change in the Contract Sum or Contract Time. Thus, if Work is shown on Drawings but not contained in Specifications or schedules, or contained in Specifications or schedules but not shown on the Drawings, the Work as shown or contained will be provided at no change in the Contract Sum or Contract Time, according to Specifications or Drawings to be issued by the Port.
- C. Inconsistency with law. In the event of a conflict between the Contract Documents and applicable laws, codes, ordinances, regulations or orders of governmental authorities having jurisdiction over the Work, or in the event of any conflict between such laws, the most stringent requirements govern.
- D. Organization of Contract Documents. The organization of the Specifications and Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of the Work to be performed. The Port assumes no responsibility for the division and proper coordination of Work between particular Subcontractors.
- E. Bid quantities are estimates only. Any "bid quantities" set forth in the Contract Documents are estimates only. The Port does not warrant that the actual amount of Work will correspond to any estimates. The basis of payment will be the actual quantities performed in accordance with the Contract Documents.

1.05 Ownership of the Contract Documents

- A. Port owns all Contract Documents. All Drawings, Specifications, and other Contract Documents furnished to the Contractor are Port property, and the Port retains all intellectual property rights, including copyrights. The Contract Documents are to be used only with respect to the Project.

ARTICLE 2 PORT OF TACOMA

2.01 Authority of the Engineer

- A. Engineer will be Port's representative. The Engineer or the Engineer's designee will be the Port's representative during the Project and will administer the Project on the Port's behalf.
- B. Engineer may enforce all obligations. The Engineer has the authority to enforce all requirements imposed on the Contractor by the Contract Documents.
- C. Only Engineer is agent of Port. Other than the Engineer, no other Port employee or consultant is an agent of the Port, and none are authorized to agree on behalf of the Port to changes in the Contract Sum or Contract Time, nor to waive provisions of the Contract Documents, nor to direct the Contractor to take actions that change the Contract Sum or Contract Time, nor to accept notice of protests or claims on behalf of the Port.

2.02 Administration of the Contract

- A. Port will administer Contract. The Port will provide administration of the Contract through the Engineer or the Engineer's designee. All communications with the Port or its consultants related to the Contract will be through the designated representative.
- B. Port not responsible for means and methods. The Port is not responsible for, and will have no control or charge of, the means, methods, techniques, sequences, or procedures of construction, or for safety precautions or programs incidental thereto, because these are the sole responsibility of the Contractor. If the Port makes any suggestion of means, methods, techniques, sequences or procedures, the Contractor will exercise its independent judgment in deciding whether to adopt the suggestion, except as otherwise provided in the Contract Documents.
- C. Port not responsible for acts or omissions of Contractor or Subcontractors. The Port is not responsible for, and will have no control or charge of, the acts or omissions of the Contractor, Subcontractors of any tier, suppliers, or any of their agents or employees, or any other persons performing a portion of the Work.
- D. Port not responsible for the Work. The Port is not responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The presence of the Engineer or others at the Project site at any time does not relieve the Contractor from its responsibility for non-conforming Work.
- E. Port will have access to the Work. The Port and its representatives will at all times have access to the Work in progress, and the Contractor will provide proper facilities for such access and for inspection.

2.03 Information Provided by the Port

- A. Port to furnish information with reasonable promptness. The Port shall furnish information and services required of the Port by the Contract Documents with reasonable promptness.
- B. Subsurface investigation. The Port may have undertaken a limited investigation of the soil and other subsurface conditions at the Project site for design purposes only. The results of these investigations will be available for the convenience of the Contractor, but they are not Contract Documents. There is no warranty or guarantee, express or implied, that the conditions indicated are representative of those existing at the site or that unforeseen developments may not occur. The Contractor is solely responsible for interpreting the information.

2.04 Contractor Review of Project Information

- A. Contractor to familiarize itself with site and conditions of Work. Prior to executing the Contract, the Contractor shall visit the site, become generally familiar with local conditions under which the Work is to be performed, and correlate personal observations with the requirements of the Contract Documents. By signing the Contract, the Contractor confirms that the Contract Sum is reasonable compensation for the Work; that the Contract Time is adequate; that it has carefully examined the Contract Documents and the Project site; and that it has satisfied itself as to the nature, location, and character of the Work, the labor, materials, equipment, and other items required and all other requirements of the Contract Documents. The Contractor's failure fully to acquaint itself with any such condition does not relieve the Contractor from the responsibility for performing the Work in accordance with the Contract Documents, within the Contract Time, and for the Contract Sum.
- B. Contractor to review Contract Documents. Because the Contract Documents are complementary, the Contractor will, before starting each portion of the Work, carefully study and compare the various Drawings, Specifications, and other Contract Documents, as well as all information furnished by the Port.
- C. Contractor to confirm field conditions. Before starting each portion of the Work the Contractor shall take field measurements of and verify any existing conditions, including all Work in place, and all general reference points; shall observe any conditions at the site affecting the Contractor; and shall carefully compare field measurements, conditions and other information known to the Contractor with the Contract Documents.

2.05 Port's Right to Reject, Stop and/or Carry-Out the Work

- A. Port may reject Work. The Port has the authority but not the obligation to reject work, materials and equipment that is defective or that otherwise does not conform to the Contract Documents, and to decide questions concerning the Contract Documents. However, the failure to so reject or the presence of the Port at the site shall not be construed as assurance that the Work is acceptable or being completed in compliance with the Contract Documents.
- B. Port may stop Work. If the Contractor fails to correct Work that does not comply with the requirements of the Contract Documents, or repeatedly or materially fails to properly carry out the Work, the Port may issue an order to stop all or a portion of the Work until the cause for the order has been eliminated. The Port's right to stop the Work shall not impose a duty on the Port to exercise this right for the benefit of the Contractor or any third party.
- B. Port may carry-out Work. If the Contractor fails to perform the Work properly, fails to perform any provision of this Contract, or fails to maintain the Progress Schedule, or if the Port reasonably concludes that the Work will not be completed in the specified manner or within the Contract Time, then the Port may, after three (3) days' written notice to the Contractor and without prejudice to any other remedy the Port may have, perform itself or have performed any or all of the Work and may deduct the cost thereof from any payment then or later due the Contractor.

2.06 Separate Contractors

- A. Port may engage separate contractors or perform work with its own forces. The Port may contract with other contractors ("Separate Contractor") in connection with the Project or perform work with its own forces. The Contractor shall coordinate and cooperate with any Port forces or Separate Contractors, as applicable. The Contractor shall provide reasonable opportunity for the introduction and storage of materials and the execution of work by others.

- B. Contractor to inspect work of others. If any part of the Contractor's Work depends on the work of the Port or any Separate Contractor, the Contractor shall inspect and promptly report to the Port, in writing, any defects that impact the Contractor. Failure of the Contractor to so inspect and report defects in writing shall constitute an acceptance by Contractor of the work of the Port or Separate Contractor.
- C. Contractor to resolve claims of others. Should the Contractor or any of its Subcontractors of any tier cause damage of any kind, including but not limited to delay, to any Separate Contractor, the Contractor shall promptly and using its best efforts settle or otherwise resolve the dispute with the Separate Contractor. The Contractor shall also promptly remedy damage caused to completed or partially completed construction.

2.07 Officers and Employees of the Port

- A. No personal liability. Officers, employees, and representatives of the Port, including the Commissioners, acting within the scope of their employment, shall not be personally liable to Contractor for any acts or omissions arising out of the Project.

ARTICLE 3 CONTRACTOR'S RESPONSIBILITIES

3.01 Duty to Perform the Entire Work

- A. Contractor must perform entire Work in accordance with Contract Documents. The Contractor shall perform the entire Work required by the Contract in accordance with the Contract Documents. Unless otherwise specifically provided, the Contractor shall provide and pay for all labor, tools, equipment, materials, electricity, power, water, other utilities, transportation and other facilities necessary for the execution and completion of the Work.
- B. Contractor shall be independent contractor. The Contractor shall be and operate as an independent contractor in the performance of the Work. The Contractor is not authorized to enter into any agreements or undertakings for or on behalf of the Port and is not an agent or employee of the Port.

3.02 Observed Errors, Inconsistencies, Omissions or Variances in the Contract Documents

- A. Contractor to notify Port of any discrepancy. The Contractor's obligations to review and carefully study the Contract Documents and field conditions are for the purpose of facilitating coordination and construction. If the Contractor at any time observes that the Contract Documents, including Drawings and Specifications, vary from the conditions of the Project site, are in error, or omit any necessary detail, the Contractor shall promptly notify the Engineer in writing through a Request for Information. Any Work done after such observation, until authorized by the Engineer, shall be at Contractor's risk. The Contractor shall also promptly report to the Engineer any observed error, inconsistency, omission, or variance with applicable laws through a Request for Information. If the Contractor fails either to carefully study and compare the Contract Documents, or to promptly report any observed error, inconsistency, omission, or variance, the Contractor shall assume full responsibility and shall bear all costs, liabilities and damages attributable to the error, inconsistency, omission, or variance.
- B. Requests for Information. The Contractor shall submit Requests for Information concerning the Contract Documents by following the procedure and using such form as the Port may require. The Contractor shall minimize Requests for Information by thoroughly studying the Contract Documents and reviewing all Subcontractor requests. The Contractor shall allow adequate time in its planning and scheduling for a response from the Port to a Request for Information.

- C. Port may provide information to supplement Drawings and Specifications. Minor items of work or detail that are omitted from the Drawings and Specifications but inferable from the information presented and normally provided by accepted good practice shall be provided and/or performed by the Contractor as part of the Contract Sum and within the Contract Time. Similarly, the Engineer may furnish to the Contractor additional Drawings and clarifications, consistent with the Contract Documents, as necessary to detail and illustrate the Work. The Contractor shall conform its Work to such additional Drawings and clarifications at no increase in the Contract Sum or Contract Time.

3.03 Supervision and Responsibility for Subcontractors

- A. Contractor responsible for Work and workers. The Contractor shall have complete control of the means, methods, techniques, sequences or procedures related to the Work, and for all safety precautions or programs. The Contractor shall have complete control over and responsibility for all personnel performing the Work. The Contractor is also responsible for the acts and omissions of the Contractor's principals, employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors of any tier.
- B. Contractor to supervise the Work. The Contractor shall continuously supervise and direct the Work using competent and skilled personnel and the Contractor's best skill and attention.
- C. Contractor to enforce discipline and good order. The Contractor shall enforce strict discipline and good order among all workers on the Project, and shall not employ any unfit person or anyone not skilled in the work to which they are assigned. Incompetent, careless, or negligent workers shall immediately be removed from the Work. The Port may, but is not obligated to, require the Contractor to remove from the Work, at no change in the Contract Sum or Contract Time, anyone whom the Port considers objectionable.

3.04 Materials and Equipment

- A. Material and equipment to be new. All materials and equipment to be incorporated into the Work shall be new unless specifically provided otherwise in the Contract Documents. The Contractor shall, if required in writing by the Port, furnish satisfactory evidence regarding the kind and quality of any materials, identify the source, and warrant compliance with the Contract Documents. The Contractor shall ensure that all materials and equipment are protected, kept dry and stored under cover in a manner to protect such materials and equipment.
- B. Material and equipment shall conform to manufacturer instructions. All materials and equipment shall conform, and shall be applied, installed, used, maintained and conditioned in accordance with, the instructions of the applicable manufacturer, fabricator or processor, unless otherwise specifically provided by the Engineer.

3.05 Contractor Warranties

- A. Work will be of good quality and performed in workmanlike manner. In addition to any specific warranties set forth in the Contract Documents, the Contractor warrants that the Work, including all materials and equipment furnished under the Contract, will be of good quality and new, will be performed in a skillful and workmanlike manner and will conform to the requirements of the Contract Documents. Any Work not conforming to this warranty, including unapproved or unauthorized substitutions, shall be considered defective.
- B. Work will be free from defects. The Contractor warrants that the Work will be free from defects for a period of one (1) year from the date of Substantial Completion of the Project.

- C. Contractor to collect and deliver warranties to Port. The Contractor shall collect and deliver to the Port any written warranties required by the Contract Documents. These warranties shall be obtained and enforced by the Contractor for the benefit of the Port without the necessity of separate assignment. These warranties shall extend to the Port all rights, claims, benefits and interests that the Contractor may have under express or implied warranties or guarantees against a Subcontractor of any tier, supplier or manufacturer for defective or non-conforming Work. Warranty provisions that purport to limit or alter the Port's rights under the Contract Documents or the laws of the State of Washington are null and void.
- D. General requirements. The Contractor is not relieved of its general warranty obligations by the specification of a particular product or procedure in the Contract Documents. Warranties in the Contract Documents shall survive completion, acceptance and final payment.

3.06 Required Wages

- A. Contractor will pay required wages. The Contractor shall pay (and shall ensure that all Subcontractors of any tier pay) all prevailing wages and other wages (such as Davis-Bacon Act wages) applicable to the Project. See Specification Section 00 73 46.
- B. The Contractor shall defend (at Contractor's sole cost, with legal counsel approved by Port), indemnify and hold the Port harmless from all liabilities, obligations, claims, demands, damages, disbursements, lawsuits, losses, fines, penalties, costs and expenses, whether direct or indirect, and including but not limited to attorneys' fees and consultants' fees and other costs and expenses of litigation, from any violation or alleged violation by the Contractor or any Subcontractor of any tier of RCW 39.12 ("Prevailing Wages on Public Works") or Chapter 51 RCW ("Industrial Insurance").

3.07 State and Local Taxes

- A. Contractor will pay taxes on consumables. The Contractor will pay the retail sales tax on all consumables used during performance of the Work and on all items that are not incorporated into the final Work; this tax shall be included in the Contract Sum.
- B. Port will pay taxes on the Contract Sum. The Port will pay state and local retail sales tax on the Contract Sum with each progress payment and on final payment for transmittal by the Contractor to the Washington State Department of Revenue or to the applicable local taxing authority. Rule 170: WAC 458-20-170.
- C. Direct all tax questions to the Department of Revenue. The Contractor should direct all questions concerning taxes on any portion of the Work to the State of Washington Department of Revenue or to the local taxing authority.
- D. State Sales Tax – Rule 171: WAC 458-20-171. For work performed related to building, repairing, or improving streets, roads, etc., which are owned by a municipal corporation, or political subdivision of the state, or by the United States, and which are used, primarily, for foot or vehicular traffic, the Contractor shall include Washington State Retail Sales Taxes in the various schedule prices, or other contract amounts, including those that the Contractor pays on the purchase of materials, equipment, or supplies used or consumed in doing the Work.
 - 1. The bid form will indicate which bid items are subject to Rule 171. Any such identification by the Port is not binding upon the Department of Revenue.

3.08 Permits, Licenses, Fees, and Royalties

- A. Contractor to provide and pay for permits unless otherwise specified. Unless otherwise specified, the Contractor shall procure and pay for all permits, licenses, and governmental inspection fees necessary or incidental to the performance of the Work. All costs related to these permits, licenses, and inspections shall be included in the Contract Sum. Any action taken by the Port to assist the Contractor in obtaining permits or licenses shall not relieve the Contractor of its sole responsibility to obtain and pay for permits, licenses, and inspections as part of the Contract Sum.
- B. Contractor's obligations when permit must be in Port's name. When applicable law or agency requires a permit to be issued to a public agency, the Port will support the Contractor's request for the permit and accept the permit in the Port's name, if:
 - 1. The Contractor takes all necessary steps required for the permit to be issued;
 - 2. The permit applies to Work performed in connection with the Project; and
 - 3. The Contractor agrees in writing to abide by all requirements of the permit and to defend and hold harmless the Port from any liability in connection with the permit.
- C. Contractor to pay royalties. The Contractor shall pay all royalties and license fees required for the Work unless otherwise specified in the Contract Documents.

3.09 Safety

- A. Contractor solely responsible for safety. The Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work and the performance of the Contract.
- B. Port not responsible for safety. The Port may identify safety concerns to the Contractor. However, no action or inaction of the Port or any third party relating to safety will: (1) relieve the Contractor of its sole and complete responsibility for safety and sole liability for any consequences; (2) impose any obligation on the Port or a third party to inspect or review the Contractor's safety program or precautions; (3) impose any continuing obligation on the Port or a third party to ensure the Contractor performs the Work safely; or (4) affect the Contractor's responsibility for the protection of property, workers, and the general public.
- C. Contractor to maintain a safe Work site. The Project site may be occupied during performance of the Work. The safety of these site occupants is of paramount importance to the Port. The Contractor shall maintain the Work site and perform the Work in a safe manner and in accordance with the Washington Industrial Safety and Health Act (WISHA) and all other applicable safety laws, rules, and regulations. This requirement shall apply continuously and not be limited to working hours.
- D. Contractor to protect Work site and adjacent property until Final Completion. The Contractor shall continuously protect the Work and adjacent property from damage. At all times until Final Completion, the Contractor shall be responsible for and protect from damage, weather, deterioration, theft, and vandalism the Work and all materials, equipment, tools, and other items incorporated or to be incorporated in the Work, and shall repair any damage, injury or loss.

3.10 Correction of Work

- A. Contractor to correct defective Work. The Contractor shall, at no cost to the Port, promptly correct Work that is defective or that otherwise fails to conform to the requirements of the Contract Documents. Such Work shall be corrected, whether before or after Substantial Completion, and even if it was previously inspected or observed by the Port.

- B. One-year correction period. The Contractor shall correct all defects in the Work appearing within one (1) year of Substantial Completion or within any longer period prescribed by law or by the Contract Documents. The Contractor shall initiate remedial action within fourteen (14) days of receipt of notice from the Port and shall complete remedial work within a reasonable time. Work corrected by the Contractor shall be subject to the provisions of this Section 3.10 for an additional one-year period following the Port's acceptance of the corrected Work.
- C. Contractor responsible for defects and failures to correct. The Contractor shall be responsible for any expenses incurred by the Port resulting from defects in the Work. If the Contractor refuses or neglects to correct the defects or does not timely accomplish corrections, the Port may correct the Work and charge the Contractor the cost of the corrections. If damage or loss of service may result from a delay in correction, the corrections may be made by the Port and reimbursed by the Contractor.
- D. Port may accept defective work. The Port may, at its sole option, elect to retain defective or nonconforming Work. In such a case, the Port shall reduce the Contract Sum by a reasonable amount to account for the defect or non-conformance.
- E. No period of limitation established. Nothing contained in this Section 3.10 establishes a period of limitation with respect to any obligations under the Contract Documents or law. The establishment of the one (1) year correction period relates only to the specific obligation of the Contractor to correct defective or non-conforming Work.

3.11 Uncovering of Work

- A. Contractor to uncover work covered prior to inspection. If any portion of the Work is covered prior to inspection and approval, the Contractor shall, at its expense, uncover or remove the Work for inspection by the Port or others, and replace the Work to the standard required by the Contract Documents.
- B. Contractor to uncover work at Port's request. After initial inspection and observation, the Port may order a reexamination of Work, and the Work must be uncovered by the Contractor. If the uncovered Work complies with the Contract Documents, the Port shall pay the cost of reexamination and replacement. If the Work is found not to comply with the Contract Documents, the Contractor shall pay the cost of replacement unless the Contractor demonstrates that it did not cause the defect in the Work.

3.12 Relocation of Utilities

- A. Contractor should assume underground utilities are in approximate locations. The Contractor should assume that the locations of any underground or hidden utilities, underground tanks, and plumbing or electrical runs indicated in surveys or the Contract Documents are shown in approximate locations. The accuracy of this information is not guaranteed by the Port and shall be verified by the Contractor. The Contractor shall comply with RCW 19.122.030 and utilize a utility locator service to locate utilities on Port property. The Contractor shall bear the risk of loss if any of its Work directly or indirectly damages or interrupts any utility service or causes or contributes to damages of any nature.
- B. Utility relocation or removal. Where relocation or removal of utilities is necessary or required, it shall be performed at the Contractor's sole expense, unless the Contract Documents specify otherwise. If a utility owner is identified as being responsible for relocating or removing utilities, the work will be accomplished at the utility owner's convenience, either during or in advance of construction. Unless otherwise specified, it shall be the Contractor's sole responsibility to coordinate, schedule, and pay for work performed by a utility owner.
- C. Contractor to notify Port of unknown utilities. If the Contractor discovers the presence of any unknown utilities, it shall immediately notify the Engineer in writing.

3.13 Labor

- A. Contractor responsible for labor peace. The Contractor is responsible for labor peace relating to the Work and shall cooperate in maintaining Project-wide labor harmony. The Contractor shall use its best efforts as an experienced contractor to adopt and implement policies and practices designed to avoid work stoppages, slowdowns, disputes or strikes.
- B. Contractor to minimize impact of labor disputes. The Contractor will take all necessary steps to prevent labor disputes from disrupting or otherwise interfering with access to Port property. If a labor dispute disrupts the progress of the Work or interferes with access, the Contractor shall promptly and expeditiously take all necessary action to eliminate or minimize the disruption or interference.

3.14 Indemnification

- A. Duty to defend, indemnify, and hold harmless. To the fullest extent permitted by law and subject to this Section 3.14, the Contractor shall defend (at the Contractor's sole cost, with legal counsel approved by Port), indemnify and hold harmless the Port, including its Commission, officers, managers, employees (including the Engineer), any consultants, and the agents and employees, successors and assigns of any of them (the "Indemnified Parties") from and against claims, damages, lawsuits, losses (including loss of use), disbursements, liabilities, obligations, fines, penalties, costs and expenses, whether direct and indirect or consequential, including but not limited to consultants' fees, and attorneys' fees incurred on such claims and in proving the right to indemnification ("Claims"), arising out of or resulting from the acts or omissions of the Contractor, a Subcontractor of any tier, their agents and anyone directly or indirectly employed by any of them or anyone for whose acts they may be liable (individually and collectively, the "Indemnitor").
- B. Duty to defend, indemnify, and hold harmless for sole negligence. The Contractor will fully defend, indemnify, and hold harmless the Indemnified Parties for the sole negligence or willful misconduct of the Indemnitor.
- C. Duty to defend, indemnify, and hold harmless for concurrent negligence. Where Claims arise from the concurrent negligence of (1) the Port and (2) the Indemnitor, the Contractor's obligations to indemnify and defend the Indemnified Parties under this Section 3.14 shall be effective only to the extent of the Indemnitor's negligence.
- D. Duty to indemnify not limited by workers' compensation or similar employee benefit acts. In claims against any of the Indemnified Parties by an employee of the Contractor, a Subcontractor of any tier, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under this Section 3.14 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable under workers' compensation acts, disability benefit acts or other employee benefit acts. After mutual negotiation of the parties, the Contractor waives immunity as to the Indemnified Parties under Title 51 RCW, "Industrial Insurance."
- E. Intellectual property indemnification. The Contractor will be liable for and shall defend (at the Contractor's sole cost, with legal counsel approved by Port) indemnify and hold the Indemnified Parties harmless for Claims for infringement by the Contractor of copyrights or patent rights arising out of or relating to the Project.
- F. Labor peace indemnification. If the Contractor fails to satisfy its labor peace obligations under the Contract, the Contractor will be liable for and shall defend (at the Contractor's sole cost, with legal counsel approved by Port), indemnify and hold harmless the Indemnified Parties for Claims brought against the Port by third parties (including but not limited to lessees, tenants, contractors, customers, licensees and invitees of the Port) for injunctive relief or monetary loss.

- G. Joinder. The Contractor agrees to being added by the Port as a party to any arbitration or litigation with third parties in which the Port alleges indemnification or seeks contribution from the Indemnitor. The Contractor shall cause each of its Subcontractors of any tier to similarly stipulate in their subcontracts; in the event any does not, the Contractor shall be liable in place of such Subcontractor(s) of any tier.
- H. Other. To the extent that any portion of this Section 3.14 is stricken by a court or arbitrator for any reason, all remaining provisions shall retain their vitality and effect. The obligations of the Contractor under this Section 3.14 shall not be construed to negate, abridge, or otherwise reduce any other right or obligations of indemnity which would otherwise exist. To the extent the wording of this Section 3.14 would reduce or eliminate an available insurance coverage, it shall be considered modified to the extent necessary so that the insurance coverage is not affected. This Section 3.14 shall survive completion, acceptance, final payment and termination of the Contract.

3.15 Waiver of Consequential Damages

- A. Mutual waiver of consequential damages. The Contractor and Port waive claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes but is not limited to: (1) damages incurred by the Port for rental expenses, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and (2) damages incurred by the Contractor for principal and home office overhead and expenses including but not limited to the compensation of personnel stationed there, for losses of financing, business and reputation, for losses on other projects, for loss of profit, and for interest or financing costs. This mutual waiver includes but is not limited to all consequential damages due to either party's termination.
- B. Limitation. Nothing contained in this Section 3.15, however, shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents, to preclude damages specified in the Agreement or to affect the Contractor's obligation to indemnify the Port for direct, indirect or consequential damages alleged by a third party.

ARTICLE 4

SUBCONTRACTORS AND SUPPLIERS

4.01 Responsibility for Actions of Subcontractors and Suppliers.

- A. Contractor responsible for Subcontractors. The Contractor is fully responsible to the Port for the acts and omissions of its Subcontractors of any tier and all persons either directly or indirectly employed by the Contractor or its Subcontractors.

4.02 Award of Contracts to Subcontractors and Suppliers

- A. Contractor to provide proposed Subcontractor information. The Contractor, within ten (10) days after the Port's notice of award of the Contract, shall provide to the Engineer with the names of the persons or entities proposed to perform each of the principal portions of the Work (i.e., either a Subcontractor listed in a bid or proposal or a Subcontractor performing Work valued at least ten percent (10%) of the Contract Sum) and the proprietary names and the suppliers of the principal items or systems of materials and equipment proposed for the Work. No progress payment will become due until after this information has been furnished.
- B. Port to respond promptly with objections. The Port may respond promptly to the Contractor in writing stating (1) whether the Port has reasonable objection to any proposed person or entity or (2) whether the Port requires additional time for review. If the Port makes a reasonable objection, the Contractor shall replace the Subcontractor with no increase to the Contract Sum or Contract Time. Such a replacement shall not relieve the Contractor of its responsibility for the performance of the Work and compliance with all of the requirements of the Contract within the Contract Sum and Contract Time.

- C. Reasonable objection defined. "Reasonable objection" as used in this Section 4.02 includes but is not limited to: (1) a proposed Subcontractor of any tier different from the entity listed with the bid, (2) lack of "responsibility" of the proposed Subcontractor, as defined by Washington law and the Bidding Documents, or lack of qualification or responsibility of the proposed Subcontractor based on the Contract or Bidding Documents, or (3) failure of the Subcontractor to perform satisfactorily in the Port's opinion (such as causing a material delay or submitting a claim that the Port considers inappropriate) on one or more projects for the Port within five (5) years of the bid date.
- D. No substitution allowed without permission. The Contractor shall not substitute a Subcontractor, person, or organization without the Engineer's written consent.

4.03 Subcontractor and Supplier Relations

- A. Contractor to schedule, supervise, and coordinate Subcontractors. The Contractor shall schedule, supervise and coordinate the operations of all Subcontractors of any tier, including suppliers. The Contractor shall ensure that appropriate Subcontractors coordinate the Work of lower-tier Subcontractors.
- B. Subcontractors to be bound to Contract Documents. By appropriate agreement, the Contractor shall require each Subcontractor and supplier to be bound to the terms of the Contract Documents and to assume toward the Contractor, to the extent of their Work, all of the obligations that the Contractor assumes toward the Port under the Contract Documents. Each subcontract shall preserve and protect the rights of the Port and shall allow to the Subcontractor, unless specifically provided in the subcontract, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Port. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with lower-tier Subcontractors.
- C. Contractor to correct deficiencies in Subcontractor performance. When a portion of the Work subcontracted by the Contractor is not being prosecuted in accordance with the Contract Documents, or if such subcontracted Work is otherwise being performed in an unsatisfactory manner in the Port's opinion, the Contractor shall, on its own initiative or upon the written request of the Port, take immediate steps to correct the deficiency or remove the non-performing party from the Project. The Contractor shall replace inadequately performing Subcontractors upon request of the Port at no change in the Contract Sum or Contract Time.
- E. Contractor to provide subcontracts. Upon request, the Contractor will provide the Port copies of written agreements between the Contractor and any Subcontractor.

ARTICLE 5 WORKFORCE AND NON-DISCRIMINATION REQUIREMENTS

5.01 Compliance with Non-Discrimination Laws

- A. Contractor to comply with non-discrimination laws. The Contractor shall fully comply with all applicable laws, regulations, and ordinances pertaining to non-discrimination.

5.02 Small Business Enterprise Participation.

- A. Small business participation encouraged. The Port's policy is to encourage the Contractor to solicit and document participation, and to provide and promote the maximum lawful, practicable opportunity for increased participation, by small business enterprises.

ARTICLE 6

CONTRACT TIME AND COMPLETION

6.01 Contract Time

- A. Contract Time is measured from Contract execution. Unless otherwise provided in the Agreement, the Contract Time is the period of time, including authorized adjustments, specified in the Contract Documents from the date the Contract is executed to the date Substantial Completion of the Work is achieved.
- B. Commencement of the Work. The Contractor shall begin Work in accordance with the notice of award and the notice to proceed and shall complete all Work within the Contract Time. When the Contractor's signed Agreement, required insurance certificate with endorsements, bonds and other submittals required by the notice of award have been accepted by the Port, the Port will execute the Contract and, following receipt of other required pre-work submittals, will issue a notice to proceed to allow the Contractor to mobilize and commence physical Work at the Project site, as further described in these contract documents. No Work at the Project site may commence until the Port issues a notice to proceed.
- C. Contractor shall achieve specified completion dates. The Contractor shall achieve Substantial Completion within the Contract Time and shall achieve Final Completion within the time period thereafter stated in the Contract Documents.
- D. Time is of the essence. Time limits stated in the Contract Documents, including any interim milestones, are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

6.02 Progress and Completion

- A. Contractor to maintain schedule. The Contractor's sequence and method of operations, application of effort, and work force shall at all times be created and implemented to ensure the orderly, expeditious, and timely completion of the Work and performance of the Contract. The Contractor shall furnish sufficient forces and shall work such hours, including extra shifts, overtime operations and weekend and holiday work as may be necessary to ensure completion of the Work within the Contract Time and the approved Progress Schedule.
- B. Contractor to take necessary steps to meet schedule. If the Contractor fails substantially to perform in a timely manner in accordance with the Contract Documents and, through the fault of the Contractor or Subcontractor(s) of any tier, fails to meet the Progress Schedule, the Contractor shall take such steps as may be necessary to immediately improve its progress by increasing the number of workers, shifts, overtime operations or days of work, or by other means and methods, all without additional cost to the Port. If the Contractor believes that any action or inaction of the Port constitutes acceleration, the Contractor shall immediately notify the Port in writing and shall not accelerate the Work until the Port either directs the acceleration in writing or denies the constructive acceleration.
- C. Liquidated damages not exclusive. Any provisions in the Contract Documents for liquidated damages shall not preclude other damages due to breaches of Contract of the Contractor.

6.03 Substantial Completion

- A. Substantial Completion defined. Substantial Completion is the stage in the progress of the Work, or portion or phase thereof, when the Work or designated portion is sufficiently complete in accordance with the Contract Documents so that the Port can fully occupy or utilize the Work, or the designated portion thereof, for its intended use, all requirements in the Contract Documents for Substantial Completion have been achieved, and all required documentation has been properly submitted to the Port in accordance with the Contract Documents. All Work other than incidental corrective or punch list Work and final cleaning must be completed. The fact that the Port may occupy the Work or a designated portion thereof does not indicate that Substantial Completion has occurred or that the Work is acceptable in whole or in part.
- B. Work not Substantially Complete unless Final Completion attainable. The Work is not Substantially Complete unless the Port reasonably judges that the Work can achieve Final Completion within the period of time specified in the Contract Documents.
- C. Notice of Substantial Completion. When the Work or designated portion has achieved Substantial Completion, the Port will provide a notice to establish the date of Substantial Completion. The notice shall establish responsibilities of the Port and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all remaining Work. If the notice of Substantial Completion does not so state, all responsibility for the foregoing items shall remain with the Contractor until Final Completion.

6.04 Completion of Punch List

- A. Contractor shall complete punch list items prior to Final Completion. The Contractor shall cause punch list items to be completed prior to Final Completion. If, after Substantial Completion, the Contractor does not expeditiously proceed to correct punch list items or if the Port considers that the punch list items are unlikely to be completed prior to the date established for Final Completion (or such other period of time as is specified in the Contract Documents), the Port may, upon seven (7) days' written notice to the Contractor, take over and perform some or all of the punch list items. The Port may also take over and complete any portion of the Work at any time following Substantial Completion and deduct the actual cost of performing the Work (including direct and indirect costs) from the Contract Sum. The Port's rights under this Section 6.04 are not obligations and shall not relieve the Contractor of its responsibilities under any other provisions of the Contract Documents.

6.05 Final Completion

- A. Final Completion. Upon receipt of written notice from the Contractor that all punch list items and other Contract requirements are completed, the Contractor will notify the Port, and the Port will perform a final inspection. If the Port determines that some or all of the punch list items have not been addressed, the Contractor shall be responsible to the Port for all costs, including re-inspection fees, for any subsequent reviews to determine completion of the punch list. When the Port determines that all punch list items have been satisfactorily addressed, that the Work is acceptable under the Contract Documents and that the Work has fully been performed, the Port will promptly notify the Contractor of Final Completion.
- B. Contractor responsible for costs if Final Completion is not timely achieved. In addition to any liquidated damages, the Contractor is liable for, and the Port may deduct from any amounts due the Contractor, all costs incurred by the Port for services performed after the contractual date of Final Completion, whether or not those services would have been performed prior to that date had Final Completion been timely achieved.
- C. Final Completion submittals. The Port is not obligated to accept the Project as complete until the Contractor has submitted all required submittals to the Port.

- D. Contractor responsible for the Work until Final Completion. The Contractor shall assume the sole risk of loss and responsibility for all Work under the Contract, and all materials to be incorporated in the Work, whether in storage or at the Project site, until Final Completion. Damage from any cause to either permanent or temporary Work, utilities, materials, equipment, existing structures, the site, or other property owned by the Port or others, shall be repaired by the Contractor to the reasonable satisfaction of the Port at no change in the Contract Sum.

6.06 Final Acceptance

- A. Final Acceptance. Final Acceptance is the formal action of the Port accepting the Project as complete. Public notification of Final Acceptance will be posted on the Port's external website (<http://www.portoftacoma.com/final-acceptance>).
- B. Final Acceptance not an acceptance of defective Work. Final Acceptance shall not constitute acceptance by the Port of unauthorized or defective Work, and the Port shall not be prevented from requiring the Contractor to remove, replace, repair, or dispose of unauthorized or defective Work or recovering damages due to the same.
- C. Completion of Work under RCW 60.28. Pursuant to RCW 60.28, "Lien for Labor, Materials, Taxes on Public Works," completion of the Contract Work shall occur upon Final Acceptance.

6.07 Port's Right to Use the Premises

- A. Port has right to use and occupy Work. The Port reserves the right to occupy or use any part of the Work before or after Substantial Completion of some or all of the Work without relieving the Contractor of any of its obligations under the Contract. Such occupancy or use shall not constitute acceptance by the Port of any of the Work, and shall not cause any insurance to be canceled or lapse.
- B. No compensation due if Port elects to use and occupy Work. No additional compensation shall be due to the Contractor as a result of the Port's use or occupancy of the Work or a designated portion.

ARTICLE 7 PAYMENT

7.01 All Payments Subject to Applicable Laws and Schedule of Values

- A. Payment of the Contract Sum. The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Port to the Contractor for performance of the Work under the Contract Documents. Payments made to the Contractor are subject to all laws applicable to the Port and the Contractor. Payment of the Contract Sum constitutes full compensation to the Contractor for performance of the Work, including all risk, loss, damages, or expense of whatever character arising out of the nature or prosecution of the Work. The Port is not obligated to pay for extra work or materials furnished without prior written approval of the Port.
- B. Schedule of Values. All payments will be based upon an approved Schedule of Values. Prior to submitting its first Application for Payment, the Contractor shall submit a Schedule of Values to the Port allocating the entire Contract Sum to the various portions of the Work. The Schedule of Values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Port may require. This schedule, unless objected to by the Port, shall be used as a basis for reviewing the Contractor's applications for payment.

7.02 Applications for Payment

- A. Applications for Payment. Progress payments will be made monthly for Work duly certified, approved by the Engineer, and performed (based on the Schedule of Values and actual quantities of Work performed) during the calendar month preceding the Application for Payment. These amounts are paid in trust to the Contractor for distribution to Subcontractors to the extent and in accordance with the approved Application for Payment.

7.03 Progress Payments

- A. Progress payments. Following receipt of a complete Application for Payment, the Engineer will either authorize payment or indicate in writing to the Contractor the specific reasons why the payment request is being denied, in whole or in part, and the remedial action the Contractor must take to receive the withheld amount. After a complete Application for Payment has been received and approved by the Port, payment will be made within thirty (30) days. Any payments made by, or through, or following receipt of payment from third parties will be made in accordance with the third party's policies and procedures.
- B. Port may withhold payment. The Port may withhold payment in whole or in part as provided in the Contract Documents or to the extent reasonably necessary to protect the Port from loss or potential loss for which the Contractor is responsible, including loss resulting from the Contractor's acts and omissions.

7.04 Payment by Contractor to Subcontractors

- A. Payment to Subcontractors. With each Application for Payment, the Contractor shall provide a list of Subcontractors to be paid by the Contractor. No payment request shall include amounts the Contractor does not intend to pay to a Subcontractor because of a dispute or other reason. If, however, after submitting an Application for Payment but before paying a Subcontractor, the Contractor discovers that part or all of a payment otherwise due to the Subcontractor is subject to withholding from the Subcontractor under the subcontract (such as for unsatisfactory performance or non-payment of lower-tier Subcontractors), the Contractor may withhold the amount as allowed under the subcontract, but it shall give the Subcontractor and the Port written notice of the remedial actions that must be taken and pay the Subcontractor within eight (8) working days after the Subcontractor satisfactorily completes the remedial action identified in the notice.
- B. Payment certification to be provided upon request. The Contractor shall provide with each Application for Payment a certification signed by Contractor attesting that all payments by the Contractor to Subcontractors from the last Application for Payment were made within ten (10) days of the Contractor's receipt of payment. The certification will also attest that the Contractor will make payment to Subcontractors for the current Application for Payment within ten (10) days of receipt of payment from the Port.

7.05 Final Payment

- A. Final payment. Final applications for payment are due within seven (7) days following Final Completion. Final payment of the unpaid balance of the Contract Sum, except retainage, will be made following Final Completion and within thirty (30) days of the Contractor's submission of an approved final Application for Payment.

- B. Releases required for final payment. The final payment shall not become due until the Contractor delivers to the Port a complete release of all liens arising out of the Contract, as well as an affidavit stating that, to the best of Contractor's knowledge, its release includes all labor and materials for which a lien could be filed. If a Subcontractor of any tier refuses to furnish a release or waiver required by the Port, the Port may (a) retain in the fund, account, or escrow funds in such amount as to defray the cost of foreclosing the liens of such claims and to pay attorneys' fees, the total of which shall be no less than 150% of the claimed amount, or (b) accept a bond from the Contractor, satisfactory to the Port, to indemnify the Port against the lien. If any such lien remains unsatisfied after all payments from the retainage are made, the Contractor shall refund to the Port all moneys that the Port may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.
- C. Contractor to hold Port harmless from liens. The Contractor shall defend (at the Contractor's sole cost, with legal counsel approved by Port), indemnify, and hold harmless the Port from any liens, claims, demands, lawsuits, losses, damages, disbursements, liabilities, obligations, fines, penalties, costs and expenses, whether direct, indirect, including but not limited to attorneys' fees and consultants' fees and other costs and expenses, except to the extent a lien has been filed because of the failure of the Port to make a contractually required payment.

7.06 Retainage

- A. Retainage to be withheld. In accordance with RCW 60.28, a sum equal to five percent (5%) of each approved Application for Payment shall be retained. Prior to submitting its first Application for Payment, the Contractor shall exercise one of the options listed below:
1. Retained percentages will be retained by the Port in a fund; or
 2. Deposited by the Port in an interest-bearing account in a bank, mutual savings bank or savings and loan association; or
 3. Placed in escrow with a bank or trust company; or
 4. If the Contractor provides a bond in place of retainage, it shall be in an amount equal to 5% of the Contract Sum plus Change Orders. The retainage bond shall be based on the form furnished in Section 00 61 23 or otherwise acceptable to the Port and duly completed and signed by a licensed surety or sureties registered with the Washington State Insurance Commissioner and on the currently authorized insurance list published by the Washington State Insurance Commissioner. The surety or sureties must be rated at least A minus, FSC(6), or higher by A.M. Best Rating Guide and be authorized by the Federal Department of the Treasury. Attorneys-in-fact who sign the retainage bond must file with each bond a certified and effective Power of Attorney statement.
- B. Contractor may withhold retainage from Subcontractors. The Contractor or a Subcontractor may withhold not more than five percent (5%) retainage from the monies earned by any Subcontractor or lower-tier Subcontractor, provided that the Contractor pays interest to the Subcontractor at the same interest rate it receives from its reserved funds. If requested by the Port, the Contractor shall specify the amount of retainage and interest due a Subcontractor.

- C. Release of retainage. Retainage will be withheld and applied by the Port in a manner required by RCW 60.28 and released in accordance with the Contract Documents and statutory requirements. Release of the retainage will be processed in the ordinary course of business within sixty (60) days following Final Acceptance of the Work by the Port provided that no notice of lien has been given as provided in RCW 60.28, that no claims have been brought to the attention of the Port, that the Port has no claims under this Contract, and that release of retention has been duly authorized by the State. The following items must also be obtained prior to release of retainage: pursuant to RCW 60.28, a certificate from the Department of Revenue; pursuant to RCW 50.24, a certificate from the Department of Employment Security; and appropriate information from the Department of Labor and Industries including approved affidavits of wages paid for the Contractor and each subcontractor.

7.07 Disputed Amounts

- A. Disputed amounts. If the Contractor believes it is entitled to payment for Work performed during the prior calendar month in addition to the agreed-upon amount, the Contractor may submit to the Port along with the approved Application for Payment, a separate written payment request specifying the exact additional amount claimed to be due, the category in the Schedule of Values to which the payment would apply, the specific Work for which additional payment is sought, and an explanation of why the Contractor believes additional payment is due.

7.08 Effect of Payment

- A. Payment does not relieve Contractor of obligations. Payment to the Contractor of progress payments or final payment does not relieve the Contractor from its responsibility for the Work or its responsibility to repair, replace, or otherwise make good defective Work, materials or equipment. Likewise, the making of a payment does not constitute a waiver of the Port's right to reject defective or non-conforming Work, materials, or equipment (even though they are covered by the payment), nor is it a waiver of any other rights of the Port.
- B. Acceptance of final payment waives claims. Acceptance of final payment by the Contractor, a Subcontractor of any tier or a supplier shall constitute a waiver of claims except those previously made in writing and identified as unsettled in Contractor's final Application for Payment.
- C. Execution of Change Order waives claims. The execution of a Change Order shall constitute a waiver of claims by the Contractor arising out of the Work to be performed or deleted pursuant to the Change Order, except as specifically described in the Change Order.

7.09 Liens

- A. Contractor to discharge liens. The Contractor shall promptly pay (and secure the discharge of any liens asserted by) all persons properly furnishing labor, equipment, materials or other items in connection with the performance of the Work (including, but not limited to, any Subcontractors of any tier).

ARTICLE 8

CHANGES IN THE WORK

8.01 Changes in the Work

- A. Changes in the Work authorized. Without invalidating the Contract and without notice to the Contractor's surety, the Port may authorize changes in the Work after execution of the Contract, including changes in the Contract Sum or Contract Time. Changes shall occur solely by Change Order, Unilateral Change Directive, or Minor Change in Work. All changes in the Work are effective immediately and the Contractor shall proceed promptly to perform the change, unless otherwise provided in the Change Order or Directive.

B. Changes in the Work Defined.

1. A **Change Order** is a written instrument signed by the Port and Contractor stating their agreement to a change in the Work and the adjustment, if any, in the Contract Sum and/or Contract Time.
2. A **Unilateral Change Directive** is a written instrument issued by the Port to transmit new or revised Drawings, issue additions or modifications to the Contract, furnish other direction and documents adjustment, if any, to the Contract Sum and/or Contract Time. A Unilateral Change Directive is signed only by the Port, without requiring the consent or signature of the Contractor.
3. A **Minor Change in the Work** is a written order from the Port directing a change that does not involve an adjustment to the Contract Sum or the Contract Time.

C. Request for Proposal: At any time, the Port may issue a Proposal Request directing the Contractor to propose a change to the Contract Sum and/or Contract Time, if any, based on a proposed change in the Work. The Contractor shall submit a responsive Change Order proposal as soon as possible and no later than fourteen (14) days after receipt in which the Contractor specifies in good faith the extent to which the Contract Sum and/or Contract Time would change. All cost components shall be limited to the manner described in Section 8.02(B). If the Contractor fails to timely respond to a Proposal Request, the Port may issue the change as a Unilateral Change Directive.

1. Fixed price method is default for Contractor Change Order proposal. When the Port has requested that the Contractor submit a Change Order proposal, the Port may specify the basis on which the Contract Sum will be adjusted by the Contractor. The Engineer's preference, unless otherwise indicated, is for changes in the Work to be priced using Lump Sums or Unit Prices or on a time and material (Force Account) basis if unit pricing or lump sums cannot be negotiated or determined. In all instances, however, proposed changes shall include a not-to-exceed price for the change and shall be itemized for evaluation purposes in accordance with Section 8.02(B), as requested by the Engineer.
2. The Port may accept or reject the Contractor's Change Order proposal, request further documentation, or negotiate acceptable terms with the Contractor. If The Port and Contractor reach agreement on the terms of any change in the Work, including any adjustment in the Contract Sum or Contract Time, such agreement shall be incorporated in a Change Order.
3. The Change Order shall constitute full payment and final settlement of all claims for time and for direct, indirect, and consequential costs, including costs of delays, inconvenience, disruption of schedule, or loss of efficiency or productivity, related to any Work either covered or affected by the Change Order, or related to the events giving rise to the request for equitable adjustment. The Port may reject a proposal, in which case the Port may either not effectuate the change or issue a Unilateral Change Directive. The Port will not make payment to the Contractor for any work until that work has been incorporated into an executed Change Order.

- D. Unforeseen Conditions: If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or any soils reports made available by the Port to the Contractor or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall immediately provide oral notice to the Engineer before conditions are disturbed, followed within 24 hours by an initial written notice. The Contractor shall submit a detailed proposal no later than seven (7) days following discovery of differing site conditions. The Engineer will promptly investigate these conditions and, if the Engineer determines that they differ materially and cause an increase or decrease in the Contractor's cost or time required for, performance of any part of the Work, will establish a change in the Contract Sum or Contract Time, or both, consistent with the requirements of the Contract Documents. If the Contractor disputes the Engineer's determination, the Contractor may proceed as provided in the dispute resolution procedure (Article 11). No increase to the Contract Sum or the Contract Time shall be allowed if the Contractor does not comply with the contractual requirements or if the Contractor knew or reasonably should have known of the concealed conditions prior to executing the Contract.
- E. Proceed Immediately: Pending agreement on the terms of the Change Order or upon determination of a differing site condition as defined in 8.01(D), the Engineer may direct Contractor to proceed immediately with the change in the Work. Contractor shall not proceed with any change in the Work until it has obtained the Engineer's written approval and documentation of the following:
1. The scope of work
 2. An agreed upon maximum not-to-exceed amount
 3. The method of final cost determination
 4. Estimated time to complete the changed work.
 5. As a change in the Work is performed, unless the parties have signed a written Change Order to establish the cost of the change, the Contractor shall maintain an itemized accounting of all costs related to the change based on the categories in Section 8.02(B) and provide such data to the Port upon request. This includes, without limitation, invoices, including freight and express bills, and other support for all material, equipment, Subcontractor, and other charges related to the change and, for material furnished from the Contractor's own inventory, a sworn affidavit certifying the actual cost of such material. Failure to provide data to the Port within seven (7) days of a request constitutes a waiver of any claim. The Port may furnish any material or equipment to the Contractor that it deems advisable, and the Contractor shall have no claim for any costs or fee on such material or equipment.
- G. Procedure for Unilateral Change Directive. Whether or not the Port has rejected a Contractor's proposal, the Port may issue a Unilateral Change Directive and the Contractor shall promptly proceed with the specified Work. If the Contractor disagrees with a Unilateral Change Directive, the Contractor shall advise the Port in writing through a Change Order proposal within seven (7) days of receipt. The Contractor's Change Order proposal shall reasonably specify the reasons for any disagreement and the adjustment it proposes. Without this timely Change Order proposal, the Contractor shall conclusively be deemed to have accepted the Port's proposal.

- I. Payment pending final determination of Force Account work. Pending final determination of the total cost of Force Account Work, and provided that the Work to be performed under Force Account is complete and any reservations of rights have been signed by the Port, the Contractor may request payment for amounts not in dispute in the next Application for Payment accompanied by documentation indicating the parties' agreement. Work done on a Force Account basis must be approved in writing on a daily basis by the Engineer or the Engineer's designee and invoices shall be submitted with an Application for Payment within sixty (60) days of performance of the Work.

8.02 Changes in the Contract Sum

- A. Port to Decide How Changes are Measured. The Port may elect, in its sole discretion, how changes in the Work will be measured for payment. Change in the Work may be priced on a lump sum basis, through Unit Prices, as Force Account, or by another method documented in the executed Change Order, Unilateral Change Directive or Minor Change in the Work.
- B. Determination of Cost of Change. The total cost of any change in the Work, including a claim under Article 11, shall not exceed the prevailing cost for the Work in the locality of the Project. In all circumstances, the change in the Work shall be limited to the reasonable, actual cost of the following components:
 1. Direct labor costs: These are the actual labor costs determined by the number of additional craft hours at their normal hourly rate necessary to perform a change in the Work. The hourly cost of labor will be based upon the following:
 - a. Basic wages and fringe benefits: The hourly wage (without markup or labor burden) and fringe benefits paid by the Contractor as established by the Washington Department of Labor and Industries or contributed to labor trust funds as itemized fringe benefits, whichever is applicable, not to exceed that specified in the applicable "Intent to Pay Prevailing Wage," for the laborers, apprentices, journeymen, and foremen performing or directly supervising the change in the Work on site. These wages do not include the cost of Contractor's project manager or superintendent or above, and the premium portion of overtime wages is not included unless pre-approved in writing by the Port. Costs paid or incurred by the Contractor for vacations, per diem, subsistence, housing, travel, bonuses, stock options, or discretionary payments to employees are not separately reimbursable. The Contractor shall provide to the Port copies of payroll records, including certified payroll statements for itself and Subcontractors of any tier, upon the Port's request.
 - b. Workers' insurance: Direct contributions to the State of Washington as industrial insurance; medical aid; and supplemental pension by class and rates established by the Washington Department of Labor and Industries.
 - c. Federal insurance: Direct contributions required by the Federal Insurance Compensation Act (FICA); Federal Unemployment Tax Act (FUTA); and State Unemployment Compensation Act (SUCA).
 2. Direct material costs: This is an itemization, including material invoices, of the quantity and actual cost of additional materials necessary to perform the change in the Work. The cost will be the net cost after all discounts or rebates, freight costs, express charges, or special delivery costs, when applicable. No lump sum costs will be allowed unless approved in advance by the Port.

3. Construction equipment usage costs: This is an itemization of the actual length of time that construction equipment necessary and appropriate for the Work is used solely on the changed Work times the applicable rental cost as established by the lower of the local prevailing rates published in www.equipmentwatch.com, as modified by the AGC/WSDOT agreement, or the actual rate paid to an unrelated third party. If more than one rate is applicable, the lowest available rate will be utilized. Rates and quantities of equipment rented that exceed the local fair market rental costs shall be subject to the Port's prior written approval. Total rental charges for equipment or tools shall not exceed 75% of the fair market purchase value of the equipment or the tool. Actual, reasonable mobilization costs are permitted if the equipment is brought to the site solely for the change in the Work. Mobilization and standby costs shall not be charged for equipment already present on the site.

The rates in effect at the time of the performance of the changed Work are the maximum rates allowable for equipment of modern design and in good working condition and include full compensation for furnishing all fuel, oil, lubrication, repairs, maintenance, and insurance. No gas surcharges are payable. Equipment not of modern design and/or not in good working condition will have lower rates. Hourly, weekly, and/or monthly rates, as appropriate, will be applied to yield the lowest total cost.

4. Subcontractor costs: These are payments the Contractor makes to Subcontractors for changed Work performed by Subcontractors. The Subcontractors' cost of changed Work shall be determined in the same manner as prescribed in this Section 8.02 and, among other things, shall not include consultant costs, attorneys' fees, or claim preparation expenses.
5. Service provider costs: These are payments the Contractor makes to service providers for changed Work performed by service providers. The service providers' cost of changed Work shall be determined in the same manner as prescribed in this Section 8.02.
6. Markup: This is the maximum total amount for overhead, profit and other costs, including office, home office and site overhead (including purchasing, project manager, superintendent, project engineer, estimator, and their vehicles and clerical assistants), taxes (except for sales tax on the Contract Sum), warranty, safety costs, printing and copying, layout and control, quality control/assurance, small or hand tools (a tool that costs \$500 or less and is normally furnished by the performing contractor), preparation of as-built drawings, impact on unchanged Work, Change Order and/or claim preparation, and delay and impact costs of any kind (cumulative, ripple, or otherwise), added to the total cost to the Port of any Change Order work. No markup shall be due, however, for direct settlements of Subcontractor claims by the Port after Substantial Completion. The markup shall be limited in all cases to the following schedule:
- Direct labor costs -- 20% markup on the direct cost of labor for the party (Contractor or Subcontractor) providing labor related to the change in the Work;
 - Direct material costs -- 20% markup on the direct cost of material for the party (Contractor or Subcontractor) providing material related to the change in the Work;
 - Construction equipment usage costs -- 10% markup on the direct cost of equipment for the party (Contractor or Subcontractor) providing equipment related to the change in the Work;
 - Contractor markup on Subcontractor costs -- 10% markup for the Contractor on the direct cost (excluding markup) of a change in the Work performed by Subcontractors (and for Subcontractors, for a change in the Work performed by lower-tier Subcontractors); and

- e. Service provider costs -- 5% markup for the Contractor on the direct cost (excluding markup) of a change in the Work performed by service providers.

The total summed markup of the Contractor and all Subcontractors of any tier shall not exceed 30% of the direct costs of the change in the Work. If the markup would otherwise exceed 30%, the Contractor shall proportionately reduce the markup for the Contractor and all Subcontractors of any tier.

7. Cost of change in insurance or bond premium. This is defined as:

- a. Contractor's liability insurance: The actual cost (expressed as a percentage submitted with the certificate of insurance provided under the Contract Documents and subject to audit) of the Contractor's liability insurance arising directly from the changed Work; and
- b. Public works bond: The actual cost (expressed as a percentage submitted under the Contract Documents and subject to audit) of the Contractor's performance and payment bond arising directly from the changed Work.

Upon request, the Contractor shall provide the Port with supporting documentation from its insurer or surety of any associated cost incurred. The cost of the insurance or bond premium together shall not exceed 2.0% of the cost of the changed Work.

- 8. Unit Prices. If Unit Prices are specified in the Contract Documents or established by agreement of the parties for certain Work, the Port may apply them to the changed Work. Unit Prices shall include pre-agreed rates for material quantities and shall include reimbursement for all direct and indirect costs of the Work, including overhead, profit, bond, and insurance costs arising out of or related to the Unit Priced item. Quantities must be supported by field measurement statements signed by the Port, and the Port shall have access as necessary for quantity measurement. The Port shall not be responsible for not-to-exceed limit(s) without its prior written approval.

8.03 Changes in the Contract Time

- A. Extension of the Contract Time. If the Contractor is delayed at any time in the commencement or progress of the Work by events for which the Port is responsible, by unanticipated abnormal weather (subject to Section 8.03(E) below), or by other causes not the fault or responsibility of the Contractor that the Port determines may justify a delay in the Contract Time, then the Contract Time shall be extended by Change Order for such reasonable time as the Port may determine. In no event, however, shall the Contractor be entitled to any extension of time absent proof of (1) delay to an activity on the critical path of the Project, or (2) delay transforming an activity to the critical path, so as to actually delay the anticipated date of Substantial Completion.
- B. Allocation of responsibility for delay not caused by Port or Contractor. If a delay was not caused by the Port, the Contractor, or anyone acting on behalf of any of them, the Contractor is entitled only to an increase in the Contract Time but not an increase in the Contract Sum.
- C. Allocation of responsibility for delay caused by Port. If a delay was caused by the Port or someone acting on behalf of the Port and affected the critical path, the Contractor shall be entitled to a change in the Contract Time and Contract Sum in accordance with Section 8.02. The Contractor shall not recover damages, an equitable adjustment or an increase in the Contract Sum or Contract Time from the Port, however, where the Contractor could reasonably have avoided the delay. The Port is not obligated directly or indirectly for damages for any delay suffered by a Subcontractor of any tier that does not increase the Contract Time.

- D. Allocation of responsibility for delay caused by Contractor. If a delay was caused by the Contractor, a Subcontractor of any tier, or anyone acting on behalf of any of them, the Contractor is not entitled to an increase in the Contract Time or in the Contract Sum.
- E. Adverse weather. If adverse weather is identified as the basis for a claim for additional time, the claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not reasonably have been anticipated and had an adverse effect on the critical path of construction, and that the Work was on schedule (or not behind schedule through the fault of the Contractor) at the time the adverse weather conditions occurred. Neither the Contract Time nor the Contract Sum will be adjusted for normal inclement weather. For a claim based on adverse weather, the Contractor shall be eligible only for a change in the Contract Time (but not a change in the Contract Sum) if the Contractor can substantiate that there was significantly greater than normal inclement weather considering the full term of the Contract Time.
- F. Damages for delay. In the event the Contractor (including any Subcontractors of any tier) is held to be entitled to damages from the Port for delay beyond the amount permitted in Section 8.02(B), the total combined damages to the Contractor and any Subcontractors of any tier for each day of delay shall be limited to the same daily liquidated damage rate specified in the Contract Documents due the Port for the Contractor's delay in achieving Substantial Completion. By submitting a bid on the Work and executing the Contract, the Contractor represents that these liquidated damages are a reasonable estimate of its loss.
- G. Limitation on damages. The Contractor shall not be entitled to damages arising out of loss of efficiency; morale, fatigue, attitude, or labor rhythm; constructive acceleration; home office overhead; expectant under run; trade stacking; reassignment of workers; rescheduling of Work, concurrent operations; dilution of supervision; learning curve; beneficial or joint occupancy; logistics; ripple; season change; extended or increased overhead or general conditions; profit upon damages for delay; impact damages including cumulative impacts; or similar damages. Any effect that such alleged costs may have upon the Contractor or its Subcontractors of any tier is fully compensated through the markup on Change Orders paid through Section 8.02(B) and any liquidated damages paid hereunder.

8.04 Reservation of Rights

- A. Reservations of rights void unless signed by Port. Reservations of rights will be deemed waived and are void unless any reserved rights are described in detail and are signed by the Contractor and the Port.
- B. Procedure for unsigned reservations of rights. If the Contractor adds a reservation of rights not signed by the Port to any Change Order, Unilateral Change Directive, Change Order proposal, Application for Payment or any other document, all amounts and all Work therein shall be considered disputed and not payable until costs are re-negotiated or the reservation is withdrawn or changed in a manner satisfactory to and signed by the Port. If the Port makes payment based on a document that contains a reservation of rights not signed by the Port, and if the Contractor cashes such payment, then the reservation of rights shall be deemed waived, withdrawn and of no effect.

8.05 Unit Prices

- A. Adjustment to Unit Prices. If Unit Prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed (less than eighty percent (80%) or more than one hundred and twenty percent (120%) of the quantity estimated) so that application of a Unit Price would be substantially unfair, the applicable Unit Price but not the Contract Time shall be adjusted if the Port prospectively approves a Change Order revising the Unit Price.

- B. Procedure to change Unit Prices. The Contractor or Port may request a Change Order revising a Unit Price by submitting information to support the change. A proposed change to a Unit Price will be evaluated by the Port based on the change in cost resulting solely from the change in quantity, any change in production rate or method as compared to the original plan, and the share, if any, of fixed expenses properly chargeable to the item. If the Port and Contractor agree on the change, a Change Order will be executed. If the parties cannot agree, the Contractor shall comply with the dispute resolution procedures (Article 11).

ARTICLE 9

SUSPENSION AND TERMINATION OF CONTRACT

9.01 Port's Right to Suspend Work

- A. Port may suspend the Work. The Port may at any time suspend the Work, or any part thereof, by giving notice to the Contractor. The Work shall be resumed by the Contractor as soon as possible, but no later than fourteen (14) days after the date fixed in a notice to resume the Work. The Port shall reimburse the Contractor for appropriate and reasonable expenses consistent with Section 8.02 incurred by the Contractor as a result of the suspension, except where a suspension is the result of the Contractor repeatedly or materially failing to carry out or correct the Work in accordance with the Contract Documents, and the Contractor shall take all necessary steps to minimize expenses.
- B. Contractor obligations. During any suspension of Work, the Contractor shall take every precaution to prevent damage to, or deterioration of, the Work. The Contractor shall be responsible for all damage or deterioration to the Work during the period of suspension and shall, at its sole expense, correct or restore the Work to a condition acceptable to the Port prior to resuming Work.

9.02 Termination of Contract for Cause by the Port

- A. Port may terminate for cause. If the Contractor is adjudged bankrupt or makes a general assignment for the benefit of the Contractor's creditors, if a receiver is appointed due to the Contractor's insolvency, or if the Contractor, in the opinion of the Port, persistently or materially refuses or fails to supply enough properly skilled workmen or materials for proper completion of the Contract, fails to make prompt payment to Subcontractors or suppliers for material or labor, disregards laws, ordinances, or the instructions of the Port, fails to prosecute the Work continuously with promptness and diligence, or otherwise materially violates any provision of the Contract, then the Port, without prejudice to any other right or remedy, may terminate the Contractor after giving the Contractor seven (7) days' written notice (during which period the Contractor shall have the right to cure).
- B. Procedure following termination for cause. Following a termination for cause, the Port may take possession of the Project site and all materials and equipment, and utilize such materials and equipment to finish the Work. The Port may also exclude the Contractor from the Project site(s). If the Port elects to complete all or a portion of the Work, it may do so as it sees fit. The Port shall not be required to accept the lowest bid for completion of the Work and may choose to complete all or a portion of the Work using its own work force. If the Port elects to complete all or a portion of the Work, the Contractor shall not be entitled to any further payment until the Work is finished. If the expense of finishing the Work, including compensation for additional managerial and administrative services of the Port, exceeds the unpaid balance of the Contract Sum, the excess shall be paid by the Contractor.
- C. Port's remedies following termination for cause. The Port may exercise any rights, claims or demands that the Contractor may have against third persons in connection with the Contract, and for this purpose the Contractor assigns and transfers to the Port all such rights, claims and demands.

- D. Inadequate termination for cause converted to termination for convenience. If, after the Contractor has been terminated for cause, it is determined that inadequate "cause" for such termination exists, then the termination shall be considered a termination for convenience pursuant to Section 9.03.

9.03 Termination of Contract for Convenience by the Port

- A. Port may terminate for convenience. The Port may, at any time (without prejudice to any right or remedy of the Port), terminate all or any portion of the Contract for the Port's convenience and without cause. The Contractor shall be entitled to receive payment consistent with the Contract Documents only for Work properly executed through the date of termination, and costs necessarily incurred by reason of the termination (such as the cost of settling and paying claims arising out of the termination under subcontracts or orders), along with a fee of one percent (1%) of the Contract Sum not yet earned on the whole or part of the Work. The total amount to be paid to the Contractor shall not exceed the Contract Sum as reduced by the amount of payments otherwise made. The Port shall have title to all Work performed through the date of termination.

9.04 Termination of Contract by the Contractor

- A. Contractor may terminate for cause. The Contractor may terminate the Contract if the Work is stopped for a period of sixty (60) consecutive days through no act or fault of the Contractor or a Subcontractor of any tier, for either of the following reasons:
1. Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped; or
 2. An act of government, such as a declaration of national emergency that requires all Work to be stopped.
- B. Procedure for Contractor termination. If one of the reasons described in Section 9.04A exists, the Contractor may, upon seven (7) days' written notice to the Port (during which period the Port has the opportunity to cure), terminate the Contract and recover from the Port payment for Work executed through the date of termination in accordance with the Contract Documents and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery, including reasonable overhead and profit on Work executed and direct costs incurred by reason of such termination. The total recovery of the Contractor shall not exceed the unpaid balance of the Contract Sum.
- C. Contractor may stop the Work for failure of Port to pay undisputed amounts. The Contractor may stop Work under the Contract if the Port does not pay undisputed amounts due and owing to the Contractor within fifteen (15) days of the date established in the Contract Documents. If the Port fails to pay undisputed amounts, the Contractor may, upon fifteen (15) additional days' written notice to the Port, during which the Port can cure, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately, and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up.

9.05 Subcontract Assignment Upon Termination

- A. Subcontracts assigned upon termination. Each subcontract is hereby assigned by the Contractor to the Port provided that:
1. The Port requests that the subcontract be assigned;
 2. The assignment is effective only after termination by the Port and only for those subcontracts that the Port accepts in writing; and

3. The assignment is subject to the prior rights of the surety, if any, under any bond issued in accordance with the Contract Documents.

When the Port accepts the assignment of a subcontract, the Port assumes the Contractor's rights and obligations under the subcontract, but only for events and payment obligations that arise after the date of the assignment.

ARTICLE 10 BONDS

10.01 Contractor Performance and Payment Bonds

- A. Contractor to furnish performance and payment bonds. Within ten (10) days following its receipt of a notice of award, and as part of the Contract Sum, the Contractor shall secure and furnish duly executed performance and payment bonds using the forms furnished by the Port. The bonds shall be executed by a surety (or sureties) reasonably acceptable to the Port, admitted and licensed in the State of Washington, registered with the Washington State Insurance Commissioner, and possessing an A.M. Best rating of "A minus, FSC (6)" or better and be authorized by the U.S. Department of the Treasury. Pursuant to RCW 39.08, the bonds shall be in an amount equal to the Contract Sum, and shall be conditioned only upon the faithful performance of the Contract by the Contractor within the Contract Time and upon the payment by the Contractor of all taxes, fees, and penalties to the State of Washington and all laborers, Subcontractors, and suppliers, and others who supply provisions, equipment, or supplies for the performance of the Work covered by this Contract. The bonds shall be signed by the person or persons legally authorized to bind the Contractor.
- B. Port may notify surety. If the Port makes or receives a claim against the Contractor, the Port may, but is not obligated to, notify the Contractor's surety of the nature and amount of the claim. If the claim relates to a possibility of a Contractor's default, the Port may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

ARTICLE 11 DISPUTE RESOLUTION

11.01 Notice of Protest and Claim

- A. Dispute resolution procedure mandatory. All claims, direct or indirect, arising out of, or relating to, the Contract Documents or the breach thereof, shall be decided exclusively by the following alternative dispute resolution procedure unless the parties mutually agree otherwise. If the Port and Contractor agree to a partnering process to assist in the resolution of disputes, the partnering process shall occur prior to, and not be in place of, the mandatory dispute resolution procedures set forth below.
- B. Notice of protest defined. Except for claims requiring notice before proceeding with the affected Work as otherwise described in the Contract Documents, the Contractor shall provide immediate oral notice of protest to the Engineer prior to performing any disputed Work and shall submit a written notice of protest to the Port within seven (7) days of the occurrence of the event giving rise to the protest that includes a clear description of the event(s). The protest shall identify any point of disagreement, those portions of the Contract Documents believed to be applicable, and an estimate of quantities and costs involved. When a protest relates to cost, the Contractor shall keep full and complete records and shall permit the Port to have access to those records at any time as requested by the Port.

- C. Claim defined. A claim is a demand by one of the parties seeking adjustment or interpretation of the Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract Documents. The term "claim" also includes all disputes and matters in question between the Port and Contractor arising out of or relating to the Contract Documents. Claims must be initiated in writing and include a detailed factual statement and clear description of the claim providing all necessary dates, locations and items of Work, the date or dates on which the events occurred that give rise to the claim, the names of employees or representatives knowledgeable about the claim, the specific provisions of the Contract Documents that support the claim, any documents or oral communications that support the claim, any proposed change in the Contract Sum (showing all components and calculations) and/or Contract Time (showing cause and analysis of the resultant delay in the critical path), and all other data supporting the claim. Claims shall also be submitted with a statement certifying, under penalty of perjury, that the claim as submitted is made in good faith, that the supporting cost and pricing data are true and accurate to the best of Contractor's knowledge and belief, that the claim is fully supported, and that the amount requested accurately reflects the adjustment in the Contract Sum or Contract Time for which Contractor believes the Port is liable. A claim shall be deemed to include all changes, direct and indirect, in cost and in time to which the Contractor and Subcontractors of any tier are entitled and may not contain reservations of rights without the Port's written approval; any unapproved reservations of rights shall be without effect.
- D. Claim procedure. The Contractor shall submit a written claim within thirty (30) days of providing written notice of protest. The Contractor may delay submitting supporting data by an additional thirty (30) days if it notifies the Port in its claim that substantial data must be assembled. Any claim of a Subcontractor of any tier may be brought only through, and after review by and concurrence of, the Contractor.
- E. Failure to comply with notice of protest and claim requirements waives claims. Any notice of protest by the Contractor and any claim of the Contractor, whether under the Contract or otherwise, must be made pursuant to and in strict accordance with the applicable provisions of the Contract. Failure to properly and timely submit a notice of protest or to timely submit a claim shall waive the claim. No act, omission, or knowledge, actual or constructive, of the Port shall waive the requirement for timely written notice of protest and a timely written claim unless the Port and the Contractor sign an explicit, unequivocal written waiver approved by the Port. The Contractor expressly acknowledges and agrees that the Contractor's failure to timely submit required notices of protest and/or timely submit claims has a substantial impact upon and prejudices the Port. For the purpose of calculating time periods, an "event giving rise to a claim," among other things, is not a Request for Information but rather is a response that the Contractor believes would change the Contract Sum and/or Contract Time.
- F. False claims. The Contractor shall not make any fraudulent misrepresentations, concealments, errors, omissions, or inducements to the Port in the formation or performance of the Contract. If the Contractor or a Subcontractor of any tier submits a false or frivolous claim to the Port, which for purposes of this Section 11.01(F) is defined as a claim based in whole or in part on a materially incorrect fact, statement, representation, assertion, or record, the Port shall be entitled to collect from the Contractor by offset or otherwise (without prejudice to any right or remedy of the Port) any and all costs and expenses, including investigation and consultant costs, incurred by the Port in investigating, responding to, and defending against the false or frivolous claim.
- G. Compliance with lien and retainage statutes required. If a claim relates to or is the subject of a lien or retainage claim, the party asserting the claim may proceed in accordance with applicable law to comply with the notice and filing deadlines prior to resolution of the claim by mediation or by litigation.

- H. Performance required pending claim resolution. Pending final resolution of a claim, the Contractor shall continue to perform the Contract and maintain the Progress Schedule, and the Port shall continue to make payments of undisputed amounts due in accordance with the Contract Documents.

11.02 Mediation

- A. Claims must be subject to mediation. At any time following the Port's receipt of a written claim, the Port may require that an officer of the Contractor and the Port's designee (all with authority to settle) meet, confer, and attempt to resolve a claim. If the claim is not resolved during this meeting, the claim shall be subject to mandatory mediation as a condition precedent to the initiation of litigation. This requirement can be waived only by an explicit, written waiver signed by the Port and the Contractor.
- B. Mediation procedure. A request for mediation shall be filed in writing with the other party to the Contract, and the parties shall promptly attempt to agree upon a mediator. If the parties have not reached agreement within thirty (30) days of the request, either party may file the request with the American Arbitration Association or such other alternative dispute resolution service to which the parties mutually agree, with a copy to the other party, and the mediation shall be administered by the American Arbitration Association (or other agreed service). The parties to the mediation shall share the mediator's fee and any filing fees equally. The mediation shall be held in Pierce County, Washington unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof. Unless the Port and the Contractor mutually agree in writing otherwise, all claims shall be considered at a mediation session that shall occur prior to Final Completion.

11.03 Litigation

- A. Claims not resolved by mediation are subject to litigation. Claims not resolved through mediation shall be resolved by litigation unless the parties mutually agree otherwise. The venue for any litigation shall be Pierce County, Washington. The Contractor may bring no litigation on claims unless such claims have been properly raised and considered in the procedures of this Article 11. The Contractor must demonstrate in any litigation that it complied with all requirements of this Article.
- B. Litigation must be commenced promptly. All unresolved claims of the Contractor shall be waived and released unless the Contractor has complied with the requirements of the Contract Documents, and litigation is served and filed within 180 days of the date of Substantial Completion approved in writing by the Port or termination of the Contract. The pendency of mediation (the time period between receipt by the non-requesting party of a written mediation request and the date of mediation) shall toll these deadlines until the earlier of the mediator providing written notice to the parties of impasse or thirty (30) days after the date of the mediation session.
- C. Port not responsible for attorneys' fees. Neither the Contractor nor a Subcontractor of any tier, whether claiming under a bond or lien statute or otherwise, shall be entitled to attorneys' fees directly or indirectly from the Port (but may recover attorneys' fees from the bond or statutory retainage fund itself to the extent allowable under law).
- D. Port may join Contractor in dispute. The Port may join the Contractor as a party to any litigation or arbitration involving the alleged fault, responsibility, or breach of contract of the Contractor or Subcontractor of any tier.

ARTICLE 12

MISCELLANEOUS

12.01 General

- A. Rights and remedies are cumulative. The rights and remedies of the Port set forth in the Contract Documents are cumulative and in addition to and not in limitation of any rights and remedies otherwise available to the Port. The pursuit of any remedy by the Port shall not be construed to bar the Port from the pursuit of any other remedy in the event of similar, different, or subsequent breaches of this Contract. All such rights of the Port shall survive completion of the Project or termination of the Contractor.
- B. Reserved rights do not give rise to duty. The rights reserved or possessed by the Port to take any action shall not give rise to a duty for the Port to exercise any such right.

12.02 Waiver

- A. Waiver must be in writing and authorized by Port. Waiver of any provisions of the Contract Documents must be in writing and authorized by the Port. No other waiver is valid on behalf of the Port.
- B. Inaction or delay not a waiver. No action, delay in acting, or failure to act by the Port shall constitute a waiver of any right or remedy of the Port, or constitute an approval or acquiescence of any breach or defect in the Work. Nor shall any delay or failure of the Port to act waive or otherwise prejudice the right of the Port to enforce a right or remedy at any subsequent time.
- C. Claim negotiation not a waiver. The fact that the Port and the Contractor may consider, discuss, or negotiate a claim that has or may have been defective or untimely under the Contract shall not constitute a waiver of the provisions of the Contract Documents unless the Port and the Contractor sign an explicit, unequivocal waiver.

12.03 Governing Law

- A. Washington law governs. This Contract and the rights and duties of the parties hereunder shall be governed by the internal laws of the State of Washington, without regard to its conflict of law principles.

12.04 Compliance with Law

- A. Contractor to comply with applicable laws. The Contractor shall at all times comply with all applicable Federal, State and local laws, ordinances, and regulations. This compliance shall include, but is not limited to, the payment of all applicable taxes, royalties, license fees, penalties, and duties.
- B. Contractor to provide required notices. The Contractor shall give notices required by all applicable Federal, State, and local laws, ordinances and regulations bearing on the Work.
- C. Contractor to confine operations at site to permitted areas. The Contractor shall confine operations at the Project site to areas permitted by applicable laws, ordinances, permits, rules and regulations, and lawful orders of public authorities and the Contract Documents.

12.05 Assignment

- A. Assignment. The Port and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to the other party and to the partners, successors, assigns and legal representatives of such other party. The Contractor may not assign, transfer, or novate all or any portion of the Contract, including but not limited to any claim or right to the Contract Sum, without the Port's prior written consent. If the Contractor attempts to make an assignment, transfer, or novation without the Port's consent, the assignment shall be of no effect, and Contractor shall nevertheless remain legally responsible for all obligations under the Contract. The Contractor also shall not assign or transfer to any third party any claims it may have against the Port arising under the Contract or otherwise related to the Project.

12.06 Time Limit on Causes of Action

- A. Time limit on causes of action. The Port and Contractor shall commence all causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the dispute resolution procedure set forth in Article 11 of these General Conditions, within the time period specified by applicable law, and within the time limits identified in the Contract Documents. The Contractor waives all claims and causes of action not commenced in accordance with this Section 12.06.

12.07 Service of Notice

- A. Notice. Written notice under the Contract Documents by either the Contractor or Port may be served on the other party by personal service, electronic or facsimile transmission, or delivery service to the last address provided in writing to the other party. For the purpose of measuring time, notice shall be deemed to be received by the other party on the next business day following the sender's electronic or facsimile transmittal or delivery by delivery service.

12.08 Records

- A. Contractor and Subcontractors to maintain records and cooperate with Port audit. The Contractor and Subcontractors of any tier shall maintain books, ledgers, records, documents, estimates, bids, correspondence, logs, schedules, emails, and other tangible and electronic data and evidence relating or pertaining to costs and/or performance of the Contract ("records") to such extent and in such detail as will properly reflect and fully support compliance with the Contract Documents and with all costs, charges and other amounts of whatever nature. The Contractor shall preserve these records for a period of six (6) years following the date of Final Acceptance under the Contract. Within seven (7) days of the Port's request, both during the Project and for six (6) years following Final Acceptance, the Contractor and Subcontractors of any tier shall make available at their office during normal business hours all records for inspection, audit and reproduction (including electronic reproduction) by the Port or its representatives; failure to fully comply with this requirement shall constitute a material breach of contract and a waiver of all claims by the Contractor and Subcontractors of any tier.
- B. Rights under RCW 42.56. The Contractor agrees, on behalf of itself and Subcontractors of any tier, that any rights under Chapter 42.56 RCW will commence at Final Acceptance, and that the invocation of such rights at any time by the Contractor or a Subcontractor of any tier, or their respective representatives, shall initiate an equivalent right to disclosures from the Contractor and Subcontractors of any tier for the benefit of the Port.

12.09 Statutes

- A. Contractor to comply with Washington statutes. The Contractor shall abide by the provisions of all applicable statutes, regulations, and other laws. Although a number of statutes are referenced in the Contract Documents, these references are not meant to be and are not a complete list.
 - 1. Pursuant to RCW 39.06, "Registration, Licensing of Contractors," the Contractor shall be registered and licensed as required by the laws of the State of Washington, including but not limited to RCW 18.27, "Registration of Contractors," and shall satisfy all State of Washington bonding and insurance requirements. The Contractor shall also have a current state unified business identifier number; have industrial insurance coverage for the Contractor's employees working in Washington as required by Title 51 RCW; have an employment security department number as required by Title 50 RCW; have a state excise tax registration number as required in Title 82 RCW, and; not be disqualified from bidding on any public works contract under RCW 39.06.010 (unregistered or unlicensed contractors) or RCW 39.12.065(3) (prevailing wage violations).

2. The Contractor shall comply with all applicable provisions of RCW 49.28, "Hours of Labor."
3. The Contractor shall comply with pertinent statutory provisions relating to public works of RCW 49.60, "Discrimination."
4. The Contractor shall comply with pertinent statutory provisions relating to public works of RCW 70.92, "Provisions in Buildings for Aged and Handicapped Persons," and the Americans with Disabilities Act.
5. Pursuant to RCW 50.24, "Contributions by Employers," in general and RCW 50.24.130 in particular, the Contractor shall pay contributions for wages for personal services performed under this Contract or arrange for an acceptable bond.
6. The Contractor shall comply with pertinent provisions of RCW 49.17, "Washington Industrial Safety and Health Act," and Chapter 296-155 WAC, "Safety Standards for Construction Work."
7. Pursuant to RCW 49.70, "Worker and Community Right to Know Act," and WAC 296-62-054 et seq., the Contractor shall provide to the Port and have copies available at the Project site, a workplace survey or material safety data sheets for all "hazardous" chemicals under the control or use of Contractor or any Subcontractor of any tier.
8. All products and materials incorporated into the Project as part of the Work shall be certified as "asbestos-free" and "lead-free" by United States standards, and shall also be free of all hazardous materials or substances. At the completion of the Project, the Contractor shall submit certifications of asbestos-free and of lead-free materials certifying that all materials and products incorporated into the Work meet the requirements of this Section, and shall also certify that materials and products incorporated into the Work are free of hazardous materials and substances.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK DESCRIBED ELSEWHERE

- A. The provisions and intent of the Contract, including the General and Supplemental Conditions apply to this work as if specified in this section. Work related to this section is described throughout these Specifications.

1.02 SUBMITTAL REQUIREMENTS

- A. Evidence of the required insurance within 10 days of the issued Notice of Award to the Contractor.
- B. Updated evidence of insurance as required until final completion.

1.03 CONTRACTOR LIABILITY INSURANCE

- A. The Contractor shall secure and maintain until Final Completion, at its sole cost and expense, the following insurance in carriers reasonably acceptable to the Port, licensed in the State of Washington, registered with the Washington State Insurance Commissioner, and possessing an A.M. Best rating of "A-, FSC (6)" or better.
- B. The Port of Tacoma (Port) and the Northwest Seaport Alliance (NWSA) will be included as an additional insured for both ongoing and completed operations by endorsement to the policy using ISO Form CG 20 10 11 85 or forms CG 20 10 03 97 and CG 20 37 10 01 (or equivalent coverage endorsements). The inclusion of the Port and the NWSA as an additional insureds shall not create premium liability for the Port.

Also, by endorsement to the policy, there shall be:

- 1. An express waiver of subrogation in favor of the Port and the NWSA;
 - 2. A cross liabilities clause,
 - 3. An endorsement stating that the Contractor's policy is primary and not contributory with any insurance carried by the Port and the NWSA.
- C. If the Contractor, Supplier or Subcontractor's will perform any work requiring the use of a licensed professional per RCW 18 the Contractor shall provide evidence to the Port of professional liability insurance in amounts not less than \$1,000,000.
 - D. This insurance shall cover all of the Contractors' operations of whatever nature connected in any way with the Contract, including any operations performed by the Contractor's Subcontractors of any tier. **It is the obligation of the Contractor to ensure that all Subcontractors (at whatever tier) carry a similar program that provides the identified types of coverage, limits of liability, inclusion of the Port as an additional insured, waiver of subrogation and cross liabilities clause.** The Port reserves the right to reject any insurance policy as to company, form, or substance. Contractor's failure to provide or the Port's acceptance of the Contractor's certificate of insurance does not waive the Contractor's obligation to comply with the insurance requirements of the Contract as specifically described below:
 - 1. Marine General Liability Insurance, in amounts not less than \$5,000,00, on an Occurrence Form Basis including but not limited to:
 - a. Bodily Injury Liability;
 - b. Property Damage Liability;
 - c. Contractual Liability;

- d. Products - Completed Operations Liability;
- e. Personal Injury Liability;
- f. Marine coverages as appropriate for the scope of work;

Alternatively, a Commercial General Liability (CGL) policy is acceptable if all of the above coverages are incorporated in the policy and there are no marine exclusions that will remove coverage for either vessels or work done by or above or around the water.

- 2. Marine Protection and Indemnity/Vessel Pollution Liability: Contractor shall obtain, at Contractor's expense and keep in effect during the term of the contract, Marine Protection and Indemnity insurance which shall include Collision Liability and Jones Act coverages, including coverage for all masters, crew and passengers. The limit of liability shall not be less than \$5,000,000. If Collision Liability is part of the Hull and Machinery coverage for the vessel, evidence of Hull and Machinery coverage in amounts not less than the actual cash value of the vessel shall also be provided.
 - a. Vessel Pollution Liability: Contractor shall obtain at Contractor's expense and keep in effect during the term of the contract, Vessel Pollution Liability on all vessels used under this contract. Vessel Pollution Liability limits shall be the same as the Protection and Indemnity (P&I) limits call for in section 2.
- 3. Comprehensive Automobile Liability including but not limited to:
 - a. Bodily Injury Liability;
 - b. Property Damage Liability;
 - c. Personal Injury Liability;
 - d. Owned and Non-Owned Automobile Liability; and
 - e. Hired and Borrowed Automobile Liability.
- 4. Contractor's Pollution Liability (CPL) covering claims for bodily injury, property damage and cleanup costs and environmental damages from pollution conditions arising from the performance of covered operations.
 - a. If the Work involves remediation or abatement of regulated waste to include but not limited to: asbestos containing materials, lead containing products, mercury, PCB, underground storage tanks or other hazardous materials or substances, the CPL policy shall not exclude such coverage or a specific policy covering such exposure shall be required from the Contractor and all Subcontractors performing such Work.
 - b. If the Work involves transporting regulated materials or substances or waste, a separate policy or endorsement to the CPL policy specifically providing coverage for liability and cleanup arising from an upset of collision during transportation of hazardous materials or substances shall be required from the Contractor and all Subcontractors performing such Work.
 - c. It is preferred that CPL insurance shall be on a true occurrence form without a sunset clause. However, if CPL insurance is provided on a Claims Made basis, the policy shall have a retroactive date prior to the start of this project and this insurance shall be kept in force for at least three years after the final completion of this project. Alternatively, the Contractor at its option may provide evidence of extended reporting period of not less than three (3) years in its place. The Contractor shall be responsible for providing the Port with certificates of insurance each year evidencing this coverage.
 - d. The Port and the NWSA shall be named as an Additional Insured on the CPL policy.

- E. Except where indicated above, the limits of all insurance required to be provided by the Contractor shall be not less than \$2,000,000 for each occurrence. However, coverage in the amounts of these minimum limits shall not be construed as to relieve the Contractor from liability in excess of such limits. The Additional Insured endorsement shall NOT be limited to the amounts specified by this contract unless expressly waived in writing by the Port of Tacoma.
- F. Contractor shall certify that its operations are covered by the Washington State Worker's Compensation Fund. The Contractor shall provide its Account Number or, if self-insured, its Certificate of Qualification Number. The Contractor shall also provide evidence of Stop-Gap Employers' Liability Insurance.

United States Longshoremen's and Harbor Worker's Act (USL&H) and Jones Act may be required for this project. The contractor shall be solely responsible for determining the applicability of USL&H and Jones Act coverage. The failure of the Contractor to procure either USL&H or Jones Act coverage shall at no time create liability on the part of the Port. The Contractor shall bear all responsibility and shall indemnify and hold harmless the Port for any and all liability, cost and/or damages. Contractor is responsible for ensuring subcontractors at all tiers

- G. The Contractor shall furnish within ten (10) days following issuance of the notice of award a certificate of insurance satisfactory to the Port evidencing that insurance in the types and minimum amounts required by the Contract Documents has been secured. The Certificate of Insurance shall be signed by an authorized representative of the insurer together with a copy of the endorsement, which shows that the Port and the NWSA is named as additional insureds.
- H. Contractor shall provide at least forty-five (45) days prior written notice to the Port of any termination or material change or ten (10) days notice in the case of non-payment of premium(s).
- I. If the Contractor is required to make corrections to the Work after Final Completion, the Contractor shall obtain at its own expense, prior to the commencement of any corrective work, insurance coverage as required by the Contract Documents, which coverage shall be maintained until the corrections to the Work have been completed and accepted by the Port.

1.04 BUILDER'S RISK INSURANCE

- A. Until Final Completion of the Work, the construction Work is at the risk of the Contractor and no partial payment shall constitute acceptance of the Work or relieve the Contractor of responsibility of completing the Work under the Contract.
- B. The Contractor shall purchase and maintain, in a company or companies lawfully authorized and admitted to do business in Washington, property insurance written on a builder's risk "all-risk" including Earthquake and Flood or equivalent policy form to cover the course of construction in the amount of the full insurable value thereof. Builder's Risk coverage shall extend to all off-site manufacturing, off-site storage and transportation to the site at limits not less than \$5,000,000. This property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made or until no person or entity other than the Port has an insurable interest in the property, whichever is later. This insurance shall include as named insureds and as loss payees the Port, the NWSA, the Contractor, and Subcontractors of any tier, as their respective interests appear. This insurance shall insure against the perils of fire (with extended coverage) and physical loss or damage including without limitation, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal, and shall also provide "all risk" coverage for the interests of the Port, the NWSA, the Contractor and Subcontractors of any tier as named insureds, as their respective interests appear. Upon written request, the

Contractor will provide a copy of its policy to the Port. Each loss may be subject to a deductible of not more than \$10,000, except that the deductible for earthquake and flood losses shall be no greater than 5% of the loss or \$100,000, whichever is more. Losses up to the deductible amount or otherwise not covered by insurance shall be the responsibility of the Contractor. This insurance shall include as named insureds and as loss payees the Port, the NWSA, the Contractor and Subcontractors of any tier, as their respective interests appear. The policy shall be endorsed to allow complete or partial occupancy by the Port before or after Substantial Completion without the insurer's approval. All tools and equipment of the Contractor and Subcontractors of any tier not intended as part of the construction or installation of the Work will be the sole responsibility of the Contractor.

PART 2 - PRODUCTS - NOT USED

PART 3 - PRODUCTS - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 PREVAILING AND OTHER REQUIRED WAGES

- A. The Contractor shall pay (and shall ensure that all Subcontractors of any tier pay) all prevailing wages and other wages (such as Davis-Bacon Act wages) applicable to the Project.
- B. Pursuant to RCW 39.12, "Prevailing Wages on Public Works," no worker, laborer, or mechanic employed in the performance of any part of the Work shall be paid less than the "prevailing rate of wage" in effect as of the date that bids are due.
 - 1. Based on the bid submittal deadline for this project, the applicable effective date for prevailing wages for this project is **March 2nd, 2016**.
- C. The State of Washington prevailing wage rates applicable for this public works project, which is located in Pierce County, may be found at the following website address of the Department of Labor and Industries:

<https://fortress.wa.gov/lni/wagelookup/prvWagelookup.aspx>
- D. The schedule of the prevailing wage rates is made a part of the Contract Documents by reference as though fully set forth herein; and a copy of the applicable prevailing wage rates are also available for viewing at the Port Administration Building, located at One Sitcum Plaza, Tacoma, WA 98421 (253-383-5841). Upon request to the Procurement Department at procurement@portoftacoma.com, the Port will email or mail a hard copy of the applicable Journey Level prevailing wages for this project.
- E. Questions relating to prevailing wage data should be addressed to the Industrial Statistician.

Mailing Address: Washington State Department of Labor and Industries
Prevailing Wage Office
P.O. Box 44540
Olympia, WA 98504

Telephone: (360) 902-5335

Facsimile: (360) 902-5300

- 1. If there is any discrepancy between the attached or provided schedule of prevailing wage rates and the published rates applicable under WAC 296-127-011, or if no schedule is attached, the applicable published rates shall apply with no increase in the Contract Sum. It is the Contractor's responsibility to ensure that the correct prevailing wage rates are paid.
- F. Statement to Pay Prevailing Wages
 - 1. Prior to any payment being made by the Port under this Contract, the Contractor, and each Subcontractor of any tier, shall file a Statement of Intent to Pay Prevailing Wages under oath with the Port and certified by the Director of Labor and Industries. The statement shall include the hourly wage rate to be paid to each classification of workers entitled to prevailing wages, which shall not be less than the prevailing rate of wage, and the estimated number of workers in each classification employed on the Project by the Contractor or a Subcontractor of any tier, as well as the Contractor's contractor registration number and other information required by the Director of Labor and Industries. The statement, and any supplemental statements, shall be filed in accordance with the requirements of the Department of Labor and Industries. No progress payment shall be made until the Port receives such certified statement.

- G. The Contractor shall post in a location readily visible to workers at the Project site (1) a copy of the Statement of Intent to Pay Prevailing Wages approved by the Industrial Statistician of the Department of Labor and Industries and (2) the address and telephone number of the Industrial Statistician of the Department of Labor and Industries to whom a complaint or inquiry concerning prevailing wages may be directed.
- H. If a State of Washington prevailing wage rate conflicts with another applicable wage rate (such as Davis-Bacon Act wage rate) for the same labor classification, the higher of the two shall govern.
- I. Pursuant to RCW 39.12.060, if any dispute arises concerning the appropriate prevailing wage rate for work of a similar nature, and the dispute cannot be adjusted by the parties in interest, including labor and management representatives, the matter shall be referred for arbitration to the Director of the Department of Labor and Industries, and his or her decision shall be final and conclusive and binding on all parties involved in the dispute.
- J. Immediately following the end of all work completed under this Contract, the Contractor, and each Subcontractor of any tier, shall file an approved Affidavit of Wages Paid with the L&I.
- K. The Contractor shall defend (at the Contractor's sole cost, with legal counsel approved by Port), indemnify and hold the Port harmless from all liabilities, obligations, claims, demands, damages, disbursements, lawsuits, losses, fines, penalties, costs and expenses, whether direct, indirect, including but not limited to attorneys' fees and consultants' fees and other costs and expenses, from any violation or alleged violation by the Contractor or any Subcontractor of any tier of RCW 39.12 ("Prevailing Wages on Public Works") or Chapter 51 RCW ("Industrial Insurance"), including but not limited to RCW 51.12.050.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS APPLICABLE PORT-WIDE

- A. The Contractor shall submit prior to the start of work a list of emergency contact numbers for itself and subcontractors, suppliers and manufacturer representatives. Each person on the project site shall have a valid identification card that is tamper proof with laminated photo identification such as one of the following:
 - 1. State-issued Driver's license (also required if driving a vehicle)
 - 2. Card issued by a governmental agency
 - 3. Passport
 - 4. Identification card issued by the Port of Tacoma
 - 5. Pacific Maritime Association card, or
 - 6. Labor organization identification card
- B. Identification cards shall be visible while on the work site or easily displayed when requested.

1.02 TRANSPORTATION WORKER IDENTIFICATION CARD (TWIC) SUMMARY

- A. TWIC is required for all personnel needing unescorted access to secure and restricted areas of Port facilities subject to 33 CFR 105, including truckers, surveyors, construction personnel, and delivery personnel. Secure areas are those areas with security measures for access control in accordance with a Coast Guard approved security plan; restricted areas are those areas within a secure area that require increased limited access and a higher degree of security protection. New terminals under construction prior to terminal operations may not be designated secure areas. Construction on existing maritime transportation facilities and punchlist or other type of work requirements on facilities that have been certified under 33 CFR will require a TWIC.
- B. Contractors should allow for application and enrollment for the security threat assessment and issuance of TWIC when submitting a bid.
- C. Husky Terminal is a restricted site requiring TWIC credentials, although access to and within the Project Limits as shown on Drawing G6.1 Constraints and Access Plan is unrestricted and TWIC credentials are **not** required. TWIC **is** required for completion of work outside the Project Limits as noted in Section 01 14 00 - Work Restrictions and on Drawing G6.2 and while establishing project work limits and temporary fencing.

1.03 ESCORTING

- A. To access restricted Port facilities, all un-credentialed individuals must be accompanied by a person who has been issued a TWIC and trained as an escort.
- B. For more information, refer to the Port Security website at:
<http://www.portoftacoma.com/Page.aspx?cid=3597>
- C. For project specific information, refer to 01 14 00 - Work Restrictions.

1.04 ELIGIBILITY FOR TWIC

- A. Refer to the Transportation Worker Identification Credential website at:
<https://twicprogram.tsa.dhs.gov/TWICWebApp> for information on eligibility and applying for TWIC.

1.05 1.06 TWIC USE AND DISPLAY

- A. Each worker granted unescorted access to secure areas of a facility or vessel must present their cards to authorized personnel, who will compare the holder to his or her photo, inspect security features on the TWIC and evaluate the card for signs of tampering. The Coast Guard will verify TWIC's when conducting vessel and facility inspections and during spot checks using hand-held scanners, ensuring credentials are valid.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SCOPE

- A. The accompanying Drawings and Specifications show and describe the location and type of Work to be performed under this project. Work is more specifically defined on the drawings listed in Section 00 01 15.
 - 1. The Work under this contract is to provide, furnish and install all labor, materials and equipment required to complete the work, installed, tested, and ready for use, and as described in these documents.
 - 2. The Pier 4 Phase 2 Reconfiguration project includes, but is not limited to:
 - a. Pier demolition activities including removal of existing pier structure and appurtenances, concrete piles, creosote treated timber piles and steel pipe piles.
 - b. Upland demolition activities including removal of an existing marine building, substation, existing utilities, asphalt pavement, high-mast light pole foundations and temporary bank protection including concrete pile remnants, filter fabric and sandbags.
 - c. Installation of stone column ground improvements.
 - d. Rip rap removal and cutback dredging of the existing channel slope including open water disposal of dredge material at the DMMP Open Water Dredge Disposal Site.
 - e. Installation of a riprap slope protection system on the dredged slope.
 - f. Pier structure construction, including installation of 24-inch octagonal precast pre-stressed concrete piles, cast-in-place/precast concrete deck, Lead Rubber Bearings, sheet pile cut-off wall, and mooring dolphin.
 - g. Under-dock repairs of spalled and delaminated concrete in the portion of the existing Pier 4 structure to remain.
 - h. Installation of pier appurtenances including water, electrical, communication utilities, bollards, crane rail, crane stowage hardware, isolation joint hardware, panelized fender system and asphalt pavement surfacing and striping.
 - i. Construction of a new 2-story Marine Building (approx. 7000 sq. ft.).
 - j. Upland civil improvements including storm, water, sewer, electrical and communication. Associated upland structural and electrical improvements, including:
 - 1) Relocation of high-mast light poles.
 - 2) Relocation of storm drainage lines, existing outfalls, and installation of new storm water treatment vaults.
 - 3) Installation of fire and domestic water systems.
 - 4) Construction of a new electrical distribution system and substation to support lighting (480V), power (208V), and crane power (13.8kV). Provisions will be installed for a future Alternative Marine Power system (shore power cold ironing).
 - 5) Asphalt paving and striping.

1.02 PROJECT PHASING

- A. Under a separate contract, the Port has procured 100-foot gauge container handling cranes to operate on Piers 3 and 4. The cranes are scheduled to be delivered to the Port in January 2018 and will be offloaded from the delivery vessels onto the northern portion of the reconfigured Pier 4. As a result, this project has been split into site areas of work as described below. Substantial completion of both areas are as defined in Section 00 52 00 Agreement Form. Work activity for Area 1 and 2 may occur concurrently.
- B. Area 1: The limits of Area 1 are as shown on Drawing G10.1 Work Area Designation Plan and as defined herein. This work generally involves completion of the northern portion of Pier 4 extending from Pier 3 south to and including Bent 29, as well as all improvements adjacent to and upland of that portion of the pier. It is the Port's intent that the Contractor vacate Area 1 after substantial completion in order to facilitate crane delivery and commissioning activities by the Port and the terminal operator.
 - 1. The Contractor shall schedule and perform all work necessary to complete Area 1. Work in Area 1 generally includes the following project components, or a portion thereof, within and around defined limits.
 - a. Utility, site, and pier demolition
 - b. Stone column installation
 - c. Dredging
 - d. Riprap slope and key protection
 - e. Upland storm drainage and utility systems
 - f. High mast light poles
 - g. Upland grading and paving
 - h. Restroom building pad preparation and utility stub-ups.
 - i. Pier piling and deck structure, including: sheet piling, lead rubber bearings, fenders, crane rail, isolation joint cover plating, all embedments & appurtenances, bollards, and all ship and crane service utilities (water, power, and fiber optic). All utility systems shall be tested and approved for service.
 - j. Pier paving and striping
 - k. Relocation of temporary ecology block crane stops from Pier 3 to the end of the completed portion of Pier 4
 - l. Relocation of the construction fence
 - m. Any other construction activities within or outside of the defined area necessary to complete this phase of work
 - 2. In addition, the electrical substation and all electrical components located elsewhere on the site that provide service to the crane power vaults, bullrail utility vaults, and high mast light poles located north of Bent 29 shall be installed, tested, and operational.

3. It is recommended that the Contractor pay special attention to the sequence of work necessary to accomplish the Area 1 substantial completion milestone, including preparation and submittal of required construction submittals for long-lead items such as concrete piling, lead rubber bearings, the electrical substation, and precast concrete deck panels. It is also recommended that special consideration be given to the sequence of work associated with demolition, stone column installation, dredging, and placement of riprap slope armoring to allow installation of all concrete piling north of Bent 29 to occur within the 2016-2017 in-water work season.
- C. Area 2: The limits of Area 2 are as shown on Drawing G10.1 and as defined herein. This work generally involves completion of all work outside of the limits of Area 1.
1. The Contractor shall schedule and perform all work necessary to complete Area 2. Area 2 work generally includes all of the items noted in paragraph 1.01.A.2 above with exception to the work accomplished as part of Area 1 improvements.

1.03 LOCATION

- A. The work is located at Husky Terminal, 1101 Port of Tacoma Road, Tacoma, WA. 98421.

1.04 WORK BY OTHER ON THIS PROJECT

- A. The following described work is to be accomplished by others.
1. Tacoma Power will be completing various components of work as generally presented below. The Contractor and Tacoma Power are required to coordinate in the completion of their individual work components.
 - a. Pull & terminate new 15kV cable from Tacoma Power Vault 9704MH (PBP25) to the new Pier 4 Substation site within existing and newly installed conduit & vault system.
 - 1) Existing conduit from 9704MH (PBP25) to 1419MH (PBP27)
 - 2) Port installed conduit & vaults from 1419MH (PBP27) to new Pier 4 Substation as shown on Port Pier 4 construction drawings E3.1, E3.6, & E5.2 with details as shown in others.
 - b. Install 15kV pad-mounted metering cabinet within new Pier 4 Substation site.
 - c. Perform cable splicing and reconfiguration within and around vault 9704MH (PBP25).
 - d. Remove existing equipment located at the prior Pier 4 Substation Site to include
 - 1) 2 Transformers
 - (a) 750 kVA 13.8kV-480/277V (TPWR #9346T)
 - (b) 1500 kVA 13.8kV-4160/2400V (TPWR #33381T)
 - 2) 1 x 15kV Pad-Mount Switchgear (TPWR #9446SG)
 - 3) 1 x 15kV Primary Metering Cabinet (TPWR #33382V)
 - 4) 15kV Primary Cable
 2. CXT Inc. will be manufacturing, delivering and installing a prefabricated restroom as indicated on the drawings. CXT will also be responsible to connecting sewer, water and electrical utilities within the building. The Contractor and CXT Inc. are required to coordinate with each other in the completion of their individual work components.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section specifies work sequence and constraints.
- B. The purpose of the milestones, sequence and limitations of construction are to ensure that the Contractor understands the requirements and limitations on its work by the specific characteristics of the Contract, schedules and conducts work in a manner consistent with achieving these purposes, and complies with the construction schedule, the specific sequence, constraints, milestones and limitations of work specified.
- C. Sequence of construction: Plan the sequence of construction to accommodate all the requirements of the specifications. The Contract Price shall include all specified requirements as described in this Section.

1.02 CONTRACTOR ACCESS AND USE OF PREMISES

- A. Work Site Regulations
 - 1. Ensure Contractor personnel deployed to the project become familiar with and follow all regulations or restrictions established by the Engineer.
 - 2. The Contractor shall have access to the construction site off of Port of Tacoma Road. All Contractor's employee cars and other private vehicles shall be parked off site or within the designated project work area limits as shown on Drawing No. G6.1 Constraints and Access Plan. If off-site parking is utilized, then the Contractor, as part of its bid, shall provide necessary shuttle service to transport its employees to and from the work site.
 - 3. There are no work hours restrictions associated with this location, although the Contractor shall comply with local ordinances with regard to noise and work hour restrictions. In the event the Contractor is planning to work outside typical work hours (Monday - Friday 0700 - 1700) the Contractor is to notify the Engineer at least 3 working days in advance to arrange for necessary inspection and testing as may be necessary.
 - 4. Access to and within the project work area limits at Husky Terminal is unrestricted. Husky Terminal, outside of the project work area limits, is a restricted site subject to TWIC requirements as noted in Section 00 73 63 Security Requirements. Should the Contractor require access within Husky Terminal outside of the work area limits the noted security requirements shall apply.
 - 5. For ingress/egress of specialty equipment that may be too large for the designated access route, the Contractor shall make arrangements with the Engineer at least 24 hours in advance for access through the main terminal gate. This alternate access may be restricted to off terminal hours. Terminal hours are Monday - Friday 0800 to 1700. Lunch between 1200 - 1300.
 - 6. Keep within the limits of work and assigned avenues of ingress and egress. Do not enter any areas outside the designated work location unless previously approved by the Engineer. The Contractor must comply with the following conditions:
 - a. Restore all common areas to a clean and useable condition that permits the resumption of Tenant operations after the Contractor ceases daily work.
 - b. Be responsible for control and security of Contractor-owned equipment and materials at the work site. Report to Port Security at (253) 383-9472 any missing/lost/stolen property.

- c. Ensure all materials, tools and equipment will be removed from the site or secured within the designated work area limits at the end of each shift.
- d. Existing lighting and communications within the terminals must not be affected by construction activities. Necessary temporary outages must occur during daylight hours and must be coordinated with the Engineer at least 3 working days in advance of the outage.

B. Waterway Restrictions

- 1. The work is in a congested waterway and is surrounded by active terminals. The Contractor shall make themselves aware of the shipping schedules in the waterway and shall adjust their work accordingly; in particular the Contractor shall review the placement of equipment, anchors, anchor lines, buoys, etc. to avoid interruption or interference with marine vessel traffic in the waterway. The operations of commercial business shall have precedence over related bid items of work. The Contractor shall coordinate with Port Operations at (253) 383-9420 on a daily basis to confirm Contractor's work and scheduled ship traffic

C. Working Facility

- 1. The Husky Terminal will remain in operation for the duration of construction. The Contractor shall conduct all items of the Work in such a manner as to prevent interference with the normal operations of the Terminal.
- 2. The Contractor may be required to relocate the northerly temporary fence, as indicated on drawing G6.1 Constraints and Access Plan, to accommodate terminal operations when not working on the interface between Pier 3 and Pier 4. The Contractor is to include at least two fence relocation efforts as part of the base bid.

1.03 SCHEDULE CONSTRAINTS

- A. Refer to Sections 00 52 00 Agreement Form and 01 10 00 Summary for schedule constraints associated with completion of the two areas of work.
- B. The official fish window for the Blair Waterway for this project is from February 15 through July 15. No in-water work below Ordinary High Water Mark (OHWM) (Elev. 12.78) will be allowed during this time frame except as noted in the project permits. Out-of-water work may commence at any time after Notice to Proceed, unless restricted as noted elsewhere in these Bid Documents. The Contractor is directed to the permit conditions in the Appendix with regard to agency notification requirements in advance of work performance.
- C. There are several scheduling constraints associated with various items of work as noted below. The Contractor shall consider these constraints when preparing its bid, and scheduling and performing the work.
 - 1. Pile extractions, including timber, steel and concrete piles, are restricted to occur only during the in-water work windows between July 16th and February 14th.
 - 2. Rip rap and debris removal, dredging, and slope protection installation below OHWM (Elev. 12.78) is restricted to occur between July 16th and February 14th. All required dredging and slope protection work, including performance and submittal of final surveys, shall be completed 15 calendar days prior to the end of the in-water work period to allow sufficient time to review the survey information and to perform any required clean-up and/or high spot removal prior to the end of the in-water work window.
 - 3. Installation of concrete piles is restricted to occur between July 16th and February 14th.

4. Installation of stone columns waterward of the OHWM (Elev. 12.78) is restricted to occur between July 16th and February 14th.
 5. See Section 31 66 13 - Stone Columns for requirements on sequencing stone column installation work in relation to dredging and sheet pile wall installation.
- D. Work Restrictions for Site Work Outside of the Project Work Area Limits
1. As indicated on Drawing Sheet G6.2, there are a number of utility and site work items that are to be completed outside of the defined project work area limits and in the active container yard. The Contractor shall notify the Engineer at least 2 weeks in advance of performing any work in the container yard to allow time for the Port to coordinate with the Tenant. The Tenant may need to clear some areas of containers or equipment and/or temporarily modify yard operations to accommodate Contractor work.
 2. Performance of work items indicated as Weekend Work is restricted to occur during weekends only (6:00 PM Friday to 6:00 AM Monday). These areas shall be open to container yard vehicular traffic between 6:00 AM Monday and 6:00 PM Friday. If necessary, appropriately sized and secured trench cover plating shall be installed over unfilled trenches to accommodate container yard traffic during the week.
 3. All work performed in the container yard outside of the project work area limits will require TWIC credentials as specified in Section 00 73 63 Security Requirements.
- E. All utilities, subgrade and pavement restoration within 100 feet of the marine restroom must be completed at least 3 months prior to the Area 1 substantial completion date in order to provide sufficient time for delivery, placement and utility hook ups prior to the milestone deadline. All utilities servicing that restroom, including sewer, water and power must be active.

1.04 PERMITS

A. General

1. The Contractor is to comply with all conditions, provisions and requirements noted in all permits.
2. The Contractor is required to attend any preconstruction meetings with the City of Tacoma as required at no additional cost to the Port.
3. There is reference to mitigation work to be completed in the permit documents attached. Mitigation work will be completed by others under a separate contract. There is no mitigation work included in this project.
4. Within the Port acquired permits noted below are various agency notification requirements. Unless specified otherwise within these bid documents the Contractor is to provide those notifications to the Port and the Port will forward the notifications to the appropriate agencies.

B. Permits acquired by the Port (Refer to Appendix)

1. Shoreline Substantial Development Permit
2. Hydraulic Project Approval
3. Water Quality Certification
4. Department of the Army Permit
5. DMMP Suitability Determination
6. Construction General Stormwater Permit

7. CZM Certificate of Consistency
 8. Pier Building Permit (paid for by the Port and picked up by the Contractor)
 9. Marine Building Permit (paid for by the Port and picked up by the Contractor)
- C. Permits to be secured by the Contractor
1. The Contractor shall be responsible for and obtain all other permits required to perform the work specified in the Contract Documents. These permits include, but are not limited to the following:
 - a. Fire Alarm Permit (Marine Building)
 - b. Fire Sprinkling Permit (Marine Building)
 - c. Elevator Permit (Marine Building)
 - d. Electrical Permit (Marine Building)
 - e. Plumbing Permit (Marine Building)
 - f. Mechanical Permit (Marine Building)
 2. Agency permit costs borne by the Contractor will be reimbursed by the Port. As practical, the Contractor shall notify the Engineer of permit costs in advance and the Port will pay the cost directly to the permit agency.
- D. Site Use Authorization (Department of Natural Resources)
1. The Site Use Authorization will be acquired by the Port in coordination with the Contractor. Refer to details associated with Contractor's responsibility discussed in Section 35 20 23.
- E. Miscellaneous
1. The Contractor shall be responsible for the costs of compliance with any of the permit conditions contained within the Contract Documents including those acquired by the Port and those not yet issued, as conditions of permit approval.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

NOTE USED.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK DESCRIBED ELSEWHERE

- A. The provisions and intent of the Contract, including the General and Supplemental Conditions apply to this work as if specified in this section. Work related to this section is described throughout these Specifications.
- B. Individual submittals are required in accordance with the pertinent sections of these Specifications

1.02 PAYMENT PROCEDURES

- A. Monthly pay estimates shall clearly identify the work performed for the given time period based on the approved Schedule of Values.
 - 1. At the Pre-construction meeting, the Engineer and the Contractor shall agree upon a date each month when payment applications shall be submitted.
- B. Prior to submitting a payment application, the Contractor and Engineer shall meet each month to review the work accomplished to determine the actual quantities including labor, materials and equipment charges to be billed.
 - 1. Prior to the payment application meeting, the Contractor shall submit to the Engineer all measurement documentation as referenced in these contract documents; to include all measurement by weight, volume or field.
 - 2. For all change work being done on a force account basis, the Contractor shall submit prior to meeting with Engineer all Force Account back-up documentation as required to process the payment application where Force Account work is being billed. The Engineer and the Contractor shall review the documentation at the payment application meeting to verify quantities and review the work accomplished.
 - 3. The Contractor shall bring a copy of all documentation to the pay application meeting with the Engineer.
- C. Following the Engineers' review, the Contractor shall prepare an original pay estimate, in a form approved by the Port or with the Port's supplied form, signed and complete with all supporting documentation attached and submit it electronically using Adobe PDF file format to cpinvoices@portoftacoma.com.
 - 1. With each payment application, the Contractor shall submit a list of all subcontractors (at all tiers) and suppliers on the Port supplied form.
- D. An estimated cashflow statement projecting the Contractor's monthly billings on the project shall be submitted with each payment application.

1.03 PAYMENT PRICING

- A. Pricing for the various lump sum or unit prices in the Bid Form, as further specified herein, shall include all compensation to be received by the Contractor for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor, operations, and incidentals appurtenant to the items of work being described, as necessary to complete the various items of the work in accordance with the requirements of the Contract Documents.
- B. Pricing also includes all costs of compliance with the regulations of public agencies having jurisdiction, including safety and health requirements of the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA).

- C. No separate payment will be made for any item that is not specifically set forth in the Bid Form, and all costs therefore shall be included in the prices named in the Bid Form for the various appurtenant items of work.
- D. All other work not specifically mentioned in the measurement and payment sections identified below shall be considered incidental to the work performed and merged into the various unit and lump sum prices bid. Payment for work under one item will not be paid for under any other item.
- E. The Port of Tacoma reserves the right to make changes should unforeseen conditions necessitate such changes. Where work is on a unit price basis, the actual quantities occasioned by such changes shall govern the compensation.

1.04 LUMP-SUM MEASUREMENT

- A. Lump-sum measurement will be for the entire item, unit of Work, structure, or combination thereof, as specified and as indicated in the Contractor's submitted bid.
 - 1. If the Contractor requests progress payments for lump-sum items, such progress payments will be made in accordance with an approved schedule of values. The quantity for payment for completed work shall be an estimated percentage of the lump sum amount, agreed to between the Engineer and Contractor, payable in monthly progress payments in increments proportional to the work performed in amounts as agreed between the Engineer and the Contractor.

1.05 REJECTED, EXCESS, OR WASTED MATERIALS

- A. Quantities of material wasted or disposed of in a manner not called for under the Contract; rejected loads of material, including material rejected after it has been placed by reasons of the failure of the Contractor to conform to the provisions of the Contract; material not unloaded from the transporting vehicle; material placed outside the lines indicated on the Contract Drawings or established by the Engineer; or material remaining on hand after completion of the Work, will not be paid for, and such quantities shall not be included in the final total quantities. No additional compensation will be permitted for loading, hauling, and disposing of rejected material.

1.06 MEASUREMENT AND PAYMENT

- A. Item #1 Mobilization and Demobilization
 - 1. Payment for MOBILIZATION AND DEMOBILIZATION shall be for preparatory work and operations performed by the Contractor including, but not limited to, those necessary for the movement of its personnel, equipment, supplies and incidentals to and from the project site; temporary facilities and controls; for the establishment and removal of its offices, buildings and other facilities necessary for work on the project; for premiums on bonds and insurance for the project, for other work and operations which it must perform or costs it must incur before beginning production work on the various items on the project site, and for removal of personnel, equipment, supplies, offices, building facilities, sheds, fencing, and other incidentals from the site.
 - 2. Mobilization and Demobilization shall be paid at the lump sum price listed in the Contractor's submitted bid. Incremental payment shall be made for each location as follows:
 - a. 40% after completion of 5% of the total contract amount of other bid items have been earned.
 - b. 40% after completion of 20% of the total contract amount of other bid items have been earned.

- c. 20% following completion of all work on the project, including cleanup and issuance of Final Completion from the Engineer.
- B. Item #2: Project Administration
1. Item Description: The Work of this item includes all administrative costs associated with administering and supervising the project including supervision of personnel, coordination of all work activities, coordination of subcontractors and/or suppliers, preparation and transmittal of submittals, permit acquisitions, compliance including Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA) monitoring, and project overhead.
 2. Measurement: This item will be measured based on a percentage complete for the overall lump sum amount.
 3. Payment: This item will be paid for at the Contract lump sum price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.
- C. Item #3: Field Engineering
1. Item Description: The Work of this item includes all work necessary for Field Engineering, verifying survey reference points, completion of pre-construction, progress, and post-construction surveys, and pre and post-dredge surveys, dredge progress surveys, slope armoring surveys, and surveying required for monitoring movement of existing pier structure during pile installation, as described in these Specifications. This includes locating and surveying utilities; land-based and hydrographic surveys; survey data processing; and preparation and submittal of all required surveys and calculations in the formats noted herein.
 2. Measurement: This item will be measured based on a percentage complete for the overall lump sum amount.
 3. Payment: This item will be paid for at the Contract lump sum price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.
- D. Item #4: Demolition
1. Item Description: The Work of this item includes for all pier, upland and utility demolitions as noted on the Drawings. This item includes, but is not limited to set up, operation, and demobilization of any processing equipment and containment measures used to further reduce demolished items for handling, transport, or recycling purposes including fugitive dust control; sawcutting, removal, and disposal of the asphalt pavement and ballast; salvaging noted items; removal and disposal of the fender system, superstructure, piles and appurtenances of Pier 4; removal and disposal of existing water, storm drain, sewer, communications and electrical utilities; hazardous material abatement; high-mast light and wood communication pole removal; substation and marine operations building removal; removal and salvage of high mast light pole and navigation aid on Pier 3; installation, maintenance, and removal of temporary structures and measures, as required, to ensure no debris or other construction materials fall into the water or land on the slope; and all other items that require demolition for the completion of the contract work.
 2. Measurement: This item will be measured based on a percentage complete for the overall lump sum amount.
 3. Payment: This item will be paid for at the Contract lump sum price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.

E. Item #5: Exploratory Excavation

1. Item Description: The Work of this item includes performing exploratory excavation for the purpose of verifying the existence and location of the buried stepped timber bulkhead wall indicated in the 1966 record drawings referenced on the Drawings and in the Specifications. Work includes pavement sawcutting, excavation, and management of excavated material for the exploratory excavation pits shown on the Drawings. Removal and disposal of asphalt pavement over the exploratory excavation pits shall be included in Bid Item #4 - Demolition.
2. Measurement: This item will be measured by the cubic yard of material removed based on field-measured neat line excavation volume calculations.
3. Payment: This item will be paid for at the unit price indicated on the bid form and on actual quantities for the period being billed.

F. Item #6: Removal of Buried Timber Bulkhead Wall

1. Item Description: The Work of this item includes removal and disposal of the buried stepped timber bulkhead wall as described on the Drawings and in the available record drawings. Work includes excavation required to expose portions of the wall not exposed through exploratory excavation; complete extraction of timber piles; removal of planking, and bracing; and removal of steel tie-back cables for portions of the wall that exist within the dredge prism, stone column area, or otherwise interferes with installation of upland utilities or any other component of the project. Costs associated with the use of a debris screen during removal of the timber bulkhead wall shall be considered incidental to this bid item. Work under this bid item shall be accomplished upon written direction of the Engineer based on the findings of exploratory excavation work performed under Bid Item #5 - Exploratory Excavation. This entire bid item may or may not be used.
2. Measurement: This item will be measured by the horizontal linear foot of the wall system removed as illustrated on the drawings.
3. Payment: This item will be paid for at the unit price indicated on the bid form and on actual quantities for the period being billed.

G. Item #7: Stone Columns

1. Item Description: The Work of this item includes installation of stone columns landside and waterside of the bulkhead as shown on the Drawings and herein; CPT testing; refuse disposal; and installation, maintenance, and removal of temporary structures and measures, as required, to ensure no debris or other construction materials fall into or enter the water. The Work of this item also includes relocation or addition of stone columns which are required to clear a subsurface obstruction, as directed by the Engineer.
2. Measurement: This item will be measured by per lineal foot of stone column installed, including additional stone column length required to clear subsurface obstructions as directed by the Engineer. Installation length shall be measured as the difference between the tip and top elevations of the installed stone column within the tolerances indicated in the specifications. Portions of stone column length installed beyond the acceptable tolerances will not be included in the measurement for payment.
3. Payment: This item will be paid for at the unit price indicated on the bid form and on actual quantities for the period being billed confirmed by daily logs provided by the Port's geotechnical engineer.

H. Item #8: Riprap and Debris Removal and Disposal

1. Item Description: The Work of this item includes removal and disposal of riprap and debris material located on the surface of the dredge area that is indicated to be removed prior to performance of the pre-dredge survey and the start of dredging.
2. Measurement: This item will be measured based on a percentage complete for the overall lump sum amount as determined by the Engineer based on the Port's above-water and below-water inspection of riprap and debris removal activity.
3. Payment: This item will be paid for at the Contract lump sum price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.

I. Item #9: Dredging and Disposal

1. Item Description: The Work of this item includes implementation of required best management practices associated with dredging operations; dredging/excavation of material as noted on the Drawings; loading into dump barges; transport and disposal of material in open water; partially filling the existing scour hole identified in the Drawings with dredge material; use of a dredge material debris screen during the first pass of dredging within the area at the south end of the site; and compliance, coordination and reporting requirements associated with open water disposal.
2. Measurement: This item will be measured by cubic yard based on a neat-line dredge-cut volume calculation comparing the pre-dredge survey performed after removal of rip rap and debris from the surface of the dredge area to the post-dredge survey performed after the removal of dredge material.
3. Payment: Incremental payment for completed work shall be determined by the Engineer upon review of Progress Surveys and volume calculations, payable in monthly progress payments.

J. Item #10: Filter Blanket

1. Item Description: The Work of this item includes the supply and placement of filter blanket material on the dredged slope as part of the slope protection system as shown on the drawings and defined in these specifications.
2. Measurement: This item will be measured per ton of furnished and accepted material placement calculated from barge displacement measurements or from certified weight tickets and delivery slips collected on-site by the Engineer. Measurement shall also include placement confirmation based on progress surveys as defined in Section 35 42 37 - Riprap Slope Protection.
3. Payment: This item will be paid for at the unit price indicated on the bid form and on actual quantities placed for the period being billed.

K. Item #11: Light Rock Riprap

1. Item Description: The Work of this item includes the supply and placement of light rock riprap material on the dredged slope as part of the slope protection system as shown on the drawings and defined in these specifications.
2. Measurement: This item will be measured per ton of furnished and accepted material placement calculated from barge displacement measurements or from certified weight tickets and delivery slips collected on-site by the Engineer. Measurement shall also include placement confirmation based on progress surveys as defined in Section 35 42 37 - Riprap Slope Protection.

3. Payment: This item will be paid for at the unit price indicated on the bid form and on actual quantities placed for the period being billed.
- L. Item #12: Heavy Rock Riprap
1. Item Description: The Work of this item includes the supply and placement of heavy rock riprap material on the dredged slope as part of the slope protection system as shown on the drawings and defined in these specifications.
 2. Measurement: This item will be measured per ton of furnished and accepted material placement calculated from barge displacement measurements or from certified weight tickets and delivery slips collected on-site by the Engineer. Measurement shall also include placement confirmation based on progress surveys as defined in Section 35 42 37 - Riprap Slope Protection.
 3. Payment: This item will be paid for at the unit price indicated on the bid form and on actual quantities placed for the period being billed.
- M. Item #13: Furnish 24-inch Concrete Pile.
1. Item Description: The Work of this item includes the supply and delivery to the site 24-inch concrete plumb, batter and mooring dolphin piles as shown on the drawings and defined in these specifications.
 2. Measurement: This item will be measured by the number of linear feet of pile furnished based on the lengths shown in the Drawings plus overdrive allowances defined in the specifications.
 3. Payment: This item will be paid for at the unit price indicated on the bid form and on actual quantities for the period being billed.
- N. Item #14: Install 24-inch Concrete Pile - Wharf Plumb Piles
1. Item Description: The Work of this item includes handling, driving, and cutting-off the 24-inch concrete plumb piles and disposal of cut-off pile portions as shown on the drawings and defined in these specifications. This item also includes installation of the grouted pile dowels at the top of the pile.
 2. Measurement: This item will be measured per each pile installed.
 3. Payment: This item will be paid for at the unit price indicated on the bid form and on actual quantities for the period being billed.
- O. Item #15: Install 24-inch Concrete Pile - Wharf Batter Piles
1. Item Description: The Work of this item includes handling, driving, and cutting-off the 24-inch concrete batter piles at the north end of the wharf (bents 2 through 10) and disposal of cut-off pile portions as shown on the drawings and defined in these specifications. This item also includes installation of the grouted pile dowels at the top of the pile.
 2. Measurement: This item will be measured per each pile installed.
 3. Payment: This item will be paid for at the unit price indicated on the bid form and on actual quantities for the period being billed.
- P. Item #16: Install 24-inch Concrete Pile - Mooring Dolphin Piles
1. Item Description: The Work of this item includes handling, driving, and cutting-off the 24-inch concrete mooring dolphin piles and disposal of cut-off pile portions as shown on the drawings and defined in these specifications. This item also includes installation of the grouted pile dowels at the top of the pile.

2. Measurement: This item will be measured per each pile installed.
3. Payment: This item will be paid for at the unit price indicated on the bid form and on actual quantities for the period being billed.

Q. Item #17: Dynamic Pile Driving Analysis

1. Item Description: The Work of this item includes performing Dynamic Pile Driving Analysis (PDA), CAPWAP analyses, and reporting as indicated on the drawings and as defined in the specifications. This item also includes work associated with restriking PDA piles.
2. Measurement: This item will be measured per each pile on which Dynamic Pile Driving Analysis is performed.
3. Payment: This item will be paid for at the unit price indicated on the bid form and on actual quantities for the period being billed.

R. Item #18: Re-strike Concrete Piles

1. Item Description: The Work of this item includes maneuvering into position and re-striking non-PDA concrete piles as defined in these specifications. Restriking of PDA piles is included in Bid Item #17 – Dynamic Pile Driving Analysis.
2. Measurement: This item will be measured per each pile restrike performed meeting the requirements of the specifications.
3. Payment: This item will be paid for at the unit price indicated on the bid form and on actual quantities for the period being billed.

S. Item #19: Pile Cut-offs (lengths greater than 10 feet)

1. Item Description: The Work of this item includes cutting-off and disposal of concrete pile lengths greater than 10 feet long. It is anticipated that pile cutoffs greater than 10 feet in length will only be necessary if unexpected below-ground obstructions or hard driving conditions are encountered during pile driving that prevent the pile from being installed to the design tip elevation. The quantity indicated on the bid form is an estimate intended only for the purposes of establishing a unit price for the work. This entire bid item may or may not be used.
2. Measurement: This item will be measured per each pile installed that requires a cut-off greater than 10 feet.
3. Payment: This item will be paid for at the unit price indicated on the bid form and on actual quantities for the period being billed.

T. Item #20: Concrete Pile Build-ups

1. Item Description: The Work of this item includes constructing concrete pile build-ups as shown on the drawings and as defined in the specifications. It is anticipated that pile build-ups will only be necessary if required geotechnical capacity of the piles is not achieved at the design tip elevation shown on the Drawings. The quantity indicated on the bid form is an estimate intended only for the purposes of establishing a unit price for the work. This entire bid item may or may not be used.
2. Measurement: This item will be measured per each pile build-up.
3. Payment: This item will be paid for at the unit price indicated on the bid form and on actual quantities for the period being billed.

U. Item #21: Furnish and Install Sheet Pile

1. Item Description: The Work of this item includes the supply, delivery and installation of sheet piles as indicated on the drawings and as defined in the specifications.
2. Measurement: This item will be measured by the number of horizontal linear feet of sheet pile installed.
3. Payment: This item will be paid for at the unit price indicated on the bid form and on actual quantities for the period being billed.

V. Item #22: Construct Mooring Dolphin

1. Item Description: The Work of this item includes constructing the mooring dolphin as indicated on the drawings and as defined in the specifications, **excluding** pile procurement and installation, earthwork and electrical work.
2. Measurement: This item will be measured based on a percentage complete for the overall lump sum amount.
3. Payment: This item will be paid for at the Contract lump sum price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.

W. Item #23: Wharf Construction

1. Item Description: The Work of this item includes construction of the wharf as shown on the drawings and as specified herein, including pile caps, pony bents, deck panels, bullrail, Lead Rubber Bearings, sheet pile wall cap beam, crane beams, isolation joint framing, structural and non-structural connections, all wharf appurtenances, integrally cast or attached fixtures, utility and power vaults, cable slots, bollards, ladders, deck drains, crane stops, crane pin sockets, crane tie downs, high performance coating, cast-in-place sleeves for pipe and conduit, and excluding only those items otherwise measured and paid for under different bid items.
2. Measurement: This item will be measured based on a percentage complete for the overall lump sum amount.
3. Payment: This item will be paid for at the Contract lump sum price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.

X. Item #24: Wharf Fender System

1. Item Description: The Work of this item includes fabrication and installation of the fender system, including spare parts, as shown in the drawings and as described in the specifications.
2. Measurement: This item will be measured based on a percentage complete for the overall lump sum amount.
3. Payment: This item will be paid for at the Contract lump sum price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.

Y. Item #25: Furnish and Install Crane Rail

1. Item Description: The Work of this item includes furnishing and installing the crane rail system, including grouting, and anchorage, complete as shown in the plans and as described in these specifications.
2. Measurement: This item will be measured based on a percentage complete for the overall lump sum amount.

3. Payment: This item will be paid for at the Contract lump sum price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.

Z. Item #26: Concrete Spall Repair to Existing Pier 4

1. Item Description: The Work of this item includes completing repairs to spalled and delaminated areas on the underside portion of existing Pier 4 deck panels to remain, complete as shown in the drawings and as described in these specifications.
2. Measurement: This item will be measured by the square foot area of repairs made.
3. Payment: This item will be paid for at the unit price indicated on the bid form and on actual quantities for the period being billed.

AA. Item #27: Storm Drain, Water and Sanitary Sewer Systems

1. Item Description: The Work of this item includes installing complete domestic and fire water, storm drainage, and sanitary sewer systems on the wharf and in the backland including but not limited to trench excavation, bedding, backfill, and compaction; installation of pipes, valves, backflow prevention devices, meters, ship water service assemblies, sanitary sewer pump station and controls, blow-off assemblies, manholes, catch basins, stormwater treatment systems, oil/water separators, flow splitters, outfall structures, thrust blocks, expansion joints, concrete embedments, hydrant assemblies and appurtenances; temporary rerouting of stormwater, complete as shown in the plans and as described in these specifications.
2. Measurement: This item will be measured based on a percentage complete for the overall lump sum amount.
3. Payment: This item will be paid for at the Contract lump sum price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.

AB. Item #28: Electrical and Communications Site Work

1. Item Description: The Work of this item includes installing complete electrical, and communication systems on the wharf, mooring dolphin and in the backland including but not limited to, trench excavation, bedding, backfill, and compaction; installation of conduits, ductbanks, vaults, junction boxes, hand-holes, electrical and fiber optic cables, testing and appurtenances; light pole relocations including drilled shaft foundations; complete as shown in the drawings and as described in these specifications.
2. Measurement: This item will be measured based on a percentage complete for the overall lump sum amount.
3. Payment: This item will be paid for at the Contract lump sum price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.

AC. Item #29: Electrical Substation

1. Item Description: The Work of this item includes furnishing and installing the electrical substation including the grounding grid, concrete slab, enclosure, equipment, testing and appurtenances; complete as shown in the drawings and as described in these specifications.
2. Measurement: This item will be measured based on a percentage complete for the overall lump sum amount.
3. Payment: This item will be paid for at the Contract lump sum price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.

AD. Item #30: Ballast and Base Course for Asphlt Paving

1. Item Description: The Work of this item includes hauling, placement, grading to the specified elevations, compacting, and shaping the material to provide a complete base conforming to the lines and grades as shown on the drawings and as specified in the specifications for all backland paving and for wharf paving over ballast.
2. Measurement: This item will be measured per ton of furnished and accepted material calculated from certified weight tickets and delivery slips collected on-site by the Engineer.
3. Payment: This item will be paid for at the unit price indicated on the bid form and on actual quantities for the period being billed.

AE. Item #31: Asphalt Paving

1. Item Description: The Work of this item includes hauling and placement of asphalt pavement surfacing on the wharf and in the backland including compaction, joint sealants and tack coats as shown on the drawings and as defined in the specifications.
2. Measurement: This item will be measured per ton of furnished and accepted material calculated from certified weight tickets and delivery slips collected on-site by the Engineer.
3. Payment: This item will be paid for at the unit price indicated on the bid form and on actual quantities for the period being billed.

AF. Item #32: Marine Building

1. Item Description: The Work of this item includes construction of the marine operations building, including associated earthwork for building foundation preparation, complete in place as shown in the drawings and as described in these specifications.
2. Measurement: This item will be measured based on a percentage complete for the overall lump sum amount.
3. Payment: This item will be paid for at the Contract lump sum price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.

AG. Item #33: All Other Work

1. Item Description: The Work of this item includes completion of all work, as shown on the drawings and as defined the specifications, that is not specifically identified or included in other bid items described in this section. This includes but is not limited to health and safety requirements, temporary erosion and sediment control (TESC), construction stormwater pollution control requirements, striping and pavement markings, upland bollards and guard rail systems, traffic barriers, removable gangway platform, permanent floating containment boom system; earthwork and foundation preparation for the restroom building, dewatering, dredge debris screen construction, and earthwork not specifically identified under other items of work.
2. Measurement: This item will be measured based on a percentage complete for the overall lump sum amount.
3. Payment: This item will be paid for at the Contract lump sum price as specified in the Contractor's submitted bid, in accordance with the approved Schedule of Values.

AH. Item #34: Stone Column Obstructions Allowance

1. Item Description: This allowance will be for compensation of costs associated with adjustments to stone column installation work that involve pre-drilling and/or removal and excavation of subsurface obstructions unidentified at the time of bid and will be paid preferably as negotiated unit price(s) or lump sum(s). This bid item does not include removal of the buried timber bulkhead wall covered under Bid Item #6 - Removal of Buried Timber Bulkhead Wall. If unit prices or lump sums cannot be established, then work will be paid on a time and material basis per Section 00 72 00 General Conditions Article 8.0. Work under this bid item shall be accomplished upon written direction of the Engineer as a Minor Change in Work. This entire bid item may or may not be used.
2. Measurement: This item will be measured based upon the method agreed upon for each Minor Change issued.
3. Payment: This item will be paid at the price agreed upon for each Change in Work issued by the Engineer in accordance with procedures noted in Section 01 26 00 - Change Management Procedures. For longer duration changes incremental payment for completed work shall be a percentage, determined by the Engineer, payable in monthly progress payments, proportional to the work completed.

AI. Item #35: Unforeseen Dredging Debris Removal Allowance

1. Item Description: This allowance will be for compensation of costs associated with removal and disposal of regulated and non-regulated materials/waste encountered during dredging/excavation within the design dredge prism that is not indicated on the Drawings or the Specifications and is not covered under other bid items. Regulated materials/waste consists of creosote timber and piles, batteries, PCB's, and the like. Non-regulated materials consist of concrete slabs, pipes, vaults and miscellaneous debris. This bid item does not include removal of the buried timber bulkhead wall covered under Bid Item #6 - Removal of Buried Timber Bulkhead Wall. This item will be paid preferably as negotiated unit price(s) or lump sum(s). If unit prices or lump sums cannot be established, then work will be paid on a time and material basis per Section 00 72 00 General Conditions Article 8.0. Work under this bid item shall be accomplished upon written direction of the Engineer as a Minor Change in Work. This entire bid item may or may not be used.
2. Measurement: This item will be measured based upon the method agreed upon for each Minor Change issued.
3. Payment: This item will be paid at the price agreed upon for each Change in Work issued by the Engineer in accordance with procedures noted in Section 01 26 00 - Change Management Procedures. For longer duration changes incremental payment for completed work shall be a percentage, determined by the Engineer, payable in monthly progress payments, proportional to the work completed.

AJ. Item #36: Unforeseen Conditions Allowance

1. Item Description: This allowance will be for UNFORESEEN CONDITIONS for work unidentified at the time of bid and will be paid preferably as negotiated unit price(s) or lump sum(s). If unit prices or lump sums cannot be established, work will be paid on a time and material basis per Section 00 72 00 General Conditions Article 8.0. Work under this bid item shall be accomplished upon written direction of the Engineer as a Minor Change in Work. This entire bid item may or may not be used.
2. Measurement: This item will be measured based upon the method agreed upon for each Minor Change issued.

3. Payment: This item will be paid at the price agreed upon for each Change in Work issued by the Engineer in accordance with procedures noted in Section 01 26 00 - Change Management Procedures. For longer duration changes incremental payment for completed work shall be a percentage, determined by the Engineer, payable in monthly progress payments, proportional to the work completed.

AK. Item #37: Screened Dredging Premium Allowance

1. Item Description: This allowance will be for compensation of additional costs associated with use of a debris screen during dredging beyond those considered incidental to Bid Item #9 - Dredging and Disposal. This includes additional material, labor, and time associated with using the debris screen to segregate debris from dredged sediment prior to open water disposal, including removal of debris from the screen and placing either upland or on a debris barge for processing and disposal. Compensation for processing and disposal of debris will be included in Bid Item 35 - Unforeseen Dredging Debris Removal Allowance. This bid item will be paid in addition to Bid Item #9 during time periods when screened dredging is required in areas not incidental to Bid Item #9. The estimated quantity indicated on the bid form is intended only to establish a budget allowance for this bid item when applied to the unit price submitted by the Contractor and is not an indication of the expected total duration of screened dredging. Refer to Section 35 20 23 - Dredging for additional requirements associated with payment of this item. This entire bid item may or may not be used.
2. Measurement: This item will be measured on an hourly basis for the time periods directed by the Engineer where the use of a debris screen is required. See Section 35 20 23 - Dredging for additional information regarding the Engineer's determination of the start and stop times for screened dredging.
3. Payment: This item will be paid at the per hour unit price indicated on the Bid Form and on the actual length of time in which screened dredging occurs for the period being billed, as documented by the Engineer.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Division 0 and 1 Specifications sections shall apply to all sections of the Contract Documents including specifications, drawings, addenda or other changes of documents issued for bidding/construction.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.

1.03 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment and methods of construction from those required by the Contract Documents and proposed by Contractor.
- B. The contract documents include performance specifications for products and equipment which meet project requirements. In those cases where a representative item or manufacturer is named in the specification it is provided for the sole purpose of identifying a product meeting the required functional performance. Where the words “or equal” are used a substitution request as further described is not required.
- C. Where non-competitive or sole source products or manufacturers are explicitly specified with the words “or approved equal”, or “Engineer approved equal”, or “as approved by the Engineer” are used, they shall be taken to mean “or approved equal”. In these cases a substitution request as further described in this section, is required.

1.04 SUBMITTALS

- A. Post-Award Substitution Requests: Submit a substitution request as defined in 01 33 00 – Submittal Procedures. All substitution requests must be submitted by the Contractor and not a subcontractor or supplier.
 - 1. Substitution Request Form: Use a copy of form located in Section 00 63 25.
 - 2. Documentation: Show compliance with requirements for substitutions with the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include, but are not limited to, attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.

- g. List of similar installations for completed projects with project names, and addresses. Also provide names and addresses of the AE and Owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for project
 - j. Comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within 7 calendar days of receipt of a request for substitution. Engineer will notify Contractor through Port of acceptance or rejection of proposed substitution within 15 calendar days of receipt of request, or 7 calendar days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order or Minor Change in Work.
 - b. Use product originally specified if Engineer does not issue a decision on use of a proposed substitution within time allocated.
- B. Substitutions will not be considered when:
- 1. Indicated or implied on shop drawings or product data submittals without formal request submitted in accordance with this Section.
 - 2. Submittal for substitution request has not been reviewed and approved by Contractor.
 - 3. Acceptance will require substantial revision of Contract Documents or other items of the Work.
 - 4. Submittal for substitution request does not include point-by-point comparison of proposed substitution with specified product.

1.05 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 30 calendar days prior to date required for preparation and review of related submittals.

1. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Requested substitution will not adversely affect Contractor's construction schedule.
 - c. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - d. Requested substitution is compatible with other portions of the Work
 - e. Requested substitution has been coordinated with other portions of the Work
 - f. Requested substitution provides specified warranty.
 - g. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Engineer will consider Contractor's requests for substitution if received within 60 calendar days after the Notice of Award.
 1. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied:
 - a. Requested substitution offers Port a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Port must assume. Port's additional responsibilities may include compensation to Engineer for redesign and evaluation services, increased cost of other construction by Port, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. Requested substitution will not adversely affect Contractor's construction schedule.
 - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - f. Requested substitution is compatible with other portions of the Work.
 - g. Requested substitution has been coordinated with other portions of the Work.
 - h. Requested substitution provides specified warranty.
 - i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.03 SUBMITTALS

- A. The Contractor shall submit the following documentation to the Port:
 - 1. List of Labor Rates
 - a. For the Contractor and each subcontractor, a list of labor rates for each trade applicable to the scope of work to be performed. These submitted rates shall be broken down to include the base wage, fringes, FICA, SUTA, FUTA, industrial insurance and medical aid premiums as stated in the General Conditions. The rates shall not contain any travel time, safety, loss efficiency factors, overhead or profit. Rates shall be submitted for straight time, overtime and double time in a form acceptable to the Engineer. Contractor shall provide proof of all labor rate costs as required by the Engineer including the submission of a copy of the most current Workers Compensation Rate Notice from Labor & Industries and a copy of the Unemployment Insurance Tax Rate notice from the Employment security department.
 - 1) If labor rates change during the course of the project or additional labor rates become required to complete the work, the Contractor shall submit new rates for approval.
 - 2. List of Equipment.
 - a. Submit for the Contractor and each subcontractor, a list of equipment and rates applicable to the scope of work to be performed. The equipment rates shall conform to the rates shown on Equipment Watch. A separate page from equipment watch detailing the hourly rate shall be submitted as backup documentation for each piece of equipment.
 - 1) If the list of equipment and/or equipment rates changes during the course of the project or additional equipment becomes required to complete the work, the Contractor shall submit a new list and rates for approval.
 - 3. No applications for payment or change orders will be processed for the Contractor until labor and equipment rates have been submitted and approved.

1.04 METHOD TO CALCULATE ADJUSTMENTS TO CONTRACT PRICE

- A. One of the following methods shall be used:
 - 1. Unit Price Method;
 - 2. Firm Fixed Price Method (Lump Sum); or,
 - 3. Time and Materials Method (Force Account).
- B. The Port preferred methods are firm fixed price or unit prices.

1.05 MINOR CHANGES IN THE WORK

- A. Engineer will issue a written directive authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.06 PROPOSAL REQUESTS

- A. Port-Initiated Proposal Requests: The Engineer will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Engineer are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Contractor shall submit a written proposal within the time specified in the General Conditions. The proposal shall represent the Contractor's offer to perform the requested work, and the pricing set forth within the proposal shall represent full, complete, and final compensation for the proposed change and any impacts to any other Contract Work, including any adjustments in the Contract Time.
 - a. Include a breakdown of the changed work in sufficient detail that permits the Engineer to substantiate the costs.
 - 1) Generally, the cost breakdown should be divided into the time and materials categories listed in the General Conditions under Article 8.02B for either Lump Sum Proposals or Force Account Proposals.
 - 2) For Unit Price Proposals, include the quantity and description of all work involved in the unit pricing being proposed, along with a not to exceed total cost.
 - b. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or differing site conditions require modifications to the Contract, the Contractor may initiate a claim by submitting a request for a change to the Engineer.
 - 1. Notify the Engineer immediately upon finding differing conditions prior to disturbing the site.
 - 2. Provide follow-up written notification and differing site conditions proposal within the time frames set forth in the General Conditions.
 - 3. Provide the differing site condition change proposal in the same or similar manner as described above under 1.04.A.
 - 4. Comply with requirements in Section 01 25 00 Substitution Procedures During Construction if the proposed change requires substitution of one product or system for product or system specified.
 - 5. Proposal Request Form: Use form acceptable to Engineer.

1.07 PROCEEDING WITH CHANGED WORK

- A. The Engineer may issue a directive instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order per the General Conditions, Article 8.01.E.
 - 1. The directive will contain a description of change in the Work and a not-to exceed amount. It will designate the method to be followed to determine the change in the Contract Sum or the Contract Time.

1.08 CHANGE ORDER PROCEDURES

A. Issuance of Change Order

1. On approval of the Contractor's proposal, and following successful negotiations, the Engineer will issue a Change Order for signature by the Contractor and execution by the Engineer.
 - a. The Contractor shall sign and return the Change Order to the Engineer within **four (4) days** following receipt of the Change Order from the Engineer. If the Contractor fails to return the signed Change Order within the allotted time, the Engineer may issue a Unilateral Change Directive.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes specifications for preparation, format, and submittal of Schedule of Values.
- B. The Schedule of Values will establish unit prices for individual items of work.
- C. The Schedule of Values will be the basis for payment of contract work.

1.02 PREPARATION

- A. To facilitate monthly pay requests, develop the Schedule of Values based on the Contractor's submitted Bid. The schedule of Values shall be used to provide an allocation of the Work for measurement and payment to a level of detail to ensure accurate payment for the Work accomplished.
- B. Obtain the agreement of the Engineer on the Schedule of Values. No payment will be made prior to an agreed upon Schedule of Values.
- C. Include an updated version of the Schedule of Values as changes occur. Update the Schedule of Values to include:
 - 1. Dollars earned and percent complete for the current progress payment period.
 - 2. Dollars earned and percent complete to-date, excluding the current progress payment period.
 - 3. Total dollars earned and percent complete to-date.
 - 4. Total dollars remaining
 - 5. Changes resulting from Change Orders
- D. The total value of the line items in the Schedule of Values plus any approved Change Orders shall be equal to the current approved contract price.
- E. The value of stored material shall be identified in the Schedule of Values with both a material-purchase activity and a separate corresponding installation activity in the Construction Schedule(s).
- F. Include as exhibits, drawings or sketches as necessary, to better define the limits of pay items that are in close proximity and that have no clear boundary in the Contract Drawings.

1.03 SUBMITTAL

- A. Submit preliminary Schedule of Values within 10 days of the effective date of the Notice to Proceed.
- B. Submit corrected Schedule of Values within 10 days upon receipt of reviewed Schedule of Values.
- C. At the Engineer's request, submit documentation substantiating the cost allocations for line items within the Schedule of Values.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 SCHEDULE OF VALUES

- A. Submit the Schedule of Values in a form acceptable to the Engineer.

- B. Provide updated Schedule of Values as required by the Engineer and as indicated in the Contract Documents.

END OF SECTION

PART 1 - GENERAL

1.01 SCOPE

- A. The purpose of this section is to provide the framework for communication between the Port and the Contractor by defining the types and timing of administrative tasks including meetings and other items related to communications.

1.02 NOTICE TO PROCEED

- A. Contract execution will be made per the requirements of the Contract Documents. Once the contract has been executed and all pre-work submittals have been received, the Engineer will issue a Notice to Proceed (NTP).
 - 1. In certain instances, the Engineer may issue to the Contractor a Limited NTP for specified elements of the work described in these Contract Documents.
- B. The Contractor shall submit all pre-work submittals within 10 days of contract execution.
 - 1. A list of all pre-work submittals required for NTP is noted below.
 - 2. No contract time extension shall be granted for any delays in issuance of the NTP by the Engineer due to the Contractor's failure to provide acceptable submittals required by the Contract Documents.

1.03 PRE-WORK SUBMITTALS

- A. List of Contractor and Subcontractor personnel per Section 00 73 63 Security Requirements
- B. List of emergency contacts
- C. Project Schedule per Section 01 32 16 Construction Progress Schedule
- D. Submittal Log per Section 01 33 00 Submittal Procedures
- E. Health and Safety Plan per Section 01 35 29 Health, Safety and Emergency Response Procedures

1.04 COORDINATION

- A. The Contractor shall coordinate all its activities through the Engineer.
- B. The Contractor shall coordinate construction operations as required to execute the Work efficiently, to obtain the best results where installation of one part of the Work depends on other portions.

1.05 PROJECT MEETINGS

- A. Pre-Construction Meeting
 - 1. After execution of the contract but prior to commencement of any work at the site, a mandatory one time meeting will be scheduled by the Engineer to discuss and develop a mutual understanding relative to the administration of the safety program, preparation of the schedule of values, change orders, RFI's, submittals, scheduling prosecution of the work. Major subcontractors who will engage in the work shall attend.
 - 2. Suggested Agenda: The agenda will include items of significance to the project. A sample agenda is attached to this section.
 - 3. Location of the Pre-Construction Meeting will be held at the Port of Tacoma Administration Building located at One Sitcum Plaza.

- B. Weekly Progress Meetings – Progress meetings include the Contractor, Engineer, consultants and others affected by decisions made.
1. The Engineer will arrange meetings, prepare standard agenda with copies for participants, preside at meetings, record minutes and distribute copies within ten working days to the Contractor, meeting participants, and others affected by decisions made.
 2. Attendance is required for the Contractor's job superintendent, major subcontractors and suppliers, Engineer, and representatives of the Port as appropriate to the agenda topics for each meeting.
 3. Standard Agenda
 - a. Review minutes of previous meeting.
 - b. Review of work progress.
 - c. Field observations, problems, and decisions.
 - d. Identification of problems that impede planned progress.
 - e. Maintenance of Progress Schedule (3 weeks ahead; 1 week back).
 - f. Corrective measures to regain projected schedules.
 - g. Planned progress during succeeding work period.
 - h. Coordination of projected progress.
 - i. Maintenance of quality and work standards.
 - j. Effect of proposed changes on progress schedule and coordination.
 - k. Demonstration that the project record drawings are up-to-date.
 - l. Other business relating to the work.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Port and Contractor shall use the Port Contract Management application (eBuilder®) for electronic information exchange throughout the duration of the Contract as later described.
- B. eBuilder is a web-based application accessed through a web portal.
 - 1. The Contractor will receive up to two separate user accounts for access to eBuilder®.
- C. The joint use of this system is to facilitate and coordinate the electronic exchange of Requests for Information, Submittals, Change Order Proposals and project specific correspondence.

1.02 USER ACCESS LIMITATIONS

- A. Access to eBuilder® is granted by the Engineer.
- B. Contractor's access to eBuilder® is controlled by the Engineer.
 - 1. The users assigned by the Contractor to use eBuilder shall be competent and experienced with the practices commonly employed in the industry for electronically submitting requests for information, submittals, product data, shop drawings and related items as required by the contract and the methods commonly used for project correspondence transmission and filing.
 - 2. Any users assigned by the Contractor whom the Engineer determines is incapable of performing the prescribed tasks in an accurate, competent and efficient manner will be removed upon request from the Engineer. The qualifications and identity of a replacement user shall be submitted within 24 hours for consideration by the Engineer. Once accepted by the Engineer, the user account will be modified accordingly.

1.03 CONTRACTOR COMPUTER HARDWARE REQUIREMENTS

- A. The Contractor is responsible for providing and maintaining the following:
 - 1. Hardware and integrated software capable of running one of the following personal computer operating systems; Microsoft Windows XP SP3 (or newer) or Mac OS X.

1.04 CONTRACTOR COMPUTER SOFTWARE REQUIREMENTS

- A. The Contractor is responsible for providing and maintaining the following:
 - 1. A personal computer OS such as Microsoft Windows XP SP3 (or newer) or Mac OS X.
 - 2. A web browser such as Internet Explorer™ 8.0 - 11.0, Google Chrome™ v29 (32 bit), Mozilla Firefox™ 35.0.1, Safari™ for Mac v6.0.4, Safari for iOS™ mobile v6.1 for Windows XP, SP3+ and Mac OS X for gaining access to eBuilder®.
 - 3. An office suite that is Microsoft Office 2010 compatible for generation and manipulation of correspondence.
 - 4. A program capable of editing, annotating and manipulating Adobe pdf files for inserting the Contractor's review stamp, clouding and adding notation to the files as necessary for review by the Engineer.
 - 5. IT support capable of making, maintaining and troubleshooting connection to eBuilder.

1.05 CONTRACTOR RESPONSIBILITY

- A. Provide all the equipment, internet connections, software, personnel and expertise required to support the use of eBuilder as described in the Contract documents.

1.06 PORT RESPONSIBILITY

- A. Provide the Contractor with all forms necessary for application to obtain permissions to access eBuilder® as described above.
- B. Provide information, basic user guides and requirements on methods for using eBuilder®.
- C. Provide training for the Contractor's staff utilizing eBuilder.
- D. Provide the Contractor with up to two (2) user accounts to access eBuilder.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 UTILIZATION OF EBUILDER®

- A. The Contractor shall provide required information in a timely manner that also supports the project schedule and meets the requirements of the Contract.
- B. The Contractor shall provide and maintain competent and qualified personnel to perform the various tasks required to support the work within eBuilder®.
- C. The Port will not be liable for any delays associated from the usage of eBuilder® including, but not limited to: slow response time, Port maintenance and off-line periods, connectivity problems or loss of information. Under no circumstances shall the usage of eBuilder® software be grounds for a time extension or cost adjustment to the contract.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preliminary schedule.
- B. Construction progress schedule, bar chart type.

1.02 RELATED SECTIONS

- A. Section 01 10 00 - Summary: Work sequence.
- B. Section 01 14 00 - Work Restrictions

1.03 REFERENCES

- A. M-H (CPM) - CPM in Construction Management - Project Management with CPM, O'Brien, McGraw-Hill Book Company; 2006.

1.04 SUBMITTALS

- A. Within 10 days following execution of the contract, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days of receiving Port comments.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
- D. Submit updated schedule monthly to the Engineer.

1.05 QUALITY ASSURANCE

- A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with one year minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

1.06 SCHEDULE FORMAT

- A. The baseline project schedule shall be produced using the Critical Path Method (CPM) format and shall be submitted on CD-ROM.
- B. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
- C. Sheet Size: Multiples of 8-1/2 x 11 inches (216 x 280 mm).

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 BASELINE SCHEDULE

- A. Prepare preliminary schedule in the form of a horizontal bar chart.
- B. The baseline project schedule shall include all the activities listed in the Schedule of Values and be directly related to items listed in the Bid Form. The Contractor is encouraged to add sufficient activities to facilitate a clear understanding of the means and methods planned for the various work items.

- C. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction and critical path. At a minimum it shall include and show the following:
 - 1. A time scale showing the elementary work items needed to complete the work.
 - 2. Estimated time durations for each activity, defined as any single identifiable work step within the project.
 - 3. A graphical network diagram showing the logical sequence of activities, their precedence relationships, and estimated float or leeway available for each.
 - 4. The different categories of work as distinguished by crew requirements, equipment requirements, and construction materials.
 - 5. The different areas of responsibility, such as distinctly separate or subcontracted work, and identifiable subdivisions of work such as structural, electrical, civil, mechanical, etc.
- D. It shall be maintained and updated as necessary to accurately reflect past progress and the most probable future progress
- E. Activities shown shall include submittals, milestones, sufficient task breakdown for major components of work.
- F. Identify work of separate stages and other logically grouped activities.
- G. Provide sub-schedules to define critical portions of the entire schedule.
- H. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, products identified, and dates reviewed submittals will be required from the Engineer. Indicate decision dates for selection of finishes.

3.02 PROGRESS SCHEDULE

- A. From the regularly-maintained baseline project schedule, progress schedules showing a three-week look-ahead, one-week look-back, shall be submitted and distributed at the weekly progress meetings. The progress schedule shall represent a practical plan to complete the work shown within the contract work window presented. At a minimum, the presentation, typically a Gantt-style chart, shall convey the task durations, a logical work sequence, task interdependencies, and identify important or critical constraints.
- B. Submittal and distribution of progress schedules will be understood to be the Contractor's representation that the scheduled work meets the requirements of the contract documents and that the work will be executed in the manner and sequence presented, and over the durations indicated.
- C. The scheduling, coordination, and execution of construction in accordance with the contract documents are the responsibility of the Contractor. The Contractor shall involve, coordinate, and resolve scheduling with all subcontractors, material suppliers, or others affected in development of the progress schedules.
- D. The progress schedule shall be used for coordination purposes for inspection and testing purposes as well as validation of work progress against the baseline schedule.

3.03 UPDATING SCHEDULE

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

- C. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- D. Indicate changes required to maintain Date of Substantial Completion.
- E. Submit reports required to support recommended changes.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK DESCRIBED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions apply to this work as if specified in this section. Work related to this section is described throughout these Specifications.
- B. Individual submittals required in accordance with the pertinent sections of these specifications. Other submittals may be required during the course of the project and are considered part of the normal work to be completed under the Contract.

1.02 SUBMITTAL LOG

- A. Contractor shall, within 10 days following execution of the contract, prepare and submit for Engineer approval a detailed log of all the submittals required under this Contract, along with any other submittals identified by the Port or Contractor. The log shall include, but not be limited to, schedules, required construction work plans, equipment and material cut sheets, shop drawings, project record documents, test results, survey records, record drawings, results of QC testing, and all other items for which a submittal is required. The submittal log shall be organized by CSI Specification Division, and Section number and include the following information:
 - 1. Submittal Number
 - 2. Item identification.
 - 3. Scheduled submittal date, date returned, date approved.
 - 4. Date submittal or material is needed.
 - 5. After the submittal log is reviewed and approved by the Engineer, it shall become the basis for the submittal of all items by Contractor, unless other submittals are identified as noted in paragraph 1.01B above.

1.03 COMPLIANCE

- A. Failure to comply with these requirements shall be deemed as the Contractor's agreement to furnish the exact materials specified or materials selected by the Engineer based on these specifications.

1.04 SHOP DRAWINGS AND MANUFACTURERS' LITERATURE

- A. The Port will not accept shop drawings that prohibit the Port from making copies for its own use.
- B. Shop drawings shall be prepared accurately and to a scale sufficiently large to indicate all pertinent features of the products and the method of fabrication, connection, erection, or assembly with respect to the work.
- C. All drawings submitted to the Engineer for approval shall be drawn to scale as ANSI D
- D. Required electronic formats for these drawings are as follows:
 - 1. AutoCad DWG
 - 2. PDF - Formatted to print to half-scale using 11x17 paper.
- E. Catalog cuts or brochures shall show the type, size, ratings, style, color, manufacturer, and catalog number of each item and be complete enough to provide for positive and rapid identification in the field. General catalogs or partial lists will not be accepted. Manufacturers' original electronic files are required for submitting.

1.05 SUBMITTAL REVIEW

- A. After review of each of Contractor's submittals, the submittal will be returned to Contractor with a form indicating one or more of the following:
 - 1. No Exceptions Taken. Means, accepted subject to its compatibility with future submittals and additional partial submittals for portions of the work not covered in this submittal. But it does not constitute approval or deletion of specified or required items not shown in the partial submittal.
 - 2. Make Corrections Noted. Same as Item 1, except that minor corrections as noted shall be made by Contractor.
 - 3. Reviewed. Means submittal has been reviewed by the port. Does not constitute approval and The Contractor is responsible for requirements in submittal.
 - 4. Reviewed as Noted. Means submittal has been reviewed by the Port with comments as noted.
 - 5. Revise and Resubmit or Rejected. Means, rejected because of major inconsistencies or errors. Resolve or correct before next submittal.
- B. Submittals marked "No Exceptions Taken", "Make Corrections Noted" or "Reviewed as Noted" authorizes Contractor to proceed with construction covered by those data sheets or shop drawings with corrections, if any, incorporated.
- C. When submittals or prints of shop drawings have been marked "Revise and Resubmit" or "Rejected," Contractor shall make the necessary corrections and submit required copies. Every revision shall be shown by number, date, and subject in a revision block, and each revised shop drawing shall have its latest revision numbers and items clearly indicated by clouding around the revised areas on the shop drawing.
- D. Submittals authorized by the Engineer do not in any case supersede the Contract Documents. The approval by the Engineer shall not relieve the Contractor from responsibility to conform to the Drawings or Specifications, or correct details when in error, or ensure the proper fit of parts when installed. A favorable review by the Port of shop drawings, method of work, or information regarding material and equipment Contractor proposes to furnish shall not relieve Contractor of its responsibility for errors therein and shall not be regarded as assumption of risk or liability by the Port or its officers, employees, or representatives. Contractor shall have no claim under the Contract on account of failure or partial failure, or inefficiency or insufficiency of any plan or method of work, or material and equipment so accepted. Favorable review means that the Port has no objection to Contractor using, upon its own full responsibility, the plan or method of work proposed, or furnishing the material and equipment proposed.
- E. It is considered reasonable that the Contractor's submittals shall be complete and acceptable by at least the second submission of each submittal. The Port reserves the right to deduct monies from payments due Contractor to cover additional costs for review beyond the second submission.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 PREPARATION OF SUBMITTALS

- A. The Contractor shall use the e-Builder software, to submit all shop drawings, catalog cuts, brochures including samples which must be hand-delivered. Notes, clouding, arrows or other post document generation notations must be applied directly into the electronic file using

software designed for that purpose. **Each submittal shall be accompanied by a transmittal developed within the e-Builder software.**

- B. A separate submittal shall be prepared for each product or procedure and shall be further identified by referencing the Specification Section and paragraph number and each submittal shall be numbered consecutively. An example of the numbering protocol is given here for an Electrical Submittal "26 05 33-001- PVC Schedule 80 Conduit". If something is rejected and needs resubmitted it gets resubmitted with the same number adding an R for revised or .1 but the submittal number stays the same ALWAYS.
- C. Product submittals that cannot be accomplished electronically shall be accompanied by a printed version of the transmittal developed within e-Builder. These submittals will be hand delivered to the Port offices at One Sitcum Plaza, Attention: Engineering Department - Trevor Thornsley.
- D. Shop and detail drawings shall be submitted in related packages. All equipment or material details which are interdependent or are related in any way must be submitted indicating the complete installation. Submittals shall not be altered once marked "No Exceptions Taken" Revisions shall be clearly marked and dated. Major revisions must be submitted for approval.
- E. The Contractor shall thoroughly review all shop and detail drawings, prior to submittal, to assure coordination with other parts of the work.
- F. Components or materials which require shop drawings and which arrive at the job site prior to approval of shop drawings shall be considered as not being made for this project and shall be subject to rejection and removal from the premises.
- G. All submittal packages including (but not limited to) product data sheets, mix designs, shop drawings and other required information for submittal must be submitted, reviewed and approved before the relevant scheduled task may commence. It is the responsibility of the Contractor to provide the submittal information which may drive a task on the construction schedule to submit items well enough in advance as to provide adequate time for review and comment from the Engineer without adversely impacting the construction schedule.
- H. When completing the eBuilder submittal form a Date Due field is required to be completed. This field is intended to inform the Port of the urgency of the submittal. Failure of the Port to return the submittal by the date provided by the Contractor will not be considered grounds for a contract time extension.

3.02 MAINTENANCE OF SUBMITTAL LOG

- A. Prepare and submit for Port review a detailed submittal log conforming to the requirements of paragraph 1.02 of this section. When approved by the Engineer use the submittal log to track the transmittal of submittals to the Engineer, the receipt of submittal comments from the Engineer, and all subsequent action with respect to each submittal. Provide an updated copy of the submittal log to the Engineer during each weekly progress meeting, unless otherwise approved by the Engineer.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. The work includes the requirements for health and safety provisions necessary for all work at the site for this project. The work also includes compliance with all laws, regulations and ordinances with respect to safety, noise, dust, fire and police action, civil disobedience, security or traffic.
- B. Some of the work tasks may place workers in the potential position of coming into contact with regulated building materials, waste, or environmental media. Detailed information regarding the known nature and extent of refuse and regulated materials in the project area is included in Section 00 31 26 Existing Hazardous Material Information.
- C. The Contractor shall monitor site conditions for indications of identified and other potentially hazardous, dangerous, and/or regulated materials (suspicious material). Indicators of suspicious material include, but are not limited to, refuse, oily sheen or coloring on soil or water, or oily or chemical odors. If suspicious materials are encountered, the Contractor shall stop all work in that area and notify the Engineer immediately.

1.02 SUBMITTALS

- A. Prior to the start of any Work, the Contractor shall provide a site specific Health and Safety Plan (HASP), which meets all the requirements of local, state and federal laws, rules and regulations. The HASP shall address all requirements for general health and safety and shall include but not be limited to:
 - 1. Description of work to be performed and anticipated chemical and/or physical hazards associated with the work.
 - 2. Map of the site(s) illustrating the location of the anticipated hazards and areas of control for those hazards (including containments, exclusion/work zones, and contaminant reduction/decontamination zones).
 - 3. Hazardous material inventory and safety data sheets (SDSs) for all chemicals which will be brought on site.
 - 4. Signage appropriate to warn site personnel and visitors of anticipated site hazards.
 - 5. Documentation that the necessary workers have completed the required Hazardous Waste Operations and Emergency Response (HAZWOPER) training.
 - 6. Engineering controls/equipment to be used to protect against anticipated hazards.
 - 7. Personal protective equipment and clothing including head, foot, skin, eye, and respiratory protection.
 - 8. Procedures which will be used for:
 - a. Lockout/Tagout;
 - b. Fall protection;
 - c. Trenching and shoring;
 - d. Hot work;
 - e. Oxygen deficient conditions;
 - f. Asbestos and lead hazards;
 - g. Suspicious materials and/or unidentified materials;

- h. Confined-space entry (could include dewatering storage tanks, manholes, or other items);
 - i. Confined-space rescue;
 - j. Odorous conditions and toxic gases.
- 9. Exposure monitoring to be used to evaluate actual hazards compared with anticipated conditions, including but not limited to arsenic exposure assessment.
- 10. Site housekeeping procedures and personal hygiene practices.
- 11. Personnel and equipment decontamination plan.
- 12. Railroad safety procedures.
- 13. Administrative controls.
- 14. Emergency plan including locations of and route to nearest hospital.
- 15. Medical surveillance program for site personnel before, during, and after completion of site work.
- 16. Recordkeeping including:
 - a. Documentation of appropriate employee training (e.g., Hazardous Waste Operations and Emergency Response [HAZWOPER] 40-hour training for staff involved with excavation and handling of soil)
 - b. Respirator fit testing
- 17. Name and qualification of person preparing the HASP and person designated to implement and enforce the HASP.
- 18. Name and qualifications for Certified Safety Professional (CSP) or Certified Industrial Hygienist (CIH) and a copy of the CIH's or CSP's certification and resume.
- 19. Excavation, stockpiling, and truck loading procedures.
- 20. Lighting and sanitation.
- 21. Signatory page for site personnel to acknowledge receipt, understanding, and agreement to comply with the HASP.
- B. Prior to the start of any Work, the Contractor shall provide a site specific Spill Prevention, Control and Countermeasures (SPCC) Plan, which meets all the requirements of local, state and federal laws, rules and regulations.
- C. Contractor may submit the HASP and SPCC Plan as one comprehensive document or may submit the plans as separate documents.

1.03 POTENTIAL CHEMICAL HAZARDS

A. Site Contaminants

- 1. The Contractor must provide site workers with Hazard Communication standard information for potential site contaminants (in accordance with WAC 296-843). The Contractor shall ensure that all site workers are aware of and understand this information. Additional information shall also be provided by the Contractor, as necessary, to meet the Hazard Communication Standard and HASP requirements as noted in WAC 296-901-14010 and 296-843. Workers shall be instructed on basic methods or techniques to assist in detecting suspicious material.

B. Potential Exposures Routes

1. Ingestion: Inadvertent transfer of site contaminants from hands or other objects to the mouth could occur if site workers eat, drink, smoke, chew tobacco, or engage in similar activities in work areas. This could result in ingestion of site contaminants. Precautions to prevent accidental or inadvertent ingestion of hazardous materials will be included in the HASP.
- C. Chemical hazards may also result from Contractor operations resulting in inadvertent release of fuel, oil, or other chemicals in a manner that would expose workers.

1.04 POTENTIAL PHYSICAL AND OTHER HAZARDS

- A. The Work of the Contractor is described elsewhere in these specifications. Precautions to prevent all anticipated physical and other hazards, including heavy equipment and vessels, shall be addressed in the HASP.
- B. Specific aspects of construction resulting in physical hazards anticipated for this project include, but are not limited to the following:
1. Work over or adjacent to water, presenting hazards of falling into water, hypothermia from exposure to the elements, and drowning.
 2. Operation of marine equipment, including winches, dredges, and related equipment, entrapment, ensnarement, and being struck by moving parts hazards
 3. Completion of diver surveys with specific health and safety elements.
 4. Major hazards associated with earthwork impacts from moving construction vehicles and trucks, noise, thermal stress, contact with unguarded machines, excavation hazards (i.e., cave-in, utility, etc.), strains from heavy lifting, and reduced visibility and communications difficulties in work area.
 5. Operation of equipment, including excavators, loaders, and related equipment, presenting hazards of entrapment, ensnarement, and being struck by moving parts.
- C. Other anticipated physical hazards:
1. Heat stress, such as that potentially caused by impermeable clothing (may reduce the cooling ability of the body due to evaporation reduction).
 2. Cold stress, such as that potentially caused during times when temperatures are low, winds are high, especially when precipitation occurs during these conditions.
 3. Biological hazards, such as mold, insect stings, or bites, poisonous plants (i.e., poison oak, sumac, etc.).
 4. Trips and falls
- D. Firewatch Procedures
1. A firewatch is implemented to ensure the fire-safety of a building, structure or area in the event of any act (e.g., hot work) or situation instigating an increased risk of fire. The term "firewatch" is used to describe a dedicated person or persons whose sole responsibility is to look for fires within an established area.
 2. A firewatch is required when all hot work is being performed.
 3. The firewatch is to perform the following functions:
 - a. Firewatch personnel are to keep diligent watch for fires in the general area where the work is being performed.

- b. Firewatch personnel are to be familiar with facilities and procedures for sounding an alarm in the event of a fire.
- c. Firewatch personnel are to have fire extinguishing equipment readily available and be trained in its use, including practice on test fires.
- d. Firewatch personnel are to inspect the site prior to hot work activities to ensure that combustibles are removed or covered and that any nearby holes or penetrations in the ground and walls are sealed or covered with fire-safe materials.
- e. Firewatch personnel are to watch for fires in all exposed areas. If a fire is located, firewatch personnel are to sound the evacuation alarm immediately and after that try to extinguish the fire only when obviously within the capacity of the equipment available.
- f. The firewatch is to be maintained for at least 120 minutes after completion of hot work such as cutting, welding, or other open flame operations in order to detect and extinguish smoldering and flaming fires. During this time, the work area and other adjacent areas where sparks or flame may have traveled are to be searched for signs of combustion.

PART 2 - PRODUCTS

2.01 SAFETY SIGNAGE

- A. The Contractor shall provide signage at strategic locations within the project site to alert jobsite workers and visitors of the associated hazards, and required precautions.

2.02 PRODUCTS SPECIFIED FOR HEALTH AND SAFETY

- A. Provide the equipment and supplies necessary to support the work as described in the site-specific HASP. Equipment and supplies may include but are not limited to:
 - 1. All chemicals to be used on site;
 - 2. A hazardous materials inventory and SDSs for the chemicals brought on site;
 - 3. Enclosure equipment (for dust and asbestos fiber control);
 - 4. Fencing and barriers;
 - 5. Warning signs and labels;
 - 6. Trenching equipment;
 - 7. Fire extinguishers;
 - 8. Equipment to support hot work;
 - 9. Equipment to support lockout/tagout procedures;
 - 10. Scaffolding and fall protection equipment;
 - 11. Personal protective equipment (hard hats, foot gear, skin, eye, and respiratory protection);
 - 12. Area and personnel exposure monitoring equipment;
 - 13. Demolition equipment and supplies;
 - 14. Decontamination equipment and supplies;
 - 15. First aid equipment;
 - 16. Spill response and spill prevention equipment; and
 - 17. Field documentation logs/supplies

PART 3 - EXECUTION

3.01 WORK AREA PREPARATION

- A. Contractor shall comply with health and safety rules, regulations, ordinances promulgated by the local, state, and federal government, the various construction permits, and other sections of the Contract Documents. Such compliance shall include, but not be specifically limited to: any and all protective devices, equipment and clothing; guards; restraints; locks; latches; switches; and other safety provisions that may be required or necessitated by state and federal safety regulations. The Contractor shall determine the specific requirements for safety provisions and shall have inspections and reports by the appropriate safety authorities to be conducted to ensure compliance with the intent of the regulations.
- B. Contractor shall inform employees, subcontractors and their employees of the potential danger in working with any potentially regulated materials, equipment, soils and groundwater at the project site.
- C. Contractor shall perform whatever work is necessary for safety and be solely and completely responsible for conditions of the job site, including safety of all persons (including employees of the Engineer, Engineer's Representative, and Contractor) and property during the Contract period. This requirement applies continuously and is not limited to normal working hours.
- D. The Engineer's review of the Contractor's performance does not include an opinion regarding the adequacy of, or approval of, the Contractor's safety supervisor, the site-specific HASP, safety program or safety measures taken in, on, or near the job site.
- E. Accidents causing death, injury, or damage must be reported immediately to the Engineer and the Port Security Department in person or by telephone or messenger. In addition, promptly report in writing to the Engineer all accidents whatsoever arising out of, or in connection with, the performance of the work whether on, or adjacent to, the site, giving full details and statements of witnesses.
- F. If a claim is made by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing within 24 hours after occurrence, to the Engineer, giving full details of the claim.

3.02 SITE SAFETY AND HEALTH OFFICER

- A. Contractor shall provide a person designated as the Site Safety and Health Officer, who is thoroughly trained in rescue procedures, has a minimum current 40-hour HAZWOPER certification (minimum), and trained to use all necessary safety equipment, air monitoring equipment, and gas detectors. The person must be available and/or present at all times while work is being performed, and conduct testing, as necessary.
- B. The Site Safety and Health Officer shall be empowered with the delegated authority to order any person or worker on the project site to follow the safety rules. Failure to observe these rules is sufficient cause for removal of the person or worker(s) from this project.
- C. The Site Safety and Health Officer is responsible for determining the extent to which any safety equipment must be utilized, depending on conditions encountered at the site.

3.03 SPILL PREVENTION AND CONTROL

- A. The Contractor shall be responsible for prevention, containment and cleanup of spilling petroleum and other chemicals/hazardous materials used in the Contractor's operations. All such prevention, containment and cleanup costs shall be borne by the Contractor.

- B. The Contractor is advised that discharge of oil, fuel, other petroleum, or any chemicals/hazardous materials from equipment or facilities into state waters or onto adjacent land is not permitted under state water quality regulations.
- C. In the event of a discharge of oil, fuel or chemicals/hazardous materials into waters, or onto land with a potential for entry into waters, containment and cleanup efforts shall begin immediately and be completed as soon as possible, taking precedence over normal work. Cleanup shall include proper disposal of all spilled material and used cleanup materials.
- D. The Contractor shall, at a minimum, take the following measures regarding spill prevention, containment and cleanup.
 - 1. Fuel hoses, lubrication equipment, hydraulically operated equipment, oil drums and other equipment and facilities shall be inspected regularly for drips, leaks or signs of damage, and shall be maintained and stored properly to prevent spills. Proper security shall be maintained to discourage vandalism.
 - 2. All land-based chemical, oil and products' storage tanks shall be diked, contained and/or located so as to prevent spills from escaping into the water. Dikes and containment area surfaces shall be lined with impervious material to prevent chemicals or oil from seeping through the ground and dikes.
 - 3. All visible floating sheen shall be immediately contained with booms, dikes or other appropriate means and removed from the water prior to discharge into state waters. All visible spills on land shall be immediately contained using dikes, straw bales or other appropriate means and removed using sand, sawdust or other absorbent material, which shall be properly disposed of by the Contractor. Waste materials shall be temporarily stored in drums or other leak-proof containers after cleanup and during transport to disposal. Waste materials shall be disposed offsite in accordance with applicable local, state and federal regulations.
 - 4. In the event of any oil or product discharges into public waters, or onto land with a potential for entry into public waters, the Contractor shall immediately notify the Port Security at their listed 24-hour response number:
 - a. Port Security: 253-383-9472
- E. The Contractor shall maintain the following materials (as a minimum) at the project site:
 - 1. Oil-absorbent booms: 200 feet.
 - 2. Oil-absorbent pads or bulk material, adequate for coverage of 200 square feet of surface area.
 - 3. Oil-skimming system.
 - 4. Oil dry-all, gloves and plastic bags.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section discloses procedures to follow if suspected and/or previously unidentified regulated materials are encountered.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions, Supplementary Conditions, and General Requirements, apply to this work as specified in this section. Work related to this Section is described in, but not limited to:
 - 1. Section 00 31 26 - Existing Hazardous Material Information
 - 2. Section 01 35 29 – Health, Safety, and Emergency Response Procedures
 - 3. Section 01 35 19 – Export Soil Management
 - 4. Section 01 74 19 – Waste Management and Disposal
 - 5. Section 02 41 00 – Site Demolition
 - 6. Section 02 41 01 – Building Demolition
 - 7. Section 02 83 13 – Lead Hazard Control Activities

1.03 NOTIFICATION AND SUSPENSION

- A. In the event the Contractor detects the presence of potentially regulated materials not previously identified in this specification, the Contractor shall stop work and immediately notify the Port. Following such notification by the Contractor, the Port shall in turn notify the various governmental and regulatory agencies concerned with the presence of regulated materials, if warranted. Depending upon the type of materials identified, the Port may suspend work in the vicinity of the discovery under the provisions of General Conditions.
 - 1. Following completion of any further testing necessary to determine the nature of the materials involved, the Port will determine how the material shall be managed. Although the actual procedures used in resuming the work shall depend upon the nature and extent of the regulated material, the following alternate methods of operation are foreseen as possible:
 - a. Contractor to resume work as before the suspension.
 - b. Contractor to move its operations to another portion of the work until measures to eliminate any hazardous conditions can be developed and approved by the appropriate regulatory agencies.
 - c. The Port to direct the Contractor to dispose or treat the material in an approved manner.
 - d. The Port to terminate or modify the Contract accordingly, for unforeseen conditions.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Soils that cannot be reused onsite and are anticipated to be exported to an off-site facility must have a completed soil profile prior to export. Contractor is responsible for collecting the appropriate data that satisfies the requirements of the receiving facility.
- B. Soils excavated within the project area, as shown on the drawings, are anticipated to be free of regulated material; however, should the Contractor identify soil that cannot be reused as part of the project, the Contractor shall notify the Engineer to determine if the soil requires special handling.
 - 1. Soil with unexpected regulated material, as identified by visual and/or olfactory methods, shall be segregated from other excavated material until such time as appropriate testing and analysis can be completed by the Port. Upon completion of the soil profile, the Engineer will inform the Contractor of any special handling requirements based on the results.
 - 2. Soil beyond construction excavation limits will not require excavation unless free draining product is observed or other special conditions exist; in which case the Engineer will direct the Contractor in additional excavation. Soils determined to require special handling will be hauled and disposed of at an approved disposal facility.
- C. No soil shall be removed from the site without prior notification to the Engineer. The notification shall include:
 - 1. An estimate of the number of truck-trips, the haul destination, and the period in which these trips will be made (e.g., 20 truck-trips to the Waste Management Facility over the two-week period beginning on March 1, 2012).

1.02 DEFINITIONS

- A. Olfactory Indications (methods): Of or relating to the sense of smell. Soils containing petroleum and other volatile constituents typically exhibit characteristic odors that can be detected (and sometimes identified) by smell.
- B. Regulated Material: Any chemical, physical, biological, or radiological substance that does not occur naturally in the environment, or that occurs at concentrations higher than natural background levels, and is regulated by agencies as to the disposal/recycling facility(ies) the material can and cannot go (i.e., EPA, Department of Ecology, Tacoma-Pierce County Health Department).
- C. Soil (waste) Profile: A characterization of the chemical and physical properties of soil material designated for off-site disposal, including the presence of pollutants and their concentrations as measured by approved laboratory analytical methods. A profile is required by the receiving permitted disposal or recycling facility.
- D. Special Handling: Refers to hauling and disposal of soils that cannot be reused in place as backfill or as general fill at another (off-site) location due to the presence of pollutants in concentrations above allowable limits. Such soils must be hauled to and managed at a permitted disposal facility.
- E. Type A Regulated Soil: Soil that must be removed from the Project site and has been determined by the Engineer to contain pollutants in concentrations that exceed state or federal dangerous or hazardous designations (respectively), or other special Port-determined criteria. Type A Regulated Soil requires disposal at an approved Subtitle C hazardous waste landfill.

- F. Type B Regulated Soil: Soil that must be removed from the Project site and has been determined by the Engineer to contain pollutants in concentrations that are below dangerous or hazardous levels, but could negatively impact the quality of air, waters of the state, soils or sediments, or pose a threat to the health of humans or other living organisms, depending on where the soil is disposed. Type B Regulated Soil requires disposal at an approved Subtitle D solid waste landfill.
- G. Type C Regulated Soil: Soil that must be removed from the Project site and has been determined by Engineer to contain unknown constituent(s) and/or in unknown concentration(s) and requires further analysis and characterization. Type C Regulated soil will require disposal at an approved Subtitle C hazardous waste landfill or Subtitle D solid waste landfill if additional soil characterization indicates special handling is required.
- H. Type D Soil: Soil determined by the Engineer not to require special handling with regard to this Contract. Classification of material as Type D Soil by the Port is not a certification nor does it release the Contractor of liability or obligation to meet any disposal or storage facility acceptance or testing requirements.
- I. Unexpected Regulated Material: Regulated material unexpectedly found in an excavation or in other locations where there is no prior knowledge, information, or history to indicate possible spills or releases of regulated material.
- J. Visual Indications (methods): A preliminary evaluation of the potential presence of contamination based on visual observation. For example, soils containing petroleum are frequently discolored or stained relative to non-petroleum impacted native soils or clean fill.

1.03 HEALTH AND SAFETY

- A. The Contractor is required to implement all health and safety provisions as required by Specification 01 35 29 – Health, Safety and Emergency Response. These provisions include any special monitoring, personal protective equipment, or work plans to accommodate regulated soil or material special handling. Use of environmental characterization data may not be appropriate for health and safety purposes.

1.04 SUBMITTALS

- A. Prior to excavation of any subsurface materials, the Contractor shall submit a Soils Management Plan to the Engineer. The Soils Management Plan must be approved by the Engineer prior to any excavation of subsurface materials. The Soils Management Plan must include the following:
 - 1. Identification of all soil disposal facilities anticipated to be used for soils that are determined to be Type A or Type B Regulated Soil.
 - 2. Identification of all fill sites, disposal/recycling facilities and/or end uses anticipated to be used for soil determined to be Type D Soil in accordance with paragraph 3.02 of this section.
 - 3. Contingency for delivery and placement of Type C Regulated Soil at an on-site soil stockpile area.
 - 4. Contingency for managing soil/debris encountered during excavation that may disqualify soil for disposal or recycle at the anticipated facilities.
 - 5. General description of how equipment operators, safety staff and other applicable on-site personnel will identify and respond to soil containing potentially regulated material.
 - 6. Contractor shall coordinate with the Engineer to facilitate handling of regulated soil in accordance with this specification.

7. Description of all haul routes to be used on the project.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 EXCAVATION/TESTING

- A. The field-testing for soil to be exported offsite will be performed by the Port and will result in the following classification of material:
 - 1. Type A Regulated Soil as defined in 1.02(E) of this Section
 - 2. Type B Regulated Soil as defined in 1.02(F) of this Section
 - 3. Type C Regulated Soil as defined in 1.02(G) of this Section
 - 4. Type D Soil as defined in 1.02(H) of this Section
- B. Contractor shall give Port no less than 21 calendar days notice to sample export soil prior to disposal offsite.
- C. Laboratory turnaround times may require additional time for analytical results; therefore, Contractor should coordinate with Engineer 30 days in advance of anticipated disposal date. Samples that are required to have "rush" analysis performed due to the Contractor's failure to disclose the anticipated disposal date shall have the difference in service fees paid by the Contractor, or the Contractor may delay the disposal until the standard analysis turnaround time is complete, at no additional cost to the Port.

3.02 TRANSPORTATION AND OFF-SITE DISPOSAL OF SOILS

- A. The Contractor shall be responsible for handling, re-handling, loading, transporting, and legal off-site removal of all waste materials and excavated soils not reused onsite.
 - 1. Contractor shall ensure that transport truck gross weight meets federal and/or state Department of Transportation (DOT) requirements and the requirements of the receiving facility, whichever is more stringent.
 - 2. Contractor shall take measures to prevent debris from being spilled from trucks or tracked from the site to local streets. Contractor shall sweep streets adjacent to the site as necessary or as directed by the Engineer.
 - 3. Contractor shall ensure that any vehicle transporting materials offsite are properly labeled and placarded in accordance with federal and state DOT requirements.
- B. Type A Regulated Soil shall be hauled to an approved facility by the Contractor for disposal.
- C. Type B Regulated Soil shall be hauled to to Pierce County Recycling, Composting and Disposal, LLC dba LRI.
- D. Type C Regulated Soil is of unknown origin or special circumstances. Type C Regulated Soil shall be hauled to an on-site segregated stockpile area. The Contractor shall protect the material from weather and other disturbances once stockpiled. The Port will inform the Contractor of the soil profile following additional analysis of the suspect material (as needed), and the soil will be categorized as either Type A Regulated, Type B Regulated or Type D Soil and disposed of accordingly.
- E. Type D Soil that is not reused onsite shall be hauled by the Contractor to a site determined by the Contractor. If the receiving/disposal facility requires additional testing or certification of this soil, Contractor shall complete these requirements, at no additional cost to the Port. The Port will not certify or declare the material suitable for unrestricted use.

3.03 OTHER REQUIREMENTS

- A. Type A, Type B or Type C Regulated Soil may be, upon approval of the Engineer, temporarily stockpiled within the construction area. Contractor shall place an impervious liner beneath the soil and securely cover the stockpile with waterproof covering (e.g., plastic sheeting). Additional measures (e.g., berm, jersey barriers, silt fence, etc.) may be required to minimize soil runoff from the stockpile area. The soil shall be removed prior to completion of Work.
- B. Contractor shall provide the Engineer with all weight tickets (or copies of receipts) from the disposal facility for all Type A, Type B or Type C Regulated Soil daily.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. The Work includes the requirements to provide air and noise control measures until Final Completion of the Work.

PART 2 - PRODUCTS - NOT USED

PART 3 – EXECUTION

3.01 AIR POLLUTION CONTROL

- A. The Contractor shall meet or exceed EPA Tier 2 off-road diesel engine emission standards for off-road equipment $\geq$ 25hp and meet or exceed EPA 1994 on-road diesel engine emission standards for on-road equipment except as follows:
 - 1. Equipment being used in an emergency or public safety capacity
- B. The Contractor shall not discharge smoke, dust, and other hazardous materials into the atmosphere that violate local, state or federal regulations.
- C. No vehicles can idle for more than 5 consecutive minutes, except as follows:
 - 1. Idling is required to bring or maintain the equipment to operating temperature;
 - 2. Engine idling is necessary to accomplish work for which the equipment was designed (i.e. operating a crane)
 - 3. Idling vehicles being used in an emergency or public safety capacity.
- D. The Contractor shall minimize nuisance dust by cleaning, sweeping, vacuum sweeping, sprinkling with water, or other means. Equipment for this operation shall be on the job site or available at all times.

3.02 NOISE CONTROL

- A. The Contractor shall comply with all local controls and noise level rules, regulations and ordinances which apply to work performed pursuant to the Contract.
- B. All internal combustion engines used on the job shall be equipped with a muffler of a type recommended by the manufacturer.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Requirements relating to referenced standards.

1.02 QUALITY ASSURANCE

- A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Should specified reference standards conflict with Contract Documents, request clarification from the Engineer before proceeding.
- C. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Engineer shall be altered by the Contract Documents by mention or inference otherwise in any reference document.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 QUALITY CONTROL FOR COMPLIANCE:

- A. All work described in the Contract Documents must be fully tested in accordance with applicable sections of these Specifications. The provisions and intent of the Contract, including the General Conditions, Supplementary Conditions and General Requirements, apply to this work as if specified in this Section.
- B. The Contractor shall perform such detailed examination, inspection and quality control and assurance of the Work as to ensure that the Work is progressing and is being completed in strict accordance with the Contract Documents. The Contractor shall plan and lay out all Work in advance of operations so as to coordinate all Work without delay or revision. The Contractor shall be responsible for inspection of portions of the Work already performed to determine that such portions are in proper condition to receive subsequent Work. Under no conditions shall a portion of Work proceed prior to preparatory work having been satisfactorily completed. The Contractor shall ensure that the responsible Subcontractor has carefully examined all preparatory work and has notified the Contractor (who shall promptly notify the Port in writing) of any defects or imperfections in preparatory work that will, in any way, affect completion of the Work.

1.02 QUALITY ASSURANCE - CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop Drawings or as instructed by the manufacturer.
- G. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.03 TOLERANCES

- A. Monitor fabrication and installation tolerance control of Products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust Products to appropriate dimensions; position before securing Products in place.

1.04 REFERENCES AND STANDARDS

- A. For Products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents, except where a specific date is established by code.

- C. Obtain copies of standards where required by product specification sections.
- D. Neither the contractual relationships, duties or responsibilities of the parties in Contract, nor those of the Engineer, shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.05 TESTING SERVICES

- A. Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities.
 - 1. Neither observations by an inspector retained by the Port, the presence or absence of such inspector at the site, nor inspections, tests, or approvals by others, shall relieve the Contractor from any requirement of the Contract Documents, nor is any such inspector authorized to change any term or condition of the Contract Documents.
- B. Necessary materials testing shall be performed by an independent testing laboratory during the execution of the Work and paid for by the Port of Tacoma, unless otherwise specified. Access to the area necessary to perform the testing and/or to secure the material for testing, shall be provided by the Contractor.
- C. Testing does not relieve Contractor to perform work to contract requirements.
- D. Re-testing required because of non-conformance to specified requirements shall be performed by the same independent firm. Payment for re-testing will be charged to the Contractor by deducting testing charges from the Contract Sum.
- E. Material testing for initial material approval will be performed by an independent, certified laboratory and paid for by the Contractor. These tests must be dated within six (6) months of the submittal date.
- F. Subsequent sampling and testing, required as the work progresses to ensure continual control of materials and compliance with all requirements of the Contract documents, shall be the responsibility of the Port, except as required by other sections of these Specifications.

1.06 MANUFACTURER'S FIELD SERVICES

- A. When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up equipment, test, and adjust and balance equipment as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Engineer 30 days in advance of required observations. Observer subject to approval of Engineer.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing.
- E. Field offices.

1.02 TEMPORARY UTILITIES

- A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- B. Acquire necessary meters for temporary use of water and power.
- C. Provide fresh drinking water for employees in sanitary containers. Make arrangements with the City of Tacoma or other sources to supply construction water for the duration of this contract.
- D. Facilitate and make all arrangements for furnishing electric power for construction purposes, and to all construction and temporary field offices. The power meter shall be registered in the name of the Contractor.
- E. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.03 TELECOMMUNICATIONS SERVICES

- A. Install and maintain the appropriate equipment to allow for efficient communication via telephone and the Internet with the Port and outside parties at all times during the term of this contract. Remove at completion of the work. All accounts shall be registered in the name of the Contractor.

1.04 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required restroom facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.
- C. At end of construction, return facilities to same or better condition as originally found.

1.05 FENCES AND BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public to allow for Port's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Refer to Drawing G6.1 Constraints and Access Plan for required fence and barrier installations. The Contractor may furnish and install additional fences and barriers to protect materials, equipment or subdivide the construction zone.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 EXTERIOR ENCLOSURES

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections,

and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.07 FIELD OFFICES

- A. Provide, install, and maintain the necessary Contractor field office space during the contract.
- B. Within 30 days of Notice to Proceed, provide and install a separate field office for Port staff, located adjacent to the Contractor's field offices within the project limits. The building shall be weather-tight, installed plumb and level including exterior access stairs and ramps. The field office shall remain in place until substantial completion and shall include the following as a minimum:
 - 1. 300 square feet of floor space
 - 2. Above ground floor with side boards
 - 3. Heat and air conditioning
 - 4. Electric overhead lighting and wall outlets
 - 5. Adequate windows
 - 6. 20 LF of shelving
 - 7. Two plan tables: 3 feet 6 inches by 6 feet long
 - 8. Two desks with chairs
 - 9. A conference table: 4 feet by 8 feet with six chairs
 - 10. Cylinder door lock and six keys
 - 11. Toilet facility adjacent to the building
 - 12. Bottled water service
 - 13. Photocopy machine (up to 11" x 17" capability)
- C. Payment shall be full compensation for furnishing, installing, maintaining, and removing the facility, including all costs associated with all required permits, utility hookups and disconnects, and monthly charges for all utilities, including telephone. Remove all field offices at the completion of the contract and restore the site to pre-installation conditions, or as directed by the Engineer.

1.08 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to final completion inspection.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing facilities used during construction to original condition.
- D. Restore new permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 – GENERAL

1.01 WORK DESCRIPTION

- A. The Work shall consist of planning, installing, inspecting, maintaining and removing Temporary Erosion and Sediment Control (TESC) Best Management Practices (BMPs) to prevent pollution of air and water; and to control, respond to, and dispose of eroded sediment and turbid water during the term of the Contract.
- B. A Construction Stormwater Pollution Prevention Plan (SWPPP) has been prepared for the Site by the Port which is included in the Appendix.
- C. These TESC requirements shall apply to all areas associated with the Work, including but not limited to the following:
 - 1. Work areas
 - 2. Equipment and material storage areas
 - 3. Staging areas
 - 4. Stockpiles
 - 5. Discharge points within or adjacent to the work areas that are impacted by stormwater runoff from the site.
- D. Acceptance of TESC plans does not constitute an approval of permanent Work or drainage design (e.g., size and location of roads, pipes, restrictors, channels, retention facilities, utilities, etc.).
- E. Contractor shall read and conform to all requirements set forth in Washington Department of Ecology's (Ecology) NPDES General Permit for Discharges Associated with Construction Activities (CSGP).

1.02 REFERENCES

- A. The rules, requirements, and regulations that apply to this Work include, but are not necessarily limited to the following:
 - 1. Washington Department of Ecology, "Stormwater Management Manual for Western Washington," 2012.
 - 2. Department of Ecology NPDES General Permit for Discharges Associated with Construction Activities, latest edition.
 - 3. Washington State Department of Transportation 2012 Standard Specification M41-10, Division 8-01 Erosion Control and Water Pollution Control.
 - 4. Pierce County Stormwater and Site Development Manual, 2012.
 - 5. City of Tacoma, "Surface Water Management Manual," Tacoma Public Works, Environmental Services, February 2012.

1.03 SUBMITTALS

- A. A Construction Stormwater Pollution Prevention Plan (SWPPP), as required by NPDES permit.
 - 1. Contractor may elect to adopt and comply with the Port project SWPPP included in the Appendix, or provide an alternative project SWPPP. If the Contractor is going to adopt the Port provided SWPPP he must submit that intent in writing.

2. Contractor shall be responsible for updating the project SWPPP during construction to reflect the required changes to BMPs, as needed, to comply with the CSGP at no additional cost to the Port.
- B. Safety Data Sheet (SDS) for any dust palliative product.
- C. A copy of all Contractor site inspection logs and monthly Discharge Monitoring Reports (DMRs).
- D. Water Management Plan/Temporary Dewatering Plan.

1.04 AUTHORITY OF ENGINEER

- A. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and fill operations, as determined by analysis of project conditions; and to direct the Contractor to provide immediate permanent or temporary pollution control measures to minimize impacts to adjacent waterway and other areas of water impoundment.
- B. In the event that areas adjacent to the work area are suffering degradation due to erosion, sediment deposit, water flows, or other causes, the Engineer may stop construction activities until the Contractor rectifies the situation.

PART 2 – PRODUCTS

2.01 DUST CONTROL

- A. Dust palliative for dust control proposed by the Contractor and approved by the Engineer.

PART 3 – EXECUTION

3.01 GENERAL

- A. The Port has obtained the CSGP. The permit shall be transferred to the Contractor prior to ground disturbing activities. The Contractor shall be the responsible Operator/Permittee for the duration of the project.
- B. In the event of conflict between these requirements and pollution control laws, rules, or regulations of other federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply as determined by the Engineer.
- C. No project discharge of water shall be allowed that exceeds the regulated pollutant levels in Ecology's CSGP.
- D. Contractor shall be solely responsible for all BMP modifications and upgrades to comply with the CSGP and the requirements of this Section, at no additional cost to the Port.
- E. Contractor shall be solely responsible for any damages and fines incurred because of Contractor, subcontractor, or supplier actions in implementing the requirements of this Section.
- F. The Contractor shall be solely responsible for schedule impacts incurred because of Contractor, subcontractor, or supplier actions in implementing the requirements of this Section.

3.02 TEMPORARY EROSION AND SEDIMENT CONTROL DEVELOPMENT

- A. The Port has prepared a project SWPPP that complies with the CSGP requirements. The Port project SWPPP is included in the Appendix.
 1. The SWPPP shall describe construction activities and sequencing, and the proposed Temporary and Permanent Erosion and Sediment Control measures.
 2. The SWPPP shall consist of planning, installing, inspecting, maintaining, and removing TESC BMPs per Volume II of the Stormwater Management Manual for Western Washington (2012) or equivalent. The BMPs shown in the Drawings are the minimum

required to prevent pollution of air and water, to control peak volumetric flow rates and velocity of stormwater, and to control, respond to, and dispose of eroded sediment and turbid water during the term of the Contract.

3. If Contractor chooses to write a SWPPP separate from the Port-provided SWPPP, it must comply with all of the requirements set forth by the CSGP.
- B. Contractor shall develop project-specific TESC BMPs and incorporate them into the SWPPP. Contractor shall address the following issues as part of developing and implementing the BMPs.
 1. TESC BMPs must meet the requirements in Ecology's Volume II of the Stormwater Management Manual for Western Washington (2012) or equivalent.
 2. TESC notes and details shown in the Drawings and the information in this Section form a basis of the minimum requirements for a TESC Plan. Contractor shall develop a TESC Plan specific to the construction schedule and proposed means and methods prior to commencing construction activities for the duration of the Project.

3.03 TEMPORARY EROSION AND SEDIMENT CONTROL IMPLEMENTATION

- A. Contractor is responsible for implementing and updating the SWPPP including TESC BMPs.
 1. Contractor shall inspect the TESC measures daily and maintain these measures to ensure continued proper functioning for the duration of the Project.
 2. Contractor will be responsible for documenting TESC site inspections on a weekly basis in areas of active construction and on a monthly basis in areas that have undergone stabilization. Contractor shall keep records of the inspections on site.
 3. During the construction period the Contractor shall, at no additional cost to the Port, upgrade and/or maintain TESC measures as needed, based on Contractor means and methods, work sequencing, and changing site conditions (e.g., changes to impervious surface coverage, proximity of work to storm conveyance systems, storm events, etc.). Contractor shall modify these measures for changing site conditions and update the SWPPP to document all modifications made.
- B. Catch basins shall be cleaned when the depth of debris reaches 30% of the sump depth or the debris surface is six (6) inches below the outlet pipe. Contractor shall clean all catch basins, manholes, and conveyance lines, if present, prior to Work completion. The cleaning process shall not flush sediment-laden water into a downstream system.
- C. Contractor shall ensure that water, or a dust palliative and a dispensing subcontractor, if needed, is available for project use. It is the responsibility of the Contractor to develop and adhere to appropriate safety measures pertaining to the palliative use. This also includes ensuring the dispensing subcontractor develops and adheres to the appropriate safety measures, if a dispensing subcontractor is used. Water used for dust suppression shall not be applied at such a rate or in a location that it will generate runoff from the site.
- D. TESC measures in an inactive area shall be inspected and maintained by the Contractor until the area is permanently stabilized.
- E. In the event that additional temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the Work as scheduled or as ordered by the Engineer, such work shall be performed by the Contractor at its own expense.
- F. Contractor shall remove all TESC facilities, install permanent site surfacing improvements and permanent BMPs with minimal disturbance, and shall clean stormwater facilities prior to Work completion.

G. Contractor shall terminate the CSGP upon final stabilization of the site.

END OF SECTION

PART 1 - GENERAL

1.01 SUBMITTALS

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 - PRODUCTS

2.01 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.

2.02 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

PART 3 - EXECUTION

3.01 TRANSPORTATION AND HANDLING

- A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- B. Transport and handle products in accordance with manufacturer's instructions.
- C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.
- F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.02 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.

- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Prevent contact with material that may cause corrosion, discoloration, or staining.
- H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Cutting and patching.

1.02 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures
- B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of the Port or separate Contractor.
- C. Project As-Built Documents: Accurately record actual locations of capped and active utilities.

PART 2 - PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.

- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.04 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.
 - 7. Remove samples of installed work for testing when requested.
 - 8. Remove and replace defective and non-conforming work.
- C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- F. Restore work with new products in accordance with requirements of Contract Documents.
- G. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.05 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.

- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.06 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED SECTIONS

- A. The provisions and intent of the Contract, including the General Conditions, and General Requirements, apply to this work as if specified in this section. Coordinate related requirements in other sections of the Specifications, including but not limited to the following:
 - 1. Section 01 33 00 Submittal Procedures
 - 2. Section 01 70 00 Execution and Closeout Requirements
 - 3. Section 31 62 00 Driven Piles
 - 4. Section 35 20 23 Dredging
 - 5. Section 35 42 37 Riprap Slope Protection

1.02 DESCRIPTION OF WORK

- A. This section describes the general requirements for topographic and bathymetric site surveying and grade control including upland surveying; pre-construction, progress, and post-construction surveying; Post-demolition surveying; pre-dredge and post-dredge surveys; dredging progress surveys; riprap slope protection surveys; and establishing and maintaining the design lines and grades shown on the Contract Documents. In addition, the work includes requirements for record keeping, documenting utilities and underground installations, keeping as-built records, and submittals.

1.03 REFERENCE STANDARDS

- A. US Army Corps of Engineers (ACOE) EM-1110-2-1003 – Hydrographic Surveying

1.04 QUALITY ASSURANCE

- A. It is the responsibility of the Contractor to schedule Contractor's survey and to verify that it has met the Contract requirements prior to proceeding to the next sequence of work. The Port shall review and approve each survey or survey increment prior to the Contractor proceeding to the next area. The Contractor shall allow up to three (3) business days for Port review. Surveys of the project shall be surveyed using the same vertical datum and horizontal coordinate system as shown on the Contract Drawings. Surveys may need to be completed in small increments to document work progress and sequential excavation and backfill.
- B. All land surveys shall be performed and stamped by a Professional Land Surveyor (PLS) registered in the State of Washington and acceptable to the Engineer. The surveyor shall have actively engaged in land survey operations during the past ten (10) years.
- C. Hydrographic surveying shall be performed by a NSPS-THSOA Certified Hydrographer with a minimum of 5 years of documented experience with hydrographic survey data collection and processing. The hydrographic surveyor shall be familiar with US Army Corps of Engineers Hydrographic Survey Standards as documented in ACOE EM-1110-2-1003 – Hydrographic Surveying, shall be experienced in dredging and marine work, and shall be familiar with the use (and quality control of) all applicable electronic survey instruments proposed for use on this project. The hydrographic surveyor shall also be knowledgeable of the requirements for hydrographic survey data processing and the specific deliverables to the Port related to the analysis of the survey results, including, but not limited to: color contour plots, cross section development, detailed dredge volume reports, and surface (TIN) creation. The hydrographic surveyor statement of qualifications shall be submitted to the Port for approval in the Dredging and Disposal Work Plan (DDWP) described in Section 35 20 23 – Dredging.

- D. The Port reserves the right to retain an independent surveyor to periodically check the Contractor's survey. Surveying performed by the Port will be at no cost to the Contractor.
- E. The Drawings contain detailed existing legal survey control, project control, monument data, benchmark information, and survey notes established by KPFF Consulting Engineers. This information shall be reviewed for suitability, accuracy, and consistency with the work before surveying of any kind is undertaken.

1.05 SUBMITTALS

- A. General submittals required for this Contract include:
 - 1. Name, address, telephone number, and statement of qualifications of Professional Land Surveyor and Hydrographic Surveyor before starting survey work. This surveyor shall be responsible for stamping and signing all work as noted below.
 - 2. On request, field notes and documentation verifying accuracy of survey work, to include cross sections of progress surveys by the Contractor.
 - 3. Project survey data shall be stored as electronic files on a compact disc (CD) formatted as a) DWG; b) PDF and printed to bond paper. At a minimum, data for each survey point shall include a sequential reference number, the elevation, and appropriate northing and easting coordinates.
 - 4. Field notes, Drawings, quantity computations, and point data for each survey shall be submitted to the Engineer.
- B. Pre-Construction Surveying
 - 1. Establish local horizontal and vertical control on the project site. Ensure closure of all survey loops. Surveys shall use the same vertical datum and horizontal coordinate system as shown on the Contract Drawings. Submit closure calculations for additional horizontal and vertical control established.
 - 2. Establish a line to define the face of the reconfigured Pier 4 based on the Work Point and bearing information shown on the Drawings for purposes of aligning the existing and new wharf sections.
 - 3. Submit a pre-construction survey in the project area that includes site topography, locations and invert elevations of drainage structures which require reconnection to new piping systems, and the existing inboard and outboard 100-foot gauge crane rail located at the south end of Pier 3.
 - 4. Immediately bring any conflicts between observed existing conditions and the survey data contained within the contract documents to the attention of the engineer, and obtain the Engineer's direction before proceeding with the affected work.
- C. Progress Surveying
 - 1. Perform progress surveys to verify that the contract requirements have been met prior to proceeding to the next work activity or sequence. The Port will review each survey or survey increment prior to the Contractor proceeding to the next work activity in that area.
 - 2. Progress surveying is required in order to verify compliance with the contract documents for the items listed below. Additional progress surveys may be performed for the Contractor's use at his own expense.
 - a. Subgrade for new pavement, including top of pier concrete.
 - b. Crushed surfacing base course and top course

- c. Asphalt base and wearing course
 - d. Utility installation locations and depths
 - e. Face of pier, inside and outside of bullrail
 - f. Centerlines of all ladders, bollards, and fender units
 - g. Centerlines of crane rails and cable slots
 - h. Centerlines of pin sockets and crane tie downs
 - i. Centerlines of all vaults for shore power, crane power, water, 480 power, and fiber optic
 - j. As-driven and cut-off locations of piles
 - k. Centerline locations of Lead Rubber Bearings (LRBs)
 - l. Centerline of mooring dolphin bollard
 - m. Centerline location of all relocated high-mast light poles
 - n. Post-demolition surveying as indicated on Sheets D4.3 and D4.4 for the portion of the Pier 4 structure to remain
- D. Dredge Progress Surveys
- 1. Progress surveys shall be conducted to monitor the accuracy and progress of the dredge work being performed. Dredge progress surveys shall be submitted weekly until dredging is complete. See Section 35 20 23 - Dredging for additional information.
- E. Pre- and Post-Dredge Surveys
- 1. Dredging surveys include all pre- and post-dredge surveys noted in Section 35 20 23 - Dredging
 - 2. At a minimum dredge survey submittals shall consist of the following:
 - a. A hardcopy drawing showing spot elevations for the area surveyed. The scale for the plan drawing shall be 1 inch = 50 feet.
 - b. A hardcopy plan drawing showing elevation contours (in color) for the area surveyed. The scale of the plan drawing shall be 1 inch = 50 feet.
 - c. Digital survey data in AutoCAD.dwg format along with an ASCII file including point number, Northing, Easting, and Depth with comma delimiters. Depth shall be relative to MLLW = 0.00 and shall be recorded as negative if recorded below MLLW.
- F. Slope Protection Surveys
- 1. Riprap slope protection surveys include all surveys noted in Section 35 42 37 Riprap Slope Protection
 - 2. At a minimum, slope protection survey submittals shall consist of the following:
 - a. A hardcopy drawing showing spot elevations for the area surveyed. The scale for the plan drawing shall be 1 inch = 50 feet.
 - b. A hardcopy plan drawing showing elevation contours (in color) for the area surveyed. The scale of the plan drawing shall be 1 inch = 50 feet.
 - c. Digital survey data in AutoCAD.dwg format along with an ASCII file including point number, Northing, Easting, and Depth with comma delimiters. Depth shall be relative to MLLW = 0.00 and shall be recorded as negative if recorded below MLLW.

G. Post-Construction Surveying

1. The Contractor shall perform a post-construction topographic/bathymetric survey of the entire project site showing all constructed features. This survey shall include the final project site topography; bathymetric finished elevation and grade line for the riprap-protected slope and keyway; location and elevation (invert and rim) of all stormwater and sanitary sewage system structures and lines; location and invert elevation of all electrical system structures and lines; location and invert elevation (top and bottom) of all communications duct banks; location and elevation of the corners of all structures; location and elevation of all crane rail; location and elevation of sheet pile wall extension at south end of pier; location and elevation (invert and top of operating nut) of all water system structures and lines, including pipe bends.
2. The finished site plan drawing shall be at a scale of 1 inch equals 50 feet and a contour interval of 1 foot. The survey shall consist of a minimum 25-foot by 25-foot grid spacing of points with horizontal and vertical coordinates and 25-foot spacing along any grade break lines, tops or toes of slopes, and other linear features.

H. As-Built Drawings:

1. Upon completion of all activities, prepare As-Built Drawings for incorporation into the Record Drawings and in accordance with the Post-Construction Surveying requirements.
2. Upon completion of the riprap slope protection, the Contractor shall prepare final hydrographic as-built drawings. The final survey shall consist of a spot elevation drawing and a contour drawing of the riprap slope protection area.
3. Provide final surveys in accordance with Section 01 77 00 Closeout Procedures.
4. Contractor electronic files for the As-Built drawings shall be fully compatible with AutoCAD 2012 so as to allow future changes by the Port.

1.06 SURVEY VERTICAL DATUM

- A. Surveys shall use the same vertical datum and horizontal coordinate system as noted on Drawing G4.1 Survey Control and Notes.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 GENERAL

- A. At the Pre-construction Meeting, the Surveyor shall meet with the Port to discuss the survey procedures, methods, and equipment to be employed for the Contractor's surveys, and the survey submittal schedules.

3.02 SURVEY REFERENCE POINTS

- A. Verify locations of survey control points prior to starting work. Promptly notify the Port in writing of any discrepancies discovered.
- B. Mark and protect survey control points prior to starting site work. Make no change without prior written notice to the Port.
- C. Promptly report to the Port the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- D. Replace or relocate dislocated survey control points, or establish new control points, based on original survey control at no added cost to the Port.

3.03 PROCEDURES

- A. Contractor survey procedures (positioning modes, equipment calibration, and data reduction, adjustment, processing, and plotting) shall conform to industry standards.
- B. Failure to perform and process such surveys in accordance with recognized standards will result in a rejection and nonpayment for work performed.
- C. All systems, methods, and procedures shall be subject to the Engineer's approval.

3.04 UNDERGROUND UTILITIES

- A. The Contractor shall be responsible for locating all underground utilities and notifying all underground utility companies prior to commencing work. Use a private locate service and exploratory excavation methods to locate and expose existing utilities.
- B. The Contractor shall be responsible for providing As-Built Drawings showing accurate locations of utilities installed, relocated, demolished, cut and capped or encountered as part of the Work.
- C. Prior to placing utility backfill, the Contractor shall survey the utility to accurately record the installed depth, alignment and location of bends, valves, manholes and all other items or conditions to provide an accurate record of all below-grade utilities. Contractor shall notify the Engineer 72 hours before any utility backfill and surveys. Provide survey data as described in Section 1.05.

3.05 NEW CONSTRUCTION

- A. Contractor shall develop and make all detailed surveys necessary for construction of new work, including setting bench marks for location of working points, verification of existing structures and critical topographic features, monitoring for movement of existing pier structures during pile installation, cut sheets, slope stakes and other surveys as required to ensure the work is installed in accordance with the Contract Documents. Contractor is responsible for notifying the Engineer of any discrepancies found as a result of the detailed survey.

3.06 DREDGING AND RIPRAP SLOPE PROTECTION SURVEYS

- A. For Progress and Pre- and Post-Dredge Surveys, refer to Section 35 20 23 - Dredging for execution requirements.
 - 1. For Slope Protection Surveys, refer to Section 35 42 37 - Riprap Slope Protection for execution requirements.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK DESCRIBED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions, Supplementary Conditions, and other sections of the General Requirements apply to this work as if specified in this section. Work related to this section is described throughout the specifications.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.01 PROGRESS CLEAN-UP

- A. The Contractor shall clean the project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with all requirements for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials for the type of material to be stored.
 - 4. Coordinate progress cleaning for joint use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free from waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 74 19 Waste Management.

- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.02 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds. in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances.
 - f. Remove debris and surface dust from limited access spaces, including roofs, attics, and similar spaces.
 - g. Sweep concrete floors broom clean in unoccupied spaces.
 - h. Remove labels that are not permanent.
 - i. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - j. Leave Project clean and ready for occupancy.

3.03 REPAIR OF WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surface, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Touch up and otherwise repair and restore marred or exposed finishes and surface. Replace finishes and surfaces that already show evidence of repair or restoration.

- a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
2. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

- A. This section includes construction waste management requirements.

1.02 DEFINITIONS

- A. Co-mingled or Off-site Separation: Collecting all material types into a single bin or mixed collection system and separating the waste materials into recyclable material types at an off-site facility.
- B. Construction, Demolition and Land-Clearing (CDL) Waste: Includes all nonhazardous solid wastes resulting from construction, remodeling, alterations, repair, demolition, and land clearing. Includes material that is recycled, reused, salvaged or disposed as garbage. This also includes uncontaminated soils that are designated as geotechnically unsuitable or excess excavation.
- C. Hazardous/Dangerous Waste: As defined by Chapter 70.105.010 Revised Code of Washington and 40 Code of Federal Register 261 and by Washington Administrative Code 173-303.
- D. Proper Disposal: As defined by the jurisdiction receiving the waste.
- E. Recyclable Materials: Products and materials that can be recovered and remanufactured into new products.
- F. Recycling: The process of sorting, cleaning, treating and reconstituting materials for the purpose of using the material in the manufacture of a new product. Can be conducted on-site (as in the grinding of concrete).
- G. Recycling Facility: An operation that is permitted to accept materials for the purpose of processing the materials into an altered form for the manufacture of a new product.
- H. Salvage for Reuse: Existing usable product or material that can be saved and reused in some manner on the project site or other projects off-site.
- I. Salvage for Resale: Existing usable product or material that can be saved and removed intact (as is) from the project site to another site for resale to others without remanufacturing.
- J. Source-Separated Materials: Materials that are sorted at the site into separate containers for the purpose of reuse or recycling.
- K. Sources Separation: Sorting the recovered materials into specific material types with no, or a minimum amount of, contamination on site.
- L. Time-Based Separation: Collecting waste during each phase of construction or deconstruction that results in primarily one major type of recovered material. The material is removed before it becomes mixed with the material from the next phase of construction.
- M. Garbage: Product or material typically considered to be trash or debris that is unable to be salvaged for resale, salvaged and reused, returned, or recycled.

1.03 SUBMITTALS

- A. Waste Management Plan
- B. Waste Management Final Report

1.04 PERFORMANCE GOALS

- A. General: Divert CDL waste to the maximum extent practicable from the landfill by one or a combination of the following activities:

1. Salvage
 2. Reuse
 3. Source separated CDL recycling
 4. Co-mingled CDL recycling
- B. CDL waste materials that can be salvaged, resold, reused or recycled, include, but are not limited to the following:
1. Clean dimensional wood, pallet wood, plywood, OSB, and particleboard
 2. Asphalt
 3. Rip Rap Armoring
 4. Concrete and concrete masonry units
 5. Ferrous and non-ferrous metals
 6. Field office waste paper, aluminum cans, glass, plastic, and cardboard
- C. Hazardous/Dangerous Wastes, contaminated soils and other hazardous materials such as paints, solvents, adhesives, batteries, and fluorescent light bulbs and ballasts shall be disposed of at applicable permitted facilities.

1.05 NON-RECYCLABLE AND NON-REUSABLE WASTE DISPOSAL

- A. All non-recyclable and non-reusable waste shall be disposed of at LRI located at 30919 Meridian Street East, Graham, WA. 98338 in accordance with the Contract for Waste Disposal, between the Port and LRI, dated October 23, 2015, included in the Appendix.
- B. The Contractor shall adhere to the conditions of the Contract for Waste Disposal and enter into LRI's Special Waste Disposal Agreement as identified in Article 5 of the Contract for Waste Disposal. Disposal rates are identified in the Appendix of the Contract for Waste Disposal.

1.06 WASTE MANAGEMENT PLAN

- A. Submit to the Engineer a Waste Management Plan narrative in accordance with these specifications. Provide a Waste Management Plan in a format as approved by the Engineer.
- B. The Waste Management Plan shall include the following:
1. Name of designated Recycling Coordinator
 2. A list of waste materials that will be salvaged for resale, salvaged for reuse, recycled, and disposed.
 3. Identify waste handling methods to be used, including one or more of the following:
 - a. Method 1 - Contractor or subcontractor(s) hauls recyclable materials to an approved recycling facility.
 - b. Method 2 - Contracting with diversion/recycling hauler to haul recyclable material to an approved recycling or material recovery facility.
 - c. Method 3 - Recyclable material reuse on-site.
 - d. Method 4- Recyclable material salvage for resale.
 4. Identification of each recycling or material recovery facility to be utilized, including name, address and types of materials being recycled at each facility
 5. Description of the method to be employed in collecting, and handling, waste materials.

6. Description of methods to communicate Waste Management Plan to personnel and subcontractors.

1.07 WASTE MANAGEMENT FINAL REPORT

- A. Provide a Waste Management Final Report, in a format approved by the Engineer. The Waste Management Final Report shall list the following for the project:
 1. A record of each waste material type and quantity recycled, reused, salvaged, or disposed from the Project. Include total quantity of waste material removed from the site and hauled to a landfill.
 2. Percentage of total waste material generated that was recycled, reused, or salvaged.
- B. Quantities shall be reported by weight (tons) unless otherwise approved by the Engineer.
- C. Submit copies of manifests, weight tickets, recycling/disposal receipts or invoices, which validate the calculations or a signed certification of completeness and accuracy of the final quantities reported.

1.08 QUALITY ASSURANCE

- A. Regulatory Requirements: The Contractor shall maintain compliance with all applicable Federal, State, or Local laws that apply to Construction Waste Management and material salvage, reuse, recycling and disposal.
- B. Disposal Sites, Recyclers and Waste Materials Processors: All facilities utilized for management of any materials covered under this specification must maintain all necessary permits as required by federal, state and local jurisdictions.

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.01 SOURCE-SEPARATED CDL RECYCLING

- A. Provide individual containers for separate types of CDL waste to be recycled, clearly labeled with a list of acceptable and unacceptable materials.

3.02 CO-MINGLED CDL RECYCLING

- A. Provide containers for co-mingled CDL waste to be recycled, clearly labeled with a list of acceptable and unacceptable materials.

3.03 LANDFILL

- A. Provide containers for CDL waste that is to be disposed of in a landfill clearly labeled as such.

3.04 REMOVAL OF CDL WASTE FROM PROJECT SITE

- A. Transport CDL waste off Port's property and legally dispose of them.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures
 - 2. Final completion procedures
 - 3. Warranties
 - 4. As-Built Drawings

1.03 ACTION SUBMITTALS

- A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

1.04 PROJECT SUBMITTALS

- A. Submittal of Project Warranties
- B. Record Drawings
 - 1. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous recordkeeping requirements and submittals in connection with various construction activities.
- C. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.05 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list) indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Port unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 3. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by the Contract Document or Engineer. Label with manufacturer's name and model number where applicable.
 - 4. Submit test/adjust/balance records.

5. Submit changeover information related to Port's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Make final changeover of permanent locks and deliver keys to Port
 2. Complete startup and testing of systems and equipment
 3. Perform preventive maintenance on equipment used prior to Substantial Completion
 4. Instruct Port's personnel in operation, adjustment, and maintenance of products, equipment, and systems
 5. Advise Port of changeover in heat and other utilities
 6. Terminate and remove temporary facilities from Project site
 7. Complete final cleaning requirements
- D. Submit a written request for inspection to determine Substantial Completion a minimum of 7 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Notice of Substantial Completion after inspection or will notify Contractor of items, either on the Contractor's list or additional items identified by the Engineer, that must be completed or corrected before notice will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for final completion.

1.06 PUNCH LIST (LIST OF INCOMPLETE ITEMS)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of Construction.
1. Organize list of spaces in sequential order.
 2. Organize items applying to each space by major elements.

1.07 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete and submit the following:
1. Submittal of all remaining items, including as-built documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, surveys, and similar final record information and all other submittals defined in the Contract Documents.
 2. List of Incomplete Items: Submit copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (Punch List). Copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 7 days prior to date the work will be complete and ready for final inspection and tests. On receipt of request, the Engineer will either proceed with inspection or notify contractor of unfulfilled requirements.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.08 FINAL ACCEPTANCE PROCEDURES

A. Submittals Prior to Final Acceptance:

1. Receipt and approval of application for final payment; due within seven (7) days of receipt of Final Completion by the Engineer.
2. Execution of all Change Orders.
3. Contractor's signed waiver and release of claims on the Engineer provided form.
4. Contractor's submittal of list of all suppliers and subcontractors and the total amounts paid to each on the Engineer provided form.
5. Contractor's submittal of a list of all subcontractors and suppliers requiring Affidavits of Wages paid on the Contract and certify that each of the companies will submit an approved Affidavit of Wages paid to the Port within 30 days.

B. The Engineer will issue the Final Acceptance Memo upon receipt of the required submittals.

PART 2 - PRODUCTS

2.01 CONTRACTOR'S WARRANTY

- A. The Contractor warrants the labor, materials and equipment delivered under the contract to be free from defects in design, material, or workmanship, and against damage caused prior to final inspection. Unless otherwise specified, this warranty extends for a period of one (1) year from the date of Substantial Completion.
1. Time of Submittal: Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit the Port's rights under warranty.
 2. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Port or Port tenants during construction.
 3. Submit Warranties to the Engineer as a submittal, as described in 01 33 00 – Submittal Procedures.
 4. Provide additional copies of each warranty in Operation and Maintenance Manuals as described in 01 78 23 – Operation and Maintenance Manuals.
- B. In the event of equipment failure, during such time or in such a location that immediate repairs are mandatory, the Contractor shall respond promptly (within 48 hours), irrespective of day of the week. If the Contractor is not available, the Port will affect repairs. The Contractor shall then reimburse the Port for parts and labor necessary to correct deficiencies as defined within the warranty clause and time.

2.02 AS-BUILT DRAWINGS

- A. Project As-Built Drawings: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
- B. Project As-Built Drawings shall be compiled by the Contractor and submitted to the Engineer for translation to the Record Drawings on a monthly basis.

1. The Project As-Built Drawings will be submitted on paper full-sized (ANSI D) copy.
2. Drawings shall be kept current and shall be done at the time the material and equipment is installed. Annotations to the record documents shall be made with an erasable colored pencil conforming to the following color code:
 - a. Additions – Red
 - b. Deletions – Green
 - c. Comments – Blue
 - d. Dimensions – Graphite
3. Project As-Built Drawings must be complete and accepted by the Engineer before Final Completion is issued.
4. As-Built Drawings shall be in accordance with horizontal and vertical control as shown on the drawings.

PART 3 – EXECUTION

3.01 MAINTENANCE OF AS-BUILT DRAWINGS

- A. The Contractor shall maintain at the Project site, in good order for ready reference by the Engineer, one complete copy of the Contract Documents, including Addenda, Change Orders, other documents issued by the Port, a current Progress Schedule, and approved Submittals. The Contractor shall also generate and keep on site all documents and reports required by applicable permits.
- B. The Contractor's As-Built Drawings shall be updated to record all changes made during construction. The location of all existing or new underground piping, valves and utilities, and obstructions located during the Work shall be appropriately marked until the Contractor incorporates the actual field dimensions and coordinates into the as-built drawings. The as-built drawings shall be updated at least weekly and before elements of the Work are covered or hidden from view. After the completion of the Work, the as-built drawings shall be provided to the Port.

END OF SECTION

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Operation and Maintenance Manual Submittal

1.02 SUBMITTALS

- A. Operation and Maintenance Data:
 - 1. For equipment, or component parts of equipment put into service during construction and operated by the Port, submit completed documents within ten days after acceptance.
 - 2. Submit 1 copy of completed documents 10 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Engineer comments. Revise content of all document sets as required prior to final submission.
 - 3. Submit 3 hard copy sets and one electronic copy on CD of revised final documents in final form before Final Completion.

PART 2 - PRODUCTS

2.01 OPERATION AND MAINTENANCE MANUALS

- A. For large equipment (such as pumps, generators, machinery), the following information (minimum of 3 printed copies, plus one electronic copy on CD) shall be furnished for all items on the Project requiring operational and/or maintenance procedures and for any additional items indicated by the Engineer. Printed information shall be organized by the Contractor into appropriately sized 3-ring binders (no larger than 3"). The binders shall be sized for material approximately 8-1/2 by 11 inches, and the material in the binders shall not protrude beyond the covers. The binder(s) shall be divided with coversheets for each major item of equipment. The cover sheets shall be typewritten to indicate the name, type of equipment, and location(s) within the Project where installed. A neatly typewritten index shall be provided. Electronic information shall be in PDF format (additional formats where specified) and shall be organized with folders with appropriate file names so information is easily accessible:
 - 1. Equipment Maintenance Summary:
 - a. Provide the following information (as applicable, indicate 'N/A' where an item does not apply) in Excel spreadsheet format:
 - 1) Asset Number (to be provided by the Engineer)
 - 2) Description
 - 3) Plan Sheet Number
 - 4) Parcel Number
 - 5) Vendor
 - 6) Manufacturer
 - 7) Model Year
 - 8) Serial Number
 - 9) Warranty – Start Date; Finish Date
 - 10) Required Preventative Maintenance
 - 11) Purchase Price
 - 12) Make

- 13) Model
 - 14) Fuel Used
 - 15) Capacity
2. Lubrication Information: This shall consist of the manufacturer's recommendations regarding the lubricants to be used and the lubrication schedule to be followed. Lubricants shall be described in detail, including type, recommended manufacturer, and manufacturer's specific compound to be used.
 3. Control Diagrams: Diagrams shall show internal and connection wiring and as-built wiring diagrams (where applicable).
 4. Start-up Procedures: These instructions consist of equipment manufacturer's recommendations for installation, adjustment, calibration, and troubleshooting.
 5. Operating Procedures: These instructions consist of the equipment manufacturer's recommended step-by-step procedures for starting, operating, stopping the equipment under specified modes of operation, and for long-term shut-down (moth-balling).
 6. Preventative Maintenance Procedures: These instructions consist of the equipment manufacturer's recommended steps and schedules for maintaining the equipment.
 7. Overhaul Instructions: These instructions consist of the manufacturer's directions for the disassembly, repair and reassembly of the equipment and any safety precautions that must be observed while performing the work.
 8. Parts List: This list consists of the generic title and identification number of each component part of the equipment. This list shall include weights of individual components of each item of equipment weighing over 100 pounds.
 9. Spare Parts List: This list consists of the manufacturer's recommendations of number of parts which should be stored by the Owner and any special storage precautions which may be required.
 10. Exploded View: Exploded or cut views of equipment shall be provided if available as a standard item of the manufacturer's information. When exploded or cut views are not available, plan and section views shall be provided with detailed callouts.
 11. Specific Information: Where items of information not included in the above list are required, they will be provided as described in the specifications for the equipment.
 12. Complete identification, including model and serial numbers.
 13. Submittal information, as specified in Section 01 33 00 Submittal Procedures.
 14. Warranty Information: This information consists of the name, address, and telephone number of the manufacturer's representative to be contacted for warranty, parts, or service information.
 15. Provide DVDs, and audio-visual training materials utilized in the manufacturer's instruction program for the Owner.
 16. All operation and maintenance information shall be comprehensive and detailed and shall contain information adequately covering all normal operation and maintenance procedures.
 17. All information shall be specific for the items of equipment installed on the project. Material not directly applicable shall be removed, omitted, or clearly marked as inapplicable.

18. If manufacturer's standard brochures and manuals are used to describe operating and maintenance procedures, such brochures and manuals shall be modified to reflect only the model or series of equipment used on this project.
 19. Extraneous material shall be crossed out neatly or otherwise annotated or eliminated. It shall be the responsibility of the Contractor to ensure that all operation and maintenance materials are obtained. Material submitted must meet the approval of the Engineer prior to project final acceptance.
- B. For small equipment and products (such as furnishings or equipment not requiring routine maintenance), the following information (minimum of 3 printed copies, plus one electronic copy on CD) shall be furnished for all items on the Project requiring operational and/or maintenance procedures and for any additional items indicated by the Engineer. Printed information shall be organized by the Contractor into appropriately sized 3-ring binders (no larger than 3"). The binders shall be sized for material approximately 8-1/2 by 11 inches, and the material in the binders shall not protrude beyond the covers. The binder(s) shall be divided with coversheets for each major item of equipment. The cover sheets shall be typewritten to indicate the name, type of equipment, and location(s) within the Project where installed. A neatly typewritten index shall be provided. Electronic information shall be in PDF format (additional formats where specified) and shall be organized with folders and appropriate file names so as to make the information easily accessible:
1. Product Summary:
 - a. Provide the following information (as applicable, indicate 'N/A' where an item does not apply) in Excel spreadsheet format:
 - 1) Asset Number (to be provided by the Engineer)
 - 2) Description
 - 3) Plan Sheet Number
 - 4) Parcel Number
 - 5) Vendor
 - 6) Manufacturer
 - 7) Model Year
 - 8) Serial Number
 - 9) Warranty – Start Date; Finish Date
 - 10) Purchase Price
 - 11) Make
 - 12) Model
 2. Operating Procedures: These instructions consist of the manufacturer's recommended step-by-step procedures for use of the product.
 3. Maintenance Procedures: These instructions consist of the equipment manufacturer's recommended steps and schedules for maintaining the product.
 4. Specific Information: Where items of information not included in the above list are required, they will be provided as described in the specifications for the equipment.
 5. Complete identification, including model and serial numbers.
 6. Submittal information, as specified in Section 01 33 00 Submittal Procedures.

7. Warranty Information: This information consists of the name, address, and telephone number of the manufacturer's representative to be contacted for warranty, parts, or service information.
8. Provide DVDs, and audio-visual training materials utilized in the manufacturer's instruction program for the Owner.
9. All operation and maintenance information shall be comprehensive and detailed and shall contain information adequately covering all normal operation and maintenance procedures.
10. All information shall be specific for the items of equipment installed on the project. Material not directly applicable shall be removed, omitted, or clearly marked as inapplicable.
11. If manufacturer's standard brochures and manuals are used to describe operating and maintenance procedures, such brochures and manuals shall be modified to reflect only the model or series of equipment used on this project.
12. Extraneous material shall be crossed out neatly or otherwise annotated or eliminated. It shall be the responsibility of the Contractor to ensure that all operation and maintenance materials are obtained. Material submitted must meet the approval of the Engineer prior to project final acceptance.

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
1. Section 00 31 00 – Available Project Information
 2. Section 00 31 26 – Existing Hazardous Material Information
 3. Section 01 10 00 – Summary
 4. Section 01 14 00 – Work Restrictions
 5. Section 01 33 00 – Submittal Procedures
 6. Section 01 35 29 – Health, Safety, and Emergency Response Procedures
 7. Section 01 50 00 – Temporary Facilities and Controls
 8. Section 01 57 13 – Temporary Erosion and Sediment Control and Construction Stormwater Pollution Prevention
 9. Section 01 74 19 – Construction Waste Management and Disposal
 10. Section 02 90 00 – Fugitive and Silica Dust Control Procedures
 11. Division 26 – Electrical
 12. Section 31 00 00 – Earthwork
 13. 13. Section 35 20 23 - Dredging
 14. Appendix – Pier 4 Marine Building and Substation Regulated Building Materials Inspection, dated June 8, 2015
 15. Appendix – Pier 4 Regulated Building Materials Inspection, dated October 31, 2014
 16. Appendix – Water Quality Monitoring and Protection Plan (WQMPP)

1.02 DESCRIPTION OF WORK

- A. The extent and location of the "Demolition" work, including "Select Demolition" is indicated on the Drawings, in the specifications, and as outlined below.
1. Removal and disposal, in whole or in part, of all items (demolition materials, debris, etc.) in compliance with the specifications and all agencies of jurisdiction. All items shall become the property of the Contractor unless otherwise noted.
 2. Payment of all costs required for disposal of items at legal disposal sites, including all permit fees and related costs.
 3. Salvaging items (including protecting and delivery to the Port) as indicated on the Drawings and in the specifications.
 4. Backfilling and compaction of holes, voids, trenches, or pits that result from such removal.
- B. The demolition details shown on the Drawings are based upon information contained in the reference drawings. The details indicate typical features of the various structures and shall not be construed as complete or adequate to supplant actual on-site inspection, additional review, and interpretation of the reference drawings by the Contractor. The reference drawings shall be used by the Contractor to establish typical features and quantities for demolition.

- C. The Contractor shall furnish all labor, materials, tools, equipment, and supervision necessary to perform demolition work as described in the Drawings and these specifications.

1.03 DEFINITIONS

- A. Demolition:
 - 1. Complete removal and disposal of all items within the areas depicted on the Drawings, unless noted otherwise, by means such that surrounding structures are not damaged.
- B. Select Demolition:
 - 1. Removal and disposal of items within the areas depicted on the Drawings utilizing means and methods such that embedded items to remain are protected for reuse on the structure and in such a way as to leave a clean and plane surface suitable for reattachment or re-incorporation into the new structure.

1.04 REFERENCE DRAWINGS

- A. Not all information pertaining to the features of pier structure to be demolished under this contract is shown on the Contract Drawings. The reference drawings indicated below provide additional information regarding the existing pier structure that is to be demolished. These documents shall be reviewed by the Contractor and are available as noted in Section 00 31 00 – Available Project Information.
 - 1. **Pier 4 Phase 1 Demolition and Slope Remediation:**
 - a. Pier 4 Phase 1 Removal Action Project (Contract No. 069982, Project No. 091452), Sheets 1 through 54.
 - 2. **Pier Structure Between Bents 86 and 92:**
 - a. Pier 4 Extension (Contract No. 546, Project No. EP-3700-13, dated September 15, 1983), Sheets 1 through 25.
 - b. Pier 4 Crane Rail Modifications – 1986 (Contract No. 598, Project No. EP-4049-13, As-builts dated September 25, 1986), Sheets 1 through 6.
 - c. Terminal 4 Wharf Crane Rail Upgrade (Contract No. 651, Project No. EP-4291-13, As-built dated September 1, 1992), Sheets 1 through 8.
 - 3. **Pier Structure Between Bents 62.5 and 92:**
 - a. Terminal 3 and 4 Wharf Construction (Contract No. 618, Project No. EP-4143-15, As-built dated July 7, 1987).
 - b. Pier 3 Upgrade (Contract No. 069458, Project No. 092935, As-built dated July 7, 2013).
 - 4. **Steel Fender Panels Between Bents 89 & 92:**
 - a. Modification of Pier 4 Fender System (Contract No. 978044, Project No. EP-5130-13, dated March 13, 1998), Sheets 1 through 10.
- B. The reference drawings indicated below provide additional information regarding the existing Terminal 4 Marine Operations Building that is to be demolished. These documents shall be reviewed by the Contractor and are available as noted in Section 00 31 00 – Available Project Information.
 - 1. Terminal 4 Marine Operations Building:

- a. Terminals 3 & 4 Redevelopment Phase 1 Record Drawings (Contract No. 998203, Project No. EP-2323, dated April 2006) Sheets 58-62, 74-80, 88-89, 92, 95 and 112-113.
- C. The reference drawings indicated below provide additional information regarding the possible existence of a buried stepped timber bulkhead structure located within a portion of the dredge prism. The anticipated location of the bulkhead is shown on the contract Drawings. These documents shall be reviewed by the Contractor and are available as noted in Section 00 31 00 – Available Project Information
 1. Bulkhead and Landfill for Pier IV Development (Project No. EP-1310, dated February 1966) Sheets 1 and 2.
 2. Pier IV Bulkhead Construction (Project No. EP-1318, dated February 1966) Sheets 1 through 3.

1.05 SITE CONDITIONS:

- A. Husky Terminal (Terminals 3 and 4) is an operating facility. The work shall be completed in accordance with the constraints and access plan shown on the Drawings. Access to the site is restricted by ongoing terminal operations. Contractor operations shall be restricted to the designated areas.
- B. Coordinate and schedule, with the Engineer, access to the site in advance, and acknowledge that terminal operations take precedence over construction activities.
- C. For access to the site see Section 01 10 00 – Summary and Section 01 14 00 – Work Restrictions.
- D. All demolition items not identified for salvage shall become the property of the Contractor. Disposal of all demolition items shall be in accordance with the specifications, local, state and federal requirements.
- E. Lead Containing Paint (LCP) has been detected on a ship bollard to be removed within the project demolition area as indicated in the Pier 4 Regulated Building Materials Inspection (ship bollard 1232-09P in report). Refer to Section 00 31 26 – Existing Hazardous Material Information and Section 02 83 13 - Lead-Hazard Control Activities for additional information.

1.06 SUMMARY

- A. Items and material categories for demolition include, but are not limited to, the following:
 1. Pier 3 and 4 timber fender system including treated timber fender piles, chocks, walers, connections, steel pipe piles, and fender panels.
 2. Portions of Pier 3 and 4 substructure and superstructure including prestressed concrete piles, prestressed concrete deck panels, cast-in-place concrete pile caps, cast-in-place crane rail pad, embedded appurtenances, and adjacent elements including the crane rail system as indicated on the Drawings.
 3. Pier 4 utilities and appurtenances including conduits, ladders, bollards, bullrail, steel crane stops, and utility vaults.
 4. Deck pavement, ballast, crane rail pads, buried utilities, utility vaults, conduits and cables for power and fiber optic systems.
 5. Yard pavement, base course, storm sewers, outfalls, manholes, water lines and fittings, hand holes, vaults, and related features.
 6. Terminal 4 Marine Operations Building

- a. Prior to building demolition, Husky (the existing terminal tenant) will remove all tenant owned equipment including, but not limited, to server gear, cameras, access panels, and IT cabinets. Any items left remaining shall be demolished.
 7. Buried stepped timber bulkhead wall located with a portion of the dredge area and stone column installation area. Material to be removed includes timber piles, wall planks, bracing, and steel cable tie-backs. Work for wall removal will be paid under Bid Item #6 – Removal of Buried Bulkhead Wall,
- B. Items or equipment to be salvaged or recycled shall be dismantled without damage. Items designated for salvage or recycling are listed below.

	Salvage/Recycle List	Destination
1	Deck Ballast	For Contractor disposal or reuse as landside backfill as needed.
2	High-mast light poles and fixtures	Reinstallation on site
3	Lids to Pier 4 ship service vaults located along the bullrail	Port Maintenance
4	(2 to 3) Tideflex Gate valves at storm sewer outfalls being demolished, as directed by the Port	Port Maintenance
5	(1) Solar powered navigation light located at south end of Pier 3	Port Maintenance
6	(1) Light Pole located at south end of Pier 3	Port Maintenance

- C. Any damage by the Contractor's operations to materials identified to be salvaged shall be repaired or replaced, as determined by the Engineer, by the Contractor and at the Contractor's expense.

1.07 SUBMITTALS

- A. Demolition Management Plan (DMP) with documentation that includes and addresses the following:
1. Work sequence and schedule. Include phased demolition requirements consistent with the overall project schedule.
 2. Activity-based schedule.
 3. List of equipment to be used for demolition operations.
 4. Means and methods for removing specified portions of existing structures as shown on the Drawings. This shall include descriptions of selective demolition at interface areas where existing structure will remain.
 5. Means and methods to protect existing infrastructure, stockpile materials, and deliver salvaged material. Include the methods used to provide floats, false work, temporary supports, bracing, and shoring.

6. Means and methods to prevent demolition materials, debris, water from construction activities, etc. from falling into or entering the Blair Waterway.
 7. Means and methods for removing or cutting timber piles that break during extraction.
 8. Laydown areas for materials management.
 9. Puget Sound Clean Air Agency, Notice of Intent to Demolish.
 10. Means, methods, procedures, and controls for handling and disposal of Asbestos Containing Material in accordance with all applicable local, state, and federal regulations.
- B. If the DMP is revised, resubmit with any proposed changes for review by the Engineer prior to incorporating changes to means, methods, equipment, tools, temporary supports, etc.
- C. Water Quality Protection, Monitoring, and Notification Procedures
1. The Contractor shall be subject to the requirements and procedures specified in the Water Quality Monitoring and Protection Plan (WQMPP). Provide written acknowledgement of understanding of all requirements and procedures contained in the WQMPP with respect to water quality monitoring, best management practices (BMPs), and notification procedures associated with demolition. Written acknowledgement shall be provided in the form of a signed letter from the Contractor to the Port of Tacoma. The WQMPP is located in the Appendix of the Contract Documents.
 2. Proposed methods and procedures for monitoring water quality in strict compliance with the WQMPP.
 3. The personnel and equipment that will be used to monitor water quality during the course of the project.
 4. Contingency measures to be implemented if water quality violations occur.
- D. Surveyed positions of all piles that break off before or while being pulled. Provide a plan that shows the position of each broken pile.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All products that are required to repair, accomplish, or be incorporated into the work shall be selected by the Contractor, subject to the approval of the Engineer.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Utility locates shall be performed prior to start of demolition. Coordinate and resolve with the Engineer and terminal operators to turn off or de-energize affected services before starting demolition.
- B. Verify all items for demolition, disposal, and salvage as early as practicable prior to start of the work. Notify the Engineer immediately if observed conditions differ from anticipated conditions.
- C. Contractor shall coordinate demolition work with the Engineer and perform demolition activities in a manner that minimizes impact to terminal operations.

3.02 DEMOLITION OF STRUCTURES

- A. All demolition work shall be coordinated and performed in strict accordance with the permit requirements and the WQMPP. This specification section does not include all required protection measures, WQMPP mitigation measures, and BMPs associated with this project. The Contractor shall pay particular attention to the conditions of issued permits and the WQMPP,

and applicable regulations and authorizations associated with this project. All protection measures, mitigation measures, and BMPs included in these documents shall be implemented by the Contractor.

- B. Completely remove and dispose of all designated items. Infrastructure or materials designated to remain that are damaged by Contractor activities shall be replaced or repaired at the Contractor's expense.
- C. Do not damage existing pavement which is to remain in place. Pavement demolition shall be accomplished by making neat vertical saw cuts at the boundaries of areas to be removed.
- D. Unless otherwise shown, $\frac{3}{4}$ - inch deep saw cuts shall be used at the interface of demolished concrete areas and areas to remain. Full-depth saw cuts shall be used where full-depth demolition is shown in the Drawings, except at areas where existing reinforcing to remain crosses the plane of demolition where selective demolition is required. Concrete edges to remain shall be cut back and squared off to eliminate feather edges in abutting concrete.
- E. Some areas of selective demolition will be required at the interface between existing structures to be demolished and existing structures to remain. For areas of selective demolition, techniques and tools shall be employed that do not damage the existing concrete and reinforcing steel for areas to remain. Use small tools appropriate for the task at hand and additional care for areas of select demolition and where existing reinforcing steel is to remain as part of the completed structure. All exposed existing reinforcing steel to remain shall be protected and cleaned by sandblasting or other approved methods to remove old concrete, surface rust, and other contaminants.
- F. All prestressed concrete piles and steel pipe piles designated for demolition shall be completely removed by pulling. Jetting is not permitted.
- G. Timber Pile Removal:
 - 1. All timber piles designated for demolition shall be completely removed by pulling vertically to avoid breaking. Jetting shall not be permitted.
 - 2. The position of each timber fender pile that breaks during pulling shall be recorded and submitted to the Port. Piles that break during pulling shall be cut off 3 feet below mudline and the hole backfilled with clean sand. Pulling piles and backfilling holes can only occur between July 16 and February 14.
 - 3. Timber piles encountered within the dredge prism shall be completely removed.
 - 4. Pile extraction, cutting, and hole backfilling activity shall be performed in compliance with the work restrictions described in Section 01 14 00 – Work Restrictions. The means and method of cut-off or removal of broken piling shall be subject to approval of the Port.
 - 5. All removed piling shall be cut into maximum lengths of 4 feet prior to disposal.
- H. At no time shall any debris be allowed to enter the water. The Contractor shall make provisions using floats, falsework, scaffolding, and other means as necessary to prevent debris from falling into the water. All debris that falls into the water, whether it sinks or floats, shall be removed immediately. Removal and disposal of all debris shall occur at no additional cost to the Port.
- I. Blasting shall not be used.
- J. Treated timber exposed to salt water shall be cut into lengths of 4-ft or less and disposed of at an approved off-site disposal facility.
- K. Treated timber not exposed to salt water (assumed to be above elevation +15.0 Mean Lower Low Water) shall be cut into lengths of 4-ft or less and disposed of as hog fuel or recycled to the extent practicable.

- L. Disposal of all asphalt pavement shall be at a Contractor-selected recycle site.
- M. Disposal of all concrete (plain and reinforced) shall be at a Contractor-selected recycle site.

3.03 REMOVAL OF BURIED TIMBER BULKHEAD WALL

- A. If exploratory excavation indicates that the buried timber bulkhead wall exists, then the Contractor shall remove and dispose of the wall as directed by the Engineer. Work for wall removal will be paid under Bid Item #6 – Removal of Buried Timber Bulkhead Wall. The Contractor shall account for impacts to construction schedule and sequencing due to wall removal work when preparing bid and when executing the project. Measurement for payment of wall system removal shall be based on the horizontal length of wall system removed. Estimation of bid quantities and costs associated with removal and disposal of the wall, and impacts to construction schedule and sequencing, shall be made by the Contractor based on information contained on the Contract Drawings and the record drawings indicated herein.
- B. If portions of the timber bulkhead wall are removed as part of dredging operations (not part of upland excavation), then a debris screen shall be used while dredging in the area of the wall. Requirements for the debris screen are included in Section 35 20 23 – Dredging. All costs associated with use of the debris screen during removal of the timber bulkhead wall shall be considered incidental to Bid Item #6 – Removal of Buried Timber Bulkhead Wall.

3.04 DEMOLITION OF UTILITIES

- A. Notify the Engineer a minimum of 72 hours before scheduled demolition of utilities. Schedule with each utility agency the work required by that agency. Meeting the conditions required by the Contract Documents and the affected utility shall be the sole responsibility of the Contractor.
- B. Piping: Remove all piping in the demolition area, including fire hydrants and underground piping or exposed piping as indicated on the Drawings.
- C. Electrical, camera, fiber optics cables and telephone items: Remove electrical conduit, fixtures and equipment from the demolition area as indicated on the Drawings. Salvage and reuse items designated for reinstallation as indicated in the specifications and the Drawings.
- D. Water Lines: Remove and cap water and other utility lines as indicated on the Drawings and in accordance with applicable codes.
- E. Storm Drains: Remove catch basins, manholes and drains noted for demolition on the Drawings. At designated locations, cap remaining lines by filling with solid concrete plugs with a minimum length of 2 pipe diameters.
- F. Electrical Supply: Remove electrical conductors as indicated on the Drawings and in the Specifications.

3.05 DISPOSAL

- A. The Contractor is responsible for the proper disposal of all demolition materials under this Contract in a manner that meets the requirements of federal, state, and local regulations for protecting the health and safety of employees, the public, and for protecting the environment.
- B. Cleanup: Clean the site after removal of all demolition items and materials. There shall be no debris, rubble or litter left at the site from any of the demolition operations.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 00 31 26 – Existing Hazardous Material Information
 - 2. Section 01 35 29 – Health, Safety, and Emergency Response Procedures
 - 3. Section 01 50 00 – Temporary Facilities and Controls
 - 4. Section 02 41 00 – Demolition
 - 5. Section 02 90 00 – Fugitive and Silica Dust Control Procedures
 - 6. Appendix – Pier 4 Regulated Building Materials Inspection, dated October 13, 2014

1.02 DESCRIPTION OF WORK

- A. Review the Pier 4 Regulated Building Materials Inspection report, dated October 31, 2014 for information on the investigation for Lead Containing Paint (LCP) within the project area. The report is provided in the Appendix.
- B. Representative painted surfaces in the project area were assessed for the presence of lead containing paint (LCP) in the above referenced report. Detectible amounts of lead were found in the following location:
 - 1. Orange paint on ship bollard (ship bollard 1232-09P in report).
- C. General work items include, but are not necessarily limited to, the following.
 - 1. Supply all labor, materials, services, insurance, special permits, and equipment necessary to accomplish LCP materials abatement and demolition.
 - 2. Be responsible for all costs associated with testing, engineering controls, decontamination, and personal protection as part of this contract.
 - 3. Ensure that the scope of lead work complies with WAC 296-155-176, Lead-in-Construction Standard and WAC 173-303, Dangerous Waste Regulations
 - 4. If painted components are discovered during the project that are different than those apparent in the project area or other areas that have been characterized, notify the Engineer so that the material can be assessed for the presence of lead.

1.03 CODES AND REGULATIONS

- A. Due to the potential health and environmental hazards associated with exposure to lead in construction, the Work shall be performed in compliance with the applicable provisions of the Washington Industrial Safety and Health Act (WISHA), and the Washington State Hazardous Waste Management Act, as well as other applicable federal, state, and local codes and regulations governing hazardous materials and hazardous waste. The Contractor shall be fully responsible for planning and executing all the Work under this Contract in a manner that meets the requirements of the Washington Administrative Code (WAC) 296-62-07521 and WAC 296-155-176 for protecting the health and safety of employees, the public, and for protecting the environment.
- B. The following regulations of the United States Department of Labor, Occupational Safety and Health Administration (OSHA), the United States Environmental Protection Agency (EPA) and

applicable requirements of the State of Washington are pertinent to this work. Other applicable regulations not specifically identified herein also apply.

1. OSHA
 - a. 29 CFR 1910, Occupational Safety and Health Standards
 - 1) 29 CFR 1910.134, Respiratory Protection
 - 2) 29 CFR 1910.1100, Air Contaminants
 - 3) 29 CFR 1910.1200, Hazard Communication
 - b. 29 CFR 1926, Safety and Health Regulations for Construction
 - 1) 29 CFR 1926.28, Personal Protective Equipment
 - 2) 29 CFR 1926.57, Ventilation
 - 3) 29 CFR 1926.62, Lead
2. EPA
 - a. 40 CFR 260, Hazardous Waste Management Systems: General
 - b. 40 CFR 261, Identification and Listing of Hazardous Waste
 - c. 40 CFR 262, Standards Applicable to Generators of Hazardous Waste
 - d. 40 CFR 263, Standards Applicable to Transporters of Hazardous Waste
 - e. 40 CFR Part 745, Lead, Requirements for Lead-Based Paint Activities in Target Housing and Child-Occupied Facilities;
3. Department of Transportation
 - a. 49 CFR 172, Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
 - b. 49 CFR 173, Shippers -- General Requirements for Shipments and Packagings
 - c. 49 CFR 178, Specifications for Packagings
4. State of Washington
 - a. Chapter 296-24 WAC, Safety Standards for General Safety & Health
 - b. Chapter 296-62 WAC, General Occupational Health Standards
 - 1) WAC 296-62-054, Hazard Communication
 - 2) WAC 296-62-071, Respiratory Protection
 - 3) WAC 296-62-07515, Control of Chemical Agents
 - c. Chapter 296-155 WAC, Safety Standards for Construction Work
 - 1) WAC 296-155-176, Lead
 - 2) WAC 296-155-200, Personal Protective Equipment
 - d. Chapter 173-303 WAC, Dangerous Waste Regulations
5. Local Regulations
 - a. Local landfill regulations

1.04 DEFINITIONS

- A. Whenever the terms below occur in this section, they will have the meanings which follow.
1. Action Level: Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air averaged over an 8-hour period. As used in this section, "30 micrograms per cubic meter of air" refers to the action level.
 2. Air Monitoring: The process of measuring the concentration of lead in a specific volume of air in a stated period of time. Air samples shall be collected and analyzed in accordance with the methods specified by the National Institute for Occupational Safety and Health (NIOSH Method 7105) and as required by WAC 296-155-176.
 3. Area Monitoring: Sampling of lead concentrations inside the physical boundaries of the lead control area that are representative of airborne lead concentrations that may reach the breathing zone of personnel.
 4. Eight-Hour Time Weighted Average (TWA): Airborne concentration of lead averaged over an 8-hour workday to which an employee is exposed.
 5. Lead: Metallic lead, inorganic lead compounds, and organic lead soaps. Excluded from this definition are other organic lead compounds.
 6. Lead Permissible Exposure Limit (PEL): Fifty micrograms per cubic meter of air as an 8-hour time weighted average.
 7. Personal Monitoring: Sampling of lead concentrations within the breathing zone of an employee to determine the 8-hour TWA concentration in accordance with WAC 296-155-176. Samples shall be representative of the employee's work tasks. The breathing zone shall be considered an area within a hemisphere, forward of the shoulders, with a radius of 6 to 9 inches and the center at the nose or mouth of the employee.
 8. Industrial Hygienist: The Industrial Hygienist shall be subject to approval as specified under Paragraph 1.06 Submittals of this specification section and shall be at least one of the following:
 - a. Certified by the American Board of Industrial Hygiene and have prior experience in the health and safety aspects of a lead hazard control work project.
 - b. A professional engineer or safety professional certified by the Board of Certified Safety Professionals with a minimum of three (3) years prior experience in industrial hygiene relating to lead hazard control work.

1.05 QUALITY ASSURANCE

- A. The Engineer will perform periodic observation of the site work to ensure that it is being performed in a manner consistent with the approved work plan and the contract documents. The Engineer will have the authority to issue a "Stop Work" order for contract and or regulatory non-compliance.

1.06 SUBMITTALS

- A. Submit for review and approval a Lead Waste Management and Disposal Plan (LWMDP) demonstrating that the handling of the LCP materials will be in compliance with applicable agency regulations and the contract documents. No lead-related work will be permitted prior to approval by the Engineer. The LWMDP shall include the following:
1. Description of waste streams (liquid and solids including PPE) that will be generated during the site work

2. Methods for managing/storing/stockpiling (accumulating) lead waste materials on site
3. Waste minimization efforts
4. Container selection and labeling
5. Qualification/certificates of lead waste transportation subcontractor
6. Qualification/certification of lead waste disposal facilities
7. Documentation of final lead waste transportation and disposition

PART 2 – PRODUCTS

2.01 EQUIPMENT AND SUPPLIES

- A. As required, provide the following equipment and supplies necessary to support the work as described in the work plan.
 1. Chemicals to be used on site including solvents, dust suppressants, wetting agents, cleaning products, degreasing agents, welding/cutting supplies, and encapsulants.
 2. Demolition equipment
 3. Demolition hauling and moving equipment
 4. Material storage containers and supplies
 5. Decontamination equipment and supplies
 6. Protective clothing and respirators
 7. Labels, manifests, and other shipping documentation
 8. Release prevention equipment

PART 3 – EXECUTION

3.01 WORK AREA PREPARATION

- A. Perform the following preliminary steps to prepare the Work Areas prior to demolition of lead-containing materials, if encountered.
- B. Control Areas: Establish a Control Area that includes a perimeter sufficient to perform the demolition work around each area that contains lead or lead-coated materials. The control area shall also consist of the pathway for transport of any lead-contaminated material to a stockpile or storage receptacle if the demolition debris is not immediately transported from the site. Provide and display caution signs in clearly visible areas at entrances indicating that hazardous material work is being conducted and that unauthorized persons should not enter. Signs shall comply with WAC 296-155-176.
- C. Lead Waste Accumulation Area: Prepare the lead waste accumulation area as described in the approved LWMDP.

3.02 WORK PROCEDURE

- A. Coordination of Work of all Trades: Coordinate the work of all trades to assure that work is performed in accordance with the applicable regulations and that the control limits are maintained at all times both inside and outside the control area.
- B. Dust Control: Prevent dust generation at all times to the maximum extent practicable, as provided in Section 02 90 00 – Fugitive and Silica Dust Control Procedures. Dry scraping, dry sanding, or dry grinding on lead-containing paints or lead-contaminated surfaces shall not be permitted without a full enclosure.

- C. Demolition Procedures: Perform demolition in areas of lead-containing paints in accordance with the approved health and safety plan. Use procedures and equipment required to limit occupational and environmental exposure to lead when lead-containing coatings or dusts may be released. All lead-coated demolition debris shall be handled, stored, and disposed of as to meet applicable federal, state, and local requirements.
- D. Unsafe Work Practices: Grossly inadequate health, safety, or environmental precautions on the part of the Contractor or the belief that the Contractor's personnel, the general public, or the environment are or may be exposed to an immediate hazard, may be cause for the Port to suspend the Contractor's site work and ask the Contractor's personnel to evacuate the hazard area. The Contractor shall not be compensated for such delays. The Contractor shall be responsible for costs identified by the Port and the Port's tenants as a consequence of the Contractor's actions.

3.03 SITE QUALITY CONTROL AND MONITORING

- A. Site Inspection: While performing the work, the Contractor may be subject to on-site inspection by WISHA, OSHA, EPA/Ecology inspectors, and/or local building or health officials. If found to be in violation of pertinent regulations, the Contractor shall cease all work immediately and may not resume work until the violation is resolved. Standby time required to resolve the violation shall be at the Contractor's expense.
- B. Quality Assurance
 - 1. Prevent dust generation at all times to the maximum extent practicable. The use of water shall be restricted to the smallest quantity necessary to minimize dust and to avoid the potential of runoff or ponding.

3.04 CLEANUP, TESTING, AND DISPOSAL

- A. Housekeeping: Housekeeping and cleanup procedures are essential tasks for contamination control. Maintain all surfaces throughout the area free of debris to the maximum extent practicable. Restrict debris from being distributed over the general area. In all possible instances, workers shall cleanup their own areas. Equip personnel engaged in cleaning up scrap and demolition debris with necessary respiratory equipment and protective clothing, as required.
- B. Cleanup: Maintain surfaces of the lead control area as free of accumulation of paint chips and dust as practicable. Restrict the spread of dust and debris; keep waste from being distributed over the work area. The use of compressed air to cleanup the area is strictly prohibited. At the end of each shift, clean the area of visible lead paint contamination by vacuuming with a HEPA filtered vacuum cleaner, wet mopping the area, or cleanup by other appropriate means.
- C. Disposal of Lead Demolition Waste: The following requirements shall be met for the disposal of lead dangerous waste:
 - 1. Collect lead dangerous waste, scrap, debris, bags, containers, equipment, and lead-contaminated clothing that may produce airborne concentrations of lead particles. Label the containers in accordance with WAC 296-155-176 and Chapter 173-303 WAC.
 - 2. Handle, store, transport, and dispose of lead or lead dangerous waste in accordance with 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265 and Chapter 173-303 WAC. Comply with land disposal restriction notification requirements as required by 40 CFR 268.
 - 3. The Contractor shall characterize the waste and provide the disposal facility with a waste profile sheet for advance notice of acceptance. At the same time, the Port will use the

waste profile sheet to obtain a Generator EPA Identification Number for dangerous waste, if required. Waste shall not be transported or disposed of without this number.

4. The Transporter and Disposal Facility must each have an EPA Identification Number. The Contractor shall submit the name, address, emergency contact phone numbers, and EPA Identification Number of the Transporter and Disposal Site to the Port prior to the disposal of hazardous waste.
5. The Contractor shall notify the Port three (3) days in advance of the time when the wastes are to be removed from the site. A copy of the completed hazardous waste manifest/bill of lading (for non-hazardous waste), and/or other documents required by the state or local agencies, shall be signed by the Port, with the final copy submitted to the Port within two weeks of pickup. These shall be signed by the generator, licensed transporter, and approved disposal or treatment facility representative.
6. It is a condition of Substantial Completion by the Port and a condition for final payment of this project that the Port has received all of the required waste disposal documentation that demonstrate proper handling, transportation, and disposal/recycling of demolition wastes and materials.
7. Payment for disposal of waste will not be made until a signed copy of the disposal documentation from the treatment or disposal facility certifying the amount of lead-containing materials delivered is provided to the Port.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK DESCRIBED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 00 31 26 – Existing Hazardous Material Information
 - 2. Section 01 35 29 – Health, Safety, and Emergency Response Procedures
 - 3. Section 01 42 19 – Reference standards
 - 4. Section 01 50 00 – Temporary Facilities and Controls
 - 5. Section 01 74 19 – Construction Waste Management and Disposal
 - 6. Section 02 41 00 – Demolition

1.02 DESCRIPTION

- A. The Contractor shall supply all labor, materials, facilities, equipment, services, employee training and testing, handling, transport, disposal, and agreements necessary to perform the work required for fugitive dust control activities and potential silica-containing dust control activities in accordance with these specifications and applicable regulations from the State of Washington Department of Labor and Industries (WISHA), Puget Sound Clean Air Agency (PSCAA), and any other applicable federal, state, and local government regulations. Whenever there is a conflict or overlap of the above references, the most stringent provisions are applicable.
- B. In all cases where potential silica dust exposures may occur, the Contractor shall use any and all feasible engineering and work practice controls to reduce and maintain employee exposure levels at or below the Washington State Permissible Exposure Limits (PELs) for silica compounds, as specified in WAC 296-62-07515. It shall be assumed that the workers generating the silica dust are exposed above the Permissible Exposure Limit (PEL) until the Contractor air monitoring demonstrates levels below the PEL.
- C. The work specified herein shall be performed by competent persons. Competent persons are those who are trained, knowledgeable, and qualified in both fugitive and silica dust evaluation and control methods.
- D. If fugitive dust emissions are visible beyond the perimeter of the work area, or if respirable crystalline silica dust concentrations exceed 0.05 mg/m³ beyond the perimeter of the work area, the Engineer is authorized to stop work. The Contractor shall perform all necessary corrective actions to eliminate visible dust and reduce respirable crystalline silica concentrations to less than 0.05 mg/m³ before resuming work. The Port may visually monitor for fugitive dust and collect air samples for silica at any time.

1.03 SCOPE OF WORK

- A. Construction work will potentially generate fugitive dust. It is the responsibility of the Contractor to control fugitive dust generation and emissions.
- B. Construction site work that requires control of silica-containing dust includes chipping, sanding, sawing, jack-hammering, and other aggressive methods on concrete building materials associated with this project.
- C. Work activities shall include the following, as applicable:

1. Provide site security to assure that no member of the public is able to gain access to the construction work area at any time. The Contractor shall maintain access and egress routes at all times.
2. Provide worker training, respiratory protection, and medical examinations, as necessary, to meet applicable silica regulations and regulatory guidance regarding silica exposures where work involves the generation of concrete or demolition-related dust.
3. Adopt work practices that prevent the release of fugitive and silica dust outside of the work area, as described in Part 3 of this section.
4. Use wet methods and High-Efficiency Particulate Absorption (HEPA) vacuuming equipment within the work area to clean the work area and control fugitive dust during demolition and construction activities, and at the completion of demolition and construction activities.
5. Use barriers to prevent the release of dust from the work area to other areas of the project.
6. Provide for worker and equipment decontamination. Worker decontamination and equipment areas shall be cleaned daily or more frequently, as required, to prevent dust emissions.
7. Protect personal security, life safety, and energy management systems, including associated wiring, which shall remain operational throughout the work activities.

1.04 PERSONAL PROTECTION

A. Respiratory Protection

1. Where exposures to respirable crystalline silica may exceed the PEL of 0.05 mg/m³ based on an 8-hour time-weighted average (8-hr TWA) per WAC 296-62-07515, workers shall be provided, as a minimum, with personally issued and marked respirators equipped with high efficiency particulate air (HEPA) filters approved by the National Institute for Occupational Safety and Health (NIOSH), 99.97% efficient, that shall be worn in the designated work area. Sufficient filters shall be provided for replacement as required by the workers or applicable regulations. Disposable respirators shall not be used. Respirators and respirator supplies shall be provided to the workers at the expense of the Contractor.
2. The Contractor shall comply with OSHA 29 CFR Part 1926.134, WAC 296-62-071 (Respiratory Protection), and ANSI Standard Z88.2-1990 "Practices for Respiratory Protection."
3. No worker shall be exposed to levels greater than 0.05 mg/m³ respirable crystalline silica as determined by the protection factor of the respirator worn and the work airborne area respirable crystalline silica levels.
4. A sufficient supply of replacement parts and HEPA filter cartridges shall be provided to the workers.
5. The Contractor shall maintain daily inspection(s) of all respirators to verify cleanliness and to replace damaged, worn or missing parts.

B. Protective Clothing

1. Workers shall be provided with sufficient sets of protective full-body clothing to be worn in the designated work area whenever a potential exposure to respirable crystalline silica concentrations exists above the PEL. Such clothing shall include, but not be limited to, coveralls and eye protection.

2. Protective clothing shall not be worn outside the work area. Non-disposable-type protective clothing and footwear shall be left in the work area.
3. Eye protection shall be provided and worn as required by applicable safety regulations. Equipment shall conform to ANSI Z87.1-1989.
4. Head Protection: Hard hats or other head protection shall be provided as required by applicable safety regulations. Hard hats shall conform to ANSI Z89.1-1991, Class A or B.
5. Foot Protection: Nonskid footwear shall be provided to all workers. Footwear shall conform to ANSI Z41.1-1993, Class 75.
6. Workers shall not eat, drink, smoke, or chew gum or tobacco in or near the work areas.

1.05 SUBMITTALS

- A. Contractors shall provide complete submittals as per Section 01 33 00 – Submittal Procedures for review by the Engineer. Following receipt of review comments from the Engineer, submit additional complete sets of revised submittals. No hazardous material abatement work or demolition work will be permitted prior to submittals being approved by the Engineer. Allow fifteen (15) calendar days for submittal review.
- B. Pre-Work Submittals: The Contractor shall submit to the Engineer for review and acceptance the Contractor's Work Plan as a prerequisite to demolition activities. The work plan must be reviewed and signed by a Certified Industrial Hygienist chosen by the Contractor. The plan must be suitably titled and indexed, providing detailed information concerning the following items as a minimum in the order listed below:
 1. Safety and health hazards;
 2. Personal protective measures and decontamination system requirements;
 3. Respiratory protection program, fit testing and training records for all employees potentially exposed above the PEL;
 4. Specific work practices and procedures;
 5. Description of engineering controls designed to keep fugitive dust and silica exposures below the levels specified herein, for outside and inside each work area;
 6. Silica Air Monitoring Plan;
 7. Dust disposal plan;
 8. Emergency procedures; and
 9. Internal administrative and inspection procedures.

1.06 SILICA AIR SAMPLING EVALUATION BY CONTRACTOR

- A. The Contractor shall conduct air sampling of workers and subcontractors for respirable crystalline silica in accordance with NIOSH Method 7500, and according to the Contractor's Work Plan. This sampling is performed to evaluate workers' exposure levels.
- B. The Contractor shall conduct perimeter area air sampling in areas of the marine building occupied by Terminal Employees and Port Employees for respirable crystalline silica in accordance with the NIOSH Method 7500, and according to the Contractor's Work Plan. This sampling is performed to evaluate potential exposures to building occupants.
- C. The Contractor shall conduct air sampling in accordance with the NIOSH Method to collect a sufficient volume of air to determine if the airborne silica dust levels are below the PELs. If the

sampling detection levels are above the PELs, the Contractor is required to re-sample at no expense to the Port of Tacoma.

- D. Results of area air samples collected by the Contractor shall be submitted to the Port Engineer within 48 hours after sample collection.

PART 2 - PRODUCTS

2.01 TOOLS AND EQUIPMENT

- A. Equipment and supplies may include but are not limited to:
 - 1. Chemicals to be used on site including solvents, dust suppressants, wetting agents, cleaning products, degreasing agents, welding/cutting supplies, and encapsulants;
 - 2. Enclosure equipment (for dust control);
 - 3. Material storage containers and supplies;
 - 4. Suitable tools for dust collection and water-jet dust suppression systems;
 - 5. Sufficient number of HEPA-filtered vacuum cleaners to cleanup visible duct residues.

PART 3 - EXECUTION

3.01 WET METHODS

- A. Use "wet" systems that eliminate or reduce dust generated by demolition activities including cutting concrete. Cleanup sludge and /or waste immediately following its generation.

3.02 ENCLOSURE METHOD

- A. Use enclosures in conjunction with air filtration devices. Air shall be moved through the filtration unit with a minimum of 1500 CFM. Provide HEPA filter-based shop vacuum units to control dust generated at the work face and use tools that include dust control features where possible.

3.03 OVERSIGHT

- A. The Engineer will stop work if, in the course of performing their monitoring duties, they observe an instance of substantial non-conformance with the contract documents and/or a situation presenting a health hazard to workers, Port employees, or the public. Work shall not resume until corrective measures have been enforced. Instances of substantial non-conformance shall include, but not be limited to, the following:
 - 1. Visible dust emissions outside of the work area barriers;
 - 2. Loss of negative pressurization (if required);
 - 3. Activities or misconduct affecting worker's or building occupant's safety; and
 - 4. Breaches of containment that could substantially damage building life safety systems.
- B. If poor work practices are observed, the Engineer shall direct the Contractor to make the necessary corrections. If appropriate corrections are not made, or if there is an immediate threat exists that silica dust could be released outside the work area, work shall be stopped. The decision to stop work shall be made by Engineer. The decision to stop work can also be made by the Contractor as part of the Contractor's management and control of the site and site activities.
- C. The Engineer may perform air sampling inside and outside the work area during the project. The Contractor shall cooperate fully with the Consultant and ensure the cooperation of his workers during collection of air samples and work area inspections.

- D. The Engineer's oversight role does not relieve the Contractor's obligation to comply with all applicable health and safety regulations promulgated by the federal, state, or local governments. Air monitoring results generated by the Port shall not be used by the Contractor to represent compliance with regulatory agency requirements for monitoring of workers exposure to airborne silica, nor shall any other activity on the part of the Port represent the Contractor's compliance with applicable health and safety regulations.

3.04 RECORDKEEPING

- A. The Contractor shall maintain for at least thirty (30) years, employee health and safety records for the project, as specified in WAC 296-802. Furnish one copy to the Engineer. The record shall include the following information:
1. The starting and completion dates of the project;
 2. A copy of all analytical results;
 3. Copies of negative pressure documentation records (as required);
 4. The name and address of the analytical laboratory used for silica analyses; and
 5. The name and address of all persons who were engaged in the concrete demolition activities.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
 - 1. Section 03 20 00 – Concrete Reinforcing
 - 2. Section 03 30 00 – Cast-in-Place Concrete
 - 3. Section 03 40 00 – Precast Concrete
 - 4. Appendix – Water Quality Monitoring and Protection Plan (WQMPP)

1.02 DESCRIPTION OF WORK

- A. The Work includes furnishing all necessary material, labor, and equipment for providing the structural support and physical barriers or forms which control the shape and location of the concrete. Also included in this section are the requirements for the removal of the forms and their supports.

1.03 REFERENCE STANDARDS

- A. American Concrete Institute ACI 301-10: Specifications for Structural Concrete.
- B. American Concrete Institute ACI 318-11: Building Code Requirements for Structural Concrete and Commentary.
- C. American Concrete Institute ACI 347-04: Guide to Formwork for Concrete.
- D. Precast/Prestressed Concrete Institute PCI MNL-116-99, 4th Edition: Quality Control for Plants and Production of Structural Precast Concrete Products.

1.04 QUALITY ASSURANCE

- A. Design all forms, falsework, accessories, and shoring to meet the requirements of the concrete type, sequence of placing, schedule, and other conditions of the project and in strict accordance with project permits and the WQMPP. Use a designer having at least five (5) years of experience designing and constructing forms and falsework under similar project conditions.
- B. Before casting concrete, inspect all forms, falsework, accessories, and shoring, using workers having at least five (5) years of experience with the types of construction involved and the techniques necessary for completion of the work.

1.05 SUBMITTALS

- A. Documentation demonstrating the falsework designer's qualifications and experience as described above.
- B. Documentation demonstrating each inspection worker's qualifications in and experience at inspecting or supervising concrete work, forms, falsework, accessories, and shoring as described above.
- C. Submit form, falsework, and shoring drawings and calculations for review prior to executing the work.
 - 1. Drawings shall show details of member sizes, connections, product data, and other related elements including proposed construction joints.
 - 2. Drawings shall indicate the construction sequence, the methods for release, and the sequence of removal.

3. Calculations shall clearly state the material weights, lateral pressures, rates of pour, direction of pour, and working loads for form ties, friction collars, wedges, she-bolts, and accessories used in the design.
 4. Drawings shall indicate how the formwork will be made watertight.
 5. Drawings and calculations for forms, falsework, accessories, and shoring designs shall be stamped by a Professional Engineer registered in the state of Washington.
- D. Documentation demonstrating friction collar capacity and clamping device test procedures and results.
1. Provide drawings and documentation indicating the specific geometry, materials, and loadings used in the tests.
 2. Conduct tests using the same materials and in the same configuration to be used for the work.
 3. Successful previous test results of friction collars or clamping devices using the same configurations will be considered sufficient test data.
- E. In the event patented or prefabricated systems are used for forms or falsework, submit complete drawings, details, and calculations for review. Paper, fiberglass, micarta, asphalt-impregnated fiber, and other miscellaneous form materials shall be approved by the Engineer prior to delivery, fabrication, and construction.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Materials for concrete forms may be new or used. The quality of the materials, not the age or previous usage, will be the determining factor as to their suitability.
- B. All prefabricated form details, whether they are part of a patented system or custom-fabricated, shall be submitted for approval by the Engineer prior to assembly or arrival on site. Forms shall be kept in a condition to produce finished work meeting the location, alignment, and surface tolerances specified.

2.02 WOOD FORMS

- A. For all exposed concrete forms, Grade B-B or B-C Plyform Plywood shall be used.
- B. For unexposed concrete forms, plywood shall be exterior type without splits or knotholes and sanded smooth. The face grain of the plywood shall run perpendicular to the pile caps. All joints in surfaces of forms used on exposed surfaces shall be vertical or horizontal. Plywood shall not be less than ½-inch thick except where curved areas require the use of ¼-inch thick material. When ¼-inch-thick material is used, it shall be backed with heavier material.
- C. Use commercial Grade No. 2 or better for all species of framing lumber. Framing lumber shall be of standard dimensions and of such quality as to meet the requirements of the applied stresses or loads.
- D. Shiplap, square-edged boards, or tongue-and-groove sheathing may be used for forming unexposed concrete surfaces.
- E. Use metal, fiberglass, or other special form linings where required.

2.03 STEEL FORMS

- A. Steel forms shall be designed and fabricated to meet the requirements of the member/members to be cast. Use only new materials for steel form construction.

- B. Forms for round elements shall consist of self-supporting metal shell or tube which will give a smooth, even surface. Forms which produce a spiral appearance or those made of wood shall not be used except as approved by the Engineer.

2.04 FORM LINERS AND COATINGS

- A. Forms shall be lined, coated, or treated with a suitable release agent or bond-breaker to ensure their timely removal with no damage to the concrete.
- B. Release agents or bond-breakers shall be non-coloring and shall not leave a film on the concrete surface that may inhibit subsequent finishing activities required to attain the prescribed finish.
- C. For pilecap formwork, release agents or bond breakers shall be applied to the forms prior to form installation over the water. Release agents or bond breakers shall not be applied while the forms are in place.

2.05 FORM TIES AND ACCESSORIES

- A. Do not use form ties or she-bolts for forms, falsework, or shoring below OHWM elevation +12.78.
- B. Wire ties and wood spacers shall not be used.
- C. Form ties shall be pre-manufactured items with published allowable stress values from the manufacturer. Form ties shall have a premeasured, break-back, weakened area so that ties can be removed 3/4-inch below the concrete surface.
- D. Tie rods for use with she-bolts shall be set back (1-1/2 inches) from the concrete surface. Tie-rod steel shall have published allowable stress values.
- E. Corner brackets, friction collars, column clamps, and other specialized accessories shall be utilized in accordance with the manufacturer's recommendations.

2.06 FALSEWORK AND SHORING

- A. Materials and elements for shoring, falsework, mudsills, or structural staging shall be selected and sized according to the Contractor's design. The use of steel scaffold-type falsework, when approved by the Engineer, shall be furnished, erected, and braced in accordance with the manufacturer's recommendations.
- B. The capacity of friction-supported forms shall be established by tests that are performed by the manufacturer or by independent test results. Tests shall be conducted using the same material and in the same configuration to be used in the work.

PART 3 – EXECUTION

3.01 GENERAL

- A. All falsework and formwork construction work shall be coordinated and performed in strict accordance with the permit requirements and the WQMPP. This specification section does not include all required protection measures, mitigation measures, and BMPs associated with this project. The Contractor shall pay particular attention to the conditions of issued permits and the WQMPP, and applicable regulations and authorizations associated with this project. All protection measures, mitigation measures, and BMPs included in these documents shall be implemented by the Contractor.
- B. Do not construct forms or falsework until the Engineer has reviewed the drawings and calculations. Review by the Engineer does not relieve the Contractor of the responsibility for sufficiency of the forms or falsework.

- C. Set forms and falsework to allow for structural camber plus an allowance for shrinkage and settlement. The finished concrete shall conform to the location lines and grades indicated on the drawings.
- D. Forms shall be constructed as to be rigid, unyielding, true to line, level, and sufficiently tight to prevent escape of mortar.
- E. Openings, embedded objects, and reinforcement shall be placed at the locations shown on the drawings. They shall be formed and fastened securely in position to maintain minimum cover for all reinforcement, and to leave smooth surfaces, true openings, accurate geometry, etc., after the forms are removed.
- F. Clean forms of all waste, debris, or other objects and substances deleterious to the concrete, concrete surface, or concrete element, prior to casting.

3.02 FORM INSTALLATION

- A. Prior to installation of form work, forms for exposed concrete shall be treated with a release agent, bond-breaker, or parting compound. Apply the compound at a rate recommended by the manufacturer, to provide a smooth surface free of dusting action caused by the chemical reaction of the compound. Release agents, bond-breakers, or parting compounds shall not be applied to the forms while in place over the water.
- B. Immediately remove any release agent or bond-breaker that comes in contact with reinforcement or embedded objects.
- C. Forms may be set with a slight bevel or draft for easy removal, where approved by the Engineer. Use $\frac{3}{4}$ -inch chamfer strips on all exposed inside and outside corners including the bottoms of pile caps and all vertical faces.
- D. All forms shall be mortar-tight.
- E. Remove all debris, waste, foreign objects from forms before assembly. Standing water in the forms shall not be permitted. Forms shall be cleaned with fresh water before assembly and prior to placing concrete.

3.03 FORM REMOVAL

- A. Forms shall remain in place for the minimum length of time indicated below, provided the ambient temperature is 40 degrees Fahrenheit or higher during that time period.
 - 1. Soffit forms for pile caps, sheet pile wall cap beams, or crane beams, forms for pile buildups: 7 days
 - 2. Sides forms for pile caps, sheet pile wall cap beams, crane beams, or wall faces: 7 days
- B. When temperatures lower than 40 degrees prevail, forms shall remain in place longer and at the Engineer's direction.
 - 1. All periods where the ambient temperature is below 40 degrees Fahrenheit shall be disregarded in determining the length of time forms are to remain in place.
 - 2. The Contractor may submit for prior approval a cold-weather concreting plan in accordance with Section 03 30 00 – Cast-in-Place Concrete.
 - 3. Development and incorporation of an approved cold-weather concreting plan shall be at the Contractor's expense.
- C. For elements described on the Civil Drawings (C-series) or the Electrical Drawings (E-series) the minimum time that forms shall remain in place may be reduced under the following conditions.

1. When concrete cylinder tests, according to ACI 318, indicate that a compressive strength greater than or equal to 80 percent of the specified 28-day strength has been reached.
 2. Additional concrete cylinder testing for the purpose of establishing the 80 percent threshold level shall be at the Contractor's expense.
- D. The removal of forms as stipulated herein shall in no case relieve the Contractor of responsibility for the performance, acceptability, or finish of the work.
- E. All form and falsework removal shall be accomplished in a manner that prevents damage to the concrete, concrete finishes, and adjacent work elements.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
 - 1. Section 03 10 00 – Concrete Forming and Accessories
 - 2. Section 03 30 00 – Cast-in-Place Concrete
 - 3. Section 03 37 33 – Concrete Spall Repair
 - 4. Section 03 40 00 – Precast Concrete
 - 5. Section 05 50 00 – Metal Fabrications

1.02 DESCRIPTION OF WORK

- A. The work includes the requirements for manufacture, detailing, cutting, bending, transporting, handling, and placing of all concrete reinforcement and associated items required or indicated on the drawings.

1.03 REFERENCE STANDARDS

- A. American Concrete Institute ACI 301-10: Specifications for Structural Concrete for Buildings.
- B. American Concrete Institute SP-66(04): ACI Detailing Manual (including ACI 315-99).
- C. American Concrete Institute ACI 318-11: Building Code Requirements for Structural Concrete and Commentary.
- D. American Society for Testing Materials (ASTM), Standard Specifications and Standard Test Methods, designated by basic reference in this section (use the most current edition at the time of bid unless otherwise indicated).
- E. American Welding Society (AWS) D1.1 Structural Welding Code – Steel, 2010 Edition.
- F. American Welding Society (AWS) D1.4 Structural Welding Code – Reinforcing Steel, 2010 Edition.
- G. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice (MSP), 2009, 28th Edition.
- H. Washington State Department of Transportation (WSDOT) Standard Specifications for Road, Bridge and Municipal Construction M41-10, 2012 Edition.
- I. Washington Association of Building Officials (WABO) Standard No. 27-13, WABO Welder and Welding Operator Performance Qualification Standard for Structural Steel, Sheet Steel, and Reinforcing Steel.

1.04 QUALITY ASSURANCE

- A. Provide at least one (1) qualified person who shall be present at all times during execution of this portion of work, be thoroughly familiar with the type of materials being installed, be skilled in the required methods for installation, and who shall direct all the work. Qualified personnel shall have a minimum of five (5) years of experience in placement of reinforcement for concrete and prestressed concrete structures.
- B. All welders shall be qualified in accordance with AWS D1.4 and WABO Standard 27-13 for the weld procedures and positions to be performed.

1.05 SUBMITTALS

- A. Documentation demonstrating the qualifications and experience of the supervisor's and welder's of the work, as described above.
- B. Detailed shop drawings that are coordinated and checked for all concrete reinforcement prior to casting concrete.
 - 1. Do not deliver concrete reinforcement to the site prior to acceptance of the shop drawings.
 - 2. The shop drawings shall include, but not be limited to, material specifications, bar lengths, bar bending schedules, order lists, splice lengths, and proposed splice locations.
- C. Mill certificates for each heat of reinforcing steel and threaded bars to be furnished, indicating specification compliance, yield strength, ultimate strength, and chemistry.
- D. Qualified weld procedure specification (WPS) including all information contained in Annex A of AWS D1.4.
- E. Weld procedure and welder qualification test reports, including valid WABO card for welds and positions to be performed.
- F. Headed reinforcement details and manufacturer data sheets.
- G. Threaded bar reinforcement details and manufacturer data sheets.
- H. Data sheets for mortar blocks and chairs used for placing reinforcement.

PART 2 – PRODUCTS

2.01 HANDLING

- A. Protect from damage all reinforcement before, during, and after installation in the work. Protect from damage the installed work and materials of other trades.
- B. All reinforcement shall be new and free from rust, grease, oil, wax, paint, soil, dirt, kinks, bends, or other defects. Store in a manner to prevent corrosion, or fouling with bond-breaking or deleterious coatings.
- C. For epoxy-coated reinforcing bars, record coating lot on each shipping notice.
 - 1. Provide systems for handling coated bars which have padded contact areas, nylon slings, etc., all free of dirt and grit.
 - 2. Lift bundled coated bars with strong back, multiple supports, or a platform bridge to prevent sagging and abrasion.
 - 3. Use padded bundling bands where in contact with coated bars. Do not drop or drag coated bars or bundles.
 - 4. Store coated bars both in shop and in field, aboveground, on wooden or padded cribbing.
 - 5. Space the dunnage close enough to prevent excessive sags.
 - 6. Stack large quantities of straight coated bars with adequate protective blocking between layers.
 - 7. Schedule deliveries of coated bars to the job site to avoid the need for long term storage.
 - 8. Protect coated bars from direct sunlight and weather. Cover coated bars to be stored longer than 12 hours at the job site with opaque polyethylene sheeting or other suitable equivalent protective material.

- D. The surface of prestressing steel shall be free from any substance or coating that may impair bond transfer length or pullout strength. If calcium stearate is used as a die lubricant during manufacture, methods approved by the Engineer shall be used to clean the steel completely.
- E. Maintain reinforcement identification after the bundles are broken. Indicate to the Engineer what bar types and grades are stored in each location.
- F. In the event of damage, immediately make all repairs and replacements necessary as directed by the Engineer and at no additional cost to the Port.

2.02 REINFORCEMENT

- A. All reinforcing bars, except as noted below, shall be deformed billet-steel bars conforming to ASTM A 615, Grade 60, deformed. Bars conforming to ASTM A 706 may be substituted for ASTM A 615 reinforcing bars at the Contractor's expense.
- B. All high-strength threaded bars shall meet the requirements of ASTM A 615, Grade 75. Bars shall be continuously threaded (all thread). All hardware and accessories used with threaded bars (nuts, washers, plates, etc.) shall meet all requirements for use with the threaded bars and shall be provided by the same manufacturer as the threaded bars.
- C. All dowel reinforcing bars for piling, bars for pile build-ups, bars for ladders and grab bars, bars for embed plates, bars requiring welds, and bars designated as weldable shall conform to ASTM A 706, Grade 60, deformed.
- D. All reinforcing bars designated on the drawings as epoxy coated shall meet ASTM A 934 (purple in color). Patching material for epoxy-coated bars shall meet the requirements of the epoxy coating manufacturer.
- E. Prestressing steel shall be uncoated, low-relaxation seven-wire strand conforming to ASTM A 416, Grade 270.
- F. Cold drawn steel wire for spirals shall conform to ASTM A 1064.
- G. Welded headed studs and welded shear connectors shall conform to ASTM A 108, Grades 1010 through 1020 according to ASTM A 29. Head geometry shall conform to AWS D1.1, Section 7.2.
- H. Mechanical couplers, where approved, shall be as follows.
 - 1. Couplers shall develop a minimum of 125% of the minimum specified yield strength of the reinforcing bar.
 - 2. Couplers connecting epoxy coated reinforcing bars shall be epoxy coated.
 - 3. Dayton Superior D-250 Bar-Lock S/CA-Series couplers, or approved equal.
 - 4. Lenton Lock B-Series mechanical couplers by Erico Inc, or approved equal.
 - 5. HRC Series 400 High Performance Mechanical Couplers by the Headed Reinforcement Company, or approved equal.
- I. Headed reinforcement shall conform to ASTM A 970.
 - 1. Heads shall be round in configuration.
 - 2. Pile Dowels: Bars shall be Lenton Terminator – D6 end anchors by Erico, Inc., Dayton Superior D-158 end anchors, Headed Reinforcement Company HRC Type 150 or 555, or approved equal.
 - 3. Crane Beam and Deck Panels: Bars shall be Headed Reinforcement Co. HRC double-ended bars with Type 555 anchors, or approved equal.

4. Other: Bars shall be Dayton Superior D-158 double-ended anchors, Headed Reinforcement Co. HRC double-ended bars with Type 150 or 555 anchors, or approved equal.

PART 3 – EXECUTION

3.01 GENERAL

- A. Prior to installation of this section, carefully inspect the installed work of other trades and verify that such work is complete to the point where reinforcement installation may commence.
- B. Details of bending, placing, and splicing of all reinforcing steel shall conform to ACI 318 and ACI SP-66, except as modified herein.

3.02 REINFORCING STEEL BARS

- A. Order Lists: Before ordering material, furnish all order lists and bending diagrams for approval by the Engineer; reinforcement placing drawings submitted for approval shall conform to the CRSI MSP. Do not order material until such lists and bending diagrams have been approved. The approval of order lists and bending diagrams by the Engineer shall in no way relieve the Contractor of responsibility for the correctness of such lists and diagrams.
- B. General Fabrication Requirements for Reinforcing Bars: Bend all bars cold to the shapes indicated on the drawings unless otherwise approved by the Engineer. Do not field-bend bars partially embedded in concrete except as indicated on the drawings or as approved by the Engineer. Do not field bend epoxy-coated reinforcing bars. Make bends and hooks in accordance with the applicable portions of the CRSI MSP.
- C. Additional Fabrication Requirements for Epoxy-Coated Reinforcing Bars: meet the requirements of ASTM A 934 (purple in color) including Appendix X2, "Guidelines for Job Site Practices" except as otherwise specified in this section.
- D. Carefully handle and install coated bars to minimize job site patching. Use the same precautions as described above for delivery, handling, and storage when placing coated reinforcement. Do not drag coated bars over other bars or over abrasive surfaces. Keep coated bars free of dirt and grit. When possible, assemble coated reinforcement as tied cages prior to final placement into the forms. Support assembled cages on padded supports.
- E. Placing and Fastening:
 1. Place all steel reinforcement accurately and hold firmly in the position indicated on the drawing during the placing and setting of concrete. Tie bars at all intersections.
 2. Minimum concrete cover to reinforcement shall be as indicated on the drawings:
 3. Maintain the minimum distance from the forms by means of stays, blocks, ties, hangers, or other approved supports.
 - a. Holding reinforcement from contact with the forms shall be by approved metal or plastic chairs. Metal chairs which are in contact with the exterior surface of the concrete shall be plastic-coated for the full depth of the indicated concrete cover.
 - b. Separate layers of bars by plastic chairs, by precast mortar blocks of compressive strength not less than 3750 pounds per square inch, spacing bars, or by other devices approved equal. Spacing bars used to separate layers of epoxy coated reinforcement shall be epoxy coated.
 - c. The minimum spacing between bars, except at lap splices, shall not be less than one bar diameter or one inch minimum, but not less than 1-1/3 times the maximum size of the coarse aggregate.

4. In the event that conduits, anchor bolts, piping, inserts, sleeves, embedded objects, headed studs, or other items interfere with placing reinforcement as indicated on the drawings, or as otherwise required, immediately contact the Engineer and obtain approval of a new procedure before placing concrete.

3.03 SPLICING

- A. Furnish all reinforcement in the full lengths indicated on the drawings, except that reinforcement over forty feet in length may be spliced.
- B. Splicing of bars, except reinforcement over forty feet in length and when indicated on the drawings, will not be permitted without approval of the Engineer. When approved, splices shall be staggered with no more than fifty percent of any particular bar type being spliced at any one location. Minimum length of lap splice shall be per the schedule of minimum lap splice lengths in the drawings unless noted otherwise on the drawings. Minimum distance between spliced zones shall be one lap length plus one foot.
- C. Splicing of spiral wire in precast piling shall be done in accordance with the details as shown on the drawings.

3.04 WELDING

- A. Welding of reinforcing steel shall be performed only as indicated on the Drawings and shall not be performed on epoxy coated reinforcing.
- B. Welding shall be performed by welders certified by the Washington Association of Building Officials (WABO) and shall conform to the current specifications of the American Welding Society (AWS) D1.4 except that weld size and reinforcement shall be as shown on the drawings.
- C. Processes used to place welds shall be either shielded metal arc or flux core arc (inner shield only) welding. All slag shall be removed from each weld.
- D. Procedures and welder qualification tests shall be witnessed by an AWS-certified welding inspector (CWI) approved by the Engineer. All tests shall be conducted in accordance with Section 6 of AWS D1.4. Such tests shall include longitudinal tension tests and macro-etch tests. Procedures and welder qualification tests shall be provided for weldable grade deformed reinforcing bars and wire spiral used in precast concrete piling. Macro-etch tests for wire spiral in precast piling are not required (tension tests only). Welding on a production basis shall not start until qualified welding procedures have been established and approved by the Engineer.
- E. Filler metal, preheat, and interpass temperature requirements shall conform with Section 5 of AWS D1.4.
- F. Exposure times for low hydrogen coated electrodes shall be in accordance with Section 5.8 of AWS D1.4.
- G. An ongoing inspection and verification program will be established by the Engineer in which visual inspection and tensile tests shall be performed for quality assurance on deck panel weld splices or other welded splices.
 1. As a minimum, all welds will be visually inspected by the Engineer. The Engineer will reject any and all welds failing visual inspection and direct that they be repaired according to AWS D1.4 or replaced at the Contractor's expense.
 2. The Contractor may choose to have rejected welds further examined by a certified testing agency at its own expense. If welds prove to be of unacceptable quality, the defective welds shall be removed and replaced by the Contractor at its own expense.

3. The Port, at its discretion, will perform tension test(s) of sample welded connection coupon(s) identical to the production connections. The Contractor shall provide sample tension connection coupons at its own expense to the Port for this purpose.
4. In the event that a sample connection fails testing, all production welds made by the welder responsible for the failing sample shall be identified and considered suspect. The Contractor shall demonstrate, at its own expense, by further testing, inspection, or other industry standard techniques that all suspect production welds are sufficient and free of defects according to AWS. Failure of the production welds to meet additional testing or inspection acceptability requirements shall be cause for rejection by the Engineer.

3.05 CLEANING REINFORCEMENT

- A. Steel reinforcement, at the time concrete is placed around it, shall be free from loose rust or mill scale, oil, paint, and all other coatings which will destroy, impair, or reduce the bond between steel and concrete.

3.06 INSPECTION AND REPAIRS TO EPOXY-COATED REINFORCING BARS

- A. Reinforcement in any member shall be placed and inspected by qualified personnel before placement of concrete.
- B. Access for inspection by the Engineer prior to concrete placement shall be provided for all pours. Concrete placed in violation of this provision will be rejected. The Contractor shall remove the rejected concrete, place new reinforcing steel, and cast new concrete at its own expense.
- C. The Contractor shall notify the Engineer at least 48 hours in advance of any concrete pour, to allow for inspection.
- D. Repairs to Epoxy-Coated Reinforcing Bars:
 1. It is expected that coated bars, when in final position ready for concrete placement, shall be completely free of damaged areas. Do not flame cut epoxy coated bars. Inspect for defects and provide required repairs prior to assembly. After assembly, re-inspect, and provide final repairs.
 2. Excessive nicks and scrapes which expose steel will be cause for rejection, as determined by the Engineer. Criteria for defects which require repair and for those that do not require repair are as indicated in ASTM A 934 (purple in color).
 3. Immediately prior to application of the patching material, manually remove any rust and/or debonded coating from the bars by suitable techniques employing devices such as wire brushes and emery paper. Exercise care during this surface preparation so that the damaged areas are not enlarged more than necessary to accomplish the repair. Clean damaged areas of dirt, debris, oil, and similar materials prior to application of the patching material.
 4. Perform repair and patching in accordance with the patching material manufacturer's recommendations. Follow these recommendations, including cure times, at the job site at all times.
 5. Allow adequate time for the patching materials to cure in accordance with the manufacturer's recommendation prior to concrete placement.
 6. Rinse placed reinforcing bars with fresh water to remove chloride contamination just prior to placing concrete.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
 - 1. Section 03 10 00 – Concrete Forming and Accessories
 - 2. Section 03 20 00 – Concrete Reinforcing
 - 3. Section 03 40 00 – Precast Concrete
 - 4. Appendix – Water Quality Monitoring and Protection Plan (WQMPP)

1.02 DESCRIPTION OF WORK

- A. The extent and location of the “Cast-in-Place Concrete” work is indicated on the drawings. The work includes the requirements for providing all cast-in-place concrete and associated work in conformance with these specifications and as indicated on the drawings.

1.03 REFERENCE STANDARDS

- A. American Concrete Institute ACI 301-10: Specifications for Structural Concrete.
- B. American Concrete Institute ACI 305R-10: Hot Weather Concreting.
- C. American Concrete Institute ACI 306R-10: Cold Weather Concreting.
- D. American Concrete Institute ACI 308R-01: Guide to Curing Concrete.
- E. Modification of ACI 305R, 306R, and 308R: accomplish work in accordance with these guides except as modified herein. Consider the advisory or recommended provisions to be mandatory. Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Engineer.
- F. American Concrete Institute ACI 318-11: Building Code Requirements for Structural Concrete and Commentary.
- G. American Society for Testing Materials (ASTM), Standard Specifications and Standard Test Methods, designated by basic reference in this section (use the most current edition at the time of bid unless otherwise indicated).
- H. Standard Specifications for Road, Bridge, and Municipal Construction, M41-10, 2012 edition, by Washington State Department of Transportation (WSDOT Standard Specifications).
- I. International Building Code (IBC) 2009, as amended and adopted by the City of Tacoma into the Tacoma Municipal Code (TMC).

1.04 QUALITY ASSURANCE

- A. All concrete work shall conform to the requirements of ACI 301, unless otherwise noted in the drawings or the specifications.
- B. Inspection and Testing: As determined by the Engineer, the Port will provide inspection and testing as required. The Contractor shall provide all necessary access and assistance in carrying out such inspections and tests at its own expense. The Contractor may obtain results of tests performed by the Port from the Engineer.
- C. Qualifications of Supplier: Ready-mixed concrete plants shall be approved and certified by the National Ready Mix Concrete Association (NRMCA) or qualified by WSDOT. Ready-mixed concrete shall be batched in accordance with the applicable portions of ASTM C 94.

D. Qualifications of Personnel:

1. Provide at least one qualified person who shall be present at all times during execution of this portion of the work, who shall be thoroughly trained and experienced in placing the types of concrete specified, and who shall direct all work performed under this section. Qualified personnel shall have at least five (5) years experience performing the work described in this section.
 2. Trained and experienced journeyman concrete finishers having at least five (5) years experience shall be responsible for finishing all exposed surfaces.
- E. Building Code: All concrete shall meet the requirements of the IBC. Where provisions of pertinent codes and standards conflict with this specification, the more stringent provisions shall govern, as determined by the Engineer.

1.05 SUBMITTALS

- A. Documentation demonstrating the qualifications and experience of supervisors and directors of work, as described above.
- B. Proposed concrete design mixes, indicating all material contents per cubic yard of concrete, including certificates of specification compliance. Written evidence that the ready-mix concrete plant is approved and certified by the NRMCA and other organizations.
- C. Test certificates for compressive strength, yield, air content, and slump of the proposed concrete mix. Report strength test results in accordance with ACI 318, Section 5.3.
- D. Manufacturer's name, address, catalog number, and specifications for all proposed admixtures, concrete bonding agents, curing compounds, etc.
- E. Identify all aggregate supply pit names and locations. Submit certificates of specification compliance for materials to be used including aggregate alkali-silica reactivity (ASR).
- F. Proposed curing methods including manufacturer's data for curing membranes, evaporation retardants, accelerated cure methods, etc. Submit detailed plans for concreting in ambient temperatures below 40 degrees F. Describe the specific methods and procedures used for substrate preparation, concrete placement, curing, and protection. Provide specific references to ACI 306R and ACI 308R.
- G. Shop drawings showing pour sequences, construction joints, expansion joints, etc. Manufacturer's data for proposed pre-fabricated construction joint systems and hardware.
- H. Concrete delivery tickets for each truck delivered to the site. Submit delivery tickets to the Engineer before unloading at the site and in accordance with ASTM C 94, Section 14.

PART 2 – PRODUCTS

2.01 CONCRETE

A. General:

1. All concrete, unless otherwise specifically permitted by the Engineer, shall be batched and mixed at the approved Ready-Mix plant. Batching, mixing, and delivery of ready-mix concrete shall conform to ASTM C 94.
2. All cast-in-place concrete shall be proportioned on the basis of field experience or laboratory trial mixtures according to ACI 318, Section 5.3.

B. Cementitious Materials:

1. All cement shall be Portland cement conforming to ASTM C 150.

2. Portland cement for use in mixes without fly ash shall be Type I-II or Type II conforming to ASTM C 150 except that the cement shall not contain more than 0.75 percent alkalis by weight calculated as Na₂O plus 0.658 K₂O and the content of Tricalcium aluminate (C₃A) shall not exceed 8 percent by weight..
3. Portland cement for use in mixes with fly ash shall be Type I or Type I-II conforming to ASTM C 150.
4. Fly ash, if used, shall meet the requirements of ASTM C 618, Type F, with the added provision that the loss on ignition shall not exceed 1 percent, and that the fly ash is stored in a separate silo from the cement. Split bins are not acceptable.

C. Aggregates:

1. Aggregates shall conform to ASTM C 33. All coarse and fine aggregate shall consist of hard, tough, durable particles free from foreign and deleterious materials, and shall be stored in such a manner as to prevent segregation, excessive breakage, and the introduction of foreign material.
 2. Evaluate and test fine and coarse aggregates to be used in all concrete for alkali-aggregate reactivity in accordance with ASTM C 1260 or ASTM C 1293. Test both coarse aggregate size groups if from different sources. Test results of the combination shall have a measured expansion equal to or less than 0.10 percent at 16 days after casting when aggregates are tested in accordance with ASTM C 1260 or 0.04 percent for aggregates tested in accordance with ASTM C 1293.
 3. Grading shall conform to WSDOT Standard Specifications paragraph 9-03.1(5) Combined Aggregate Gradation for Portland Cement Concrete. Maximum nominal aggregate size shall be ¾ inch, unless approved by the Engineer.
 4. The maximum size of coarse aggregate shall not be larger than three fourths of the minimum clear spacing between reinforcing bars, between reinforcing bars and side forms, and between reinforcing bars and top or bottom surface of the concrete.
 5. The maximum size of aggregate for "pea gravel" concrete shall be 3/8 inch.
- D. Water used for mixing concrete shall conform to the quality requirements of paragraph 9-25.1 of the WSDOT Standard Specifications.
- E. Admixtures: All admixtures shall be supplied by one manufacturer approved by the Engineer.
1. Air-entraining admixtures shall conform to ASTM C 260. Dosage rates shall be in accordance with the manufacturer's recommendations to meet the air content specified herein.
 2. Water-reducing admixtures shall conform to the requirements of ASTM C 494. Dosage rates shall be in accordance with the manufacturer's recommendations.
 3. Water reducing admixture shall be Type A, D, F, or G. The amount shall control the desired workability and water/cement ratio of the mix and shall be within the manufacturer's recommended range.
- F. Epoxy Bonding Agent:
1. Meets ASTM C 881, Type V, Grade 2, Temperature Class A, B, or C, and match the surface temperatures to which the bonding agent is applied, as endorsed by the manufacturer.

2. MasterEmaco ADH 326 manufactured by BASF, or Sikadur 32 HI-MOD LPL, manufactured by Sika Corporation, or equal, as approved by the Engineer before the start of the work where it will be used.

2.02 OTHER MATERIALS

- A. All other materials not specifically described but required for a complete and proper installation of cast-in-place concrete shall be selected by the Contractor subject to the approval of the Engineer.

2.03 MIX PROPORTIONS AND STRENGTH

- A. The mix proportions shall produce a mixture that will readily work into all corners, sides, and angles of the forms, around reinforcement and embedded items, with no segregation, and prevent free water from collecting on the surface.
- B. The mix proportions shall be selected in accordance with ACI 318.
 1. Test data representing thirty recent consecutive tests for each design shall be submitted to establish the standard deviation used in Section 5.3.1.
 2. The criteria for acceptance of submitted tests shall be accordance with Section 5.3.1.1. Section 5.3.1.1(b) shall be amended to read, "... 500 psi of f'c", instead of 1000 psi.
 3. Where 30 recent consecutive tests are not available, the standard deviation may be determined by records based on no less than 15 tests as described in Section 5.3.1.2.
 4. Where no previous data are available, the mix or mixes shall be overdesigned in accordance with Section 5.3.2.2.
 5. When consecutive test data have been established during the project the overdesign criteria may be relaxed in accordance with Section 5.5.
 6. Deviation from any reviewed design mix without approval of the Engineer will not be permitted.
- C. Unless otherwise indicated, concrete minimum 28-day compressive strengths are shown on the drawings.
- D. Concrete, except for pile buildups, shall meet the following requirements:
 1. Minimum Cementitious Material
 - a. Cement without fly ash: 6.5 sacks/cy (611 lbs/cy)
 - b. Cement with fly ash: 6 sacks/cy (564 lbs/cy) and 100 lbs fly ash/cy
 2. Maximum Water/Cement Ratio: 0.40, computed by weight, including free moisture on aggregate. If fly ash is used, the water/cement ratio shall be calculated as the weight of water divided by the combined weight of cement and fly ash.
 3. Air Content: 3.5 percent to 6.5 percent
 4. Slump: Maximum 8 inches, and chosen to enhance workability without violating the maximum water/cement ratio requirement.
- E. "Pea gravel" concrete shall meet the following requirements:
 1. Minimum Cementitious Material
 - a. Cement without fly ash: 6.5 sacks/cy (611 lbs/cy)
 - b. Cement with fly ash: 6 sacks/cy (564 lbs/cy) and 100 lbs fly ash/cy

2. Maximum Water/Cement Ratio: 0.40, computed by weight, including free moisture on aggregate. If fly ash is used, the water/cement ratio shall be calculated as the weight of water divided by the combined weight of cement and fly ash.
 3. Air Content: 3.5 percent to 6.5 percent
 4. Slump: Maximum 8 inches, and chosen to enhance workability without violating the maximum water/cement ratio requirement.
- F. Concrete for pile buildups shall meet the following requirements:
1. Minimum Cementitious Material
 - a. Cement without fly ash: 7 sacks/cy (658 lbs/cy)
 - b. Cement with fly ash: 6.5 sacks/cy (611 lbs/cy) and 100 lbs fly ash/cy
 2. Maximum Water/Cement Ratio: 0.40, computed by weight, including free moisture on aggregate. If fly ash is used, the water/cement ratio shall be calculated as the weight of water divided by the combined weight of cement and fly ash.
 3. Air Content: 3.5 percent to 6.5 percent
 4. Slump: Maximum 8 inches, and chosen to enhance workability without violating the maximum water/cement ratio requirement.

PART 3 – EXECUTION

3.01 PREPARATORY WORK

- A. General:
1. All concrete work shall be coordinated and performed in strict accordance with the permit requirements and the WQMPP. This specification section does not include all required protection measures, mitigation measures, and BMPs associated with this project. The Contractor shall pay particular attention to the conditions of issued permits and the WQMPP, and applicable regulations and authorizations associated with this project. All protection measures, mitigation measures, and BMPs included in these documents shall be implemented by the Contractor.
 2. Prior to casting, inspect the installed work of all other trades and verify it is complete to the point where this installation may commence.
 3. Verify that all items to be embedded in concrete are in place, properly oriented, located, and secured.
 4. Verify that concrete may be placed to the lines and elevations indicated on the drawings with all required clearances for reinforcement.
 5. All areas in which concrete is to be placed shall be thoroughly cleaned to remove wood debris, sawdust, tie wire cuttings, and all other deleterious material.
 6. Tie wire ends shall be bent back so they do not encroach into the specified clear cover of the concrete.
 7. Concrete forms which have not been treated with oils, waxes, or other bond breakers shall be thoroughly wet prior to placing concrete.
 8. Clean and roughen existing concrete or concrete from previous pours to provide a bondable surface.
 9. All transporting and handling equipment shall be cleaned of all hardened concrete and other debris.

10. Platform areas within the intertidal zone shall be swept/cleaned after each concrete pour before tidal inundation to remove any fresh or loose concrete materials. Concrete material shall not be swept or washed down into the water.
- B. Notification: Notify the Engineer at least 48 hours in advance of any concrete pour. Notify the Engineer when inspection by the Contractor is complete. In the event of discrepancy, immediately notify the Engineer. Do not proceed with installation until all discrepancies have been fully resolved.

3.02 TRANSPORTING AND PLACING CONCRETE

- A. Placement:
 1. Concrete that does not reach its final position in the forms within 1-1/2 hours after the addition of cement shall not be used. During hot weather, this time limit shall be reduced in accordance with ACI 305R.
 2. Place concrete as soon as possible after mixing. Concrete which has developed initial set or partially hardened shall not be re-tempered or remixed.
 3. The method and manner of placing concrete shall not allow segregation of the aggregates or displacement of reinforcement and embedded objects.
 4. When using a concrete pumps as the placing system, the pump priming slurry shall be discarded before placement into the forms. Initial acceptance testing may be delayed until the pump priming slurry has been eliminated. No pump shall be used that allows free water to flow past the piston. Aluminum conduits or tremies shall not be used for pumping or placing concrete.
 5. Place concrete in continuous horizontal layers, or lifts, not exceeding 18 inches and compact so that there will be no line of separation between layers. Carefully fill each part of the forms by depositing concrete directly in its final destination.
 6. When concrete must be dropped more than five feet into the forms, it shall be deposited through a sheet metal or other approved conduit. Approved conduit shall also be used to place concrete in sloping forms or in other locations, as directed by the Engineer, to prevent concrete from sliding around reinforcing or other embedded objects.
 7. The methods of depositing and compacting concrete shall produce compact, dense, impervious concrete with the required surface finishes and no segregation. Remove defective concrete as directed by the Engineer at no additional cost to the Port.
 8. During pile driving, or other vibratory activity, do not place concrete within 100 feet of the activity, and do not perform or resume the activity within 100 feet of placed concrete until a minimum of 3 days after initial concrete set.
 9. Concrete shall not be placed or allowed to fall in the water or on the bank within the wharf footprint. Otherwise, concrete shall be immediately removed from the water or the bank.
- B. Hot/Cold Weather Placement: Do not place concrete on frozen ground or against frosted reinforcing steel or forms. Do not mix or place concrete while the atmospheric temperature is below 40° F. If air temperature exceeds 90°F, provide water spray or other approved methods to cool contact surfaces to less than 90°F. Hot and cold-weather concrete placement shall follow the respective recommendations in ACI 305R and ACI 306R.
- C. Underwater Placement: Concrete shall not be placed in the water. See Section 31 63 29 – Concrete Piers and Drilled Shafts for concrete placement below groundwater level for high mast light pole foundations.
- D. Consolidation of Concrete:

1. Provide suitable internal vibrators for use in compacting all concrete. The vibrators shall be of the type designed to be placed directly in the concrete, and their frequency of vibration shall not be less than 7,000 impulses per minute when in actual operation.
 2. Vibration shall be such that the concrete becomes uniformly plastic. Insert vibrators to a depth sufficient to vibrate the bottom of each layer effectively, but do not penetrate partially hardened concrete. Do not apply the vibrators directly to steel which extends into partially hardened concrete. The intervals between points of insertion shall be not less than 2 feet, nor more than 3 feet.
 3. Do not continue vibration in any one spot such that pools of cement or cement and sand are formed. In vibrating and finishing top surfaces which are exposed to weather or wear, avoid drawing water or laitance to the surface. In relatively high lifts, the top layer shall be comparatively shallow and the concrete mix shall be as stiff as can be effectively vibrated into place and properly finished.
 4. Do not use vibrators to transport or move concrete inside the form.
 5. A sufficient number of vibrators shall be supplied to effectively vibrate all of the concrete placed. Hand-tamping or rodding shall be required wherever necessary to secure a smooth and dense concrete on the outside surfaces.
 6. When vibrating concrete with epoxy-coated reinforcement, only use vibrators with coated stingers than do not damage the epoxy coating.
- E. Concrete trucks shall not be washed out onsite unless contained within a concrete wash-out area that complies with the requirements of the latest version of the Department of Ecology Stormwater Management Manual for Western Washington.
- F. Any delivered load of concrete that is rejected shall be completely disposed of offsite.

3.03 CONSTRUCTION JOINTS

- A. Joints and stoppages, except as specifically shown on the drawings, shall conform to ACI 318, Chapter 6. Wire mesh or similar materials shall not be used.
- B. Submit for the Engineer's approval all requests for additional, deleted, or relocated construction joints. Changes as a result of such requests shall be at the Contractor's expense.
- C. Thoroughly clean and roughen all joint surfaces and remove loose concrete, gravel, sediment, laitance, and all other deleterious substances.
- D. Thoroughly wet and condition all joint surfaces to a saturated surface dry (SSD) condition for a minimum twelve hour period immediately prior to placing fresh concrete.
- E. Horizontal surfaces of construction joints, such as between Stage 1, Stage 2, and Stage 3 crane beam or pile cap pours, shall have a clean roughened surface but need not have a bonding agent or neat cement paste applied.
- F. Unless otherwise noted, joints requiring roughened surfaces shall have grooves ½-inch to 1-inch wide, ¼-inch to ½-inch deep, which are spaced at twice the width of the groove.
- G. Where a roughened surface is not required, provide shear keys with a positive mechanical bond using formed depressions covering one third to one half of the joint area and approximately 1-1/2 inches deep. Provide shear keys on vertical surfaces between pours including crane beam, sheet pile wall cap beam, and pile cap sections.

3.04 CURING CONCRETE

- A. Follow ACI 308R.

- B. Concrete shall be maintained above 40° F and in a moist condition for at least the first seven days (168 hours) after placement.
- C. Do not use curing compounds on surfaces to receive additional concrete.
- D. Where permitted, apply an ASTM C 309, Type 1, Class A or B curing compound to the fresh concrete immediately after finishing the concrete and as soon as the visible bleed water has evaporated or as directed by the Engineer. Apply according to the manufacturer's recommendations. The rate of coverage shall be at least one gallon per 100 square feet and be sufficient to effectively obscure the original color of the concrete.
- E. Apply the curing compound in two applications to ensure full coverage of the concrete, with the second coat applied in a direction perpendicular to that of the first application.
- F. Do not apply curing compound to construction joint surfaces, reinforcing steel, or embedments in the concrete. Curing compound on construction joints, reinforcing steel, or embedments shall be completely removed before the following concrete pour.
- G. Supply backup spray equipment and sufficient workers to properly apply the curing compound.
- H. Within 12 hours following the application of the curing compound, the top surfaces shall be covered with cotton mats, an approved vapor proof curing paper, or white polyethylene sheeting. If the covering used is cotton mats, it shall be kept continuously wet day and night for the period of time specified above, and if curing paper or plastic film is used, it shall be left in place for the same length of time.
- I. Curing paper and white polyethylene sheeting shall be kept tightly in place by taping and weighting joints, or other methods for the prescribed length of time.
- J. Membrane curing compounds which leave a waxy film on the concrete shall not be used.
- K. After the concrete has cured for the required time, the top surfaces shall be swept clean.
- L. All concrete shall be protected from damage and accelerated drying. No fire or excessive heat shall be permitted near the concrete at any time.
- M. In lieu of curing compounds the Contractor may use wet burlap or other wet cure methods as approved by the Engineer.
- N. Only wet cure methods shall be used on concrete surfaces against which additional concrete will be cast.
- O. Wet cure methods shall be continuous for the prescribed duration of the curing period.

3.05 FINISHING CONCRETE

- A. Finish: All permanently exposed surfaces, unless specifically noted otherwise, shall be free from local bulging and all ridges or lips shall be removed to leave a smooth, flat surface. Patching mortar, if used, shall be of the same color as the surrounding concrete. White Portland cement shall be added to the patching mortar for color matching. A test section, approved by the Engineer, shall be completed prior to production work.
- B. Protect finished surfaces from damage, stains and abrasion. Surfaces or edges damaged during construction shall be repaired at the Contractor's expense.
- C. Defects:
 - 1. Surface defects include honeycomb, rock pockets, spalls, chips, air bubbles, voids, pinholes, bug holes, and indentations greater than or equal to 1/4 inch in depth, or greater than or equal to 1/2 inch in width, length, or diameter. These defects shall be chipped out

to reveal sound concrete and then shall be patched according to Section 03 60 00 – Grouting.

2. Surface cracks greater than or equal to 0.007 inches in width. These cracks shall be patched according to Section 03 60 00 – Grouting.
3. Surface irregularities include embedded objects, embedded debris, lift lines, sand lines, bleed lines, segregation, form pop-outs, fins, form leakage, texture irregularities, stains and other discolorations that cannot be removed by water blast cleaning. These defects shall be repaired as specified in this Section unless otherwise directed by the Engineer.

D. Vertical Surfaces and Walls:

1. Immediately after removal of forms or form linings, inspect the concrete surfaces for defects and irregularities.
2. All defects, defective concrete, and tie rod holes shall be repaired immediately after the forms are removed unless otherwise directed by the Engineer. Exposed tie wires shall be removed (chipped out) and the resulting holes patched. The repair mortar shall be BASF EMACO R350 CI or an epoxy mortar approved by the Engineer applied according to the manufacturer's instructions by experienced personnel qualified by the manufacturer of the repair material.
3. All vertical surfaces, against which concrete will be cast, are construction joints, and shall be thoroughly cleaned and roughened to an amplitude of 1/4 inch. Roughening shall be accomplished using methods in accordance with the construction permits and approved by the Engineer, to expose sound concrete without undercutting around the edges of the larger aggregate particles or cracking the concrete to remain.

E. Horizontal Surfaces:

1. All horizontal surfaces that will carry additional concrete are construction joints and shall be thoroughly cleaned and roughened to an amplitude of 1/4 inch. Roughening shall be accomplished using methods in accordance with the construction permits and approved by the Engineer, to expose sound concrete without undercutting around the edges of the larger aggregate particles or cracking the concrete to remain.
2. Exposed horizontal surfaces that will not receive additional concrete shall have a smooth wood float finish except for the tops of bullrails, pile caps, sheet pile wall cap beams, and crane beams, which shall have a light broom finish. The broom stria shall be 1/16 inch to 1/8 inch.

3.06 TESTING

- A. Testing of concrete will be performed by an accredited testing agency retained by the Port. Methods of sampling, testing, evaluation, and acceptance will conform to ACI 301. The Contractor shall assist the Port with access to collect samples.
- B. Testing as described above will be at the Port's discretion and in no way relieves the Contractor of any obligations.
- C. The Contractor shall perform its own tests and institute a quality assurance program to assure the specified quality of materials and work are provided.
- D. Tests performed by the Port will be done at no cost to the Contractor, except as noted below.
 1. Additional testing and inspection required because of changes in materials, proportions, and procedures requested by the Contractor.

2. Additional testing of materials or concrete when either fails to meet the specification requirements when tested in accordance with the ACI standards outlined and the appropriate ASTM standards contained therein.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:

1. Section 03 20 00 – Concrete Reinforcement

1.02 DESCRIPTION OF WORK

- A. Repair delaminated and spalled areas of concrete where indicated on Drawings by removing unsound material, cleaning rust and scale from exposed reinforcement, applying a corrosion inhibitor to the exposed reinforcing, and applying a polymer-modified Portland Cement-based mortar patch. Work may also include installation of replacement or supplemental reinforcing bars.

1.03 REFERENCE STANDARDS

- A. American Society for Testing Materials (ASTM), Standard Specifications and Standard Test Methods, designated by basic reference in this section (use the most current edition at the time of bid unless otherwise indicated).

1.04 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts, and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Inspection: Comply with the provisions of Paragraph 3.04 of this section.

1.05 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications and installation instructions for each repair material used to demonstrate compliance with these specifications.
- B. Repair Procedure: Submit procedures outlining proposed means and methods of completing required repair work. Submittal shall include all equipment, materials, personnel, and BMPs proposed for use.

1.06 PRODUCT HANDLING:

- A. Provide and maintain one set of current Safety Data Sheets (SDSs) for each material being used onsite. Comply with all SDS requirements.

PART 2 - PRODUCTS

2.01 POLYMER-MODIFIED PORTLAND-CEMENT MORTAR

- A. A two-component polymer-modified Portland cement patching mortar that shall be suitable for use on vertical and overhead surfaces.
- B. The following minimum performance data shall apply to the hardened repair mortar:

<u>Characteristic Performance</u>	<u>Test Method</u>	<u>Minimum</u>
Compressive Strength	ASTM C 109	4,000 psi at 14-days 6,000 psi at 28-days
Slant Shear Bond Strength	ASTM C 882	1,800 psi at 28-days
Modulus of Elasticity	ASTM C 469	2,000 ksi at 28-days

Permeability	ASTM C 1202	500 Coulombs @ 28-days
Freeze/Thaw Resistance	ASTM C 666	300 cycles, 98%

- C. In addition, the coefficient of thermal expansion for the hardened repair mortar shall not exceed 6.0x10 inch/inch/degree F over the temperature range of 40° F to 100° F.

2.02 REINFORCING STEEL

- A. Comply with the provisions of Section 03 20 00.

2.03 BONDING AGENT/CORROSION PREVENTATIVE COATING FOR REINFORCING STEEL

- A. The bonding agent/corrosion preventative coating shall be as recommended by the mortar manufacturer for compatibility with the cementitious repair materials.

PART 3 - EXECUTION

3.01 REPAIR AREAS

- A. Delaminated and/or spalled areas shall be inspected and repaired as specified herein and as shown on the drawings. The Contractor shall first locate each designated repair on the structure and shall determine the actual repair perimeter by hammer sounding to determine if unseen subsurface delaminations exist in addition to visual spalls. Following the hammer sounding, the Contractor shall mark the outline of the actual repair area and notify the Engineer and shall provide for inspection prior to proceeding with repairs.
- B. Mark any delaminated and/or spalled areas that are not shown on the drawings in a different color and obtain the Engineer's approval prior to repairing them.

3.02 REPAIR PROCEDURE

- A. Concrete Removal: Delaminations and spalled areas shall be removed as shown on the drawings. Concrete shall be removed by saws and/or chipping hammers as required. Saw cuts shall be made 1/2-inch minimum to 3/4-inch maximum deep around the perimeter of unsound concrete area. The perimeter saw cut shall be either square or rectangular in shape. The entire saw cut shall be made in sound concrete. Determine the depth of the reinforcing bar cover in the spall area prior to saw cutting. The depth of saw cut shall be reduced, where required, to avoid cutting embedded reinforcement. Concrete shall be chipped at those locations to provide sharp edges. Do not "feather edge" the patch perimeter. Where half or more of a reinforcing bar's diameter is exposed by removal of spalled or delaminated concrete, additional concrete shall be removed around the reinforcing bars to provide at least one-inch clear space around the bar circumference. Where reinforcing steel is corroded, remove additional concrete to a point along the bar 6-inches beyond active corrosion. Care shall be taken to avoid damage to sound concrete adjacent to repair area and to embedded steel reinforcement. Reinforcement damaged during sawing or concrete removal shall be repaired at no additional cost to the Port.
- B. Hydrojetting is not allowed to be used for concrete removal unless all wash water is collected and disposed of in accordance with project permits. Wash water from hydrojetting shall not be allowed to enter the waterway.
- C. Cleaning of Embedded Reinforcement: Sandblast or high-pressure water jet all exposed embedded reinforcement to remove all corrosion products and distressed concrete. Pay particular attention to the back of exposed reinforcing bars. The diameter of all exposed and cleaned reinforcing bars shall be measured and compared with original bar diameter. The Engineer shall be consulted if any bar has lost more than 20 percent of its original diameter. Those bars that have lost 25 percent or more of their original diameter shall be supplemented by splicing in new bars. Supplemental reinforcement shall be lapped 36 bar diameters beyond

the section of existing reinforcing that has lost sectional area to develop the full strength of the bar. Additional saw cutting and chipping shall be performed to provide for this lap as necessary. A lap of 24 bar diameters shall be provided if two bars of equivalent size and grade are installed to replace the original bar section. Where reinforcement is broken or missing, supplemental bars shall be installed and lapped as directed by Engineer. Supplemental reinforcing bars shall be located to provide a minimum of 1 1/2-inches of concrete cover over the bar. Additional concrete chipping shall be performed, as required, to provide the required cover over bars.

- D. Surface Preparation: Sandblast or high-pressure water jet the cavity and the immediate surrounding concrete area to remove any deleterious materials such as laitance, dirt, grease, caulk, curing compounds, paint, and algae. Surface roughness of the cavity shall have a minimum full amplitude of 1/4-inch. The cavity shall be blown clean with dry oil-free compressed air to ensure that all loose particles have been removed. Notify the Engineer and provide for inspection of prepared repair areas after surface preparation is complete but prior to proceeding with repairs below.
- E. Surface Treatment of Exposed Reinforcement: Thoroughly coat all areas of exposed steel reinforcement with a bonding agent/corrosion preventative coating in accordance with the mortar manufacturer's recommendations. Rebar coating shall not be applied to concrete surfaces. Any rebar coating on the concrete surfaces (cavity and surrounding area) shall be completely removed at no additional cost to the Port.
- F. Final Surface Preparation: Predampen cavity surface with clean water. Cavity substrate shall be saturated surface dry with no freestanding water when the repair mortar is placed.
- G. Mortar Mixing: Mix in accordance with the mortar manufacturer's recommendations.
- H. Application: Apply in accordance with the mortar manufacturer's recommendations. A scrub layer of mortar must be scrubbed into the substrate, coating all surfaces. Immediately following, the patching mix shall be worked into the cavity and adequately compacted to ensure that no voids remain in the patch. Special care shall be taken to ensure that mortar is placed behind the reinforcing bars. Follow mortar manufacturer's instructions regarding patching material placement in lifts for patch depths. Minimum ambient and surface temperatures shall be 45° F and rising at time of application.
- I. Reinforcement Cover: Whenever the final concrete cover will be less than 1-inch for ties or 1 1/2-inches for main reinforcing extend the surface of the patch outward to provide the required cover.
- J. Finish: Finish in accordance with mortar manufacturer's recommendations. The finished surface of patches shall be flush with the existing surface unless the patch must extend beyond the existing surface to provide the specified cover.
- K. Curing: Cure in accordance with mortar manufacturer's recommendations.

3.03 EQUIPMENT:

- A. Removal equipment shall be power-operated saws, mechanical scarifiers, or grinders capable of removing concrete surface to the specified depth. Power-driven hand tools will be permitted, except jack hammers and chipping hammers heavier than 15-pound class and 30-pound class, respectively, shall not be used. Jackhammers and mechanical chipping shall not be operated at an angle in excess of 45 degrees measured from concrete surfaces. The equipment shall be provided with a control device attached to the cutter head to limit the depth of cut.
- B. Sawing equipment shall be capable of sawing concrete to the specified depth.

- C. Sandblasting and pressure washing equipment shall be capable of removing rust, oil, concrete laitance, and other foreign materials from the existing concrete and reinforcing steel surfaces.
- D. Water supply and spray equipment shall be adequate to control dust, clean concrete surfaces during chipping and scarification, and maintain wet curing.

3.04 INSPECTION:

- A. Final surface preparation shall be completed sufficiently in advance of the repair placement to allow the Engineer to inspect repair areas prior to repair.
- B. The patch repair areas shall be sounded by the Contractor with a sounding bar or hammer after sufficient curing (approximately 7 to 10-days after placement). Any hollowness or cracking of the patch material shall be corrected by removing and replacing the unbonded or cracked patch at no cost to the Port. The Engineer shall be present during the sounding operation.

3.05 ACCEPTANCE OR REJECTION

- A. Acceptance or rejection of the concrete patch repair will be by the Engineer. Such acceptance or rejection will be based on observations of visual defects or sounding of the repair.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 03 10 00 - Concrete Forming and Accessories
 - 2. Section 03 20 00 - Concrete Reinforcing
 - 3. Section 03 30 00 - Cast-in-Place Concrete
 - 4. Section 03 60 00 - Grouting
 - 5. Section 31 62 00 - Driven Piles

1.02 DESCRIPTION OF WORK

- A. The work includes furnishing of all necessary material, labor, and equipment for providing precast and precast prestressed concrete piling, deck panels, and LRB batter pile caps including manufacture, transportation, erection, and other related work as required for a complete installation.

1.03 REFERENCE STANDARDS

- A. American Concrete Institute ACI 301-10: Specifications for Structural Concrete.
- B. American Concrete Institute ACI 308R-01: Guide to Curing Concrete.
- C. Modification of ACI 308R: accomplish work in accordance with this guide except as modified herein. Consider the advisory or recommended provisions to be mandatory. Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Engineer.
- D. American Concrete Institute ACI 318-11: Building Code Requirements for Structural Concrete and Commentary.
- E. American Society for Testing Materials (ASTM), Standard Specifications and Standard Test Methods, designated by basic reference in this section (use the most current edition at the time of bid unless otherwise indicated).
- F. Precast/Prestressed Concrete Institute PCI MNL-116-99, 4th Edition, Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products.

1.04 QUALITY ASSURANCE

- A. Use a company specializing in providing precast and/or precast prestressed concrete products and services normally associated with the industry for at least five years. Written evidence shall be submitted to the Engineer to show experience, qualifications, and adequacy of plant capability and facilities for performance of contract requirements, including proof of plant certification by the Precast/Prestressed Concrete Institute (PCI). Upon request by the Engineer, the manufacturing facility shall be made available for inspection.
- B. Precast concrete materials, manufacturing, testing, quality control, record keeping, and product tolerances shall be in accordance with the provisions of PCI MNL-116.
- C. Individual precast units may be inspected by the Engineer at the casting yard. The Contractor shall give notice 14 days prior to the time the members will be available for plant inspection. Neither the exercise nor waiver of inspection at the plant by the Port shall affect the Port's right to enforce contractual provisions after units are transported or erected.

- D. All damaged and/or otherwise defective precast units, as determined by the Engineer, shall be rejected.
- E. Erectors shall have regularly engaged for at least five years in the erection of precast structural concrete elements similar to those required for this project.

1.05 SUBMITTALS

- A. Proof of plant certification by PCI for precast prestressed piles according to PCI MNL-116. Include written evidence to show experience, qualifications, and adequacy of the plant's facilities for performance of contract requirements.
- B. Detailed plant quality control plan including specific and pertinent references to PCI MNL-116 provisions. .
- C. Complete shop drawings indicating all shop and fabrication details, including position and quantities of reinforcing steel, prestressing steel, anchors, inserts, element geometry, etc. Indicate the concrete compressive strength, prestressing forces, and material stresses at the various stages of manufacture, handling, and erection. Provide supporting calculations for handling and delivery stress calculations for each element type.
- D. Proposed concrete mix design, indicating material contents per cubic yard including test certificates for compressive strength, yield, air content, slump, admixtures, etc. Include manufacturer's data sheets for all proposed admixtures, release agents, curing compounds, epoxy grout, etc. See Section 03 30 00 – Cast-in-Place Concrete.
- E. Submit a record of the actual curing temperature regime and cast date for each precast element.
- F. Mill certificates indicating specification compliance regarding strength and chemistry of reinforcing steel to be furnished. Note the requirement for weldable steel in Section 03 20 00 – Concrete Reinforcing.
- G. Certificates indicating specification compliance of constituent concrete materials including alkali-silica reactivity (ASR) for aggregates.
- H. Provide all test reports to the Port prior to delivery of materials and casting of concrete. See Section 03 30 00 – Cast-in-Place Concrete.

PART 2 - PRODUCTS

2.01 CONCRETE

- A. See Section 03 30 00 - Cast-in-Place Concrete.
- B. Concrete for precast deck panels and pile caps shall be air entrained. Concrete for piling need not be air entrained.
- C. Concrete for all precast piling, deck panels, and pile caps shall develop the minimum 28-day compressive strength as indicated on the Drawings before being delivered to the site.

2.02 OTHER MATERIALS

- A. Reinforcing: See Section 03 20 00 - Concrete Reinforcing.
- B. Grout: See Section 03 60 00 - Grouting.
- C. Deck panel bearing pads: Preformed continuous-strip asphalt saturated fiber expansion material conforming to ASTM D 1751, "Preformed Expansion Joint Filler for Concrete Paving and Structural Construction". Provide sizes indicated in the drawings.

PART 3 - EXECUTION

3.01 FABRICATION

- A. Obtain acceptance of all test reports and submittal documentation prior to delivery of materials and casting concrete. Manufacturing procedures shall be in compliance with PCI MNL-116.
- B. Formwork: See Section 03 10 00 - Concrete Forming and Accessories. Construct forms to maintain units within specified tolerances and to withstand tensioning and detensioning operations. Forms shall be thoroughly cleaned before each use.
- C. The prestressing elements shall be accurately held in position and stressed by jacks. A record shall be kept of the jacking force and corresponding elongations. The prestressing elements shall be released only after the concrete has attained a minimum strength of 60 percent of the specified 28-day strength for the piling and 67-percent of the specified 28-day strength for the deck panels. The prestressing elements shall be released in such an order that lateral eccentricity of prestress is minimized.
- D. See Section 03 30 00 - Cast-in-Place Concrete, for mixing, placing, consolidating, and curing requirements.
- E. Accelerated curing methods for precast concrete shall meet the requirements of PCI MNL-116, Division 4.
- F. Areas to receive additional concrete shall be left clean and rough with minimum amplitude of $\frac{1}{4}$ -inch. All other exposed concrete surfaces shall have a wood float finish. Formed areas shall have smooth dense steel-formed surfaces free of defects, abrasions, voids, stains, etc.
- G. Manufacturing Tolerances:
 - 1. Deck Panels
 - a. Length +3/4 inch
 - b. Width +1/4 inch
 - c. Thickness +1/4 inch
 - d. Horizontal alignment (sweep) $\frac{1}{4}$ inch maximum
 - e. Differential camber between deck panels $\frac{1}{4}$ inch maximum adjacent
 - 2. Piling
 - a. Length +6 inches, -2 inches
 - b. Section Size $\pm 3/8$ inch
 - c. Horizontal alignment (sweep) 1/8 inch per 10 feet of pile
 - d. End squareness 1/8 inch maximum
 - e. Tendon locations $\pm 1/8$ inch
 - f. Lifting eye locations ± 6 inches along length
- H. Product Identification Number: Each pile, pile cap, and deck panel shall be marked using a permanent system that includes, as a minimum, the element type, cast date, cast length, and casting number.
- I. Any element that is structurally impaired, as determined by the Engineer, will be rejected. The Engineer shall make the sole determination whether a member is structurally impaired

- J. Repairs to honeycombed sections shall be approved by the Engineer prior to repairs. Elements which contain honeycombed sections deep enough to expose reinforcing steel or contain excessive honeycombed sections, as determined by the Engineer, will be rejected.
- K. Elements containing cracks greater than 0.007 inches in width may be approved by the Engineer. If approved, the member shall be repaired in a manner approved by the Engineer. If not approved, the element shall be replaced at the Contractor's expense.

3.02 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery and Handling:

- 1. Precast concrete members shall be lifted and supported during manufacturing, stockpiling, transporting, and erection operations only at the lifting or supporting points, or both, as shown on the approved shop drawings, and with approved lifting devices.
- 2. Transportation, site handling, and erection shall be performed with industry standard equipment and methods, and by qualified personnel.
- 3. Do not damage units during all handling and delivery operations. Handling methods and delivery operations shall not overstress, crack, damage, fracture, or produce impact on the units.
- 4. Damaged units shall be repaired at the Contractor's expense. Repair methods shall be approved by the Engineer prior to commencement. Units damaged beyond repair, as determined by the Engineer, shall be removed and replaced at the Contractor's expense.

B. Storage:

- 1. Store all units off ground.
- 2. Place stored units so that identification marks are discernible.
- 3. Separate stacked members by battens across full width of each bearing area.
- 4. Stack so that lifting devices are accessible and undamaged.
- 5. Store all units on level ground and timber blocking so that the axis of each pile is maintained in a straight line and that bending stresses are not produced. Locate the blocking of successive tiers exactly above the blocking of the lower tiers.
- 6. Do not use upper member of stacked tier as storage area for shorter member or heavy equipment.

3.03 ERECTION

A. Piling:

- 1. See Section 31 62 00 - Driven Piles, of these specifications for requirements of concrete piling installation.
- 2. Prior to erection, and again after installation, The Contractor shall check piles for damage, such as cracking, spalling, and honeycombing. Follow the requirements herein for repair or rejection of elements with damage.
- 3. Piling shall not be driven until the concrete has attained the full design strength and only after a minimum of 28 days after casting.

B. Deck Panels and Pile Caps:

- 1. Preparation: Provide true, level bearing surfaces on all field-placed supporting members.

2. Panels and Pile Caps shall not be erected until the concrete has attained the minimum specified design strength and only after a minimum of 14 days after pouring.
 3. Installation: Members shall be lifted by means of suitable lifting devices at points provided by the manufacturer. Set panels on bearing pads as indicated on the drawings. Provide necessary temporary shoring and bracing, where required, to keep members plumb and stable. Align and level members as required. Provide temporary bearing pads between pile caps and temporary pile cap shoring
 4. Fastening: Fasten members only where indicated on the drawings. For welding of rebar in deck panels, see Section 03 20 00 - Concrete Reinforcing.
 5. Patching: Cut off lifting devices and fill voids with an approved epoxy grout. Lifting device voids shall be filled with an approved non-shrink cementitious grout such as Masterflow 928 or Masterflow 713 manufactured by BASF. If cementitious grout is use for lifting device voids, surface preparations and curing shall be done in strict conformance with the manufacturer's recommendations.
- C. Inspection: Erected precast units will be inspected by the Engineer to verify compliance with the drawings and these specifications.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 03 30 00 – Cast-in-Place Concrete
 - 2. Section 03 40 00 – Precast Concrete
 - 3. Section 05 50 00 – Metal Fabrications
 - 4. Section 32 62 00 – Driven Piling
 - 5. Section 34 11 00 – Track Rails

1.02 DESCRIPTION OF WORK

- A. The work includes furnishing of all necessary material, labor, and equipment for grouting and doweling as shown on the drawings and described in the specifications. The work also includes the patching of demolished or damaged surfaces and epoxy coating of exposed reinforcing steel (to remain) resulting from demolition activities.

1.03 REFERENCE STANDARDS

- A. American Society for Testing Materials (ASTM), Standard Specifications and Standard Test Methods, designated by basic reference in this section (use the most current edition at the time of bid unless otherwise indicated)

1.04 QUALITY ASSURANCE

- A. The Port will provide testing and inspection services as required. The Contractor shall provide all necessary assistance in testing of materials and provide access for testing and inspection at its own expense.
- B. Provide at least one person who shall be present at all times during execution of the work, who shall direct all work performed, and who has at least five (5) years experience with the materials and the methods of installation necessary to meet the performance specifications.
- C. Dowel installers shall be trained and certified by the doweling adhesive, grout, or system manufacturer.
- D. The Contractor shall make all arrangements for the crane rail grout manufacturer's representative to be on site during crane rail grouting.

1.05 SUBMITTALS

- A. Documentation that the supervisor's directing the work and that the dowel installers have the qualifications and experience as described above.
- B. For each application, manufacturer's name, address, catalog cuts, and specifications for grout, epoxies, adhesives, admixtures, and proprietary products.
- C. Manufacturer's test certificates for grout compressive strength and non-shrink properties of proposed cementitious grout. Indicate the working time, fluid consistency, flow rate, volume change characteristics, and manufacturer's recommended installation temperatures.
- D. Doweling system manufacturer's instructions for preparation, placement, drilling holes, installation of anchors and adhesive, and handling of cartridges, nozzles, and equipment.

- E. Doweling system manufacturer's ICC Evaluation Service - ES Reports and written letter of certification identifying the installer's qualifications to install the manufacturer's products.
- F. Crane rail grout manufacturer's letter of certification indicating the entire installation has been installed according to the manufacturer's requirements.
- G. Test samples for crane rail grout, with testing to be performed by the Port.

PART 2 – PRODUCTS

2.01 NON-SHRINK CEMENTITIOUS GROUT

- A. Locations: pile dowels, under crane stops, in and under pier double bitt bollards, supporting metal fabrications, and all other locations not specified.
- B. Requirements:
 - 1. Meet ASTM C 1107 for hydraulic-cement non-shrink grout.
 - 2. Plastic height change of 0% to +4% according to ASTM C 827.
 - 3. Hardened height change of 0% to +0.3% according to ASTM C 1090.
 - 4. Fluid consistency at 25 to 30 seconds according to ASTM C 939.
 - 5. Minimum working time of 30 minutes.
 - 6. Minimum compressive strength of 10,000 psi @ 28 days when prepared in fluid consistency according to ASTM C 109.
 - 7. Shall not contain powdered aluminum.
- C. Suppliers, or approved equal:
 - 1. Euclid Chemical Co., Hi-Flow Grout, Cleveland, OH.
 - 2. Masterflow 928, by BASF Construction Chemicals LLC, Shakopee, MN.
 - 3. SikaGrout 328, by Sika Corporation, Lyndhurst, NJ.
 - 4. Sure-Grip High Performance Grout, by Dayton Superior Corp., Dayton, OH.

2.02 REPAIR MORTAR

- A. Typical locations: demolition surfaces, incomplete drilled holes for dowels, damaged concrete, locations determined by the Engineer.
- B. Shrinkage-compensated mortar EMACO R350 CI manufactured by BASF Construction Chemicals LLC, or approved equal.

2.03 EPOXY GROUT

- A. Typical Locations: lifting locations for piles or precast elements, overhead repairs on new concrete elements, damaged concrete, pier double bitt bollard bolt head recesses, and locations determined by the Engineer.
- B. Five Star High Performance (HP) precision epoxy grout, or approved equal.

2.04 DRILLED-IN AND BONDED DOWEL ADHESIVE

- A. Store adhesive at temperatures and in locations indicated in the manufacturer's literature. Do not use and dispose of adhesives with expired shelf lives.
- B. Meet ASTM C 881, Type IV, Grade 2 or 3. Overhead applications shall meet Grade 3. Temperature Class A, B, or C shall match, or be endorsed by the manufacturer, the surface temperature of the concrete to which the bonding system is applied.

C. Suppliers, or approved equal:

1. Hilti HIT-RE 500, or Hilti HIT-RE 500 SD adhesive, by Hilti Inc., Tulsa, OK.
2. SET-XP adhesive, by Simpson Strong-Tie Co., Dublin, CA.

2.05 CRACK REPAIR

A. Products shall be appropriate for the specific defect and are subject to the approval of the Engineer. Suppliers, or approved equal:

1. MasterInject 1000, by BASF Construction Chemicals LLC, Shakopee, MN.
2. Sikadur 35, Hi-Mod LV, by Sika Corporation, Lyndhurst, NJ.
3. SCB Concresive 1350, by BASF Construction Chemicals LLC, Shakopee, MN.
4. SCB Concresive 1360, by BASF Construction Chemicals LLC, Shakopee, MN.

2.06 CRANE RAIL

A. Grout under the crane rail sole plates shall meet the requirements of the crane rail mounting system manufacturer and shall be high-strength, non-shrink, 100 percent solids epoxy grout.

1. Atlantic Track – 1700 epoxy grout, or approved equal.
2. Gantrex – K3 epoxy grout, or approved equal.

PART 3 – EXECUTION

3.01 GENERAL

- A. Products shall be stored, mixed, placed, and cured in accordance with the manufacturer's published specifications. Surface shall be prepared in accordance with manufacturer's published specifications unless otherwise indicate herein. In case of a discrepancy the more strict requirements, as determined by the Engineer, shall apply.
- B. Concrete surfaces shall be thoroughly cleaned and wetted before placing grout. Steel members to be embedded and grouted shall be set level at proper elevation with the use of steel shims or leveling screws before grout placement begins.
- C. See Section 34 11 13 – Track Rails for crane rail epoxy grout installation.

3.02 DOWEL INSTALLATION

- A. Drilling hammers for dowel holes shall be pneumatic rotary type with medium or light impact. Holes for dowels shall not be core drilled unless otherwise shown on the drawings or approved by the Engineer.
- B. Use a drill bit diameter meeting the ICC-ES Report requirements of each dowel system and as recommended by the manufacturer.
- C. Locate drilled holes to avoid existing reinforcing steel and other embedded objects. Prior to drilling, locate the existing reinforcement using a pachometer or other non-destructive methods approved by the Engineer.
- D. When existing reinforcing steel is encountered, obtain criteria from the Engineer for relocating and re-drilling the hole. Incomplete holes, or holes that expose existing reinforcing steel shall be patched.
- E. Clean, roughen, prepare, wet, and inspect each hole in accordance with the manufacturer's instructions before installing dowels and adhesive, or grout.

3.03 FIELD TESTING OF CRANE RAIL GROUT

- A. The Port will obtain one test sample of crane rail grout for each day's production for the first 5 days of production and one sample each week thereafter. Two successive test failures shall require resumption of daily sampling. Each test sample shall consist of 12 test cubes. Clearly identify samples by designated name, specification number, batch number, project contract number, where used, and quantity involved.
- B. The Port will test samples in accordance with ASTM C 579 Method B with 3 cubes tested at 16 hours, 3 at 1 day, and 3 at 7 days, and hold 3 in reserve. If a sample fails to meet the manufacturer's published physical properties after two tests, the Contractor, at no additional cost to the Port, shall replace the repaired area represented by the samples tested and provide the Port with a new test sample for the next 5 days of production followed by one sample each week thereafter.
- C. Molds used for casting test cubes shall be clean 2" x 2" x 2" brass gang molds. Molds shall be double paste waxed to facilitate clean release. Oils or greases shall not be used as release agents.
- D. Molds shall be placed and kept on level surface during filling and curing. Once filled, the molds shall be left undisturbed and shall not be transported until the grout has set. Molds left onsite to cure shall be protected from direct sunlight and rain.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
1. Section 03 20 00 – Concrete Reinforcing
 2. Section 03 30 00 – Cast-in-Place Concrete
 3. Section 03 40 00 – Precast Concrete
 4. Section 05 50 00 – Metal Fabrications
 5. Section 09 96 00 – High Performance Coatings

1.02 DESCRIPTION OF WORK

- A. The work specified herein consists of manufacturing, testing, and installation of lead rubber seismic isolation bearings (herein referred to as “Lead Rubber Bearing”, “LRB”, bearings or “isolators”) and all necessary materials, labor, and equipment to accomplish the work. The isolators shall be installed between the top of the batter pile cap and the underside of the pilecap where shown on the Drawings. The isolation system shall be composed of lead, steel and natural rubber. No alternate isolation devices will be accepted. The isolator supplier shall supply the isolator (including galvanized and coated top and bottom bonded steel mounting plates), the galvanized and coated steel upper and lower embed plates embedded into the pilecap concrete above and below the isolators (including Welded Headed Reinforcing), and the connection bolts used to attach the isolator to the steel embed plates. All isolators shall meet the external dimension limits and performance requirements as shown on the Drawings and in these Specifications.

1.03 REFERENCE STANDARDS

- A. The design and testing of the isolators shall conform to the applicable provisions of the current editions of the following standards, except as indicated otherwise in the Specifications:
1. International Building Code, 2012
 2. ASCE 7-05 Minimum Design Loads for Buildings and Other
 3. ASCE 61-14 Seismic Design of Piers and Wharves
 4. ASTM A36 Specification for Structural Steel
 5. ASTM A570 Specification for Structural Steel Sheet
 6. ASTM A572 Specification for Structural Steel
 7. ASTM B29 Specification for Lead
 8. ASTM D395 Test for Rubber Property: Compression Set
 9. ASTM D412 Test for Rubber Property: Tension
 10. ASTM D429 Determination of Rubber-to-Metal Bond Strength
 11. ASTM D573 Test for Rubber Deterioration: Heat Resistance
 12. ASTM D1149 Test for Rubber Deterioration: Ozone Resistance
 13. ASTM D1229 Test for Rubber Property: Compression Set at Low

- 14. Temperature
- 15. ASTM D2240 Test for Rubber Property: Durometer Hardness
- 16. ASTM D4014 Test for Rubber Property: Shear Modulus
- 17. ASTM E37 Chemical Methods for the Analysis of Lead
- 18. ASTM A123, A143, A153, A384, A385 Specifications for Hot-Dip Galvanized
- 19. American Galvanizers Association (AGA), Quality Assurance Manual.

1.04 QUALITY ASSURANCE

- A. Demonstrate that the isolator manufacturer has designed, manufactured, tested, and supplied similar isolators (similar in dimensional, technical, and performance properties) on at least 3 projects in the last 10 years, with at least one project occurring within the last 5 years.
- B. Demonstrate that the isolator manufacturer has tested similar isolators to 400% shear strain or more. Also demonstrate that the manufacturer has performed high velocity testing on similar isolators at or above the velocities required for the Project.
- C. The galvanized coating applicator shall specialize in hot-dip galvanizing after fabrication and follow the procedures in the AGA Quality Assurance Manual.

1.05 SUBMITTALS

- A. The Contractor shall prepare his bid based on the products and performance requirements indicated on the Drawings and in this Specification. Submit all data and test reports necessary to demonstrate product equivalence and achievement of performance requirements.
- B. Detailed and coordinated isolator shop drawings indicating all shop and erection details, including external dimensions, hole sizes and patterns for connection to structural steel embed plates above and below the isolators, welded headed reinforcement details, fasteners, material specifications, surface preparations, and finishes.
- C. Detailed isolator installation plan including details of the installation steps at the pre-cast manufacturer's plant and at the project site. The installation plan shall include details on how templates will be utilized and how grades and tolerances will be achieved.
- D. Documentation that the fabricator has the qualifications and experience described above.
- E. Galvanized coating applicator's Certificate of Compliance that the hot-dip galvanized coatings meets or exceed the specified requirements of ASTM A 123 or A 153, as applicable, and has followed the procedures in the AGA Quality Assurance Manual.
- F. Mill certificates for each heat number of structural and miscellaneous steel.
- G. Certificates of Compliance with material and isolator test criteria as specified herein.
- H. Test reports for all isolators.

PART 2 – PRODUCTS

2.01 GENERAL

- A. The isolator system shall consist of the complete assembly of the lead-rubber bearing (including bonded steel mounting plates), fabricated steel embedment plates, and all connection bolts and hardware.
- B. The isolator system assembly as depicted on the Drawings and described herein is based on the performance, dimensions, and material characteristics of a single Lead Rubber Bearing (LRB) base isolator as manufactured by Dynamic Isolation System (DIS), Inc (885 Denmark Dr.

Suite 101, McCarren, NV 89434, 775-359-3333). Alternate products proposed shall be equivalent to the DIS system. Submit all information, test reports, and product data necessary to demonstrate equivalence. The cost of all labor, including any testing necessary to demonstrate equivalence, shall be at the Contractor's expense.

- C. All isolators shall be manufactured in accordance with the DIS document, "Base Isolator Quality Control Procedures". Quality control procedures implemented for alternate proposed products shall be at least as stringent as those included in the DIS document.
- D. All products shall be new, free from oxidation, corrosion, and defects, and shall be of the specified quality. All products shall be suitable for long-term use in the marine environment and have a minimum service life of 50 years.
- E. Protect all materials and fabrications before, during, and after installation from damage. Protect the installed work of other trades from damage.
- F. The isolators shall be delivered to the jobsite or precast batter pile cap manufacturer with match-marked embedment plates in protective packaging for freight and handling purposes. They shall be stored under cover above the ground in the original packaging until installation.
- G. Protect galvanized and painted finishes from damage by use of padded slings and straps.
- H. In the event of damage, immediately make all repairs and replacements as per the manufacturer's written recommendations and as approved by the Engineer at no additional cost to the Port.

2.02 MATERIALS

- A. The base polymer of the isolator elastomer layer shall be natural rubber with the following characteristics:
 - 1. Heat resistance per ASTM D573 (70 degrees Celsius for seven days):
 - a. Maximum permissible change in tensile strength: -25%
 - b. Maximum permissible change in ultimate elongation: -25%
 - c. Maximum permissible change in durometer hardness: +10 points
 - 2. Compression set per ASTM D395 Method B (70 degrees Celsius for 22 hours):
 - a. Maximum permissible set: 50%
 - 3. Ozone resistance of elastomer exposed to the environment:
 - a. Ozone resistance shall be determined by tests on strips of representative material mounted as per Method A of ASTM D518. The tests shall be performed by ASTM D1149 at an ozone concentration of 50 ± 5 parts per hundred million at 20% strain at 100 ± 2 degrees Fahrenheit for 100 hours. The ozone resistance shall be regarded as satisfactory if, on conclusion of a test, no cracks are visible using 7X magnification.
 - 4. Bond of elastomer to steel laminate:
 - a. Peel strength shall be performed by ASTM D429 Method B. The failure shall be 100% rubber tear.
 - 5. Tensile strength and ultimate elongation of elastomer:
 - a. Minimum tensile strength and ultimate elongation tests shall be performed by ASTM D412. The minimum tensile strength shall be 2,250 psi and the minimum ultimate elongation shall be 550%
 - 6. Hardness of elastomer:

- a. The durometer hardness at 20 ± 5 degrees Celsius shall be determined by ASTM D2240 and reported.
7. Shear modulus at 50% shear strain of elastomer:
 - a. The shear modulus of the elastomer at 50% shear strain shall be determined by ASTM D4014 and reported. The tangent modulus shall be determined and reported.
- B. Shim plates shall be made from rolled carbon steel conforming to ASTM A 1011-00-SS-Gr. 36-Type 1 (formerly ASTM A570 Grade 36).
- C. Top and bottom mounting plates shall be designed by the isolator manufacturer and at a minimum shall be made from steel conforming to ASTM A36. The top and bottom steel embed plates shall be made from steel conforming to ASTM A572, Grade 50.
- D. Welded Headed Reinforcement shall comply with Section 03 20 00 – Concrete Reinforcing.
- E. High-Strength bolts, nuts, and washers: ASTM A 325-X, Type 3, ASTM A 563-DH, hot-dip zinc coated, and ASTM F 436, hot-dip zinc coated, respectively.
- F. Purity of Lead:
 1. The purity of lead shall be established by chemical analysis from a sample of lead used in the isolators. The test shall confirm a minimum of 99.9% purity of the lead.
- G. All other materials not specifically described but required shall be proposed by the Contractor, new, free of corrosion, and subject to the approval of the Engineer.

2.03 FABRICATION

- A. The tolerances on isolator dimensions after manufacture and prior to testing shall be as follows:
 1. External plan dimensions: ± 0.25 inches
 2. Parallelity of surface of top and bottom mounting plates: $= 0.005$ radians
 3. Horizontal offset: ± 0.25 inches
 4. Overall bearing height: ± 0.25 inches
- B. All exposed steel surfaces shall be hot-dip galvanized in conformance with ASTM A 123, A 143, A 153, A 384, and A 385, as applicable. The steel mounting plates shall be hot-dip galvanized prior to bonding to the rubber isolator. The steel embed plates shall be hot-dip galvanized after fabrication. Damaged galvanizing shall be restored in accordance with ASTM A 780, annex A3. Zinc-rich paints and cold spray materials are not acceptable. Surface preparation and application shall be according to the manufacturer's specifications. Galvanized surfaces that will be exposed after installation shall be painted per Specification Section 09 96 00.
- C. Each isolator shall be permanently marked on the vertical rubber surface. The marking shall consist of an isolator serial number specified by the manufacturer, and any other markings as specified by the manufacturer, or requested by the Engineer and agreed to by the manufacturer. The bearings and embed plates shall be match-marked prior to shipment whether shipped together or separate. All markings shall be permanent and suitable for long-term exposure to the marine environment.

2.04 PERFORMANCE REQUIREMENTS AND TESTING

- A. Prototype tests shall be performed on two isolators per Table 1 below. Testing velocity shall be 25 mm/s. Prototype Acceptance Criteria will be per ASCE 7-05 Section 17.8. Bearings used for prototype tests may be incorporated as production bearings provided they are placed in separate bents at least two bents apart.

Table 1: Combined Compression and Shear Prototype Test Plan

Test ID	Compression Load	Number of Cycles	Displacement
A	1000 kip	20	1.7"
B	0 kip	3	6.4"
C		3	12.9"
D		3	25.7"
E		3	28"
F	2000 kip	3	1.7"
G		3	6.4"
H		3	12.9"
I		3	25.7"
J		3	28"

- B. Production testing shall be with 1000 kip of vertical load for three cycles to 25.7" of displacement and shall be performed on all production isolators. The production isolators may be tested in pairs and the value reported may be the average result of the tested pair. All test results shall identify the isolators by the Manufacturer's serial number
- C. Acceptance criteria for individual isolators: The effective stiffness shall be within $\pm 15\%$ of the value used in design, and the energy dissipation capacity (EDC) shall be greater than 85% of the value used in design.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install isolators at the locations shown on the Drawings in an undamaged condition. Supply and use wooden or steel templates to accurately locate and align all elements to be embedded in concrete.
- B. Do not damage, cut, or tear the rubber or the isolator assembly during installation. Canvas slings, wood cradles, or other protective devices shall be used as recommended by the manufacturer.
- C. The isolators shall be installed level and perpendicular to the horizontal surface of the pilecap above and below the isolator.
- D. There shall be no obstructions, including bolt extensions, which prevent the isolators from deforming horizontally in any direction. The area around each isolator shall be cleaned of all debris, formwork and other construction materials at the completion of the contract.
- E. Any welding on steel in contact with an isolator shall be performed in such a manner as to avoid heat transfer into the isolator. The temperature of the isolator mounting plates immediately adjacent to the rubber shall remain at a temperature less than 100 degrees Celsius.
- F. Concrete reinforcing in the pilecaps above and below the isolators shall be detailed and placed to accommodate the steel embed plates.
- G. Each isolator unit shall be assembled in the shop to demonstrate alignment of the bolt holes between the mounting plates and the embed plates and each isolator shall be delivered to the site in its assembled condition. Care shall be taken by the Contractor to ensure that the bolt holes in the mounting plates and embed plates align when the isolators are installed in the final configuration between the pilecaps.
- H. Connection bolts shall be tightened as indicated on the Drawings.

- I. The isolator units will be inspected after installation and subject to approval by the Engineer.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
 - 1. Section 03 30 00 – Cast-in-Place Concrete
 - 2. Section 03 40 00 – Precast Concrete
 - 3. Section 03 60 00 – Grouting
 - 4. Section 05 05 23 – Lead Rubber Bearings
 - 5. Section 09 96 00 – High Performance Coatings
 - 6. Section 34 11 13 – Track Rails
 - 7. Section 35 59 13 – Marine Fenders

1.02 DESCRIPTION OF WORK

- A. All metal fabrications are indicated on the Drawings and in the specifications. The work shall consist of furnishing all materials, labor, and equipment for fabricating and/or repairing, galvanizing, and erecting metal fabrications and cast steel pier double bitt bollards, in accordance with the Drawings, notes, and this specification. Work also includes furnishing and installing the permanent floating containment boom system under the pier.

1.03 REFERENCE STANDARDS

- A. American Galvanizers Association (AGA), Quality Assurance Manual.
- B. American Institute of Steel Construction (AISC), Specification for Structural Steel Buildings, 2010.
- C. American Institute of Steel Construction (AISC), Code of Standard Practice for Steel Buildings and Bridges, 2010.
- D. American Society for Testing Materials (ASTM), Standard Specifications and Standard Test Methods, designated by basic reference in this section (use the most current edition at the time of bid unless otherwise indicated).
- E. American Welding Society (AWS) D1.1 – 2010, Structural Welding Code – Steel.
- F. American Welding Society (AWS) A2.4 – 2012, Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- G. Society for Protective Coatings (SSPC), Surface Preparation Specifications.
- H. Washington Association of Building Officials (WABO) Standard No. 27-13, WABO Welder and Welding Operator Performance Qualification Standard for Structural Steel, Sheet Steel, and Reinforcing Steel.

1.04 QUALITY ASSURANCE

- A. Demonstrate that the fabricator has a minimum of five (5) years of experience fabricating and working similar metals and configurations, including cutting, bending, forming, welding, and finishing.
- B. Demonstrate that the manufacture and fabricator of the gas spring assisted shore power vault (cold ironing) lids, gas spring assisted crane power vault lids, and their perimeter framing

elements has a minimum of five (5) years experience designing and fabricating similar gas spring assisted vault lids utilized in a marine environment and capable of carrying substantial vehicle loading.

- C. Welders shall be currently certified by the Washington Association of Building Officials (WABO) for structural welding.
- D. Welding procedures, operations, welders, and tackers shall be qualified in accordance with AWS D1.1.
- E. The galvanized coating applicator shall specialize in hot-dip galvanizing after fabrication and follow the procedures in the AGA Quality Assurance Manual.
- F. Nondestructive testing (NDT) and inspection of all shop and field welds will be performed in accordance with AWS D1.1 by an independent testing agency retained by the Port. Welds failing to comply shall be repaired or replaced at the Contractor's expense.
- G. Quality assurance requirements for the permanent floating containment boom system are indicated on Sheet S1.3 of the Drawings.

1.05 SUBMITTALS

- A. Design calculations stamped and signed by a professional engineer licensed in the State of Washington showing that the gas spring assisted shore power vault (cold ironing) lids, gas spring assisted crane power vault lids, and their perimeter framing elements are capable of carrying the design loads as indicated on the drawings. For the crane power vault lids, the calculations shall show verification that the HSS sections and corbels called out in the drawings are sufficient for the design loading and for smooth operation of the lids.
- B. Manufacturer installation instructions and requirements for the gas spring assisted shore power vault (cold ironing) lids, gas spring assisted crane power vault lids, and their perimeter framing elements.
- C. Detailed and coordinated shop drawings indicating all shop and erection details, including cuts, copes, connections, holes, fasteners, material specifications, welds, surface preparations, and finishes.
- D. Documentation that the fabricator has the qualifications and experience described above.
- E. Welder qualifications and certifications.
- F. Weld Procedure Specifications (WPS's) proposed for use on the project. Submit supporting Procedure Qualification Records (PQR's) for all WPS's not prequalified by AWS.
- G. Galvanized coating applicator's Certificate of Compliance that the hot-dip galvanized coatings meets or exceed the specified requirements of ASTM A 123 or A 153, as applicable, and has followed the procedures in the AGA Quality Assurance Manual.
- H. Mill certificates for each heat number of structural and miscellaneous steel.
- I. Operation and Maintenance manual for the gas spring assisted shore power vault (cold ironing) lids and gas spring assisted crane power vault lids indicating pertinent operation and maintenance criteria required to maximize the life of the gas springs, latches and handles; and indicating pertinent gas spring and latch part numbers and suppliers that are relevant in the event that replacement parts are required in the future.
- J. Certificate of warranty stating that the manufacturer of the gas spring assisted shore power vault (cold ironing) lids and the gas spring assisted crane power vault lids will repair or replace damaged lids, springs, or latches resulting from product defect or poor manufacturing processes for a period of five (5) years from Substantial Completion.

K. Mooring Bollards

1. Drawing of proposed bollard and hardware.
2. Installation procedures including proposed grouting procedure.
3. Manufacturer's Certification of Compliance stating that the product supplied will meet the load requirements shown on the Drawings with the required factor of safety found in Section 2 of this specification.
4. Manufacturer's information showing mill test certificates for each heat number.
5. Record showing heat numbers and serial numbers. Serial numbers shall be stenciled onto the surface of the bollard.

L. Permanent Floating Containment Boom System

1. Submittal requirements for the permanent floating containment boom system are indicated on Sheet S1.3 of the Drawings.

PART 2 – PRODUCTS

2.01 GENERAL

- A. All products shall be new, free from oxidation, corrosion, and defects, and shall be of the specified quality.
- B. Protect all materials and fabrications before, during, and after installation from damage. Protect the installed work of other trades from damage.
- C. Protect galvanized finishes and painted coatings from damage by use of padded slings and straps.
- D. In the event of damage, immediately make all repairs and replacements as per the manufacturer's written recommendations and as approved by the Engineer at no additional cost to the Port.

2.02 STRUCTURAL STEEL

- A. Plates and bars: ASTM A 572, Grade 50, unless noted otherwise.
- B. Angles and channels: ASTM A 36.
- C. HSS sections: ASTM A 500, Grade B.
- D. Pipe: ASTM A 53, Grade B, ASTM A 106, Grade B or C.
- E. Pier Bollard Types 1 and 2, and Mooring Dolphin Bollards: ASTM A 106, Grade C.
- F. Vault lid cover plates, cover plate stiffeners, and welded attachments: ASTM A 514, quenched and tempered.

2.03 BOLTS, NUTS, AND WASHERS

- A. Anchor bolts or anchor rods: ASTM F 1554, Grade 55, headed, unless noted otherwise.
- B. Economy bolts, hex head bolts, and other bolts not specified as high-strength: ASTM A 307, Grade A.
- C. Nuts and washers for economy bolts, hex head bolts, and other bolts not specified as high-strength: ASTM A 563, suitable for grade of bolt, ASTM F 844, wide series, maximum thickness, respectively.
- D. High-Strength bolts, nuts, and washers: ASTM A 325-X, Type 3, ASTM A 563-DH, hot-dip zinc coated, and ASTM F 436, hot-dip zinc coated, respectively.

2.04 PIER DOUBLE BITT BOLLARDS

- A. Pier Double Bitt Bollard shall be a new MDB 200 as manufactured by Maritime International, Inc. or approved equal as shown on the Drawings. Bollard material shall be stress-relieved cast steel conforming to ASTM A27 Grade 65-35. Bollards shall have a load rating of 100 Metric Tonnes per bitt in the direction of -10 degrees to 60 degrees in the vertical plane and -90 degrees to 90 degrees in the horizontal plane. The factor of safety of the bollard bitt against yielding shall be 2.0 and the factor of safety against breaking shall be 3.0. Anchor hardware shall be designed to AISC Manual of Steel Construction, 13th Edition. Bollards shall have a hole through the top of each bitt through which non-shrink grout will be deposited after placement and bolting of bollards.
- B. Bollard anchorage hardware shall be 10 anchor bolts of 2-1/4" diameter conforming to ASTM F1554 Grade 105 in the pattern shown on the Drawings, or such that they provide equal attachment capacity to the concrete.

2.05 OTHER MATERIALS

- A. Vault lid hinge pipes: ASTM A 312, Type 316 stainless steel. Pipes may be welded or seamless, but inside surface shall allow for insertion and smooth rotation of hinge pin.
- B. Vault lid hinge pins: ASTM A 276, Type 316 stainless steel.
- C. Gangway platform checkered plate: ASTM A 786
- D. Drilled-in expansion anchors AISI Type 316 stainless steel: Simpson Strong-Tie Wedge-All anchor, Hilti Kwik-Bolt 3 expansion anchor, or approved equal.
- E. Welded headed studs and shear stud connectors: See Section 03 20 00 – Concrete Reinforcing.
- F. Chains, shackles, links, and wire rope: See Section 35 59 13 – Marine Fenders.
- G. Traffic Bollards: ASTM A 53 Grade B
- H. All other materials not specifically described but required shall be proposed by the Contractor, new, free of corrosion, and subject to the approval of the Engineer.

2.06 PERMANENT FLOATING CONTAINMENT BOOM SYSTEM

- A. Product requirements for the permanent floating containment boom system are indicated on Sheet S1.3 of the Drawings.

PART 3 – EXECUTION

3.01 PREPARATORY REVIEW

- A. Prior to all work of this section, inspect the installed work of all other trades affecting this work and verify that all such work is complete to the point where this installation may commence.
- B. Coordinate and furnish placement drawings, templates, instructions, and directions for installation of embedded anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items.
- C. Verify that the work can be fabricated and installed in accordance with the Drawings, specifications, and reference standards. Immediately report discrepancies to the Engineer and do not proceed with fabrication or installation until discrepancies are resolved and direction is provided.

3.02 FABRICATION

- A. All structural steel shall be fabricated in accordance with the approved shop drawings and reference standards.
- B. Shop-fabricate and preassemble all items complete for installation to the extent practicable to minimize field assembly. Disassemble units only as necessary for shipping and handling limitations.
- C. Weld all shop connections unless otherwise directed on the Drawings. All joints shall be tightly fitting, securely fastened, square, plumb, straight, and true.
- D. Drill or punch all holes required for attachments and bolted connections including those of other trades. Burned holes are not acceptable.
- E. Welding of all metal fabrications shall conform to AWS D1.1.
- F. Install and erect all miscellaneous metal and metal fabrications in accordance with the design drawings, shop drawings, and reference standards.

3.03 PROTECTIVE COATINGS

- A. Galvanizing:
 - 1. All miscellaneous metal, metal fabrications, and fasteners, except as noted in this specification, shall be hot-dip galvanized in conformance with ASTM A 123, A 143, A 153, A 384, and A 385, as applicable.
 - 2. All miscellaneous metal, metal fabrications, and fasteners that have a galvanized coating, and are to be further coated (painted), shall be cleaned, prepared, primed, and coated with additional coatings over the galvanized coating as specified in Section 09 96 00 – High Performance Coatings.
 - 3. Identify proposed drain holes or vent holes required to produce galvanized coatings to the specified standards. Clearly locate these holes on the shop drawings.
 - 4. Galvanize items, to the extent practicable, immediately after fabrication is complete.
 - 5. Damaged galvanizing, including damage due to welding, shall be restored in accordance with ASTM A 780, annex A3. Zinc-rich paints and cold spray materials are not acceptable. Surface preparation and application shall be according to the manufacturer's specifications.
- B. The following metal fabrications shall be galvanized and coated as specified in Section 09 96 00 – High Performance Coatings.
 - 1. Pier Bollard Types 1 and 2, and Mooring Dolphin Bollard
 - 2. Ladders, grab bars, and bars protruding from concrete ladder weights
 - 3. Crane pin socket cover plates
 - 4. Crane tie down vault cover plates
 - 5. Bullrail utility vault lids
 - 6. Crane power vault lids, floor framing, wall plate, cable drums, and miscellaneous carbon steel components
 - 7. Shore power vault (cold ironing) lids
 - 8. Fiber optic vault lids
 - 9. Bullrail corner guards

10. Bullrail cover plate between Bents 67.9 and 1
 11. Isolation joint cover plates
 12. Lead Rubber Bearing Upper and Lower Embed Plates
 13. Lead Rubber Bearing Top and Bottom Bearing Plates
- C. The following metal fabrications shall be coated only as specified in Section 09 96 00 – High Performance Coatings (not galvanized).
1. Crane Stops
 2. Fender panels, carbon steel fender panel elements, and fender spacers
 3. Traffic bollards
 4. Traffic bollard guardrails
 5. Gangway platform
 6. Pier Double Bitt Bollards

3.04 PIER DOUBLE BITT BOLLARDS

- A. Anchor bolts and sleeves shall be held in place with embedded setting templates that match bollard manufacturers bolt pattern. Templates shall ensure proper location of bolts and sleeves during placement of concrete. Anchor bolt sleeves shall be filled with non-shrink grout after aligning anchor bolts in template and hand tightening bottom anchor bolt nuts below the pile cap. After anchor bolt installation, the nuts on the bottom ends of anchor bolts beneath the pile cap shall be protected with a SAP-SEAL screw-on caps filled with corrosion inhibiting grease.
- B. Bollard base shall be set in recess in the top of the pier formed by an embedded setting template provided by the bollard manufacturer. Bollard shall be leveled using leveling nuts below the base prior to grouting. Upper anchor bolt nuts shall be hand tight before grouting of base and filling inside of bollard with non-shrink grout. After grouting has cured for seven days the upper anchor bolt nuts shall be tightened to the snug tight condition. Areas around nuts in bollard base shall be filled with an epoxy grout or molten zinc so as to prevent standing water. To prevent damage to vessel mooring lines, no sharp edges around bolting area shall exist after installation.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
 - 1. Section 01 25 00 – Substitution Procedures
 - 2. Section 05 55 00 – Metal Fabrications
 - 3. Section 34 11 13 – Track Rails
 - 4. Section 35 59 13 – Marine Fenders
 - 5. Division 26 – Electrical

1.02 DESCRIPTION OF WORK

- A. The work includes furnishing all materials, labor, equipment, and accessories for preparing and providing the required finished painting and protective coatings on the fabrications and items identified on the drawings and in the specifications. See Section 05 50 00 for list of project components to receive high performance coating.

1.03 REFERENCE STANDARDS

- A. Society for Protective Coatings (SSPC), SSPC Painting Manual, Volume I, 4th Edition, “Good Painting Practice”.
- B. SSPC Painting Manual, Volume II, 2008 Edition, “Systems and Specifications”.
- C. SSPC, “The Fundamentals of Cleaning and Coating Concrete”.
- D. SSPC, “Procedure for Determining Conformance to Dry Coating Thickness Requirements”, SSPC-PA2.

1.04 QUALITY ASSURANCE

- A. Coating application shall be by qualified and experienced personnel having demonstrated at least five (5) years of experience in coating applications for marine structures.
- B. Conform to all manufacturers’ specifications and recommendations for achieving published results with each product, application, and condition. If manufacturers’ specifications or recommendations differ from those in these specifications, report the discrepancy to the Engineer and obtain further direction before proceeding.
- C. The Engineer may inspect coating preparation, application, or touchup at its discretion. Provide access to the Engineer for these inspections and at no additional cost to the Port.

1.05 SUBMITTALS

- A. A complete list of products and product descriptions proposed for use as coating systems.
 - 1. Provide manufacturer product data and accessories, including specifications, physical characteristics, and performance data.
 - 2. Manufacturer instructions and directions for application of the coating systems.
 - 3. Manufacturer instructions and procedures for use in performing field repairs and touch-ups to the coating systems.
 - 4. Use the same manufacturer’s products for all coats unless otherwise approved by the Engineer.

- B. Documentation that key personnel of the coating applicator have at least the minimum experience and certifications described above and below. Demonstrate consistent experience applying the proposed coating systems under similar conditions. List information by individual and include the following.
 - 1. Position or responsibility
 - 2. Employer (if other than the Contractor)
 - 3. Name of facility owner
 - 4. Mailing address and telephone number of facility owner
 - 5. Name of contact reference in facility owner's organization
 - 6. Location, size, and description of structure
 - 7. Dates work was performed
 - 8. Description of work performed on structure
- C. Samples of all paints and finishes proposed for use.
- D. Schedule of coating operations with dates and items listed.
- E. Measurement reports of dry paint thickness on metal surfaces according to SSPC-PA2.

1.06 PRODUCT HANDLING

- A. Deliver paint and associated materials in undamaged and unopened containers bearing labels of the manufacturer, which indicate the contents and directions for use, storage, and handling. Store materials in a location where the ambient temperature and humidity is not outside the ranges recommended by the manufacturer.
- B. Prevent fire. Open containers of inflammable materials only as needed. Keep rubbing cloths, oily rags, etc., in tightly closed metal containers, or remove from the job site daily. Benzene, gasoline, or distillates shall not be stored on the job site.
- C. Do not damage the coating materials before, during, or after installation and prevent damage to the installed work and materials of other trades.
- D. In the event of damage, immediately make all repairs and replacements as directed by the Engineer according to the manufacturer's recommendations and procedures at no additional cost to the Port.

PART 2 – PRODUCTS

2.01 COATING SYSTEMS

- A. Manufacturers who have provided acceptable coating systems for past marine projects include the following. This does not imply that products from any manufacturer listed below will be acceptable.
 - 1. Carboline Protective Coatings (1-206-243-6494)
 - 2. International Marine Coatings of AkzoNobel (1-206-763-8003),
 - 3. Sherwin Williams Co Industrial and Marine Coatings (1-360-931-4645)
 - 4. Tnemec Company (1-206-762-5755)
 - 5. Wasser High-Tech Coatings (1-253-218-2222)
 - 6. Fields Company LLC (1-253-627-4098)

- B. Coating systems selected for each type of finish surface shall be products of a single manufacturer. Coating materials shall be suitable for corrosion protection in an aggressive marine environment.
- C. Materials not specifically noted but required for the work, such as thinners, or other materials, shall be products of the approved paint manufacturer or compatible products accepted by the coating manufacturer.
- D. Paint products for coating systems shall be mixed according to the manufacturer's directions. Do not deviate except with written approval of the Engineer.

2.02 SUBSTITUTIONS

- A. Manufacturer-specific coating systems are referenced in this specification. The manufacturer's product identification numbers indicate the product type, quality, and performance required for a specific application. Bids shall be based upon the manufacturer-specific coating systems referenced herein.
- B. Submit in writing a request to the Engineer for review and approval prior to material procurement and in accordance with Section 01 25 00 – Substitution Procedures. Substantiating technical data and documentation are required as described above for all submittals.
- C. Proposed coating system substitutions will be reviewed and evaluated, subject to the approval of the Engineer, based on equivalency to the coating systems referenced in this herein. Substitute coating system data and documentation that does not demonstrate equivalency will not be approved.
- D. Approved substitutions shall be at no additional cost to the Port.

2.03 COLOR SCHEDULE

- A. OSHA safety yellow: Pier and mooring dolphin bollards, crane stops, ladders, ladder grab bars, bars protruding from concrete ladder weights, light stanchions, bullrail corner guards, concrete traffic barriers, traffic bollards, traffic bollard guardrails, and gangway platform.
- B. Standard gray with non-skid coating on walking surfaces and OSHA safety red lettering (letterings shall be as indicated on drawings): Crane power vault lids, shore power vault (cold ironing) lids, crane tie down vault cover plates, bullrail cover plate, fiber optic vault lids, isolation joint cover plates.
- C. OSHA safety red with white lettering (lettering shall be as indicated on drawings): Electrical bullrail utility vault lids, bullrail ladder locations.
- D. OSHA safety blue with white lettering (lettering shall be as indicated on drawings): Water bullrail utility vault lids.
- E. OSHA safety orange with non-skid coating: Crane pin socket cover plates plus 4-inch width of asphalt/concrete on all sides.
- F. Black: Fender panels, carbon steel fender panel elements, and fender spacers.
- G. Standard gray: All other items scheduled for painting.

2.04 COATING SCHEDULE

- A. Galvanized metal surfaces that are indicated in Section 05 50 00 – Metal Fabrications to be coated (painted) and that are above MHHW shall be coated as follows:
 - 1. Solvent cleaned to remove contaminants using a biodegradable, water soluble, cleaner in conformance with SSPC-SP1.

2. Solvent cleaned galvanized surfaces shall receive a light, sweeping abrasive sand blast to create a toothed surface profile in accordance with SSPC-SP7.
 3. Primer: Intergard 345 epoxy primer by International Marine Coatings of AkzoNobel, applied to a minimum dry film thickness of 5 mils on all surfaces.
 4. Top coat: Intergard 345 epoxy primer by International Marine Coatings of AkzoNobel, applied to a minimum dry film thickness of 5 mils on all surfaces.
 5. Non-skid coating: Intergard 631 epoxy non-skid deck finish EK 6312A by International Marine Coatings of AkzoNobel, applied to a minimum dry film thickness of 40 mils on specified surfaces.
- B. Non-galvanized metal surfaces that are indicated in Section 05 50 00 – Metal Fabrications to be coated (painted) and that are above MHHW shall be coated as follows:
1. Surfaces shall be “white metal blast cleaned,” conforming to SSPC-SP5.
 2. Primer: Interzinc 52, zinc-rich epoxy primer by International Marine Coatings of AkzoNobel, applied to a minimum dry film thickness of 2.5 mils for all surfaces.
 3. Top coat: Intergard 345 epoxy primer by International Marine Coatings of AkzoNobel, applied to a minimum dry film thickness of 5 mils on all surfaces.
- C. Galvanized surfaces or non-galvanized surfaces to be coated, and with any part below MHHW (ladders, fender system, Lead Rubber Bearing components, steel framing in crane power vaults) shall be coated as follows:
1. Solvent cleaned to remove contaminants using a biodegradable, water soluble, cleaner in conformance with SSPC-SP1.
 2. Solvent cleaned galvanized surfaces shall receive a light, sweeping abrasive sand blast to create a toothed surface profile in accordance with SSPC-SP7.
 3. Primer: Interzone 954 modified epoxy barrier coat by International Marine Coatings of AkzoNobel, applied to a minimum dry film thickness of 15 mils on all surfaces.
 4. Top coat: Interthane 990 acrylic polyurethane by International Marine Coatings of AkzoNobel, applied to a minimum dry film thickness of 2.5 mils on all surfaces.

2.05 CRANE RAILS

- A. Exposed surfaces, the base and webs (not the heads) of rails, shall have a field-applied asphalt mastic painting system of A100 AtcoCoat by Fields Company LLC, or approved equal. Mastic shall be applied to minimum dry film thickness of 30 mils.

PART 3 – EXECUTION

3.01 GENERAL

- A. Apply paints and coatings in accordance with the manufacturer's recommendations for each application. Adhere to the manufacturer's provisions, directions, and procedures for the following.
1. Surface preparation
 2. Ambient temperature and humidity monitoring
 3. Mixing techniques
 4. Method of product application
 5. Minimum and maximum thickness per coat to achieve total thickness

6. Minimum time between coats

- B. Use clean equipment and brushes. Spread materials evenly without runs, drips, sags, laps, brush marks, variations in color, texture, or sheen, and without "holidays".
- C. Vary color or sheens between coats and apply all coats to uniform thicknesses. Refinish any work determined defective or damaged, and repair all defective or damaged work at no additional cost to the Port. Leave finished surfaces clean, completely covered, and uniform in appearance.

3.02 APPLICATION

- A. The location, lettering size, and style of the surface regulatory markings shall be as indicated on the drawings and in the specifications.
- B. Number of coats as specified herein.
- C. Thickness of coats: Use ample undiluted materials; apply in uniform thickness over entire areas; do not exceed manufacturer's recommended spreading rate per gallon.
- D. Tint prime coats if necessary to obtain uniform finish coats.

3.03 TOUCHUP PAINTING

- A. Paint film damaged due to field welding or other Contractor activities shall be immediately restored to its original thickness after thorough cleaning and necessary surface preparation according to the written manufacturer's recommendations.
- B. Touchup painting shall be at the Contractor's expense.

3.04 INSPECTION

- A. The Contractor shall perform measurements of dry paint thickness on all metal surfaces by means of magnetic gages as described in SSPC-PA2.
- B. Copies of the measurement reports shall be provided to the Engineer prior to delivery.
- C. The Engineer will perform verification testing/inspection at the Port's expense. The Contractor shall make arrangements for these tests/inspections at all facilities performing coating applications and give the Engineer a notice at least 14 days in advance of each coating operation.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 26 05 13 – Medium Voltage Cable and Accessories
 - 2. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
 - 3. Section 26 05 73 – Overcurrent Protective Device Coordination Study
 - 4. Section 26 09 23 – Lighting Controls
 - 5. Section 26 12 14 – Transformers (Oil Filled)
 - 6. Section 26 22 13 – Dry Type Transformers
 - 7. Section 26 24 13 – Low-Voltage Switchboards
 - 8. Section 26 24 16 – Panelboards
 - 9. Section 26 27 26 – Wiring Devices
 - 10. Section 33 77 00 – Medium Voltage Switchgear and Protection Devices
 - 11. Section 33 79 00 – Site Grounding

1.02 SUMMARY

- A. This Section includes requirements for acceptance testing by the contractor and testing required to be completed by a contractor retained independent testing agency.
- B. Related Documents: The provisions and intent of the Contract, the General and Division 1 Specification Sections, apply to the Work as if specified in this Section.

1.03 APPLICABLE PUBLICATIONS

- A. All inspections and tests shall be in accordance with the following applicable standards and codes. These publications form a part of this specification to the extent referenced.
 - 1. Institute of Electrical and Electronic Engineers (IEEE):
 - a. 81 Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.
 - b. 400 Guide for Making High-Direct-Voltage Tests on Power Cable Systems in the field.
 - 2. American Society for Testing and Materials (ASTM):
 - a. D877 Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes.
 - 3. Insulated Cable Engineers Association (ICEA):
 - a. S-19-81 Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
 - 4. National Electrical Manufacturers Association (NEMA):
 - a. WC3-1992 Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
 - 5. National Electrical Code – NEC

6. American National Standards Institute - ANSI
7. National Fire Protection Association - NFPA
8. Occupational Safety and Health Administration - OSHA 29CFR Part 1910.269
9. InterNational Electrical Testing Association – NETA
10. Nationally Recognized Testing Laboratory - NRTL
11. State of Washington Administrative Code – WAC

1.04 TESTING FIRM QUALITY ASSURANCE

- A. The Contractor shall include costs in the bid for an independent testing organization which can function as an unbiased testing authority, professionally independent of the manufacturers, suppliers and installers of systems being evaluated, and regularly engaged in the testing of electrical equipment, devices, installations and systems. The Testing Firm shall meet Washington State Department of Labor and Industries criteria for accreditation of testing laboratories, for electrical product testing.
- B. Testing Firm's Field Supervisor Qualifications: A person, regularly employed by the firm for testing services and currently certified by the International Electrical Testing Association to supervise on-site testing specified.
- C. Contractor shall submit testing firm qualifications to the Engineer for their review of qualifications for items to be tested.

1.05 GENERAL REQUIREMENTS AND SUBMITTALS

- A. General Scope: Engage the services of a recognized independent testing firm for the purpose of performing quality control inspections and tests as herein specified.
 1. The Testing Firm shall provide all material, equipment, labor and technical supervision to perform all tests and inspections to determine suitability of equipment for energization and continued reliable operation.
 2. The purpose of these tests is to assure all tested electrical equipment, both Contractor- and Owner-supplied, is operational within industry and manufacturer's tolerances and equipment is installed and functioning in the system in accordance with design specifications of the Engineer.
 3. The Testing Firm (not the Contractor) shall inspect and test following:
 - a. Low voltage conductors (600V and below).
 - b. Ground resistance at new and revised wiring, and electrical service ground tests at the new substation.
 - c. Inspection of exothermic welds of the "Ground Grid" at the new Substation, and the molds for the exothermic welds.
 - d. Medium voltage 15kV Cables.
 - e. Ground-fault / ground-check monitors for new cranes. See specification Section 33 77 00 "Medium Voltage Switchgear and Protection Devices", 2.05.A.8. Ground fault protection system tests.
 - f. Medium voltage 15kV circuit breakers and relays. Breaker settings shall be as provided by 26 05 73 Overcurrent Protective Device Coordination Study.
 - g. Motor tests.

h. Phase balance

B. Submittals by the Testing Firm:

1. Field Test Reports: Maintain a written record of all tests. Assemble and certify a final test report upon completion of Phase 2 of the project, showing dates, personnel making tests, equipment used, material tested, tests performed, and results. The field test forms included in the report shall be the original hand-written test results that were recorded and signed by the individual(s) who performed the testing.

C. Testing firm and personnel qualifications.

1.06 DIVISION OF RESPONSIBILITY

- A. The Contractor shall perform routine insulation-resistance and continuity tests for all utilization equipment prior to, and in addition to tests performed by the Independent Testing Firm.
- B. The Contractor shall supply a suitable and stable source of electrical power to each test site. The Testing Firm shall determine the specific power requirements.
- C. The Contractor shall notify the Testing Firm when equipment becomes available for acceptance tests. Coordinate work to expedite project scheduling.
- D. The Contractor shall supply a short-circuit and protective device coordination study, a protective device setting form, a complete set of electrical drawings and specifications, and any pertinent change orders to the Testing Firm prior to commencement of testing.
- E. The Testing Firm shall notify the Engineer prior to commencement of any testing.

1.07 SAFETY

- A. The Contractor shall adhere to safety procedures as required by the following:
 1. Occupational Safety and Health Act.
 2. Accident Prevention Manual for Industrial Operations, National Safety Council.
 3. ANSI/NFPA 70E, Electrical Safety Requirements for Employee Workplaces.
 4. American National Standards for Personnel Protection: Lockout/Tagout.
 5. Applicable state and local safety operating procedures.
- B. Perform all tests with apparatus de-energized, except where specifically required.
- C. Designate a Project Safety Representative to supervise operations with respect to safety.

1.08 WORK INCLUDED:

- A. The Contractor shall perform tests of the electrical system to assure code compliance and proper system operation according to the intent of the contract documents.
- B. Applicable Codes, Standards and References for Tests:

All inspections and tests shall be in accordance with the following applicable codes and standards except as provided otherwise herein.

1. National Electrical Code - NEC
2. National Electrical Manufacturer's Association - NEMA
3. American Society for Testing and Materials - ASTM
4. Institute of Electrical and Electronic Engineers - IEEE
5. InterNational Electrical Testing Association - NETA

6. American National Standards Institute - ANSI
7. State and Local Codes and Ordinances
8. Insulated Cable Engineers Association - ICEA
9. Association of Edison Illuminating Companies - AEIC

1.09 CIRCUIT TESTS:

- A. Perform routine insulation resistance, continuity and grounding tests for all utilization equipment prior to their connection and energization.
- B. A standard megger-type instrument shall be used to demonstrate insulation values are above the minimum values as specified in NETA Acceptance Testing Specifications for the applicable voltage rating, ground system is continuous and the neutral system is isolated from the grounding system except at the systems' single ground point.
- C. System defects, indicated by the circuit tests, shall be corrected. Tests shall be repeated until satisfactory results are obtained.

1.10 GROUNDING TEST:

- A. Measure the ohmic value of the Electrical Service Entrance "System Ground", and the "Ground Grid" at the new Substation with reference to "Earth Ground" using multiple terminal, fall of potential methods and suitable test instruments.
- B. Maximum resistance to ground shall be less than 10 ohms. Notify the Engineer if this resistance value is not obtained for the initially installed system; and then provide corrective measures required to reduce ground resistance to less than 10 ohms.

1.11 MOTOR AND EQUIPMENT TESTS:

- A. Verify proper rotation of all motors before placing into service.
- B. Measure and record electrical data for each motor installed under this contract. Data shall include these items:
 1. Motor description
 2. Controller description
 3. Motor nameplate amperes
 4. Actual measured motor running amperes
 5. Overload heater manufacturer and catalog numbers
 6. Overload heater ampere range
 7. Voltage (measured) and phase
- C. Motor controller overload heaters shall be sized to the actual motor nameplate full load current. Do not oversize overload heaters.

1.12 PHASE BALANCE TESTS:

- A. Verify the balance of the electrical system's phase currents. Re-assign load connections necessary to obtain a balance that is acceptable to the Port of Tacoma.

1.13 GROUND FAULT PROTECTION SYSTEM TEST:

- A. Visual and Mechanical Inspection
 1. Inspect neutral main bonding connection to assure:

- a. Zero sequence is grounded upstream of sensor.
 - b. Ground connection is made ahead of neutral disconnect link.
2. Inspect control power transformer to insure adequate capacity for system.
3. Monitor panels (if present) shall be manually operated for:
 - a. Trip test
 - b. No trip test
 - c. Non-automatic reset
 - d. Proper operation and sequence shall be recorded.
4. Zero sequence systems shall be inspected for symmetrical alignment of core balance transformers about all current carrying conductors.
5. Ground fault device circuit nameplate identification shall be verified by device operation.
6. Pickup and time delay settings shall be set in accordance with Overcurrent Protective Device Coordination Study.

B. Ground Fault System Electrical Tests

1. System neutral insulation resistant shall be measured to insure no shunt ground paths exist, neutral-ground disconnect link shall be removed, neutral insulation resistance measured and link replaced.
2. The relay pickup current shall be determined by current injection at the sensor and the circuit interrupting device operated.
3. The relay timing shall be tested by injecting one hundred fifty percent (150%) and three hundred percent (300%) of pickup current into sensor. Total trip time shall be electrically measured.
4. System operation shall be tested at fifty-five percent (55%) rated voltage.
5. Zone interlock systems shall be tested by simultaneous sensor current injection and monitoring zone blocking function.

C. Test Parameters

1. System neutral insulation resistance shall comply with applicable industry standards.
2. Relay pickup current shall be within ten percent (10%) of device dial or fixed setting.
3. Relay timing shall be in accordance with manufacturer's published time-current characteristic curves.

- D. For Ground Fault System Testing, Contractor shall retain the services of a NEMA member firm, or a firm approved by the Engineer.**

- E. Apply label certifying satisfactory test completion in accordance with NETA Labeling Procedure.**

1.14 CABLE TESTS – MEDIUM VOLTAGE

A. Visual and Mechanical Inspections

1. Inspect exposed section for physical damage.
2. Verify cable is supplied and connected in accordance with single line diagram.
3. Inspect shield grounding, cable support, and termination.

4. Visible cable bends shall be checked against ICEA or manufacturer's minimum allowable bending radius.
 5. Inspect for proper fireproofing in common cable areas.
- B. Electrical Tests
1. Testing of the medium voltage cables shall be per the latest edition of IEEE 400 Standard for the type of cable specified.
- C. Test Values – Visual and Mechanical
1. Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
 2. Bolt-torque levels should be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA Acceptance Testing Specifications Table 100.12.
 3. Results of thermographic survey shall be in accordance with NETA Acceptance Testing Specifications Section 9.
 4. The minimum bend radius to which insulated cables may be bent for permanent training shall be in accordance with NETA Acceptance Testing Specifications Table 100.22.
- D. Test Values – Electrical
1. Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
 2. Insulation-resistance values shall be in accordance with manufacturer's published data. In the absence of published data, use NETA Acceptance Testing Specifications Table 100.1. Values of insulation resistance less than this table or manufacturer's recommendations should be investigated.
 3. Shielding shall exhibit continuity. Investigate resistance values in excess of ten ohms per 1000 feet of cable.
 4. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.
 5. Based on the test methodology chosen, refer to applicable standards or manufacturer's literature for acceptable values.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

- A. Utilize test equipment in good mechanical and electrical condition with shape and frequency output waveforms appropriate for the test and the tested equipment.
1. Accuracy shall be appropriate for the test being performed, but not in excess of 2% of the scale being used.
- B. Field test meters used to check installed power system instrument calibration must have an accuracy higher than the instrument being checked.

2.02 TEST INSTRUMENTS AND CALIBRATION

- A. The Testing Firm shall have a calibration program which assures all applicable test instruments are maintained within rated accuracy as dictated by the National Institute of Standards and Technology (NIST).
 - 1. Instruments calibration schedule:
 - a. Field instruments: Analog, 6 months maximum; Digital, 12 months maximum
 - b. Laboratory instruments - 12 months.
 - c. Leased specialty equipment - 12 months (where lessor guarantees accuracy).
 - 2. Provide visible dated calibration labels on all test equipment.
 - 3. Maintain up-to-date instrument calibration instructions and procedures for each test instrument.
- B. Provide all testing equipment required including, but not limited to, the following:
 - 1. 500V, 1000V and 15kV meggers.
 - 2. Wet and dry-bulb thermometer.
 - 3. Battery-powered portable telephone sets
 - 4. Test equipment for testing medium voltage cable to be compatible with the cable and testing method used.
 - 5. Multimeter (Volts-Ohms-Millimeter) rated 20k ohms per volt or higher.
 - 6. Three-phase rotation meter, 60-Hz.
 - 7. Commercial model three-point earth ground test set reading directly in ohms.
 - 8. Miscellaneous cable, test leads, jumpers, test lights, buzzers, bells, switches, plugs, receptacles, and other test equipment as required.
 - 9. Insulation Tester (Megger): 2,000 Megohms
 - 10. Dranetz, BMI Model 355, Fluke 41 or equivalent recording type harmonic analyzer to display individual and total harmonic currents and voltages.
 - 11. Clamp-on Ammeter.
 - 12. Circuit breaker Current Injections Test Set.

2.03 MATERIALS AND INSTRUMENTATION:

- A. Contractor and/or testing agency shall supply all apparatus and materials required for indicated tests.
- B. Contractor shall include all costs associated with testing in bid proposal.

2.04 TEST REPORT(S):

- A. Furnish minimum three (3) bound copies of test reports, as specified herein, for inclusion into the project operation and maintenance manuals. Each test report shall include the following items:
 - 1. Name, address and telephone number of the testing agency.
 - 2. Name(s) of personnel conducting the tests
 - 3. Summary of project

4. Description of equipment tested
 5. Description of test procedure
 6. List of items tested
 7. List of actual test equipment including make, model(s), serial number(s) and calibration date(s) as applicable.
 8. Test results
 9. Analysis and recommendations
 10. Appendix, including appropriate test forms
- B. Furnish 3 copies of the completed report to the Engineer no later than twenty days after completion of the tests.
- C. These are in addition to requirements on Paragraph 3.05.

PART 3 - EXECUTION

3.01 TESTING

- A. General requirements: Test all wire, cable, and electrical equipment installed and connected by the Contractor to assure proper installation, setting, connection, and function as indicated or to conform to Contract Documents and manufacturer's instructions. As an exception to requirements stated elsewhere in the Contract, give the Engineer at least 7 calendar days notice of the dates and times scheduled for tests (except megger tests) so Engineer may witness the tests. After the installation has been completed, the Contractor shall conduct an operating test demonstrating all equipment and devices operate in accordance with the requirements of the plans and specifications.
1. Be responsible for all damage to equipment or material due to improper test procedures or test apparatus handling.
 2. Perform tests recommended by the equipment manufacturer.
 3. Perform additional tests issued by the Port of Tacoma which are required due to field conditions.

3.02 IDENTIFICATION

- A. Upon completion of the tests and inspections noted in these specifications, attach a label to all serviced devices indicating the date serviced and the testing company responsible.

3.03 TESTING PROCEDURE:

- A. All tests shall be conducted according to applicable industry standards.

3.04 SCHEDULING:

- A. Notify Engineer at least seven (7) calendar working days prior to performance of any test.

3.05 TRANSMITTAL OF REPORTS:

- A. Transmit test reports to the Engineer per Section 01 70 00 – CLOSEOUT PROCEDURES.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
1. Section 26 01 26 – Acceptance Testing of Electrical Systems
 2. Section 26 05 13 - Medium Voltage Cables and Accessories
 3. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
 4. Section 26 05 33 – Raceways and Boxes for Electrical Systems
 5. Section 26 05 48 – Seismic Controls for Electrical and Communications Work
 6. Section 26 05 53 – Identification for Electrical System
 7. Section 26 05 73 – Overcurrent Protective Device Coordination Study
 8. Section 26 09 13 – Electrical Power Monitoring and Control
 9. Section 26 09 23 – Lighting Controls
 10. Section 26 12 14 – Transformers (Oil Filled)
 11. Section 26 22 13 – Dry Type Transformers
 12. Section 26 24 13 – Low-Voltage Switchboards
 13. Section 26 24 16 – Panelboards
 14. Section 26 27 16 – Cabinets and Enclosures
 15. Section 26 27 26 – Wiring Devices
 16. Section 26 43 13 – Transient Voltage Surge Suppression System
 17. Section 26 56 36 – Flood Lighting Fixtures
 18. Section 27 05 13 – General Communications Requirements
 19. Section 27 05 28 – Communications Pathways
 20. Section 27 13 00 – Backbone Cabling Requirements
 21. Section 33 71 19 – Electrical Underground Ducts and Manholes
 22. Section 33 77 00 – Medium Voltage Switchgear and Protective Devices
 23. Section 33 79 00 – Site Grounding

1.02 DEFINITIONS:

- A. NEC means National Electrical Code.
- B. The term "code" as used herein shall mean all applicable National, State and local codes.
- C. The term "provide" shall mean furnish, install, and connect equipment and materials complete in operating condition.
- D. The term "approved" as used herein shall mean the written approval of the Engineer.

1.03 WORK INCLUDED:

- A. The Electrical work consists of furnishing, installing, testing and placing in satisfactory operation all equipment, materials, devices and appurtenances, necessary to provide a complete electrical system according to the intent of the Drawings and Specifications. In general this includes all labor, materials, equipment, tools, etc. to complete the electrical work.
- B. All metal fabrications are to be 316 stainless steel for exterior installations, and painted steel for interior installations. The work shall consist of furnishing all materials, labor, and equipment for fabricating and/or repairing, PVC coating, painting, and erecting metal fabrications, all in accordance with the Drawings, notes, and this specification. Exposed galvanized steel is not allowed.
- C. General requirements for materials and installation methods.
- D. As part of this project, Contractor is required to perform civil work as related to Tacoma Power vaults, conduits and trench requirements as indicated on the drawings. Prior to bid, Contractor shall become familiar with Tacoma Power Electrical Construction Standards. These can be reviewed at www.mytpu.org/tacomapower/electrical-permitting/electrical-construction-standards.htm. This work will be inspected by a Tacoma Power Construction Inspector. This is a different electrical inspector and inspection from the NEC inspector and inspections required by the electrical permit. The portion of the electrical work associated with Tacoma Power's conduits and vaults must be done by an electrical contractor listed on Tacoma Power's pre-qualified electrical contractors list. The list is available at:

<http://www.mytpu.org/contact/bids-contracts/prequalification-electrical-contractors.htm>

1.04 INTENT OF DRAWINGS:

- A. The Electrical Drawings are intended to serve as working Drawings for general layout. Equipment, concrete vaults, switches, panels, disconnects and raceway locations are partially diagrammatic and do not necessarily indicate actual routings or all appurtenances required for a complete installation.
- B. Minor changes in the locations of concrete vaults, raceways, outlets and the like, from those shown on the Drawings, shall be made without extra charge if so directed before installation.
- C. Contractor is required to take all working dimensions from civil drawings and field measurements. Do not scale electrical Drawings.

1.05 MANUFACTURERS' RECOMMENDATIONS:

- A. Make all installations in strict accordance with manufacturers' published recommendations and details. All equipment, materials and installation methods recommended by manufacturers' shall be considered as part of this contract.

1.06 RELATED WORK:

- A. TEMPORARY CONSTRUCTION POWER:
 - 1. Arrange with the Port of Tacoma for 480V service from a spare circuit breaker in Switchboard #1 of Substation #3 at Pier 4.
 - 2. Contractor is responsible for all costs associated with setup and removal of the temporary service and construction utility meter to serve the Contractor and Port of Tacoma's work trailers.
 - 3. Portable power sources to construction sheds, outdoor construction machinery, and temporary exterior work areas shall be the responsibility of individual contractors.

4. Provide and maintain construction lighting with portable wiring and temporary energization of the permanent site wiring, complete with lamps. Suitable construction lighting shall be provided. See NEC ARTICLE 305 Temporary Wiring.
5. Provide adequate feeders, circuit breakers and duplex 15-ampere 120-volt receptacles. Provide 120 volt construction receptacles with Ground Fault circuit protection in accordance with applicable WISHA safety standards.
6. Portable power cords from the outlets specified herein shall be the responsibility of individual contractors using the cords.
7. The Contractor shall assume all responsibility for safety, Electrical and Safety Code compliance, performance and adequacy of the construction power and lighting installation. The Engineer assumes no responsibility for the performance or safety and will not inspect nor design this temporary installation, as it is not part of the completed project.

B. EQUIPMENT FURNISHED BY OTHERS:

1. All equipment furnished for this project shall be coordinated with the Drawings to ensure correctness of Voltage, Phase and Ampacity. Equipment served by single circuit or feeder shall be provided with appropriate internal wiring including fusing of multiple circuits as required by code.
2. Control Voltages shall not exceed 120 volts. Provide control transformers for higher line voltages. Control transformers shall be connected from phase to neutral.

1.07 SUPERVISION AND COORDINATION:

- A. Coordinate work with Tacoma Power to ensure compliance with their specific requirements. Before starting work, contact Tacoma Public Utilities, 253-502-8292, Dan Reed and make arrangement for their services to this project.
- B. Contact Electrical Inspection, Tacoma Power (253-502-8541), obtain and pay for permit before starting work.
- C. Contractor shall have a responsible person in charge at the site any time work is in progress or when necessary for coordination with other trades.

1.08 CODES AND REGULATIONS:

- A. All work shall conform to current applicable National, State and local Codes; these shall be regarded as the minimum standard of quality for material and workmanship. Contractor shall provide all Labor and Material required for compliance with Code Requirements or Code Interpretations, although not specifically detailed on the Drawings or in the Specifications. Contractor shall become familiar with all the following codes prior to bidding.

ASTM	American Society for Testing and Materials
NBFU	National Board of Fire Underwriters
NEC	National Electrical Code
WAC	Washington State Administrative Code
NESC	National Electrical Safety Code
NEMA	National Electric Manufacturers Association
NETA	National Electrical Testing Association
NFPA	National Fire Protection Association
UL	Underwriters Laboratories, Inc.

ICEA	Insulated Cable Engineers Association
CBM	Certified Ballast Manufacturers
IBC	International Building Code
ETL	Electrical Testing Laboratories
TPU	Tacoma Public Utility Standards and Requirements

- B. Nothing in these Drawings and Specifications shall be construed as permitting work not conforming with governing codes.
- C. The Contractor shall not be relieved from complying with any requirements of these contract documents which may exceed, but not conflict with requirements of the governing codes.
- D. Contractor shall include in bid all costs to have a Department of Labor & Industries approved firm to evaluate the installation safety, and compliance with code as required per WAC 296-40-100 for any equipment specified or furnished that is not UL labeled.
- E. For equipment furnished by others not UL labeled the contractor shall not connect the equipment to the electrical system until receiving written approval by the electrical authority having jurisdiction.

1.09 PERMITS AND FEES:

- A. Obtain and pay all fees for licenses, permits and inspections required by laws, ordinances and rules governing work specified herein. Arrange for inspection of work and provide inspectors with all necessary assistance.

1.10 WORKMANSHIP:

- A. All work shall be done by competent craftsmen skilled in the specific work to be done. Equipment shall be installed in a neat and workmanlike manner following the best practice of the trade.

1.11 AS-BUILT RECORD DRAWINGS:

- A. See Specification Section 01 77 00 - CLOSEOUT PROCEDURES.

1.12 OPERATING INSTRUCTIONS:

- A. Fully instruct the Owner's designated representatives in the operation and maintenance of all components of the electrical system upon completion of the work and after all tests and final inspection(s) by the Authority(s) Having Jurisdiction.

1.13 ELECTRICAL EQUIPMENT O&M MANUALS:

- A. See Specification Section 01 77 00 - CLOSEOUT PROCEDURES.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. All materials shall be new, free from defects, of the quality specified herein and on the Drawings. Materials shall be designed to ensure satisfactory operation and manufacturer's rated life in the prevailing environmental conditions where installed. Materials and equipment shall be listed by Underwriter's Laboratories or a Washington Administration Code (WAC) recognized testing laboratory for use under these conditions.
- B. Each type of material shall be of the same make and quality throughout the job. The materials furnished shall be the latest standard design products of manufacturers regularly engaged in their production.

2.02 TECHNICAL DATA:

- A. Technical information contained herein relies entirely on tests and ratings provided by manufacturers who are solely responsible for their accuracy. The Engineer using this information in no way implies having tested or otherwise verified the results of published manufacturer's information.

2.03 AS SPECIFIED EQUIPMENT:

- A. This specification generally lists only one make and model number for each item of equipment or material required for the project. This is not intended to be restrictive but is intended to indicate the standard of quality, design and features required.
- B. In addition, the listed product is the basis of the design regarding physical size, electrical power requirements and performance. The product so identified is designated "as specified."

2.04 COMPLETE SYSTEMS:

- A. All systems specified herein and shown on the Drawings shall be complete and operational in every detail. Mention of certain materials in bidding documents shall not be construed as releasing the Contractor from furnishing additional materials required by the manufacturer, installation methods, codes and performing all labor required to provide a complete and operable system.

2.05 SUBMITTALS

- A. Submit for all materials specified. Comply with the Conditions of the Contract and Division 01 Sections.

PART 3 - EXECUTION

3.01 PROTECTION OF WORK:

- A. Protect all work, wire, materials and equipment installed under this Division against damage by other trades, weather conditions or any other causes. Equipment found damaged or in other than new condition will be rejected as defective.
- B. Equipment shall be kept covered or enclosed to exclude moisture, dust, dirt, cement, or paint and shall be free of all such contamination before acceptance. Enclosures and trims shall be in new condition, free of rust, scratches or other finish defects. Properly refinish in a manner acceptable to the Engineer if damaged.
- C. Keep conduit and raceways closed with suitable plugs or caps during construction to prevent entrance of dirt, moisture, concrete or foreign objects. Pull a properly sized mandrel through each conduit prior to installation of wire or pull string for empty conduits and within 24 hours of CDF placement (duct tape not acceptable). Raceways shall be clean and dry before installation of wire and at the time of acceptance.
- D. Make up and insulate wiring promptly after installation of conductors. Wire shall not be pulled-in until raceways are complete.
- E. Empty conduits and conduits with conductors shall be provided with 150-pound-test nylon cord with distance markings, and with labels at source and destination matching plans. Ends of empty conduits shall be filled with removable foam.

3.02 CUTTING AND PATCHING:

- A. Obtain permission from the Engineer prior to cutting. Locate cuttings so they will not weaken structural components. Cut carefully and only the minimum amount necessary. Cut concrete with diamond core drills or saws except where space limitations prevent the use of such equipment.

- B. All construction materials damaged or cut into during installation must be repaired or replaced with materials of like kind and quality as original materials by skilled labor experienced in that particular building trade.

3.03 PAINTING:

- A. Equipment scratched or marred in shipment or installation shall be refinished to the satisfaction of the Engineer.

3.04 LABELING:

- A. Refer to Specification 26 05 53 Identification for Electrical System.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 26 01 26 – Acceptance Testing of Electrical Systems
 - 2. Section 26 05 00 – Common Work Results for Electrical
 - 3. Section 26 05 33 – Raceways and Boxes for Electrical Systems
 - 4. Section 26 05 53 – Identification for Electrical System
 - 5. Section 26 05 73 – Overcurrent Protective Device Coordination Study
 - 6. Section 26 12 14 – Transformers (Oil Filled)
 - 7. Section 33 71 19 – Electrical Underground Ducts and Manholes
 - 8. Section 33 77 00 – Medium Voltage Switchgear and Protective Devices
 - 9. Section 33 79 00 – Site Grounding

1.02 WORK INCLUDED:

- A. Provide 15KV medium voltage cable, splices, terminations and equipment.

1.03 QUALIFICATION AS ACCEPTABLE INSTALLER:

- A. The subcontractor installing the materials specified in this section shall meet the following qualifications:
 - 1. Organization has installed similar primary voltage systems for 5 years as a principal business, not just occasionally.
 - 2. Organization has proper tools for medium voltage work.
 - 3. Above information shall be submitted for Engineer's review and approval as part of the shop drawing review process.

1.04 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections:
 - 1. Product Data: For each type of product indicated.
- B. Schedule of cable pulls showing calculated pulling tension and sidewall pressure values for all cables.

PART 2 - PRODUCTS

2.01 CONDUCTORS - 15KV POWER CABLE, COPPER, UL TYPE MV105:

- A. Quality Assurance
 - 1. Single-Source Responsibility: All medium-voltage cable and accessories shall be the product of a single manufacturer.
 - 2. Manufacturer Qualifications: Firm with 10 years experience in manufacturing medium-voltage cable with triple extrusion of EPR insulation and accessories similar to those

indicated for this Project, with a record of successful in-service performance and having ISO-9000 approval certification.

3. Manufacturer Warranty: Provide 20-year design service life statement.
4. Listing and Labeling: Provide medium-voltage cable and accessories that are Listed and Labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Authority Having Jurisdiction, and marked for intended use for the location and environment in which they are installed.
 - a. Cable shall comply with UL Standard 1072.
5. Comply with the following standards:
 - a. NFPA 70, as adopted and administered by the Authority Having Jurisdiction.
 - b. ANSI C2 "National Electrical Safety Code" for components and installation.
 - c. Insulated Cable Engineers Association (ICEA) for components and installation.
 - d. Association of Edison Illuminating Companies (AEIC) for components and installation.
 - e. ASTM for components and installation.
 - f. National Electrical Manufacturers Association (NEMA) for Components and Installation
6. Identification: Cable shall be new and of recent manufacture (no more than 12 months old) and shall have label showing the name of cable manufacturer, size, plant location, insulation type, insulation thickness, voltage rating, insulation level, sequential footage, year of manufacture and UL designations.
7. Installer Qualifications: Engage an experienced and certified cable splicer to install, splice, and terminate medium-voltage cable.

B. SUBMITTALS

1. General: Comply with the Conditions of the Contract and Division 01 Sections.
2. Product data for cables and cable accessories, including splices and terminations.
3. Product certificate signed by product manufacturer stating the product(s) supplied comply with the specified requirements.
4. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Engineers and Owners, and other information specified.
5. Product Test Reports: Certified reports of Manufacturers' design and production tests indicating compliance of cable and accessories with referenced standards. Cables with the manufacturing date exceeding 12 months prior to the date of delivery to the Project site will not be accepted.
6. Schedule of cable pulls showing calculated pulling tension and sidewall pressure values.
7. Field test reports indicating and interpreting test results relative to compliance with performance requirements specified. Include certified copies of field test records.
8. Maintenance data for cables and accessories to include in the "Operations and Maintenance Manual" specified in Division 01.

C. DELIVERY, STORAGE, AND HANDLING

1. Deliver medium-voltage cable on factory reels conforming to NEMA WC 26.

2. Store cables on reels on elevated platforms in a dry location.

D. MANUFACTURERS

1. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cables:
 - 1) BICC Cables.
 - 2) The Okonite Co.
 - 3) Kerite.
 - 4) Southwire
 - 5) Pirelli
 - 6) General Cable
 - 7) Approved Equal
 - b. Cable Splicing and Terminating Products and Accessories:
 - 1) Elastimold.
 - 2) 3M Company; Electrical Products Division.
 - 3) Raychem Corp.; Energy Division.
 - 4) Cooper Power Systems, Inc., RTE Components.
 - 5) Thomas & Betts Corp.
 - 6) Adalet-PLM, Scott Fetzer Co.
 - 7) Approved Equal

E. 15kV CABLES

1. Type: MV-105 (UL Standard 1072).
2. Conductor: Copper single-conductor.
3. Conductor Stranding: Compact Class B conductor stranding.
4. Insulation: Ethylene-propylene rubber (EPR) conforming to AEIC CS6.
5. Insulation: Shielded Power Cables 5-46kV.
 - a. Voltage Rating: 15 kV.
 - b. Insulation Thickness: 133 percent insulation level with thickness per manufacturer's standard.
6. Shielding: 5-mil uncoated copper tape with minimum 25% overlap.
7. Jacket: Sunlight-resistant polyvinyl chloride (PVC).

F. SPLICE KITS

1. Connectors: IEEE 404, compression type, as recommended by cable or splicing kit manufacturer for application.
2. Splicing Products: As recommended in writing by the splicing kit manufacturer for the specific sizes, ratings, and configurations of cable conductors and splices specified. Include all components required for complete splice, with detailed instructions.

- a. Taped splice kit.
- b. Combination tape and cold-shrink rubber sleeve kit with re-jacketing by cast-epoxy-resin encasement or other waterproof, abrasion-resistant material.
- c. Heat-shrink splicing kit of uniform cross-section polymeric construction with outer heat-shrink jacket.
- d. Premolded, cold-shrink rubber, inline splicing kit.
- e. Premolded ethylene propylene diene monomer (EPDM) splicing body kit with cable joint sealed by interference fit of mating parts and cable.

G. SOLID TERMINATIONS

1. Conductor Terminations: Comply with IEEE Standard 48, as indicated. Insulation class equivalent to that of the cable. Terminations for shielded cables shall include a shield grounding strap.
 - a. Class 1 Termination for Shielded Cable: Modular type, furnished as a kit, with stress-relief tube, multiple molded silicone rubber insulator modules, shield ground strap, and compression-type connector.
 - b. Class 1 Termination for Shielded Cable: Heat-shrinkable type with heat-shrinkable inner stress control and outer non-tracking tubes, multiple molded non-tracking skirt modules, and compression-type connector.
 - c. Class 1 Termination for Indoor Shielded Cable: Kit with stress-relief tube, non-tracking insulator tube, shield ground strap, compression-type connector, and end seal.
 - d. Class 2 Termination for Shielded Cable: Kit with stress-relief tube, non-tracking insulator tube, shield ground strap, and compression-type connector. Include silicone rubber tape, cold-shrink rubber sleeve, or heat-shrink plastic sleeve moisture seal for end of insulation whether or not supplied with kits.
 - e. Class 3 Termination for Shielded Cable: Kit with stress cone and compression-type connector.

H. SEPARABLE INSULATED CONNECTORS

1. Separable Insulated Connectors: Modular system complying with IEEE 386. Disconnecting, single-pole, cable terminators and matching stationary, plug-in, dead-front terminals designed for cable voltage and for sealing against moisture.
 - a. Terminations at Distribution Points: Modular type, consisting of terminators installed on cables and modular, dead-front, terminal junctions for interconnecting cables.
 - b. Load-Break Cable Terminators: Elbow-type units with 200 ampere load make/break and continuous current rating. Coordinate with insulation diameter and conductor size and material of cable being terminated. Include capacitively coupled test point on terminator body.
 - c. Dead-Break Cable Terminators: Elbow-type unit with 600 ampere continuous current rating, designed for de-energized disconnecting and connecting. Coordinate with insulation diameter and conductor size and material of cable being terminated. Include capacitively coupled test point on terminator body.
 - d. Dead-Front Terminal Junctions: Modular bracket-mounted groups of dead-front stationary terminals that mate and match with above cable terminators. Two-, three-, or four-terminal units as indicated, with fully rated, insulated, watertight conductor

connection between terminals. Grounding lug and manufacturer's standard accessory stands and stainless steel mounting brackets and attaching hardware.

- e. Protective Cap: Insulating, electrostatic-shielding, water-sealing cap with drain wire.

I. ARC-PROOFING MATERIALS

- J. Tape for First Course on Metal Objects: 10-mil thick, corrosion-protective, moisture-resistant PVC pipe-wrapping tape.

- 1. Arc-Proofing Tape: NRTL-listed fireproofing tape, flexible, conformable, intumescent to 0.3 inch thick, and compatible with the cable jacket on which used. Scotch No. 77 or approved equal.

- 2. Glass Cloth Tape: Pressure-sensitive adhesive type, 1/2 inch wide.

3. SOURCE QUALITY CONTROL

- a. Test and inspect cables according to NEMA WC 74 (ICEA S-93-639) before shipping.

PART 3 - EXECUTION

3.01 CABLES - GENERAL

- A. Examine and swab out raceways to receive medium-voltage cable for compliance with installation tolerances and other conditions affecting performance of the cable.
- B. Install medium-voltage cable according to manufacturer's written instructions and IEEE 576.
- C. Pull conductors simultaneously where more than one cable is indicated in same raceway.
 - 1. Use NRTL-listed and manufacturer-approved pulling compound or lubricant where necessary.
 - 2. Lubricants used to facilitate pulling of cables shall not be damaging to the cable jacket.
 - 3. Use pulling attachments that will not damage cables such as fish tape, cable, rope and basket-weave/cable grips.
 - 4. Use of trucks, forklift, or similar equipment are not acceptable for pulling of cable. Where cables are not hand pulled contractor shall use "hydraulic tugger" with tension gauge.
 - 5. Submit to the Engineer a schedule of cable pulls showing calculated pulling tension and sidewall pressure values. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Train cables around walls of cable vaults, handholes, pull boxes and junction boxes by the longest route from entry to exit and support cables at intervals adequate to prevent sag.
- E. Arrange cables in manholes/vaults to avoid interference with duct entrances.
- F. Ground shields and metal bodies of shielded cable at terminations, splices and separable connectors.
- G. Arc-proof medium-voltage cable with fire taping at locations not protected by conduit, cable tray, or termination materials.
- H. Install exposed cables parallel and perpendicular to sides of exposed structural members.
- I. Install 'BURIED CABLE' warning tape 12 inches below base course ACP.

3.02 CABLE TERMINATIONS AND SPLICES

- A. Install splices in manholes/vaults through which the cable passes using a standard kit. Conform to kit manufacturer's written instructions.

- B. Install terminations at ends of conductors. Conform to manufacturer's written instructions. Comply with classes of terminations indicated.
- C. Quantities: Provide the following quantities of components:
 - 1. Protective Cap: Install at each terminal junction, one on each terminal to which no feeder is indicated to be connected.
 - 2. Standoff Insulator: 3.
- D. Contractor to apply NO-OX-ID, or Engineer approved equal electrical contact grease at all terminations on the wharf.

3.03 ARC-PROOFING

- A. Arc-proof medium-voltage cable at locations not protected by conduit, or termination materials except where indicated. Apply as follows and as recommended by the manufacturer of the arc-proofing tape.
 - 1. Clean cable sheath.
 - 2. Wrap metallic cable components with 10-mil pipe wrapping tape.
 - 3. Smooth surface contours with electrical insulation putty.
 - 4. Apply arc-proofing tape in one half-lapped layer with the coated side toward the cable.
 - 5. Band the arc-proofing tape with 1-inch-wide bands of half-lapped adhesive glass-cloth tape 2 inches on center.

3.04 GROUNDING

- A. Ground shields of shielded cable at terminations, splices, and separable insulated connectors. Ground metal bodies of terminators, splices, cable and separable insulated connector fittings, and hardware according to Manufacturer's written instructions.

3.05 IDENTIFICATION

- A. Identify medium-voltage cables in accordance with Specification Section 26 05 53.
- B. Label cables, feeders, and power circuits in vaults, pull boxes, junction boxes, manholes, and at all terminations. Include operating voltage, circuit number and phase designation.

3.06 FIELD QUALITY CONTROL

- A. Testing: Upon installation of medium-voltage cable and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA Standard ATS, Section 7.3.2. Certify compliance with test parameters.
 - a. Megger all cables before hypotential testing. Use the following megger voltages:

<u>Cable Rating</u>	<u>Megger Voltage</u>
15 kV	15kV

Determine the insulation resistance values with cables disconnected at each end. Megger cable and hypotential test only after all splices and termination's are made.
 - b. Field test all cables in accordance with:
 - 1) IEEE 400.

- 2) ICEA No. T-27-581, "Standard Test Methods for extruded dielectric Power Cables"
- 3) 15kV EPR 133 percent insulation level grounded shielded cable tests:
Cable Size (AWG or kcmil).....1-750
Test Voltage (KV, dc).....40 (15KV Cable)
Duration Minutes.....15
- 4) Do not test cable with an ac test set. Disconnect cables from all equipment during testing. Testing cable on reel will not be acceptable. Test cable after installation but before final connection of equipment. Individually test each conductor with all other conductors grounded. Ground all shields.
- 5) Use standard NETA test forms and record results.
- 6) Correct deficiencies and retest to demonstrate compliance.

3.07 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to Manufacturer and Installer, to prevent entrance of moisture into the cable and ensure medium-voltage cable is without damage or deterioration.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
1. Section 26 01 26 – Acceptance Testing of Electrical Systems
 2. Section 26 05 00 – Common Work Results for Electrical
 3. Section 26 05 33 – Raceways and Boxes for Electrical Systems
 4. Section 26 05 53 – Identification for Electrical System
 5. Section 26 05 73 – Overcurrent Protective Device Coordination Study
 6. Section 26 09 23 – Lighting Controls
 7. Section 26 12 14 – Transformers (Oil Filled)
 8. Section 26 22 13 – Dry Type Transformers
 9. Section 26 24 13 – Low-Voltage Switchboards
 10. Section 26 24 16 – Panelboards
 11. Section 26 27 16 – Cabinets and Enclosures
 12. Section 26 27 26 – Wiring Devices
 13. Section 26 43 13 – Transient Voltage Surge Suppression System
 14. Section 26 56 36 – Flood Lighting Fixtures
 15. Section 33 71 19 – Electrical Underground Ducts and Manholes
 16. Section 33 79 00 – Site Grounding

1.02 WORK INCLUDED:

- A. Provide all wire and terminations for a complete installation

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections:
1. PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED.

PART 2 - PRODUCTS

2.01 PACKAGING:

- A. Conductors shall be delivered to the job site in approved original cartons, or on reels as recommended by the manufacturer, and shall bear the Underwriter's Label. Reels shall be provided with suitable protection to prevent fork-lift damage to conductors during shipment or storage prior to use.

2.02 CONDUCTORS - 600 VOLTS:

- A. Stranded Copper, insulated for 90 degree centigrade and 600 volts.

- B. Insulation type XHHW-2 for exterior use and type THHN/THWN for indoor use. Insulation requirements may vary per the NEC where necessary to suit more stringent installation conditions.

2.03 CONNECTORS AND SPLICES - 600 VOLTS:

- A. Branch circuit conductor splices:
Pre-insulated "twist-on" type or "crimped-on" type as approved (Scotch-lok, Ideal or equal).
- B. Terminator lugs of No. 12 wire and smaller:
Spade, insulated type to be tool applied.
- C. Terminator lugs for No. 10 wire or larger:
Two bolt (or approved positive restraint), tool applied compression type (Burndy or equal).

2.04 INSULATING MATERIALS:

- A. Insulating tape or heat shrink tubing shall have the equivalent rating of the applicable conductor insulation (Scotch 3M, RAYCHEM or equal).

2.05 PLASTIC CABLE TIES:

- A. Nylon, or equivalent, locking type (T&B or equal).

PART 3 - EXECUTION

3.01 GENERAL:

- A. Install all wiring in raceway.

3.02 CONDUCTOR TYPES, REFERENCED ON PLANS:

- A. Conductors shall be stranded copper.

3.03 CONDUCTOR COLORING CODE:

CONDUCTOR COLOR CODING SHALL BE AS FOLLOWS:

- A. 208/120 volt system
 - A Phase - Black
 - B Phase - Red
 - C Phase - Blue
 - Neutral – White
 - Grounding - Green
- B. 480/277 volt system
 - A Phase - Brown
 - B Phase - Orange
 - C Phase - Yellow
 - Neutral -Gray
 - Grounding – Green with Yellow Trace
 - Other Colors - Switched Wires

- C. Conductors shall have colored insulation except wires larger than #8 may be black with colored tape identification at all terminations and splices.
- D. Additional colors may be used where such colors will help in identifying wires and different systems.

3.04 CONDUCTOR INSTALLATION:

- A. Raceways shall be complete, clean and free of burrs before pulling conductors.
- B. U.L. approved pulling compounds may be used with the residue cleaned from the conductors and raceway entrances after the pull is made.
- C. Contractor shall obtain the manufacturer's published recommendations for the handling, pulling and terminating of the cable. Contractor shall perform work in accord with manufacturer's recommendations.
- D. Pulleys or blocks shall be used for alignment of the conductors when pulling. Pulling shall be in accordance with manufacturer's specifications regarding pulling tensions, bending radius of the cable and compounds. No mechanical pulling means shall be used for wires No. 8 AWG and smaller. Cables shall be pulled by the conductor, not by the insulation or shielding.
- E. Train wires around walls of cable vaults, handholes, pull boxes and junction boxes by the longest route from entry to exit and support cables at intervals adequate to prevent sag.
- F. Splices in raceways are not allowed. Splice only in vaults, handholes, or in equipment if approved per the NEC.

3.05 MOISTURE PROTECTION:

- A. Cable ends shall be protected at all times from moisture. Provide approved heat-shrink end caps or equivalent for all unterminated cable ends.

3.06 TERMINATIONS - COPPER CONDUCTORS 600 VOLTS:

- A. Control and special systems wires shall be terminated with a crimped on lug when terminating at a screw connection.
- B. All screw and bolt type connectors shall be made up tight and retightened after an eight-hour period. Tighten all bolted connections with a ratcheting type torque wrench per manufacturer's standards.
- C. All tool applied crimped connectors shall be applied per manufacturer's recommendations and physically checked for tightness.
- D. Contractor to apply NO-OX-ID, or Engineer approved equal electrical contact grease at all terminations on the wharf.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
1. Section 26 05 00 – Common Work Results for Electrical
 2. Section 26 05 13 – Medium Voltage Cables and Accessories
 3. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
 4. Section 26 05 53 – Identification for Electrical System
 5. Section 26 05 48 – Seismic Controls for Electrical and Communications Work
 6. Section 26 05 73 – Overcurrent Protective Device Coordination Study
 7. Section 26 12 24 – Transformers (Oil Filled)
 8. Section 26 22 13 – Dry Type Transformers
 9. Section 26 24 13 – Low-Voltage Switchboards
 10. Section 26 24 16 – Panelboards
 11. Section 26 27 16 – Cabinets and Enclosures
 12. Section 26 27 26 – Wiring Devices
 13. Section 26 56 36 – Flood Light Fixtures
 14. Section 33 71 19 – Electrical Underground Ducts and Manholes
 15. Section 33 77 00 – Medium Voltage Switchgear and Protective Devices
 16. Section 33 79 00 – Site Grounding

1.02 WORK INCLUDED:

- A. Provide all raceways for a complete electrical system. Include all fittings, hangers and appurtenances required for a complete installation.
- B. All steel slotted support systems for securing and supporting electrical equipment and devices are to be 316 stainless steel for exterior installations, and galvanized steel for interior installations. Galvanized structural steel materials used for supporting electrical equipment shall be painted. The work shall consist of furnishing all materials and labor in accordance with the Drawings, notes, and this specification.

1.03 SUBMITTALS:

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections:
1. Product Data: For each type of product indicated.

1.04 REFERENCES:

- A. Polyvinyl Chloride (PV) Coated Rigid Steel Conduit, thick wall (PVRSC): NEMA RN 1.
- B. Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit: NEMA FB 1.
- C. Flexible Metal Conduit with polyvinyl chloride (PVC) jacket (LFMC): UL 360, and NFPA 70.

- D. Electrical Metallic Tubing (EMT): ANSI C80.3 and C80.4, and NFPA 70.
- E. Flexible Metal Conduit (FMC): UL 1, UL 1479, and NFPA 70
- F. Stainless Steel Enclosures: UL 508.

PART 2 - PRODUCTS

2.01 CONDUITS:

- A. Polyvinyl Chloride (PV) Coated Rigid Steel Conduit, Thick Wall (PVRSC).
- B. Electrical Metallic Tubing (EMT)
- C. Flexible Metal Conduit with polyvinyl chloride jacket (LFMC).
- D. Flexible Metal Conduit (FMC).
- E. Stainless Steel Enclosures.

2.02 FITTINGS:

- A. PVRSC fittings shall have threaded connections, and material to match conduit.
- B. PVC Coated Flexible Metal Conduit: Thomas & Betts "Super Liquid-Tight" with external ground lug or equal.
- C. EMT: Use only compression type couplings, bushings, elbows, nipples, and other fittings.
- D. FMC: Fittings shall be compression type.
- E. Expansion Couplings: O.Z. type EX with ground jumper.
- F. Siesmic deflection coupling: Appleton or equal.
- G. All conduit elbows 30 degrees or greater shall be factory made for galvanized rigid steel or PVRSC on wharf. All 90 degree elbows shall be a minimum radius of 24" or greater. Provide corrosion resistant tape (1/2 lap on all steel elbows below grade).

2.03 PULL AND JUNCTION BOXES:

- A. Enclosures: 316 Stainless steel NEMA 4X, with hinged door, suitable for outdoor locations.

2.04 EXPOSED RACEWAY IDENTIFICATION:

- A. Refer to Specification 26 05 53 Identification for Electrical System.

PART 3 - EXECUTION

3.01 GENERAL:

- A. All exposed raceway on the wharf or where subject to damage shall be PVRSC.
- B. Cut conduit ends square, ream smooth and extend maximum distance into all couplings and connectors.
- C. Provide and install manufactured end caps on all conduit ends during construction to prevent the entrance of water or dirt. Tape, as a cover, is unacceptable.
- D. Field made elbows are not acceptable for PVRSC conduits.
- E. The conduit layout shall be carefully planned by the contractor to ensure neat and workmanlike installation.
- F. Any work showing inadequate planning may be ordered removed by the Engineer and shall be replaced in a neat and proper manner at no additional cost to the Port of Tacoma.

3.02 CONDUIT SIZING:

- A. Conduits shall be sized per code for conductors with type XHHW-2 insulation for exterior installations, and type THHN/THWN for interior installations, although thinner insulation types are permitted in some cases. Conduit size shall not be reduced if large size is specified on the drawing. Minimum conduit size shall be 3/4" trade diameter for above grade exterior installations, and 1/2" trade diameter for interior installations.

3.03 PVRSC:

- A. Install PVRSC for all conduits where conduit is exposed on the wharf, in bullrail vaults, or above grade where subject to damage.

3.04 FLEXIBLE CONDUIT:

- A. Provide liquid tight flexible metal conduit connection to outdoor dry type transformers, motors, and other equipment with rotating or moving parts. Conduit shall be installed without sharp bends and in minimum lengths required for the application but not longer than 6'-0". Provide flexible conduit connection(s) at each light pole base to allow for a maximum of 6" settlement. Provide bonding jumper when required by N.E.C.
- B. Flexible metal conduit may be used indoors only. Flexible metal conduit may be used in locations requiring flexibility, but shall not be used for general-purpose raceway. Use maximum of 6 feet of flexible conduit for equipment subject to vibration, noise transmission or movement, and for all motors. Provide a separate ground conductor across flexible connections.

3.05 ELECTRICAL METALLIC TUBING (EMT):

- A. Electrical metallic tubing may be used indoors only unless otherwise indicated on the Plans.

3.06 CONTINUITY OF CONDUIT SYSTEM:

- A. Conduits shall be assembled continuous and secured to boxes, panels, etc., with appropriate fittings to maintain electric continuity.

3.07 PULL-LINES:

- A. Provide 150 pound plastic pull-lines, with numbered distance marks at one-foot increments in all empty conduits and conduits with conductors to facilitate future conductor installation. Provide labels on source and end point of all pull lines

3.08 CONCRETE CAPS:

- A. All conduits installed for 13.8KV and shore power systems shall be encased in controlled density fill (CDF) the length of conduit trench: The CDF shall have a red dye added to the mix (five pound bag per yard) by the concrete manufacturer. Adding dye or other coloring after pour is not acceptable.

3.09 ELECTRICAL TRENCHES

- A. All electrical trenching shall comply with Division 31 and Specifications 31 00 00 Earthwork.

END OF SECTION

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections.
 - 1. Section 26 12 24 - Transformers (Oil Filled)
 - 2. Section 26 22 13 – Dry Type Transformers
 - 3. Section 26 24 13 – Low-Voltage Switchboards
 - 4. Section 26 24 16 – Panelboards
 - 5. Section 26 27 16 – Cabinets and Enclosures
 - 6. Section 33 77 00 – Medium Voltage Switchgear and Protective Devices

1.02 WORK INCLUDED

- A. The extent and location of “Seismic Controls for Electrical and Communication Work” Work is shown in the Contract Documents. This section includes seismic restraints and other earthquake-damage-reduction measures for electrical components.
- B. Definitions
 - 1. Seismic Restraint: A fixed device such as a seismic brace, an anchor bolt or stud, or a fastening assembly used to prevent vertical or horizontal movement, or both vertical and horizontal movement, of an electrical system component during an earthquake.

1.03 GOVERNING CODES, STANDARDS, AND REFERENCES

- A. ACI 318 (American Concrete Institute) - Building Code Requirements for Structural Concrete.
- B. ASCE 7 (American Society for Testing of Civil Engineers) - Minimum Design Loads for Buildings and Other Structures.
- C. ASTM - American Society for Testing and Materials.
- D. ICBO - International Conference of Building Officials.
- E. IBC - International Building Code as adopted by the City of Tacoma.
- F. NFPA 70 (National Fire Protection Association) - National Electrical Code.

1.04 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specifications Sections:
- B. Submittals shall include the following:
 - 1. Plan: Provide layout and details of seismic bracing assemblies, including relevant information about supporting structure and supported electrical system. Show attachment locations, methods, and spacings, and identifying components.
 - 2. Calculations: Provide structural calculations for all seismic restraint assemblies, including calculation of loads for assembly design and reactions applied to supporting structure.
 - a. Calculations shall include sufficiency of supporting as needed.

- b. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
3. Product Data: For each component used, provide the following:
 4. Illustration of component and its place in the associated assembly
 5. Type and style, including model number if applicable.
 6. Size.
 7. Material.
 8. Strength, including maximum working or ultimate loads in all applicable directions.
 9. Fastening provisions.
 10. Finish.
 11. Limits of use as applicable, indicating suitability for specified application.
12. Additional Information for Anchor Bolts, Expansion Anchors, Epoxy Anchored Anchors, Studs, and other Anchors: In addition to characteristics listed above, provide the International Code Council Evaluation Services (ICC-ES) report. All anchors shall be certified for use in seismic systems.
13. Shop Drawings: For anchorage and bracing not defined by details and charts on Drawings. Indicate materials, and show designs and calculations signed and sealed by a Professional Engineer licensed in the State of Washington.
14. Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of all loads and reactions. Where applicable, include analysis of structural element to from which bracing is supported.
15. Details: Detail fabrication and arrangement. Detail attachment of restraints to both structural and restrained items. Show attachment locations, methods, and spacings, identifying components and listing their strengths. Indicate direction and magnitude of all forces and moments transmitted to the structure during seismic events.
 - a. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
16. Pre-approval and Evaluation Documentation: By the ICC-ES, showing maximum ratings of restraints and the basis for approval (tests or calculations).
17. Product Certificates: For each type of seismic restraint system, provide a product certificate signed by manufacturer certifying that products furnished comply with requirements.
18. Qualification Data: Provide evidence of current licensure for firms and persons specified in "Quality Assurance" section.

1.05 QUALITY ASSURANCE

- A. Comply with ASCE 7 Chapter 13, Seismic Design Requirements for Nonstructural Components, unless requirements in this section are more stringent.
- B. Professional Engineer Qualifications:
 1. All required calculations shall be provided by a Professional Engineer who is licensed in the State of Washington and who is experienced in providing seismic engineering services.

2. Certification by a Professional Engineer licensed in a state other than Washington, if requested, may be approved by the Engineer.

1.06 PROJECT CONDITIONS

- A. In accordance with Section 1613, "Earthquake Loads" of the International Building Code:

1. The following design values shall be used:

AREA	Port of Tacoma
Site Class	D
	1.45g
	0.498g
	0.967g
	0.498g
Seismic Design Category	D
	1.0 or 1.5

2. The Component Importance Factor, I_p , shall be selected for each restraint assembly based on the system's purpose in accordance with Seismic Design Requirements for Nonstructural Components in ASCE 7.
3. Load combinations for design shall be in accordance with the IBC.
4. Any alternative designs to be considered for substitution shall be per the IBC and ASCE 7 provisions and will be subject to the approval of the Engineer.

1.07 COORDINATION

- A. Coordinate layout and installation of seismic bracing structural system and electrical and other features in the vicinity.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Bracing and attachment: Subject to compliance with requirements, provide bracing and attachment products by one of the following, or other manufacturer with at least 5 years of experience in seismic-specific bracing systems:
 1. Cooper B-Line; Division of Eaton.
 2. Erico
 3. GS Metals; Division of Cooper
 4. Hilti
 5. Thomas & Betts; Division of ABB
 6. Unistrut
 7. Or Approved Equal.
- B. Anchorage: Subject to compliance with requirements, provide anchorage products by one of the following, or other manufacturer with at least 5 years of experience in seismic-specific anchorage:
 1. Hilti
 2. Powers Fasteners

3. Red Head
4. Simpson Strong-Tie
5. Or Approved Equal.

2.02 MATERIALS

A. Use the following materials for restraints:

1. Indoor Dry Locations: Steel, zinc plated.
2. Outdoors and Damp Locations: Galvanized steel, painted.
3. Corrosive Locations: Stainless steel.

B. Unless otherwise noted, steel materials shall be per Section 05 50 00 – Metal Fabrications.

2.03 ANCHORAGE AND STRUCTURAL ATTACHMENT COMPONENTS

A. Strength:

1. Strengths used for anchor design shall be as noted in the ICC-ES reports, including use of anchor design criteria specified in ACI 318.
 - a. Unless otherwise specifically approved by the Engineer, all anchors located in concrete shall be ICC-approved for and designed using “cracked concrete” criteria.
2. For each seismic restraint assembly, either Allowable Strength or Ultimate Strength design shall be used. Methodologies shall not be mixed within a single assembly.

B. Concrete and Masonry Anchor Bolts and Studs: Steel-expansion wedge type.

C. Concrete Inserts: Steel-channel type.

D. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A325.

E. Welding Lugs: Comply with MSS SP-69, Type 57.

2.04 SEISMIC BRACING COMPONENTS

A. Slotted Steel Channel: 1-5/8-by-1-5/8-inch cross section, formed from 0.1046-inch thick steel, with 9/16-by-7/8-inch slots at a maximum of 2 inches on center in webs, and flange edges turned toward web.

1. Materials for Channel: ASTM A1011, Grade 33.
2. Materials for Fittings and Accessories: ASTM A575, ASTM A576, or ASTM A36.
3. Fittings and Accessories: Products of the same manufacturer as channels and designed for use with that product.
4. Finish: Baked, rust-inhibiting, acrylic-enamel paint applied after cleaning and phosphate treatment, unless otherwise indicated.

B. Channel-Type Bracing Assemblies: Slotted steel channel, with adjustable hinged steel brackets and bolts.

C. Hanger Rod Stiffeners: Slotted steel channels with internally bolted connections to hanger rod.

PART 3 - EXECUTION**3.01 INSTALLATION**

- A. Install seismic restraints according to applicable codes and regulations and as approved by authority having jurisdiction, unless more stringent requirements are indicated by manufacturer's recommendation or this section.

3.02 STRUCTURAL ATTACHMENTS

- A. Use bolted connections with steel brackets, slotted channel, and slotted-channel fittings to transmit the design loads.
- B. Attachments to New Concrete: Bolt to channel-type concrete inserts or use expansion anchors.
- C. Holes for Expansion Anchors in Concrete: Drill at locations and to depths that avoid reinforcing bars and comply with anchor manufacturer's recommendations.

3.03 ELECTRICAL AND COMMUNICATION EQUIPMENT ANCHORAGE

- A. Anchor rigidly to a single mobile structural element or to a concrete base that is structurally tied to a single mobile structural element.
- B. All floor-mounted equipment shall be secured to the housekeeping bases with ductile steel anchor bolts, preset in the concrete base. Secure vibration mounts, where required, to the concrete bases such that the equipment is free to vibrate but cannot move from the base.
 - 1. Housekeeping Bases: Provide appropriately sized concrete housekeeping bases for all floor-mounted equipment unless noted otherwise. Size concrete bases so expansion anchors will be a minimum of 10 bolt diameters from the edge of the concrete base, or the minimum required by the anchor manufacturer, whichever is larger. Bases shall be 4" nominal thickness of concrete with #4 reinforcing bars each way on 12" centers. Trowel finish with 1" bevel edge all around.
- C. Torque bolts and nuts on studs to values recommended by equipment manufacturer.

3.04 SEISMIC BRACING INSTALLATION

- A. Expansion and Contraction: Install all electrical system components to allow for thermal movement of braced components.
- B. Attachment to Structure:
 - 1. All attachment to the structure shall be per the approved details.
 - 2. If specific attachment is not indicated for panels, switchboard, and other heavier equipment, submit planned attachment detail to the Engineer for specific approval.

3.05 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Make flexible connections in raceways and cables where they cross expansion and seismic control joints, where adjacent sections or branches are supported by different structural elements, and where they terminate at electrical equipment anchored to a different mobile structural element from the one supporting them.
 - 1. Where expansion or control joints are crossed, the flexible connection shall allow for movement in each direction (closing, opening, right, and left) equal to the joint's total width or greater, unless specified otherwise in the Contract Documents, specified otherwise on the structural drawings for the joint's construction, or approved by the Engineer.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
1. Section 26 05 00 – Common Work Results for Electrical
 2. Section 26 05 13 – Medium Voltage Cables and Accessories
 3. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
 4. Section 26 05 33 – Raceways and Boxes for Electrical Systems
 5. Section 25 09 23 – Lighting Controls
 6. Section 26 12 14 – Transformers (Oil Filled)
 7. Section 26 22 13 – Dry Type Transformers
 8. Section 26 24 13 – Low-Voltage Switchboards
 9. Section 26 24 16 – Panelboards
 10. Section 26 27 16 – Cabinets and Enclosures
 11. Section 26 27 26 – Wiring Devices
 12. Section 33 71 19 – Electrical Underground Ducts and Manholes
 13. Section 33 77 00 – Medium Voltage Switchgear and Protection Devices
 14. Section 33 79 00 – Site Grounding

1.02 SUMMARY

- A. This Section includes identification of electrical materials, equipment, and installations.

1.03 REFERENCES

- A. ANSI/IEEE C2 - National Electrical Safety Code.
- B. NFPA 70 (National Fire Protection Association) – National Electrical Code.

1.04 QUALITY ASSURANCE

- A. Comply with NFPA 70, as adopted and administered by the Authority Having Jurisdiction.
- B. Comply with ANSI C2.

1.05 SUBMITTALS

- A. Product Data for each type of product specified.
- B. Provide sample label with identification nomenclature for one of each label type to be used for identification and equipment labels.
- C. Contractor shall field stamp one (lid and frame) for Engineer review and approval prior to field stamping all vaults and handholes.

PART 2 - PRODUCTS

2.01 LABEL TYPES

- A. Manufacturer's standard products with colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.
- B. Black felt-tip permanent marker on backside of wiring device coverplate in all locations.
- C. Individual wires shall have flexible, preprinted pre-tensioned wraparound plastic sleeves sized to suit the diameter of the wire it identifies at terminations, and arranged to stay in place by pre-tensioned gripping action when placed in position.
- D. For equipment, engraved melamine plastic laminate flat stock, 1/16-inch minimum thickness for sizes up to 15 square inches. Use 1/8-inch minimum for sizes larger than 20 square inches, white with black letters. Text height shall be 1/4" for nameplates on cabinet and equipment interiors, 3/8" height for sub letters on cabinet and equipment exteriors, and 1/2" height for main letters on cabinet and equipment exteriors. UV-inhibited when used outdoors. Secure with stainless steel drive screws, stainless steel self-tapping screws or stainless steel oval-head 6-32 screws tapped into enclosure, or with stainless steel bolts with elastic stopnut. Do not attach labels with screws or bolts if it voids manufacturer warranty UL listing of equipment. Provide alternate adhesive type label.
- E. Plain-colored vinyl adhesive tape, 3-mil minimum by 1-inch wide minimum, for conductor phase identification. Apply 1/2-inch minimum over-wrap through 2-inch minimum length.
- F. Cable and wire tags shall be plastic, 3" x 1 1/2", impact resistant, with rounded corners, white color, with 2 holes at each end for attachment to cables and wires with plastic cable ties. Labels shall be machine printed with black indelible ink, size 20 font, with description having source point, circuit breaker, fused switch, equipment name or equipment ID, and termination location. Labels shall be provided in all power signal vaults and handholes for all wires, cables and pull ropes provided under this contract.
- G. Provide field stamped label on exposed metal frame and lid. Label shall match vault or manhole ID on electrical site plans.
- H. Underground metallic line-warning tape with pre-printed warning message identifying type of system. Material shall be compounded for unlimited life when direct buried. Use when metal-detection of line is required on Medium Voltage Systems. 6-inch minimum width by 4-mils thick. (Reference Seton style 6ELE.)
- I. Warning signs: Baked Enamel on aluminum plate, 0.040-inch minimum thickness. OSHA standard wording where approved. Custom wording if required. Secure with non-corrosive fasteners.
- J. Warning labels: Flexible pressure-sensitive vinyl conforming to OSHA "Danger" and "Caution" standards. 2 1/2 x 1 3/4" minimum with black letters on yellow background. Label shall read: "WARNING! DO NOT USE AS WALKWAY, LADDER, OR SUPPORT FOR LADDERS OR PERSONNEL – CABLES ADDED AFTER INITIAL INSTALLATION REQUIRE PORT OF TACOMA APPROVAL." (Reference Seton "On-the-Spot.").
- K. Conduit/duct tags shall be 304 Stainless steel, machine or hand-stamped (size 20 font), 1 1/2" diameter or 1 1/2" square, minimum 40 mils thick with hole for attaching to conduit/duct using stainless steel wire. Use in handholes and vaults, and exposed conduits, with text to identify conduit/duct per the conduit and conductor schedules.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install identification labels according to manufacturer's written instructions.
- B. Install labels where indicated and as required by the Authority Having Jurisdiction. Locate for optimum viewing and without interference with the operation and maintenance of equipment.
- C. Coordinate names, abbreviations, colors, graphics and other designations used for electrical identification with corresponding designations used in the Contract Documents or as required by codes and standards.

Use consistent designations throughout the Project. Labeling abbreviations are not allowed.

- D. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.
 - 1. Coordinate installing electrical identifying labels prior to installing finishes that conceal such items.
- E. Clean surfaces of dust, loose material, and oily films before applying painted or self-adhesive identification products.
- F. Painted Identification Products:
 - 1. Prime surfaces according to manufacturer's instructions prior to applying painted labels:
 - a. For galvanized metal, use single-component, acrylic vehicle coating formulated for galvanized surfaces.
 - b. For concrete masonry units, use heavy-duty, acrylic-resin block filler.
 - c. For concrete surfaces, use clear, alkali-resistant, alkyd binder-type sealer.
 - 2. Apply one intermediate and one finish coat of paint.
- G. Conductor Identification:
 - 1. Conductors to be Extended in the Future: Indicate source and circuit numbers.
 - 2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color coding for voltage and phase indication of secondary circuit.
 - 3. Multiple Control and Communications Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color coding, or cable marking tape.
- H. Warning, Caution, and Instruction Signs:
 - 1. Install warning, caution, and instruction signs where indicated or required to ensure safe operation and maintenance of electrical systems and of items to which they connect.
 - 2. Warning labels for arc flash shall be 3 ½" x 5" thermal transfer type of high adhesion polyester for each work location analyzed. The label shall have an orange header with the wording "WARNING", a sub-header with the wording "ARC FLASH AND SHOCK HAZARD APPROPRIATE PPE REQUIRED", and shall include the following information:
 - a. Location designation
 - b. Nominal voltage
 - c. Flash protection boundary

- d. Hazard risk category
 - e. Incident energy
 - f. Working distance
 - g. Engineering report number, revision number, and issue date
 - h. Labels shall be machine printed, with no field markings.
- I. Apply equipment identification labels of engraved plastic laminate on each major unit of equipment, including central or master unit of each system. This includes communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Except as otherwise indicated, provide a single line of text with 1/4-inch high lettering on 1-inch high label. Use white lettering on black field. Apply labels parallel to equipment lines.
- J. Apply instrument labels on all field-mounted instruments, transmitters, pressure gauges and control valves.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 26 05 00 – Common Work Results for Electrical
 - 2. Section 26 05 13 – Medium Voltage Cables and Accessories
 - 3. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
 - 4. Section 26 12 14 – Transformers (Oil Filled)
 - 5. Section 26 22 13 – Dry Type Transformers
 - 6. Section 26 24 13 – Low-Voltage Switchboards
 - 7. Section 26 24 16 – Panelboards
 - 8. Section 33 77 00 – Medium Voltage Switchgear and Protection Devices

1.02 SUMMARY

- A. This section includes computer-based, fault current and overcurrent protective device coordination studies for all devices. Protective devices shall be set by the independent testing agency based on results of the protective device coordination study.
- B. This study also includes:
 - 1. An arc flash hazard analysis.
 - 2. Providing self-adhesive arc flash hazard labels.
- C. Medium voltage switchgear manufacturer shall provide an initial study and submit with the electrical gear submittals.
- D. Medium voltage switchgear manufacturer shall provide a final study prior to substantial completion. The final study shall include all installed cable lengths and changes made during construction.

1.03 SUBMITTALS

- A. Product data: Submit computer software program to be used for studies.
- B. Product Certificates: Submit coordination-study and fault-current-study computer software programs to certify compliance with IEEE 399.
- C. Other Action Submittals: The following submittals shall be made after the approval process of system protective devices has been completed.
 - 1. Coordination-study input data, protective device settings including completed computer program input data sheets.
 - 2. Study and Equipment Evaluation Reports.
 - 3. Coordination-study report.
 - 4. Submit protective equipment shop drawings simultaneously with the protective device study.
 - 5. Certification: Two weeks prior to final inspection, deliver to the Engineer four copies of the following certifications:

- a. Certification by the contractor that the protective devices have been adjusted and set in accordance with the approved protective device study.
6. The Contractor will be fully responsible for all changes required to remove and replace portions of the distribution system required by the study if the study is not performed PRIOR to ordering the gear.

1.04 QUALITY ASSURANCE

- A. Studies shall use computer programs distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this section. Manual calculations are not acceptable.
- B. Coordination-study Specialist Qualifications: an entity experienced in the application of computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices. The medium voltage switchgear equipment manufacturer shall be responsible for the study. All elements of the study shall be performed under the direct supervision and control of a licensed Engineer.
- C. Comply with IEEE 242 for short-circuit currents and coordination time intervals.
- D. Comply with IEEE 399 for general study procedures.

PART 2 - PRODUCTS

2.01 COMPUTER SOFTWARE DEVELOPERS

- A. Available Computer Software Developers: Subject to compliance with requirement. Companies offering computer software programs that may be used in the Work include, but are not limited to, the following:
 1. CGI CYME
 2. EDSA Micro Corporation
 3. ESA Inc.
 4. Operation Technology, Inc.
 5. SKM Systems Analysis

2.02 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

- A. Comply with IEEE 399.
- B. Analytical features of fault-current-study computer software program shall include "mandatory", "very desirable", and "desirable" features as listed in IEEE399
- C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and rating of all Overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

PART 3 - EXECUTION

3.01 GENERAL

- A. Examine project Overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance.

3.02 POWER SYSTEM DATA

- A. Gather and tabulate the following input data to support coordination study:

1. Product data for Overcurrent protective devices specified in other Division 26 and 33 sections and involved in Overcurrent protective device coordination studies. Use equipment designation tags consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Impedance of utility service entrance.
 - a. Electrical Distribution System Diagram: In hard-copy and electronic-copy formats, showing the following
 - b. Circuit breaker and fuse-current ratings and types.
 - c. Relays and associated power and current transformer ratings and ratios.
 - d. Transformer kilovolt amperes, primary and secondary voltages, connection type, impedance, and X/R ratios.
 - e. Cables: indicate conduit material, sizes of conductors, conductor material, insulation, and length.
 - f. Busway ampacity and impedance.
 - g. Motor horsepower and code letter designation according to NEMA MG1.
3. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:
 - a. Special load considerations, including stating inrush currents and frequent starting and stopping.
 - b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capacity.
 - c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
 - d. Ratings, types, and settings of utility company's Overcurrent protective devices.
 - e. Special Overcurrent protective device settings or types stipulated by utility company.
 - f. Time-current-characteristic curves of device indicated to be coordinated.
 - g. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long time adjustment range, short-time adjustment range, and instantaneous attachment adjustment range and current transformer ratio for Overcurrent relays.
 - h. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment range, and current transformer ratio for Overcurrent relays.
 - i. Panelboards, switchgear ampacity, and interrupting rating in amperes rms symmetrical.

3.03 FAULT CURRENT STUDY

- A. The medium voltage switchgear manufacturer shall calculate the maximum available short-circuit current in amperes rms symmetrical at circuit –breaker positions of the electrical power distribution system. The calculation shall be for a current immediately after initiation and for a three-phase bolted short circuit at each of the following:
 1. Medium Voltage Switchgear and Switchboard Bus

2. Distribution Panelboards
3. Branch Circuit Panelboards
- B. The medium voltage switchgear manufacturer shall calculate momentary and interrupting duties on the basis of maximum available fault current. Show interrupting (five-cycle) and time-delayed currents (six cycles and above) on medium-voltage breakers as needed to set relays and assess the sensitivity of Overcurrent relays.
- C. Equipment Evaluation Report:
 1. Overcurrent Protective Devices: Ensure interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
 2. Devices and Equipment Rated for Asymmetrical Fault Current: Apply multiplication factors listed in the standards to 1/2 –cycle symmetrical fault current.
 3. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

3.04 COORDINATION STUDY

- A. The medium voltage switchgear manufacturer shall perform coordination study using approved computer software program. Prepare written report using results of fault-current study. Comply with IEEE 399.
 1. Calculate the maximum and minimum 1/2-cycle short circuit currents.
 2. Calculate maximum and minimum interrupting duty (five cycles to two seconds) short-circuit currents.
 3. Calculate the maximum and minimum ground-fault currents.
- B. Transformer Primary Overcurrent Protective Devices:
 1. Device shall not operate in response to the following:
 - a. Inrush current when first energized.
 - b. Self-cooled, full load current.
 - c. Permissible transformer overloads according to IEE C57.96 if required by unusual loading.
 2. Device settings shall protect transformers according to IEEE C57.12.00 for fault currents.
- C. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves in IEEE-242. Demonstrate that equipment withstands the maximum short circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.
- D. Coordination-study Report: The medium voltage switchgear manufacturer shall prepare a written report indicating the following results of coordination study:
 1. Tabular Format of Settings Selected for Overcurrent Protective Devices:
 - a. Device tag
 - b. Relay-current transformer ratios;

- c. Circuit-breaker sensor rating; long-time, short-time, and instantaneous settings.
 - d. Fuse-current rating and type
 - e. Ground-fault relay-pickup and time-delay settings
- 2. Coordination Curves: Prepared to determine settings of Overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Show the following information:
 - a. Device tag
 - b. Voltage and current ratio for curves.
 - c. Three-phase and single phase damage points for each transformer.
 - d. No damage, melting, and clearing curves for fuses.
 - e. Cable damage curves.
 - f. Transformer inrush points
 - g. Maximum fault-current cutoff point.
- E. Completed data sheets for setting of Overcurrent Protective Devices.

3.05 ARC FLASH HAZARD ANALYSIS

- A. The medium voltage switchgear manufacturer shall calculate the arc flash hazard category, the incident energy level and the flash hazard boundary for all electrical equipment.
- B. Provide self-adhesive labels complying with ANSI Standards Z535.4-1998

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 26 05 00 – Common Work Results for Electrical
 - 2. Section 33 77 00 – Medium Voltage Switchgear and Protection Devices

1.02 SYSTEM DESCRIPTION

- A. Furnish, install and test a complete Metering System (MS) as indicated on the drawings and described in this specification. The system is defined to include, but not be limited to, devices for metering electrical service to main and branch 13.8KV circuits, communication interface hardware, one remote (within 30 feet) indoor metering enclosure inter-communication wiring, software, ancillary equipment, installation and connection to contractor furnished touch screen computer workstation and printer wall mounted, in lockable enclosure inside the Power Distribution Switchgear Enclosure (PDSE).
- B. The MS shall utilize Ethernet Gateway as the high-speed backbone network that supports direct connection of a personal lap top computer workstation anywhere on the network. See Paragraph 2.03.
- C. Provide two (2) application software and device licenses (Port of Tacoma and Elcon Associates, Inc.) shall be provided as described in Paragraph 2.04 of this specification.
- D. All cabling (intercommunication wiring) shall be supplied and coordinated by the MS System supplier with PDSE supplier. This applies to factory and field installed cabling requirements.
- E. Provide complete catalog data and detailed wiring diagram of the MS system as related to the PDSE equipment. Submittal shall be detailed and specific. General catalog data if provided is not desired and will be rejected for resubmittal.

1.03 REFERENCES

- A. All Power Meters shall be UL and cUL Agency compliant, listed per 7207. They shall also have +/- 1% overall system accuracy (including instrument transformer accuracy) from 2% to 100% of rated load. Accuracy is to meet or exceed ANSI C12.1.
- B. The system shall comply with the applicable portions of NEMA standards.

1.04 SUBMITTALS

- A. Indicate electrical characteristics and connection requirements. When MS components are installed by the power equipment manufacturer, the power equipment shop drawings shall clearly identify the components, the internal connections, and all contractor required field connections. The MS drawings shall show all MS components including necessary component dimensions; type, size, and weight; location of conduit entry and exit; single line diagram indicating internal and external wiring requirements. Drawings shall identify terminal blocks used for interconnections and wire type to be used.
- B. Product Data: Provide highlighted and detailed catalog sheets and technical data sheets to indicate physical data and electrical performance, electrical characteristics, and connection requirements. Do Not submit general product data or catalog material unidentified.

1.05 QUALITY

- A. The MS vendor shall be ISO 9000 registered to demonstrate quality compliance.

- B. MS components included within the switchgear equipment lineup shall be factory installed, wired and tested prior to shipment to the job site.

PART 2 – PRODUCT

2.01 METERING CABINET

- A. The metering cabinet shall be as a minimum, NEMA 1 indoor, door-in-door construction with padlockable front cover, top and bottom screened vents and mounting racks/hardware sized for metering equipment to be provided.
- B. The metering cabinet shall be surface mounted indoors in the power distribution switchgear enclosure (PDSE)
- C. The Port of Tacoma will furnish padlock at final completion.
- D. The metering cabinet shall have separate terminal blocks for incoming and outgoing communications circuit connections.
- E. The metering cabinet shall have space sufficient for installation of an Ethernet Gateway and power supply.

2.02 POWER MONITORS

- A. The power monitoring system shall be Siemens Sentron PAC4200, no EXCEPTIONS.
- B. Power monitoring shall make use of data generated in the individual circuit breaker control relays as provided under Section 33 77 00 Medium Voltage Switchgear and Protection Devices. Relays shall be equal to Schweitzer 351A. The relays shall be installed by the switchgear manufacturer.
- C. Power monitoring shall make use of the same potential transformers and current transformers provided for the circuit breaker control relays.
- D. Power monitoring data shall be transmitted from each circuit breaker control relay over a twisted pair data cable to a data processor located approximately 30 feet from the switchgear.
- E. Provide a communication processor to collect and scale the power monitoring data from each switchgear circuit breaker relay. Processor shall be equal to Schweitzer 2030/32.
- F. Power Monitor Installation
 - 1. The switchgear manufacturer shall provide a single termination point for the twisted pair data cables from the circuit breaker relays.
 - 2. Provide raceway for communication wire from the switchgear to the metering cabinet to provide minimum 90 day on-site data transfer and storage with portable lap top connection and remote reading capability.
 - 3. Mount the communication processor in the metering cabinet.

2.03 ETHERNET GATEWAY

- A. Advanced Ethernet Gateway (EGX-400)
 - 1. The advanced Ethernet Gateway shall feature one 10/100baseT Ethernet port and one 100baseFX Fiber Optic port.
 - 2. The advanced Ethernet Gateway shall feature a minimum of 16 MB of internal non-volatile memory.
 - 3. The Ethernet Gateway shall provide storage for standard and to display real-time power equipment data, and historical time/date stamped interval reading data.

4. The Ethernet Gateway shall be capable of accepting HTML files, PDF files, active X CRG, GIF, JPG graphics, MS Office files (doc, xls, ppt, etc.).
5. The Ethernet Gateway shall be configured remotely using a standard Internet browser.
6. The Ethernet Gateway shall feature two serial communication ports: one RS-485 serial port, and a second port configurable for either RS-232 or RS-485 (support for 2-wire or 4-wire).
7. A single Ethernet Gateway, assigned a single IP address, shall provide high speed Ethernet support for up to 32 devices (data logging of up to 6 parameters per metering device, and a minimum of 38 days of non-volatile data logging @ 15 minute intervals).
8. The Ethernet Gateway shall feature the following protocols: Ethernet -- MODBUS/TCP HTTP, FTP. Serial – MODBUS RTU, or PROFIBUS-DP.
9. The Ethernet Gateway shall operate in ambient temperature of -30 to 80° C, an ambient storage temperature of - 40 to 85° C and shall operate in relative humidity of 5 to 95%.
10. The Ethernet Gateway shall be fitted with a web server to allow users to configure its Ethernet and Serial communication parameters, trouble shoot both Ethernet and serial communication, and add devices.
11. The Ethernet Gateway shall be a stand-alone product that offers various mounting configurations and includes at a minimum the following mounting options: DIN- rail mounting or Wall/Panel Mounting.
12. The Ethernet Gateway shall be UL, CUL, CE, NOM and FCC class A compliant.
13. The Ethernet Gateway shall be compatible with Ethernet TCP/IP networks and allows users to access power metering information from any location on a local area network (LAN) or a wide area network (WAN).
14. The Ethernet Gateway shall utilize Modbus/TCP protocol as its high-speed backbone network protocol.
15. The Ethernet Gateway shall allow connection to metering RS-485 field devices. Metering Software running on a PC with a Modbus/TCP driver shall be able to access monitoring, metering, and protective data via the LAN. The PC shall be connected to the Ethernet LAN via a Network Interface Card.
16. The gateway shall provide a twisted pair UTP cable connection and a fiber optic port to connect to the Ethernet backbone. The Ethernet twisted-pair port shall have: An RJ45 connector, support for 10/100BaseT connection (10 or 100Mbit auto-negotiate), support for both unshielded twisted-pair (UTP) as well as shielded twisted-pair (STP) wiring. Gateway shall also provide support for a 100baseFX fiber optic connection.

LED's to indicate Ethernet activity. The following status LED's shall be provided for Ethernet communications: one for Physical Ethernet Link (LK), one for Transmit (TX), one for Receive (RX).
17. The Ethernet Gateway shall have two serial RS-485 ports that are used to connect serial field devices to the LAN. Each RS-485 serial port shall have the following specification: Supports up to 32 serial devices without a repeater. Supports Modbus, PROFIBUS-DP, or mixed mode daisy chain devices. Supports both 2-wire or 4-wire daisy chain devices. Support for baud rates of 1200 to 38400. Support for parity values of even and none. Screw type connectors with 5-positions. LED's to indicate serial communication activity. At a minimum, there shall be the following LED's; One for Transmit (Tx), and one for Receive (Rx) per port.

18. The Ethernet Gateway shall have a minimum of one port that can be configured for either RS-485 or RS-232.
19. Each serial port shall have configurable biasing and termination to support 2-wire and 4-wire communicating devices.
20. The Ethernet Gateway shall allow a Modbus master on one of its serial ports to request data from devices on the second serial port.
21. The Ethernet Gateway shall be compliant to industrial temperature. It shall withstand an operating temperature range of -30 deg. C to +80 deg. C.
22. The Ethernet Gateway shall be configurable by either: Local RS-232 connection and a Hyper Terminal® interface or local or remote Ethernet connection and a standard web browser.
23. The Ethernet Gateway shall provide multilingual user interface that includes English.
24. Setup of the Ethernet communication card shall be accomplished via the on-board Ethernet port and a web browser. It shall also be possible via the Ethernet port to upgrade the firmware of the Ethernet communication card in the field to accommodate new system features.
25. All Ethernet cabling shall be installed by a qualified data communications cable installer or the electrical contractor qualified to install data communications equipment. All communications cabling shall be Category 5 rated for 100baseT, or Fiber Optics rated for 100baseFX.

B. Additional Network Media Options

1. Ethernet shall be used where shown on the project drawings. Ethernet Gateways shall be provided by the OMS vendor and installed by System Installer. Ethernet network connections shall be established using industry standard Ethernet protocols such as TCP/IP. All components shall work with existing Ethernet Gateway, Router, and Hub technology. Use of Ethernet shall be transparent to OMS software and monitoring devices.

2.04 TENANT METERING SOFTWARE

- A. The METERING SOFTWARE shall operate using the Windows 10 operating system.
- B. The METERING SOFTWARE shall have a simple user interface for managing individual meter information for each tenant.
- C. The METERING SOFTWARE shall be capable of providing metering information for Electricity, Water, and Natural Gas usage.
- D. The METERING SOFTWARE shall allow selection of the time Period (Start date/time and End date/time) for trending purposes.
- E. The METERING SOFTWARE shall support "interval data" readings of electricity imported from a database. For example: kWhrs (Energy) and kWd (Demand) from each meter in the system -- typically sampled at a 15 minute interval.
- F. METERING SOFTWARE Database compatibility
 1. Shall support reading "interval data" directly from a Microsoft SQL database.
 2. Shall utilize Microsoft SQL to execute the database queries to minimize query times.
 3. Microsoft Access shall not be acceptable, due to database processing speed limitations.

- G. The METERING SOFTWARE shall support grouping and aggregation of meters to combine multiple meters into one aggregate total reading. For example: multiple meters record total crane operations -- Owner requests one statement each month indicating individual meters and aggregate total for all meters.
- H. The METERING SOFTWARE shall support the following User-configurable calculations:
 - 1. Electrical Energy
 - 2. Demand
 - 3. Power Factor
 - 4. Water Consumption (not used for this project)
 - 5. Gas Usage (not used for this project)
 - 6. Custom Miscellaneous
- I. The METERING SOFTWARE shall include a "Coincident Demand" cost allocation function. This function will not be utilized for this project.
 - 1. Determine the Peak Demand, date and time for the main meter at the PDSE Switchgear.
 - 2. Query the "interval data" database to identify the Demand reading at each submeter coincident (at the same date and time) as the main meter.
- J. The METERING SOFTWARE shall identify if any expected meter readings (data points) are missing from the system database, and shall provide these Statistics to the User. The METERING SOFTWARE will execute the program even if some data points are missing, and will attempt to estimate missing data points, when feasible.
- K. The METERING SOFTWARE shall be authored by the system manufacturer.
 - 1. System manufacturer must have the capability to customize the METERING SOFTWARE core software program for special Owner requirements.
 - 2. System manufacturer shall provide complete documentation to the User for program operations and configuration. Provide written manuals and extensive on-line Help screens.
 - 3. System manufacturer shall maintain a full-time Technical Support group
 - a. Free Telephone Tech Support Center
 - b. Free Tech Support Web Site
 - c. Optional Priority Support (remote troubleshooting via modem)
 - 4. System manufacturer shall maintain a full-time Engineering Services group
 - a. System integration capabilities
 - b. Energy usage consulting capabilities
 - c. Power Quality consulting capabilities
 - 5. System manufacturer shall maintain a full-time Customer Training group
- L. The METERING SOFTWARE shall include the following Output options:
 - 1. Report: USAGE BY METER -- a printout showing each meters information -- with each meters information printed on a separate page.
 - 2. Report: OWNER REPORT -- a printout showing the Total Energy Consumption and Demand calculated for the facility, and each Meter.

3. Spreadsheet: SUMMARY REPORT -- Export the Total Consumption and Demand and each Meter's Consumption and Demand monthly amount to a Microsoft Excel spreadsheet file for custom reporting or data export by the User.

2.05 EPMS SERVER

- A. The EPMS Server computer include 1 factory supplied computer with at least the following features.
 1. Server computer with 4GB RAM, dual 2GHz CPU, 146 GB storage on SCSI RAID-1, CD/DVD RW drive, touch screen monitor, and XGA video card.
 2. Microsoft Server 2014
 3. Windows 10 operating system.
 4. Microsoft Office recommended for reporting
 5. PDF maker recommended for reporting.
 6. A minimum of one (1) parallel port and two (2) serial ports.
 7. Dual NIC Card – 10/100 Base T
 8. Auto-reboot capability upon return from power failure. Necessary programs must then automatically launch without user intervention.
 9. One 400VA, 120VAC, plug-in UPS.

2.06 EMPS STANDARD GRAPHIC DISPLAY FEATURES:

- A. The EPMS installation shall include as standard a graphical package that allows custom developed graphic screens to match customer on-line drawings, customer floor plan or actual power distribution equipment front elevations, as agreed upon by owner. Owner shall be able to select colors, numbering scheme and general arrangement of screens.

2.07 METERING SYSTEM CABLING

- A. Metering system manufacturer shall provide all factory and field wiring. Coordinate length, routing and installation requirements with PDSE manufacturer.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. All control power, CT, PT, RS485 and Ethernet data communications wire shall be installed by medium voltage switchgear (PDSE) manufacturer. These requirements are not shown on the drawings. Contractor shall coordinate with the PDSE manufacturer prior to bid and include materials and labor for this work in the bid.
- B. Contractor field metering interconnection wiring requirements shall be clearly identified on the MS network drawings, including highlighted product data sheets and detailed wiring diagrams.

3.02 SYSTEM START-UP AND TRAINING

- A. On-site start-up and training of the MS shall be included in the project bid. MS vendor to include one-half day of on-site, hands-on orientation training for owner personnel and Engineer with the fully commissioned MS system.
- B. Start-up shall include a complete working demonstration of the MS.
- C. Training shall include standard documentation and hands-on exercises for owner's electrical operations personnel and engineers to become familiar with operation of the MS.

- D. The project bid shall include 4 days on-site start-up assistance to include 2 trip(s).
- E. The power monitoring manufacturer shall provide a dedicated 24/7 telephone technical help center for customers.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 26 05 00 – Common Work Results for Electrical
 - 2. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
 - 3. Section 26 05 33 – Raceways and Boxes for Electrical Systems
 - 4. Section 26 05 73 – Identification for Electrical Systems
 - 5. Section 26 27 16 – Cabinets and Enclosures
 - 6. Section 33 79 00 – Site Grounding

1.02 WORK INCLUDED

- A. The extent and location of “Lighting Controls” Work is shown in the Contract Documents. This section includes the following:
 - 1. Lighting Control Contactors.
 - 2. Photoelectric Cells.

1.03 GOVERNING CODES, STANDARDS AND REFERENCES

- A. NFPA 70 (National Fire Protection Association) - National Electrical Code,

1.04 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.
- B. Submittals shall include the following:
 - 1. Product Data: Include dimensions and data on features and components. Include elevation views of front panels of control stations.
 - 2. Maintenance Data: For controls to include in maintenance manuals specified in Division 1 General Requirements. Include operation and maintenance manuals.

1.05 QUALITY ASSURANCE

- A. Listing and Labeling: Provide electrical components, devices, and accessories that are Listed and Labeled as defined in NFPA 70, Article 100 and marked for intended use for the location and environment in which they are installed.
- B. Comply with NFPA 70, as adopted and administered by the Authority Having Jurisdiction.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Contactors
 - a. Square D.; Division of Schneider Electric.
 - b. General Electric.

- c. Cutler-Hammer; Division of Eaton.
 - d. Allen Bradley.
 - e. Or Approved Equal.
2. Photoelectric Cell
- a. Intermatic
 - b. Tork
 - c. Or Approved Equal.

2.02 CONTACTORS

- A. Configuration: Electrically held with 20 Amp tungsten halogen rating, and 30 Amp ballast rating. Match branch circuit overcurrent protection considering derating for continuous loads.
 - 1. Current Rating for Switching: Listing or rating consistent with type of load served, including high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
 - 2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
- B. Coil operating voltage: 120 60Hz.
- C. Auxiliary Contacts: Field convertible contacts with normally open contacts and normally closed indicators.
- D. Poles: As required to match circuit configuration. 12-pole maximum.
- E. Provide field convertible contacts with N.O. and N.C. indicators.
- F. Provide contactors with mounting brackets.
- G. Enclosure: Refer to Specification 26 27 16 Cabinets and Enclosures.

2.03 PHOTOELECTRIC CELLS

- A. Description: Solid state, with dry contacts rated for 1000-VA inductive , to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.
- B. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Level Monitoring Range: 1-5 fc on, 3-15 fc off, with an adjustment for turn-on and turn-off levels within that range.
- D. Delay up to two minutes to prevent false switching.
- E. Provide on/off adjustment by light level sensor.
- F. Enclosure: Heavy-duty die cast zinc, gasketed for maximum weather protection.
- G. Cell: Cadmium sulphide, epoxy coated.
- H. Contacts: Closed between dusk and dawn.
- I. Temperature range: -40°F to 140°F.
- J. Manual bypass switch shall be installed in parallel to the photocell.

PART 3 - EXECUTION

3.01 SENSOR INSTALLATION

- A. Photoelectric Cells shall be oriented north, and shall be directed to avoid detection of artificial light source.
- B. Install lighting contactors in NEMA enclosure appropriate for location. Provide disconnecting means and overcurrent protection at contactor enclosures.
- C. Installation shall comply with sensor manufacturer's recommendations.

3.02 CONTACTOR INSTALLATION

- A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration.
- B. Mount Contactors in NEMA enclosure rated for location.
- C. Mount control equipment according to manufacturer's written instructions and requirements in Section 26 05 48 - Seismic Controls for Electrical and Communication Work.

3.03 CONTROL WIRING INSTALLATION

- A. Install wiring as specified in Section 26 05 19 - 600 Volt or Less Wire and Cable for low-voltage connections.
- B. Wiring Method: Install all wiring in raceway as specified in Section 26 05 33 - Raceway and Boxes.
- C. Bundle, train, and support wiring in enclosures.
- D. Ground equipment.
- E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.
- F. Connections: Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.04 IDENTIFICATION

- A. Identify components and power and control wiring according to Section 26 05 53 - Electrical Identification.
- B. Label lighting control panels with equipment designation, power source and circuit numbers, and power source location.
- C. Label all relays and control devices.

3.05 FIELD QUALITY CONTROL

- A. Inspect control components for defects and physical damage, testing laboratory labeling, and nameplate compliance with the Contract Documents.
- B. Check tightness of electrical connections with torque wrench calibrated within previous six months. Use manufacturer's recommended torque values.
- C. Verify settings of photoelectric devices with photometer calibrated within previous six months.
- D. Electrical Tests: Use particular caution when testing devices containing solid-state components. Perform the following according to manufacturer's written instructions:
 - 1. Continuity tests of circuits.

2. Operational Tests: Set and operate controls to demonstrate their functions and capabilities in a methodical sequence that cues and reproduces actual operating functions.

3.06 ADJUSTING

- A. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.

3.07 CLEANING

- A. Cleaning: Clean equipment and devices internally and externally using methods and materials recommended by manufacturers, and repair damaged finishes.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 26 05 00 – Common Work Results for Electrical
 - 2. Section 26 05 13 – Medium Voltage Cables and Accessories
 - 3. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
 - 4. Section 26 05 48 – Seismic Controls for Electrical and Communications Work
 - 5. Section 26 05 53 – Identification for Electrical System
 - 6. Section 26 05 73 – Overcurrent Protective Device Coordination Study
 - 7. Section 33 71 19 – Electrical Underground Ducts and Manholes
 - 8. Section 33 79 00 – Site Grounding

1.02 WORK INCLUDED

- A. Provide all transformers complete with enclosures, connections, and grounding.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections:
 - 1. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.01 TRANSFORMERS (OIL FILLED)

- A. Acceptable manufacturers:
 - 1. General Electric
 - 2. ABB
 - 3. RTE/Cooper
 - 4. Approved Equal
- B. Pad Mounted Deadfront: Transformer shall be complete with a weatherproof, tamper resistant, metal cabinet consisting of a primary compartment and an oil-immersed transformer section suitable for outdoor mounting on a concrete vault lid. High voltage terminations and equipment shall be deadfront and conform to ANSI C57.12.28. Transformers shall meet the Department of Energy's 2016 energy efficiency requirements.
- C. Size as shown on drawings, 95KV BIL. Transformer shall be five legged core constructed in compliance with applicable IEEE, NEMA, and ANSI standards for oil-immersed, self-cooled distribution transformers.
- D. Rating: Transformer shall be 3-phase, 60 cycle, with (2) 2-1/2% below normal and (2) 2-1/2% above normal taps. Maximum temperature rise at continuous full load shall be 65 degrees C. Secondary voltage shall be grounded "Y". Primary shall be 13800 volts "Delta". See drawings for size and voltage.

- E. Primary Compartment: The primary bushings shall be 200-ampere load break epoxy bushings. There shall be 3 primary bushings as well as 3 parking stand bushings. Primary compartment shall include three BAY-O-NET type fuse holders with current sensing fuse link in series with ELSP current-limiting fuse. All fusing shall be manufacturer standard sizes. Provide grounding bushing caps for feed through bushings and parking bushings. Provide 3 spare BAY-O-NET type fuses of each style. Provide a gang operated, primary oil immersed switch (LBOR). Switch handle with eye for operation with distribution hot stick shall be located in the high voltage compartment and shall have indexing plate. Provide distribution class surge arrestors.
- F. Secondary Compartment: Shall contain compression-type hydraulic applied lugs, mounted on 8-hole copper spades. The compartment shall also contain a dial type thermometer, oil-level gauge and oil drain valve (alternate location in primary compartment) and manufacturer's nameplate listing the technical data of the transformer. Low voltage bushings shall have adequate internal bracing to support the secondary cables involved without undue strain on the bushings. Secondary compartment shall be 24-inch deep minimum and sufficient size to adequately terminate secondary cables. The neutral bushing shall have a copper ground strap to the transformer tank.
- G. Pressure Relief: The transformer shall be designed so excessive pressure buildups are released automatically without damage to the tank. There shall also be a manually controlled vent which will release any pressure buildup beyond one atmosphere before the tank is open.
- H. Filling and Drain Devices: The transformer shall include one tank ground in the low-voltage compartment. Each ground shall be 1/2-inch hole with 13 threads per inch, and 7/16-inch deep.
- I. Doors: The transformer shall have two flat hinged horizontally swinging doors, one covering the high voltage compartment and one covering the low-voltage compartment. The two doors shall be located side by side with the high-voltage compartment accessible only after the low voltage compartment door has been opened. The high voltage compartments shall be separated by a steel barrier. To facilitate making connections, the doors and compartment hood shall be removable. The low-voltage compartment door shall have a three-point latch, as well as locking provisions and pentahead bolt.
- J. Lifting Provisions: The transformer shall include four lifting lugs, as well as jacketing provisions.
- K. Insulation: All insulating components, oil, paper and wire enamel shall be made of thermally-upgraded materials, which are all compatible at 65 degrees C temperature rise.
- L. Color: The transformers shall be olive green in color.
- M. Delivery: Special precaution shall be exercised to assure the delivery and installation well in advance to the completion date to assure no delay to the project. Submittal data must be submitted promptly to avoid delays. Submittal data must include scheduled delivery date. If additional charges are required for fast shipment, costs shall be the responsibility of the Contractor.

2.02 SHOP DRAWINGS

- A. Prepare and submit for review prior to manufacture; include dimensioned front plan and section views, wiring and connection diagrams and bolting template. Contractor shall indicate on the drawings mounting methods and connection lugs required. Provide BAY-O-NET fuse data.
- B. Note (written or highlighted) compliance with all specification items in Specification Section 26 12 14.

PART 3 - EXECUTION

3.01 GENERAL

- A. Install transformer securely on a level concrete vault lid designed to accept the transformer.
- B. Repaint all scratched and marred surfaces to original condition using color and type of paint recommended by manufacturer.
- C. Connect the ground in accordance with manufacturer's recommendations and code requirements.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 26 05 00 – Common Work Results for Electrical
 - 2. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
 - 3. Section 26 05 33 – Raceways and Boxes for Electrical Systems
 - 4. Section 26 05 48 – Seismic Controls for Electrical and Communications Work
 - 5. Section 26 05 53 – Identification for Electrical System
 - 6. Section 26 05 73 – Overcurrent Protective Device Coordination Study
 - 7. Section 33 71 19 – Electrical Underground Ducts and Manholes
 - 8. Section 33 79 00 – Site Grounding

1.02 WORK INCLUDED

- A. Provide dry transformers and Mini Power-Zones (MPZ) packaged power supplies, of the types and characteristics specified herein and shown on the drawings.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections:
 - 1. 1. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Dry Type Distribution Transformers:
 - 1. General Electric QL
 - 2. Sorgel Quiet Quality
 - 3. Tierney
 - 4. Federal Pacific
 - 5. Similar units by Acme. Hevi-Duty or Westinghouse may be utilized if the core and coil assembly is mounted on rubber isolation pads.
 - 6. Approved Equal

2.02 SHOP DRAWINGS

- A. Prepare and submit for review, prior to manufacture; include dimensioned elevations, base plans, section views, wiring and connection diagrams and bolting templates. Contractor shall review shop drawings and indicate mounting methods and connection lugs required.

2.03 DRY TYPE DISTRIBUTION TRANSFORMERS

- A. Dry type transformers shall be provided to satisfy 208Y/120 volt or 120/240V requirements from the 480 volt system. Transformers shall comply with NEMA Standard ST-20, Energy Star and shall bear the UL label.

B. Enclosure Construction

1. Steel panel enclosure over core, coil and terminal chamber with louvered openings for convection cooling.
2. Provide weatherproof enclosure for exterior installations.

C. Windings: - Separate primary and secondary windings shall have Class H insulation rated for continuous operation at 115 degrees C above a 40 degree C ambient, with a maximum hot spot temperature of 220 degrees C. Windings, core and coil assembly shall be treated and built to resist the effects of dirt and moisture.

D. Connections: All dry type distribution transformers shall have a 480 volt delta connected primary and 208Y/120 volt, three phase, four wire connected secondary or 480 volt primary to 120/240 volt single phase secondary. Provisions for external connections shall be made by means of a terminal board employing lugs compatible for the external conductors installed.

E. Primary Taps: Provide four full capacity taps, minimum of two 2-1/2% above and two 2-1/2% below normal (rated) primary voltage.

F. Capacity: Transformers furnished shall have a continuous overload capability not less than 115% of the nominal size shown on the plans.

G. Efficiency: Transformers shall be designed for substantially lower losses than NEMA standard transformers.

H. Core Steel: Thin lamination for efficiency, not thicker than 9 mils.

I. Sound Level: Transformers shall have a guaranteed sound rating. Sound level shall not exceed 36dB per IEEE C57.12.91 testing for all sizes through 300 KVA (similar to Tierney Quietran). All transformers shall be factory certified to have sound levels not exceeding those specified.

J. Each MPZ shall include a primary main breaker, an encapsulated dry-type transformer and a load center with secondary main breaker and branch breakers.

K. The MPZ primary main, secondary main and feeder breakers shall be enclosed with a padlockable hinged door.

L. MPZ's shall be suitable for service entrance application.

M. The MPZ transformers shall be copper wound, 115 degrees C temperature rise, and epoxy-resin encapsulated.

N. The MPZ enclosure shall be MEMA 3R painted stainless steel.

O. Certification: Submittals shall include appropriate test and manufacturing data to show that project transformers comply with all requirements of this specification.

P. Transformers shall meet the Department of Energy's 2016 energy efficiency requirements.

2.04 VIBRATION ISOLATORS

A. General: Isolators shall be selected according to manufacturer's recommendations.

B. Mounting Pads: Shall be ribbed elastomeric pads for direct mounting under equipment.

C. Spring Vibration Isolators: Shall be seismically restrained type, incorporating integral ribbed noise isolation pad.

PART 3 - EXECUTION

3.01 MOUNTING

A. General

1. Transformers shall be ground mounted on a concrete pad as required for the particular installation.
2. All units shall be seismically restrained/braced to comply with the requirements of the International Building Code (IBC) and manufacturers seismic testing.
3. MPZ's shall be surface mounted in accordance with the manufacturer's recommendations.
4. Remove all shipping blocks and packing materials prior to installation.

B. Ground Mount

1. Provide concrete housekeeping pads, 4" high and 6" larger (length and width) than the "footprint" of the equipment.
2. Size blockouts, anchor bolt spacings and other critical dimensions according to published recommendations of the manufacturer.

3.02 VIBRATION ISOLATION

A. General

1. All transformers shall be provided with vibration isolation as recommended by the manufacturer and sized for the specific application.

B. Mounting Pads

1. General elastomeric type mounting pads shall be used for vibration isolation. Provide pads directly under the transformer base channels or mounting brackets. Pads shall be punched to accept hold-down/anchor bolts.

3.03 RACEWAY CONNECTIONS

- ##### **A. Transformer raceway connections shall be seal-tight flexible metal conduit for equipment subject to vibration.**

3.04 GROUNDING CONNECTIONS

- ##### **A. Dry transformers shall be considered "grounded neutral, separately derived systems;" the neutral shall be grounded per code accordingly.**

3.05 VOLTAGE TAP CONNECTIONS

- ##### **A. Connect all transformers at "normal" voltage tap. Measure and record secondary voltages of all transformers after the facility is completely energized. Forward a list to the Engineer for evaluation; reconnect taps as subsequently directed. All costs associated with this work shall be included in the basic bid.**

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 26 01 26 – Acceptance Testing of Electrical Systems
 - 2. Section 26 05 00 – Common Work Results for Electrical
 - 3. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
 - 4. Section 26 05 33 – Raceways and Boxes for Electrical Systems
 - 5. Section 26 05 48 – Seismic Controls for Electrical and Communications Work
 - 6. Section 26 05 53 – Identification for Electrical Systems
 - 7. Section 26 05 73 – Overcurrent Protection Device Coordination Study
 - 8. Section 26 43 13 – Transient Voltage Surge Suppression System
 - 9. Section 33 71 19 – Electrical Underground Ducts and Manholes
 - 10. Section 33 79 00 – Site Grounding

1.02 WORK INCLUDED

- A. The extent and location of “Low-Voltage Switchboards” Work is shown in the Contract Documents. This section includes a distribution switchboard rated 600V and less, 400 amp through 2000 amp, outdoor, circuit breaker type.
- B. DEFINITIONS
 - 1. TVSS: Transient voltage surge suppressor.

1.03 GOVERNING CODES, STANDARDS AND REFERENCES

- A. NEMA PB 2 (National Electrical Manufacturers Association) - Deadfront Distribution Switchboards,
- B. NEMA 250 (National Electrical Manufacturers Association) - Enclosures for Electrical Equipment (1000 Volts Maximum),
- C. NETA ATS (International Electrical Testing Association) - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems,
- D. NFPA 70 (National Fire Protection Association) - National Electrical Code,
- E. UL 891 (Underwriter's Laboratory) - Dead-Front Switchboards,

1.04 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.
- B. Submittals shall include the following:
 - 1. Product Data: For each type of switchboard, overcurrent protective device, TVSS device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

2. Manufacturer Seismic Qualification Certification: Submit certification that switchboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Section 26 05 48 - Seismic Controls for Electrical and Communication Work. Include the following:
 - a. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - b. The term "withstand" means "the unit will remain in place without separation of internal and external parts during a seismic event and the unit will be fully operational after the event."
3. Dimensioned Outline Drawings of Equipment Unit: Provide equipment weight, identify center of gravity and locate and describe mounting and anchorage provisions.
4. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
5. Field Test Reports: Submit written test reports and include the following:
 - a. Test procedures used.
 - b. Test results that comply with requirements.
 - c. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
6. Manufacturer's field service report.
7. Maintenance Data: For switchboards and components to include in maintenance manuals specified in Division 1 General Requirements. In addition to requirements specified in Division 1 General Requirements , include the following:
 - a. Routine maintenance requirements for switchboards and all installed components.
 - b. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 - c. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.05 QUALITY ASSURANCE

- A. Listing and Labeling: Provide switchboards that are Listed and Labeled as defined in NFPA 70, Article 100 and marked for intended use for the location and environment in which they are installed.
- B. Comply with NEMA 250, NEMA PB 2 and UL 891.
- C. Comply with NFPA 70, as adopted and administered by the Authority Having Jurisdiction. Particular attention is drawn to Article 384, "Switchboards and Panelboards"

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver in sections of lengths that can be moved past obstructions in delivery path. Shipping splits shall not exceed 72-inches.
- B. If stored in areas subjected to weather, cover switchboards to provide protection from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside switchboards; install electric heating (250W per section) to prevent condensation.
- C. Handle switchboards according to NEMA PB 2.1.

1.07 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following, unless otherwise indicated:
 - 1. Ambient Temperature: Not exceeding 104°F (40°C).
 - 2. Altitude: Not exceeding 1000 feet.

1.08 COORDINATION

- A. Coordinate layout and installation of switchboard and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required clearances for equipment access doors and panels, workspace clearances, and maintenance clearances for mechanical equipment.
- B. Coordinate size and location of concrete bases. Refer to Section 03 30 00 - Cast-in-Place Concrete for concrete, reinforcement, and formwork requirements.
- C. Provide dedicated electrical equipment space in accordance with NEC 110-26.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cutler-Hammer; Division of Eaton.
 - 2. General Electric (only if rated for 40°C ambient operation).
 - 3. Square D Co;
 - 4. Or Approved Equal.

2.02 MANUFACTURED UNITS

- A. Switchboard shall not require side or rear access unless engineering considerations dictate otherwise.
- B. Front-Connected, Front-Accessible Switchboard: Panel-mounted main device, panel-mounted branches, and with sections rear aligned.
- C. Nominal System Voltage: 480Y/277 Volts, 3-phase, 4-wire.
- D. Seismic Rating: Refer to Section 26 05 48 – Seismic Controls for Electrical and Communication Work.
- E. Operating Temperature: The entire switchboard shall be designed for continuous operation at nameplate rated values in an ambient temperature of 40°C.
 - 1. Maximum bus temperature shall not exceed 65°C rise over 40°C ambient.
- F. Main-Bus Continuous: 1600A rating.

2.03 FABRICATION AND FEATURES

- A. Enclosure: Steel: NEMA 250, Type 3R.
- B. Enclosure Finish for Outdoor Units: Factory-applied finish in manufacturer's standard color, including undersurfaces treated with corrosion-resistant undercoating.
- C. Space Heaters: Factory-installed electric space heaters of sufficient wattage in each vertical section to maintain enclosure temperature above expected dew point.

1. Space-Heater Control: Thermostats to maintain temperature of each section above expected dew point.
2. Space-Heater Power Source: 120V external branch circuit.
- D. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.
- E. Buses and Connections: Three-phase, four-wire, unless otherwise indicated. Include the following features:
 1. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity with feeder circuit-breaker line connections.
 2. Ground Bus: 1/4-by-2-inch minimum size, drawn-temper copper of 98 percent conductivity, equipped with pressure connectors for feeder and branch-circuit ground conductors.
 3. Contact Surfaces of Buses: Silver plated. NO ALUMINUM BUS WILL BE ALLOWED.
 4. Main Phase Buses, Neutral Buses, and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
 5. Neutral Buses: 100 percent of the ampacity of the phase buses, unless otherwise indicated, equipped with pressure connectors for outgoing circuit neutral cables. Bus extensions for busway feeder neutral bus are braced.
- F. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

2.04 TVSS DEVICES

- A. Refer to Specification section 26 43 13 Transient Voltage Surge Suppression System.
- B. Accessories shall include the following:
 1. Audible alarm activated on failure of any surge diversion module.
 2. Six-digit transient-counter set to totalize transient surges that deviate from the sine-wave envelope by more than 125V.

2.05 OVERCURRENT PROTECTIVE DEVICES

- A. Coordinate trip curves so that faults and shorts will clear at the nearest overcurrent device without tripping upstream devices.
- B. Feeder breakers rated 800A and less shall be group mounted.
- C. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
 1. Ampacity of Molded Case Circuit Breakers may be up to but not including 1200 amps. Comply with UL 489, with interrupting capacity to meet available fault currents.
 2. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 3. Ground-Fault Equipment Protection (GFEP) Circuit Breakers, where required: Class B ground-fault protection (30-mA trip).
- D. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
 1. Lugs: Mechanical style, suitable for number, size, trip ratings, and material of conductors.

2. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator. Settings shall be provided by Engineer of Record.

PART 3 - EXECUTION

3.01 PROTECTION

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

3.02 EXAMINATION

- A. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 INSTALLATION

- A. Install switchboards and accessories according to NEMA PB 2.1.
- B. Support switchboards on concrete bases, 3-1/2" nominal thickness. Comply with mounting and anchoring requirements specified in Section 26 05 48 - Seismic Controls for Electrical and Communication Work.
 1. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor bolts to elevations required for proper attachment to switchboards.
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.

3.04 CONNECTIONS

- A. Install equipment grounding connections for switchboards with ground continuity to main electrical ground bus.
- B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.05 PROTECTION

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

3.06 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components as specified in Section 26 05 53 - Electrical Identification.
- B. Identify switchboard name, designation, power source, source location and voltage.
- C. Label each switchboard circuit breaker with engraved laminated-plastic nameplate indicating current rating, load served and load location.
- D. Provide warning and caution signs where indicated or required by the Authority Having Jurisdiction.

3.07 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.
 2. Test continuity of each circuit.
- B. Testing: After installing switchboards demonstrate product capability and compliance with requirements.
1. Inspect accessible components for cleanliness, mechanical and electrical integrity, and damage or deterioration. Verify that temporary shipping bracing has been removed. Verify that no tools or loose parts are left in the equipment
 2. Inspect bolted electrical connections for completion and tightness.
 3. Perform a ground resistance test
 4. Check the operation at interlocks and switch mechanism.
 5. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Sections 7.1, 7.5, 7.6, 7.9, 7.10, 7.11, and 7.14 as appropriate. Certify compliance with test parameters.
 6. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 7. Megger test switchboard and feeders with all breakers open before energizing. Use 1000V Megger for 480V equipment.
 8. Verify proper phase rotation
 9. Check load balance. If load unbalance exceeds 10% notify the Engineer for remedial action required.
 10. Verify continuity of equipment grounds and bonding jumper.
- C. Infrared Scanning: Perform an infrared scan of switchgear two weeks after Substantial Completion and before final acceptance. Make bus joints and connections accessible to a portable scanner and perform scanning during a period of normal working load as advised by Port.
1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 2. Record of Infrared Scanning: Prepare a certified report that identifies switchboard checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken and observations after remedial action.

3.08 CLEANING

- A. On completion of installation, inspect interior and exterior of switchboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

3.09 STARTUP SERVICES

- A. Verify that switchboard is installed and connected according to the Contract Documents.
- B. Complete installation and startup checks according to manufacturer's written instructions.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 26 01 26 – Acceptance Testing for Electrical Systems
 - 2. Section 26 05 00 – Common Work Results for Electrical
 - 3. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
 - 4. Section 26 05 33 – Raceways and Boxes for Electrical Systems
 - 5. Section 26 05 48 – Seismic Controls for Electrical and Communications Work
 - 6. Section 26 05 53 – Identification for Electrical System
 - 7. Section 26 05 73 – Overcurrent Protective Device Coordination Study
 - 8. Section 26 43 13 – Transient Voltage Surge Suppression System
 - 9. Section 33 71 19 – Electrical Underground Ducts and Manholes
 - 10. Section 33 79 00 – Site Grounding

1.02 WORK INCLUDED

- A. Provide all panelboard equipment complete. All equipment shall be dead front type construction and shall bear the U.L. label. Load centers will not be acceptable.
- B. All panels provided for service entrance locations as defined by the NEC shall be provided with a UL label as Suitable for Use as Service Entrance Equipment (SUSE).

1.03 SHOP DRAWINGS

- A. Prepare and submit for review prior to manufacture. Include front view, dimensions, device sizes and layout, list of nameplates and all other information required to demonstrate conformance with contract documents.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Siemens
- B. General Electric
- C. Square D
- D. Cutler Hammer
- E. Approved Equal

2.02 PANELBOARD DESCRIPTION

- A. Voltage, arrangement, and capacity of bus and overcurrent protective devices shall be as shown on the drawings. Bus shall extend behind all spaces ready for future overcurrent protective devices.
- B. Buss bars shall be plated copper with ampere density not-to-exceed 1200/1000 amperes per square inch. Bussing will be 3 phase, 4 wire, or 1 phase, 3 wire, 100 percent neutral, braced to match the interrupting rating of the breakers.

- C. Provide multiple lugs where parallel or "feed-through" connections are shown on drawings.
- D. Provide separate neutral and ground buses at the bottom of each panelboard.

2.03 OVERCURRENT PROTECTIVE DEVICES

- A. The AIC rating of the panel shall be as specified on the drawings.
- B. Mount breakers in all panelboards so breaker handle operates in a horizontal plane. Provide common trip on all multiple pole breakers.
- C. All circuit breakers shall be solid state bolt-in type. All circuit breakers 200 amps and above shall be rated 100%.
- D. Circuit Breakers rated 15A through 30A shall be U.L. rated for 60/75 degree centigrade wire. Breakers 35A and larger shall be rated for 75 degree centigrade.
- E. Circuit breakers intended for switching 120 volt loads shall be switching duty rated (SWD).
- F. Provide "Spare" overcurrent devices, where noted on the drawings, complete and ready for future circuit connections.
- G. Provide "Space" for future overcurrent devices, where noted on the drawings. Space shall include all bussing and device mounting hardware. Provide approved coverplates or overcurrent devices in all spaces. Open spaces in the panel are not permitted.

2.04 ENCLOSURE GENERAL CONSTRUCTION

- A. Provide cabinets of sufficient dimensions to allow future addition of overcurrent devices within the panelboards. All panelboards shall be provided with door-in-door construction. Provide increased enclosure width required for installation of conduits.
- B. Provide panelboards NEMA 4X, gasketed, 316 stainless steel for use in a salt spray environment for exterior installations, and NEMA 1 for interior locations.
- C. All electrical distribution equipment locks shall be keyed identically.
- D. Fasten panelboard front with machine screws with oval counter-sunk heads, finish hardware quality, with escutcheons or approved trim clamps. Clamps accessible only when dead front door is open are acceptable.
- E. Surface mounted panelboards with fronts greater than 48 inches vertical dimension shall be hinged at right side in addition to hinged door over dead front. Provide three point latching mechanism with one T-handle operator.
- F. Provide matching trim of same height for adjacent panels or control devices in finished areas.
- G. Transient Voltage Surge Suppression (TVSS) equipment provided by the panelboard manufacturer shall have equal or better characteristics as identified in section 26 43 13.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

- A. Secure panelboards in place with top of cabinet at 6'-0", above finished grade unless otherwise noted. Top of cabinet and trim shall be level; trim and door shall fit neatly without gaps, openings or distortion.
- B. Top edges of adjacent panels shall be even.
- C. Securely anchor panelboards to structural framing with stainless approved fasteners and concealed bracing as required. Provide painted stainless steel channel support framing with

concrete pad or anchor base where panelboard(s) are free standing. Submit support rack shop drawings for approval prior to fabrication.

3.02 CIRCUIT INDEX

- A. Each panelboard shall be provided with a typewritten index listing each circuit in the panel by number, with its proper designation. Listing shall match circuit breaker arrangements, with odd numbers on the left and even numbers on the right. Mount index with a transparent protective cover inside the cabinet door.
- B. Contractor shall provide a typed duplicate index for each panel in the O & M manuals.

3.03 PANELBOARD NAMEPLATE

- A. Provide phenolic engraved nameplate for each panelboard. See Section 26 05 00.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 26 05 00 – Common Work Results for Electrical
 - 2. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
 - 3. Section 26 05 33 – Raceways and Boxes for Electrical Systems
 - 4. Section 26 05 48 – Seismic Controls for Electrical and Communications Work
 - 5. Section 26 05 53 – Identification for Electrical System
 - 6. Section 26 09 23 – Lighting Controls
 - 7. Section 33 79 00 – Site Grounding

1.02 WORK INCLUDED:

- A. The extent and location of “Cabinets and Enclosures” Work is shown in the Contract Documents. This section includes hinged cover enclosures, cabinets, terminal blocks, and accessories.

1.03 GOVERNING CODES, STANDARDS AND REFERENCES

- A. NECA (National Electrical Contractors Association) - National Electrical Installation Standards
- B. NEMA 250 (National Electrical Manufacturers Association) - Enclosures for Electrical Equipment (1000 Volts Maximum)
- C. NEMA ICS 4 (National Electrical Manufacturers Association) – Application Guideline for Terminal Blocks.
- D. NFPA 70 (National Fire Protection Association) - National Electrical Code

1.04 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections:
- B. Submittals shall include the following:
 - 1. Product Data: For enclosures, cabinets, and terminal blocks.
 - 2. Manufacturer’s Installation Instructions, including storage, handling, protection, examination, preparation, and installation of product.

1.05 QUALITY ASSURANCE

- A. Listing and Labeling: Provide products that are Listed and Labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Authority Having Jurisdiction, and marked for intended use for the location and environment in which they are installed.
- B. Comply with NECA’s “National Electrical Installation Standards.”
- C. Comply with NFPA 70, as adopted and administered by the Authority Having Jurisdiction.

PART 2 - PRODUCTS

2.01 HINGED COVER ENCLOSURES

- A. Construction: NEMA 250, Type 1, except as noted below, with continuous hinge cover and flush latch.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Application in other than NEMA 250, Type 1 environments:
 - a. Outdoor Locations: NEMA 250, Type 4X, stainless steel with continuous hinge cover with door clamps.

2.02 CABINETS

- A. Cabinets: NEMA 250, Type 1, except as noted below, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 1. Hinged door in front cover with flush latch and concealed hinge.
 - 2. Include metal barriers to separate wiring of different systems and voltage.
 - 3. Application in other than NEMA 250, Type 1 environments:
 - a. Outdoor Locations: NEMA 250, Type 4X, stainless steel with continuous hinge cover with door clamps.

2.03 TERMINAL BLOCKS

- A. Minimum 600-volt rating for 480-volt circuits.
- B. Clamp or screw terminals sized for maximum conductor size.
- C. Separate connection point for each conductor.
- D. Ten percent spare terminal points.
- E. Individual identification for each terminal block.
- F. Phenolic block separators or barriers to isolate low-voltage and control terminations from analog and DC circuits.
- G. Terminal Blocks: NEMA ICS 4.
- H. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts.
- I. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts.
- J. Provide ground bus terminal block, with each connector bonded to enclosure.

2.04 PLASTIC RACEWAY

- A. Plastic channel with hinged or snap-on cover.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces to receive enclosures, and cabinets for compliance with installation tolerances, access and working clearances. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 EXISTING WORK

- A. Clean and repair existing cabinets and enclosures which remain or are to be reinstalled.

3.03 INSTALLATION

- A. Install enclosures and cabinets as indicated, according to manufacturer's written instructions and in accordance with NECA "National Electrical Installation Standards."
- B. Install enclosures and cabinets plumb and level. Anchor securely under the provisions of Section 26 05 48 - Seismic Controls for Electrical and Communication Work.

3.04 IDENTIFICATION

- A. Provide labels for enclosures and components as specified in Section 26 05 53 - Electrical Identification.
- B. Control Panels: Include panel designation, power source location, panel designation and circuit number.

3.05 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.
 - 1. Repair damage to finishes with matching touchup coating recommended by manufacturer.

3.06 CLEANING

- A. On completion of installation, clean electrical parts and remove conductive and harmful materials
- B. Remove dirt and debris from enclosure.
- C. Clean finishes and touch up damage.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 26 01 26 – Acceptance Testing of Electrical Testing
 - 2. Section 26 05 00 – Common Work Results for Electrical
 - 3. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
 - 4. Section 26 05 33 – Raceways and Boxes for Electrical Systems
 - 5. Section 26 05 53 – Identification for Electrical Ssystem
 - 6. Section 33 79 00 – Site Grounding

1.02 WORK INCLUDED:

- A. Provide all wiring devices and plates for a complete installation.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections:
 - 1. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

- A. Hubbell
- B. G.E. Wiring Devices
- C. Leviton
- D. Pass & Seymour
- E. Crouse-Hinds
- F. Approved Equal

2.02 MATERIALS:

- A. Wiring devices shall be specification grade, and the product of a nationally recognized manufacturer regularly engaged in their production.
- B. All wiring devices specified in this section shall be the product of one manufacturer. Each type shall have identical appearance and characteristics.

2.03 SWITCHES AND RECEPTACLES:

- A. Ivory, toggle type, 20A, 277V.
- B. Ivory duplex 20A, 125V, specification grade with GFCI with trip indicator light for installation outdoors or as required by the NEC.
- C. Ivory duplex, 20A, 125V, specification grade for installation indoors.
- D. Bull rail receptacles used for heat trace tape, ivory, duplex 20A, 208V, specification grade with GFCI with trip indicator light.

- E. All switch and receptacle covers shall be NEMA 3R "In Use".
- F. 200A, 600V, 3-wire, 4-pole, pin and sleeve receptacle with shell grounding, rain tight construction with back box, angle adapter, and clamp cover.

PART 3 - EXECUTION

3.01 MOUNTING:

- A. Rigidly fasten each device to auxiliary pole, non-metallic strut or painted galvanized steel strut.

3.02 RECEPTACLE GROUNDING:

- A. Provide bare bonding wire between receptacle grounding terminal and box.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 26 05 00 – Common Work Results for Electrical
 - 2. Section 26 05 13 – Medium Voltage Cables and Accessories
 - 3. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
 - 4. Section 26 24 13 – Low-Voltage Switchboards
 - 5. Section 26 24 16 – Panelboards
 - 6. Section 33 77 00 – Medium Voltage Switchgear and Protection Devices

1.02 SUMMARY

- A. This Section describes the materials and installation requirements for Surge Protective Devices (SPD). SPD's are used for the protection of all AC electrical circuits from the effects of lightning induced currents, substation switching transients and internally generated transients resulting from inductive and/or capacitive load switching.
- B. This specification also describes the mechanical and the electrical requirements for the SPD. The SPD shall be suitable for application in both category B and C environments as described in ANSI/IEEE C62.41- 2002.
- C. The Manufacturer/Vendor shall furnish all of the necessary SPD products and related hardware (i.e. flush mounting kits, mounting brackets, etc.) as required for the installation of surge protective devices.

1.03 DEFINITIONS

- A. ATS: Acceptance Testing Specifications.
- B. VPR: Voltage Protection Rating.
- C. SPD: Surge Protective Device, replacement acronym for TVSS: Transient Voltage Surge Suppressor
- D. CLF: Component Level Fusing
- E. LIC: Low Impedance Cable
- F. SCCR: Short Circuit Current Rating

1.04 REFERENCE STANDARDS

- A. All manufacturers must comply with the standards listed below and any additional current revisions of industry standards. All products that do not comply with current industry standards will not be accepted.
 - 1. Underwriters Laboratories 1449 – (UL 1449) 3rd Edition
 - 2. NEC article 285. National Electrical Code 2014
 - 3. NFPA 780 Standard for the installation of lightning protection systems
 - 4. UL96A – Lightning Protection System Master Label

5. IEEE (Institute of Electrical and Electronic Engineering Inc.) Latest Revision C62.41.1, C62.41.2, C62.45, C62.33 & C62.35
6. Previous NEMA LS-1 testing standards
7. ISO 9001 (International Organization for Standardization) Quality Systems – Quality Management System

1.05 SUBMITTALS

- A. Submittals shall include written specification response referencing each specification section and sub-section indicating compliance or non-compliance. If manufacturer cannot fully comply with specification section, this must be stated in the response along with a full description of the variance. Submittal responses shall be signed by manufacturer's VP of Engineering or Product Line Manager.
- B. Submit the following information, indexed by response and test results.
 1. Specification compliance response sheet referencing each specification section.
 2. Proof of UL1449 Third Edition compliance from Nationally Recognized Test Lab (NRTL) accepted by local authority having jurisdiction. UL1449 Third Edition Nominal Discharge Current Rating and Voltage Protection Ratings shall be provided.
 3. Published specifications, cut sheets & product data with appropriate IEEE C62.41 & UL1449 Third Edition performance ratings for intended installation locations.
 4. Electrical and mechanical shop drawings.
 5. Installation requirements/instructions.
 6. Operations & maintenance manuals.
 7. Performance / warranty information.

1.06 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Manuals
- B. Warranty Documentation

1.07 DELIVERY, STORAGE AND HANDLING

- A. Inspect for damage and replace any damaged device.
- B. Store in a clean, dry space suitable for equipment and protect against damage.
- C. Clean equipment and touch up minor scratches using suitable materials.

1.08 QUALIFICATIONS

- A. Manufacturer shall have local representation and distribution within 400 miles of the project location to provide technical, warranty claim, and installation support for the project.
- B. Manufacturer/vendor must be capable of supplying SPD for project within 30 days of receipt of order for orders of 25 units and less for models submitted in response to this specification.
- C. Manufacturers shall be certified to latest ISO 9001 standard and shall be registered for the design and manufacturing of SPD devices.
- D. Manufacturer shall provide access to a readily available factory engineer for answering questions about this product.
- E. Manufacturer qualifications shall be provided as part of the submittal.

- F. The successful manufacturer/vendor shall assign a technical contact person for SPD application, installation and warranty questions. This contact shall be available to provide a response to a technical question within a maximum of two business days.
- G. All SPDs for this project must be supplied by the same manufacture.

PART 2 - PRODUCTS

2.01 MANUFACTURES/MODELS OR APPROVED EQUAL

- A. Total Protection Solutions – Contact Power Solutions NW (206) 930-1980.

Total Protection Solutions (TPS) ServiceTrack & LowProfile Series			
<u>Voltage</u> Application	<u>480Y277v</u> 3 Phase Wye	<u>208Y120v</u> 3 Phase Wye	<u>120/240v</u> 1 Phase
Main Services	ST240- 3Y480-FL	ST240- 3Y208-FL	ST240-1S240-L
Distribution & Branch Panels	LP120-3Y480-FL	LP120- 3Y208-FL	LP120- 1S240-L
Use Delta units for all unbonded/ungrounded & high resistance ground Wye applications.			

- B. Low Impedance Cable: Required for all installations with lead lengths over 36"

- 1. Total Protection Solutions (TPS)
 - a. Main Services – LIC-6X-xx
 - b. All other applications – LIC-10X-xx
 - c. (Where xx denotes length in feet; 5', 10', 15')

2.02 SURGE CURRENT RATINGS

- A. Minimum Single Impulse Ratings with Independent testing per previous NEMA LS1.

Main Services	240kA per Phase, 120kA per Mode
Distribution & Branch Panels	120kA per Phase, 60kA per Mode

2.03 TYPE

- A. External, non-modular SPD/TVSS required for all applications (not integrated with gear/panels) connected in parallel to switchgear via dedicated circuit breaker.

2.04 LISTINGS: UL1449 3RD EDITION, UL96A & NFPA 780 (OR CURRENT REVISION)

- A. Type 1 & 2: Suitable for applications including direct buss connection with no additional overcurrent protection requirements.
- B. Nominal Discharge Current (In): 20kA for Main Service and 10kA for all other applications (for compliance to NFPA 780, NEC 280 and UL96A Lightning Protection Master Label).
- C. SCCR: 200KA Short Circuit Current Rating with no additional/external overcurrent protection.

2.05 MODES OF PROTECTION - ALL MODES FOR ALL CONFIGURATIONS AND

- A. WYE: Discrete MOV Line to Neutral, Line to Ground, Neutral to Ground
- B. Delta: Discrete MOV Line to Line & Line to Ground

- C. Sinewave tracking transient filter protection for all modes on Wye & L-L for Delta.

2.06 LOW IMPEDANCE CABLE (LIC):

- A. An LIC must be available from the SPD manufacture that reduces effective lead impedance by 75%, and be used for all SPD installations with lead lengths exceeding 36".

2.07 DURABILITY TESTING

- A. TVSS/SPD devices shall withstand a minimum of 5,000 hits delivered at a rate of one pulse per minute. Unit shall not fail or suffer let through voltage degradation of more than 7%. Lead length for testing and let through measurements shall be 6".

2.08 COMPONENT LEVEL FUSING

- A. Balanced array MOV based SPD/TVSS with individual Component Level Fusing (Oxygen Free High Conductivity [OFHC] elements in silica sand) are required for all components.

2.09 SPD MUST NOT HAVE, USE OR REQUIRE ANY OF THE FOLLOWING

- A. Board trace fuses, crowbar type gas tube arrestors or SAD devices are not allowed.
- B. Integrated primary overcurrent protection Fuses or Circuit Breakers are not allowed.
- C. SPDs with external over-current protection requirements (UL Type-2 listing only) are not allowed.

2.10 SAFETY

- A. SPD must not fail catastrophically when a continuous over-voltage is applied to 6 modes simultaneously (Line-Neutral & Line-Ground * 3 Phases). UL1449 only requires one mode be tested at a time.

2.11 MONITORING

- A. Green "Phase Status" LEDs, Red "Service Required" LED, Dry Contacts & Audible Alarm w/silence button are required. SPD must not rely solely on primary overcurrent protection (no CLF), as this will likely open up on SPD failure, thus disabling the alarm (no power, no alarm).

2.12 SERVICE CONDITIONS

- A. SPDs shall be rated for continuous operation under the following conditions, unless otherwise indicated:
 1. Maximum Continuous Operating Voltage (MCOV) above nominal – Minimum 115%.
 2. Enclosures: Heavy duty, powder coated steel with appropriate NEMA rating for application.
 3. Operating Temperature: 30 to 120 deg F (0 to 50 deg C).
 4. Humidity: 5 to 95 percent, non-condensing.
 5. Altitude: Up to 13,000 feet (4,000 m) above sea level.
 6. Noise Level: SPD shall not emit any audible noise unless "in alarm" indicating a "service required" condition.

2.13 DIMENSIONS (MAXIMUM):

- A. SB – 16"Hx13"Wx7"D; Dist/Branch – 4"Wx4"Dx10"H. Compact SPD dimensions are critical for achieving installations with short leads.

2.14 FLUSH COVER PLATE

- A. Manufacture shall provide smoked acrylic cover plates for flush mounting applications.

2.15 MAXIMUM LET THROUGH VOLTAGES (LTV)

A. Tested w/6" leads & 500MHz Scope from 0 ref per NEMA-LS1

SERVICE APPLICATIONS

Voltage Configuration	Test Waveform	L-N	L-G	L-L	N-G	Phase °
480/277 Wye	IEEE C3 – 20 kV/10ka				1500	90°
	UL VPR – 6 kV/3kA	820	996	1497	899	90°
	IEEE A1 – 2kV – 67A	44	77	54	52	180°
120/208 Wye 120/240	IEEE C3 – 20 kV/10kA	907	1173	1267	1090	90°
	UL VPR – 6 kV/3kA	502	627	864	568	90°
	IEEE A1 – 2kV – 67A	40	76	54	46	180°
	IEEE C3 – 20 kV/10kA	907	1173	1267	1090	90°
	UL VPR – 6 kV/3kA	502	67	864	568	90°
	IEEE A1 – 2kV – 67A	40	76	54	46	180°

DISTRIBUTION & BRANCH PANEL APPLICATIONS

480/277 Wye	UL VPR – 6 kV/500A	670	785	1020	324	90°
	IEEE A3 – 6kV – 200A	71	119	73	67	180°
	IEEE A1 – 2kV – 67A	27	52	39	48	180
120/208 Wye 120/240	UL VPR – 6 kV/500A	437	592	612	324	90°
	IEEE A3 – 6kV – 200A	56	81	88	112	180°
	IEEE A1 – 2kV – 67A	29	46	39	40	180°
	UL VPR – 6 kV/500A	437	592	612	324	90°
	IEEE A3 – 6kV – 200A	56	81	88	112	180°
	IEEE A1 – 2kV – 67A	29	46	39	40	180°

2.16 WARRANTY

A. Warranty:

1. SPD Manufacturer's Warranty: shall provide a product warranty for a period of not less than thirty (30) years from date of installation. Warranty shall cover unlimited, complete replacement of TVSS devices during the warranty period with no exceptions for lightning, utility accidents etc.
2. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents. Those firms responding to this specification shall provide proof that they have been regularly engaged in the design, manufacturing and testing of TVSS for not less than five (5) years.

PART 3 - EXECUTION

3.01 PRE-INSTALLATION

- A. Training: Onsite installation training for the contractor must be provided by the SPD supplier.
- B. Review all installation information in manufacturer's installation manual prior to installing SPD's

3.02 INSTALLATION

A. GENERAL

1. Verify all voltages before connecting to avoid injury and damage to equipment.
2. The SPD's shall be installed external to switchboard, distribution and panelboard.
3. Internally mounted SPD's will not be accepted.
4. Ground resistance shall be 25 ohms or less per NEC Article 250.56
5. Suppressors shall be installed per the manufacturer's installation instructions and the requirements of: the NEC, the local authority having jurisdiction and the Engineer.
6. The Engineer or their appointed representative may perform inspection of the installed suppressors and reserves the right to require corrections to the installation to comply with manufacturer's installation requirements and project specifications.
7. The SPD/TVSS supplier must provide on-site installation training for the electrical contractor.
8. All circuit breakers feeding SPDs must have locking safety clips installed to prevent the circuit breaker from inadvertently being turned off.

B. SECONDARY SPDs FOR DISTRIBUTION & BRANCH PANELS

1. Install one secondary suppressor at each Switchboard, Panelboard, & MPZ Panel location as indicated on the drawings.
2. Provide a 30 Amp circuit breaker (with a safety clip to ensure the circuit breaker cannot be inadvertently turned off) in the panel being protected as over-current protection for the wire and as a disconnecting means for the SPD.
 - a. Only UL1449 Type-1 devices are allowed, so by definition of Type-1, the manufacture cannot have any external overcurrent protection requirements. If the SPD manufacture does have external overcurrent protection requirements, that SPD equipment will not be accepted.

3. Conductors between suppressor and point of attachment to the panelboard shall be kept as short and straight as possible. Mount the TVSS directly adjacent to the circuit breaker closest to the neutral bus, such that the maximum length of all connecting wiring is kept as short as possible, not exceed 18 inches.
4. Over-length SPD leads (greater than 18") must be twisted together (2 twists/foot) and securely tie-wrapped once per foot to reduce impedance of the leads. Quality compression butt-splice connections are required when extending SPD leads (wire nuts are not acceptable).
5. Grounding: Suppressor's ground lead shall be bonded to the panel enclosure with a small ground lug as close as possible to the TVSS mounting point. Conduit between the TVSS/SPD and the switchboard must provide secure electrical/mechanical connections.

3.03 FIELD QUALITY CONTROL

- A. A factory authorized representative shall inspect and photograph all SPD installations and report findings in writing to the Engineer.

3.04 STARTUP SERVICE

- A. Do not energize or connect panelboards to their sources until SPD's are installed and connected.
- B. Do not perform insulation resistance "Hipot" tests of the distribution wiring with the SPDs installed/connected. Disconnect before conducting insulation resistance tests, and reconnect immediately after the testing is over.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
1. Section 26 05 00 – Common Work Results for Electrical
 2. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
 3. Section 26 05 33 – Raceways and Boxes for Electrical Systems
 4. Section 26 05 48 – Seismic Controls for Electrical and Communications Work
 5. Section 26 09 23 – Lighting Controls
 6. Section 33 71 19 – Electrical Underground Ducts and Manholes
 7. Section 33 79 00 – Site Grounding

1.02 WORK INCLUDED:

- A. Remove and relocate seven (6) existing 110' steel, flood light poles, Clean all existing high mast lighting fixtures. Remove and dispose of one steel lighting pole and relocate the eight (8) flood light fixtures on the pole to other poles being relocated. See the key notes on the drawings for the poles to be removed and disposed of or removed and relocated.
- B. Relocate existing flood light fixtures on the poles being removed or relocated, and provide flood light fixtures such that the relocated poles have the quantity of fixtures as indicated below.

EXISTING INSTALLATION

POLE	"WHARF" FIXTURES	"YARD" FIXTURES	"SECURITY" FIXTURES
YL05		14	2
YL12		20	2
WYL01	10	10	4
WYL02	10	10	4
WYL03	8	10	4
WYL04	10	8	4
WYL05		12	3
Pole at South End of Pier 3	8		
SUB-TOTAL	46	84	23

FINAL CONFIGURATION

POLE	"WHARF" FIXTURES	"YARD" FIXTURES	"SECURITY" FIXTURES
YL05	10	10	2
YL12		16	2
WYL01	10	10	4
WYL02	10	10	4
WYL03	10	10	4
WYL04	10	10	4

WYL05	10	10	3
SUB-TOTAL	60	76	23

- C. Contractor shall provide new anchor bolts for all re-located light poles. See Structural Drawings Sheet S45.1 for painting and new concrete pole base requirements.
- D. Light fixture manufacturer shall provide contractor with a computer generated photometric plan (initial and maintained) along with aiming coordinates for each lighting fixture.

1.03 LIGHTING PERFORMANCE:

- A. Contractor prior to removing existing light pole(s) and lights shall field measure light levels on wharf and yard areas. Measurements shall be taken on 20' X 20' grid in a area roughly 800' square with poles at quarter points.
- B. The lighting fixture manufacturer shall supply lighting equipment and computer generated point by point analysis(s) to meet the following:
 - 1. Performance Criteria – Container Yard Wharf
 - a. The performance criteria requires lighting equipment which will provide initial minimum light levels of 6 footcandles in the container yard and 4 footcandles at the Wharf bullrail, disregarding obstructions. A maintenance factor of .8 is to be used in determining the initial light value after adjustment for a tilt factor. These initial light levels shall provide a maintained lighting level of 5 footcandles in the container yard and 3 footcandles at the Wharf bullrail. The light levels are to be stated in the numeric values to be obtained during the initial hours of the operation of the lighting system.
 - b. Uniformity ratio. The footcandle level shall have a uniformity ratio of average to minimum of not greater than 4.5:1 or better.
 - 2. Spill/Glare Light - Designated Areas
 - a. Maximum spill light values - light levels shall not exceed the designated maximum footcandles or average footcandles shown below. These levels shall be shown are initial footcandles and shall be measured at a distance of 100 feet from the Wharf only.

From Defined Boundary	Horizontal Footcandles	Footcandles with meter aimed toward brightest light bank
Maximum Footcandles	.19	.72
Average Footcandles	.08	.34

- b. Arc Tube Brightness (Luminance):

No portion of any arc tube shall be visible beyond 12 degrees vertical and 35 degrees horizontal measured from the center axis line of the light out put in the direction of the defined problem.

- C. Point By Point Analysis

- 1. Computer Models - Test Stations
 - a. Field test stations for the horizontal field measurements shall consist of points on an equally spaced 20' by 20' grid.

- b. Spill/glare test stations shall consist of horizontal footcandles and maximum footcandles on a line as defined in 1.03 B, 2a above from the boundaries noted. Horizontal maximum footcandle readings shall be shown every 30 feet on the line.
 - c. Pole orientation shall be such that the flood light horizontal structural steel support arms are parallel to the Wharf for all poles.
 - d. Light fixture manufacturer shall provide a written guarantee of the light levels submitted.
 - e. All photometric calculations shall include light loss factors for all light fixtures assumed to have internal louvers and glare shields.
- D. All information required in Paragraphs 1.03 A, B and C above shall be provided for Engineers review and approval along with light fixture, lamp and ballast catalog data.

PART 2 - PRODUCTS

2.01 LIGHTING PERFORMANCE AND MEASUREMENTS:

- A. Test and Measurement Procedures
- 1. All testing will be done with entire facility illuminated.
 - 2. Horizontal footcandle readings shall be taken with the meter positioned horizontal 36 inches above grade. Maximum footcandles shall be taken with the test cell positioned 36 inches above grade and aimed at the brightest light source.
 - 3. Ambient light levels shall be measured at the specified test stations. Maximum ambient footcandle level explored in all planes for each test station shall be recorded. Once the maximum spill light readings as defined have been recorded, subtract the ambient light readings from the respective footcandle readings at each test station.
 - 4. Testing equipment for measurement of footcandle levels shall be a calibrated Gossen Panalux Electronic 2 light meter or an approved equal. For final approval of the project the manufacturer shall provide a final report from the test results that shall provide the following items:
 - a. Identification of number and location of the test stations.
 - b. Actual horizontal footcandle readings taken at each test station.
 - c. Actual spill/glare footcandle readings taken at each test station.
 - d. Total of hours of operation for the lighting system at the time of test readings.
- B. In event the measured values do not meet specified levels adjusted up from maintained to initial levels, then Contractor after reviewing the uniformity ratio as calculated and the measured results, shall generate a new aiming diagram, and a computer plot to the satisfaction of the Engineer before re-aiming the fixtures. Contractor shall then re-aim and retest the fixtures at no additional cost to the Port.

2.02 MATERIALS:

- A. Exterior Fixtures
- 1. Housings and appurtenances shall be corrosion resistant materials, such as non-ferrous metal, stainless steel, lexan or ferrous metal with approved special finish. All exterior fixtures shall be suitable for outdoor service without tarnishing or other damage due to exposure.

2. Zinc or cadmium plate all metal parts concealed by canopies, including screws, plates, brackets and back boxes.
3. Mounting hardware shall be galvanized steel, steel with powder coat finish, stainless steel or anodized aluminum. All screws shall be stainless steel.
4. Provide manufacturer's standard colors.

2.03 FLOODLIGHTS AND MOUNTING HARDWARE:

A. General Description:

1. The luminaire assembly shall consist of lamp, lamp socket, reflector, lens, internal louvers, glare shield, integral ballast housing, adjustable aiming mounting devices, galvanized steel fixture support assemblies, wiring, and assembly mounting hardware. The existing floodlighting fixtures were updated from a 1000W High Pressure Sodium to a 775W Metal Halide. The existing floodlighting fixtures were GE # PP1K-1000-HPS-480-A-1-6X5-6X5-Gray-F.

B. Ballast Housing:

1. The ballast housing shall be heavy die-cast aluminum uniformly finished inside and outside using an epoxy-acrylic electro-coat paint finish. Paint adhesion shall be tested in accordance with ASTM B117 Salt Fog test and shall successfully pass this test. It shall have a formed aluminum front access wiring compartment panel so that the ballast can be serviced without disturbing aiming of the optical assembly. The panel fastener hardware shall be captive to prevent loss during installation and maintenance. Make-up wiring leads shall be pre-stripped and protected using a weather resistant strain relief bushing in accordance with U.L. 1572.
2. It shall have a heavy gauge formed steel trunnion. The trunnion shall be finish coated with a zinc rich epoxy powder thermo-setting overcoat for corrosion resistance and meet ANSI Salt Fog adhesive polymer over coated with an inter-metallic undercoat to resist galvanic corrosion and for ease of maintenance.
3. The ballast housing shall include an aiming degree marker to facilitate re-aiming following re-lamping. Additionally, an integral retractable two element aiming sight shall be provided on the lamp housing.
4. In order to insure adequate heat dissipation, each ballast shall be mounted within its own enclosure and installed to provide maximum surface area exposure of the enclosure to ambient air. Under no condition shall multiple ballasts be permitted in the same enclosure.

C. Lamp Sockets:

1. The mogul base lamp socket shall be heavy-duty porcelain. It shall be constructed with a nickel plated tempered brass, split screw shell to insure proper axial lamp positioning, compatibility with lamp base materials, and to prevent lamp backout caused by vibration.
2. The nickel plated tempered brass center electrical contact shall be spring loaded, free floating, flat surfaced to insure good electrical contact and compatibility with the lamp base center contact. Electrical connection to the socket shall not be welded, riveted or use screen termination.

D. Electrical Specifications:

1. The ballast shall be capable of starting and operating one pulse start metal halide lamp of the required wattage from a nominal 480 volt, 60 Hz power source.

2. The ballast shall be in full compliance with lamp/ballast specifications available to the fixture manufacturer from the lamp manufacturer at time of manufacture. The ballast must protect itself against normal lamp failure modes and be capable of operation with the lamp in open condition for six (6) months without accelerated loss of ballast life. The ballast shall be capable of a 2500 volt RMS, one minute applied potential (high pot) test and 10,000 volt transient insulation level (til) test in accordance with ANSI C82.4, C82.6 and C92.1 specifications.
3. The ballast design center shall not vary more than $\pm 5\%$ from rated lamp wattage for nominal line voltage and nominal lamp voltage when operated hot in the fixture. Lamp wattage regulation shall not exceed 30% for $\pm 10\%$ line voltage variation when measured with a nominal reference lamp in accordance with ANSI C82.4 and C82.6 specifications.
4. The ballast shall reliably start and operate the lamp in ambient temperatures down to -20 degree F for the rated life of the lamp. The ballast primary current during starting and open circuit conditions must not exceed normal operating current. The ballast shall be capable of sustaining lamp operation with a line voltage dip or sag of 20% for up to 4 seconds when operating a nominal voltage lamp with ANSI C82.6 specifications.
5. The ballast crest factor shall not exceed 1.8 for $\pm 10\%$ line voltage variation, including lamp starting, or from nominal lamp voltage throughout rated end of life lamp voltage as defined by ANSI C82.4 specifications. The line power factor of the lamp/ballast system shall not be less than 90% for $\pm 10\%$ line voltage variation in accordance with ANSI C82.6 specification.

E. Fusing:

1. All 480 volt ballasts shall have fuses to isolate a burned out ballast. Fuse shall be located in the fixture or the cross arm.

F. Optical Assembly:

1. The General Purpose Standard Optical Assembly: Shall be a one piece symmetrically spun, parabolic aluminum reflector. It shall be uniformly coated inside and outside with a 95% pure potassium silicate chemically bonded corrosion resistant transparent glass finish or ALZAK finish.
2. The optical assembly shall include an impact and thermal resistant tempered glass lens. The lens shall be mounted in a corrosion resistant steel hinged door secured to the optical assembly with a permanently mounted hinge mechanism with 3 or more ASTM series 400, stainless steel spring latches. The lensed door when closed shall be sealed to the optical assembly with a molded concentric butt-welded high temperature, solid silicone gasket. The optical assembly design shall include a granular charcoal or fine fiber filtration system, in addition to silicone gasketing, to protect internal reflective surfaces from photometric degradation caused by the entry of particulate atmosphere environmental pollutants.
3. The optical assembly shall include a thermal resistant, vibration dampening lamp support positioned at the lamp base so as not to interfere with light distribution. It shall be covered by a Fiberglass, thermal protective sleeve that will prevent damage to the lamps outer glass envelope.

2.04 LAMP SPECIFICATION:

A. General:

The lamp shall be 775 watt pulse start metal halide rated at least 66,000 Lumens and be manufactured to current industry standards. Lamp construction shall be such that it is capable

of operation in the lighting fixture without need for special retaining devices installed in the fixture.

B. Availability:

The lamps used for this project must be commercially available at common sources of supply. The manufacturer shall submit the names, addresses and telephone number of three local lamp suppliers along with submittal package.

PART 3 - EXECUTION

3.01 SETTING POLES:

- A. All pole bases shall be carefully set to within 2 feet of designated spot. Refer to civil site plans and specifications for exact locations and backfill compaction requirements.
- B. Anchor bolts shall be installed using approved pole manufacturer supplied templates.
- C. Luminaire poles shall be installed plumb; utilize approved leveling nuts and/or baseplates.
- D. New pole bases shall be painted with color to match existing bases.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 26 05 00 - Common Work For Electrical
 - 2. Section 26 05 53 – Identification for Electrical Systems
 - 3. Section 33 79 00 – Site Grounding
 - 4. Section 27 05 28 – Communications Pathways
 - 5. Section 27 13 00 – Backbone Cabling Requirements

1.02 SUMMARY OF WORK

- A. The extent and location of “General Communications Requirements” Work is shown in the Contract Documents. Section includes, but is not limited to, general requirements for communications and electronic installations. The Work includes:
 - 1. Provide and install pathways for Backbone fiber optic and UTP cabling.
 - 2. Splice/Terminate fiber optic cable in communications rooms and cabinets.
 - 3. Provide testing of communication components and systems to meet warranty requirements. Coordinate with the Engineer for UTP and fiber optic cable testing.
 - 4. Provide and install labels.
 - 5. Contractor to provide as-built labeling information to Engineer within three (3) days of project completion.
 - 6. Coordinate with the Engineer for use of existing cable pathways (underground ducts) to install portions of the cabling.
 - 7. Comply with low-voltage grounding specifications in Section 26 05 26 - Grounding.

1.03 GOVERNING CODES, STANDARDS AND REFERENCES

- A. ANSI/TIA/EIA-568-B, Commercial Building Telecommunications Cabling Standard.
- B. ANSI/TIA-606-A Administration Standard for Commercial Telecommunications Infrastructure
- C. ANSI/TIA-758-A, Customer-Owned Outside Plant Telecommunications Infrastructure Standard.
- D. BICSI (Building Industry Consulting Services International): Comply with the most current editions of the following BICSI manuals:
 - 1. BICSI - Telecommunications Distribution Methods Manual
 - 2. BICSI – Outside Plant Design Reference Manual
 - 3. BICSI -Electronic Safety and Security Design Reference Manual
- E. Underwriters Laboratories (UL) Cable Certification and Follow-Up Program.
- F. National Electrical Manufacturers Association (NEMA)
- G. American Society for Testing Materials (ASTM)
- H. National Electrical Code (NEC) with applicable edition year

- I. National Electrical Safety Code (NESC) with applicable edition year
- J. Institute of Electrical and Electronic Engineers (IEEE)
- K. UL Testing Bulletin
- L. ETL Testing Laboratories
- M. Federal Communications Commission (FCC)
- N. Washington State Department of Labor and Industries

1.04 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections:
 - 1. Product Data: For each type of product indicated.

1.05 DEFINITIONS FOR INFRASTRUCTURE

- A. The following UTP cables shall be utilized for BACKBONE cable infrastructure
 - 1. Voice circuits (Outside Plant [OSP] applications): 12-pair Category 3 (Cat 3)
 - a. Terminate Source (Husky Administration Building Communication Rm.) to type 66 wiring block.
 - b. Terminate Destination to type 66 wiring block.
 - c. OSP applications shall follow required protector panel setup at each end of cable
 - 2. The following Fiber Optic (FO) cables shall be utilized for BACKBONE applications such as Port backbone additions or new construction of MDR to ER, ER to ER, and ER to TE. Also, Tenant Demarcation Work of ER to Equipment panel or cabinet. Minimum fiber to be installed is 12 strands, fully terminated.
 - a. Minimum Fiber Backbone (FB): Minimum strand count is 6 strands Singlemode Fiber (SMF). Refer to E8 Series drawings for conduit and conductor schedules.
 - b. Terminate SMF first in any Fiber Optic Patch Panel (FOPP)
 - c. Strand counts over 36 SMF shall terminate to separate FOPP's.
 - d. Fiber optic cables
 - 1) Terminate Sources (Husky Administration Building Communication Room or Marine Operations Building IT Room).
 - 2) Destination termination equipment* varies per application; refer to engineered drawings. Refer to E8 Series drawings for conduit and conductor schedules.
 - 3) As required, utilize necessary Fiber optic cables, patch panels, splice shelves, adapters, connectors, buffer kits, breakout kits, consumables, and accessories.

1.06 EQUIPMENT CERTIFICATION

- A. Listed Equipment: All applicable material, including accessories to the system and including all wire and cable, shall be listed by an approved agency recognized by Washington State Department of Labor and Industries for the use intended i.e., UL, ETL, etc.
- B. Applicable standards compliance: In addition to the L&I approved listing agency, all communication equipment shall meet applicable portions of FCC, TIA/EIA, ANSI, standards for product performance and quality.

1.07 WARRANTY

- A. See Specification Section 01 77 00 – Closeout Procedures.

1.08 RECORD DOCUMENTS

- A. Record documents: Prepare record documents in which indicate the following installed conditions:
 - 1. Communication pathways, size and location, for both exterior and interior; and locations of patch panels, and equipment racks.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 26 05 00 – Common Work Results for Electrical
 - 2. Section 26 05 33 – Raceways and Boxes for Electrical Systems
 - 3. Section 26 05 53 – Identification for Electrical System
 - 4. Section 26 27 16 – Cabinets and Enclosures
 - 5. Section 27 05 13 – General Communications Requirements
 - 6. Section 27 13 00 – Backbone Cabling Requirements
 - 7. Section 33 71 19 – Electrical Underground Ducts and Manholes
 - 8. Section 33 79 00 – Site Grounding

1.02 SUMMARY OF WORK

- A. The extent and location of “Communication Pathways” Work is shown in the Contract Documents. The Contractor shall furnish and install cable pathways as shown in the Drawings and specified herein. Pathways shall include, but not be limited to, PVC and metallic conduit, fabric innerduct, and underground manholes and handholes.

1.03 GOVERNING CODES, STANDARDS AND REFERENCES

- A. American National Standards Institute (ANSI)
- B. American Society for Testing and Materials (ASTM) A123 - Specification for Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.
- C. National Electrical Code (NEC)
- D. National Fire Protection Agency (NFPA) 70
- E. Underwriters Laboratory (UL)
- F. UL 910 Test for Flame-Propagation and Smoke Density
- G. UL 2024 Standard for Cable Routing Assemblies and Communications Raceways
- H. Washington State Labor and Industry
- I. American National Standards Institute (ANSI)/National Fire Protection Agency (NFPA) 70 - National Electrical Code (NEC).

1.04 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections:
 - 1. Product Data: For each type of product indicated.

1.05 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of cable trays and fittings of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. NEMA Compliance: Comply with NEMA standards publication number VE1, "Cable Tray Systems."
- C. NEC Compliance: Comply with NEC, as applicable to construction and installation of cable tray, conduit, and innerduct systems.
- D. Listing Compliance: Provide products that are UL labeled or Washington State Labor and Industry recognized.
- E. NFPA Compliance: Comply with NFPA 70B, "Recommended Practice for Electrical Equipment Maintenance" pertaining to installation of cable tray systems.

1.06 DRAWINGS

- A. The Drawings indicate the general route of the underground ducts and conduits. Data presented on the Drawings are as accurate as preliminary surveys and planning can determine. Accuracy is not guaranteed and field verification of all dimensions and routing is required.
- B. Specifications and Drawings are for assistance and guidance, but exact routing, locations, distances, and levels will be governed by actual field conditions. The Contractor shall make field surveys as part of his Work. Deviations from indicated routes, additional bends, and vertical transitions shall be submitted to the Engineer for approval prior to installing underground ducts or conduits.

PART 2 - PRODUCTS

2.01 CONDUIT REQUIREMENTS

- A. Refer to Specification Sections 26 05 33 "Raceways and Boxes for Electrical Systems" and 33 71 19 "Electrical Underground Ducts and Manholes".
- B. Refer to Innerduct in Sec. 2.04 for proper fill of backbone conduits.
- C. The Contractor shall provide all metal conduits with threaded plastic bushings and pull cords.
- D. Routing of any metallic media cabling such as voice, data or coaxial in the same conduit as power conductors is not allowed.

2.02 INNERDUCT

- A. Acceptable manufacturers:
 - 1. Pyramid
 - 2. Carlon
 - 3. MaxCell
 - 4. Or Approved Equal.
- B. Flexible fabric innerduct
 - 1. Color: Use three unique colors, use one color per 3-pack (color shall be in stitched spine or on fabric material)
 - 2. Use product in 2" and above backbone conduit runs.
 - 3. Pull Tape: Provide tape per fabric innerduct.

4. UL: UL 910 and/or 2024 list with tags or marking and for cables listed under ANSI/UL-1666 (1997) or Washington State Labor and Industries recognized.
5. National Electrical Code (NEC) Compliance: Comply with NEC as applicable.

2.03 PULL CORD

- A. The Contractor shall provide and install a pull cord and true tape from end to end in every conduit, and innerduct.
 1. The pull cord shall be new polypropylene over polyester rope with a minimum 1700 lb. tensile strength.
 2. The Contractor shall leave at least 18 inches of pull cord accessible at both ends of the conduit, cable tray, or innerduct.
 3. The pull cord shall be continuous with no knots or splices for the length installed.

2.04 GROUNDING SYSTEM AND CONDUCTORS

- A. Bonding and grounding shall meet the requirements specified in Section 26 05 26 - Grounding.

2.05 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.01 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. All installation shall be in accordance with manufacturer's published recommendations.
- C. Install to facilitate service, maintenance, and repair or replacement of components of both communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

3.02 SEPARATION FROM EMI SOURCES

- A. Comply with TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
- B. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 1. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
 2. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 3. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
- C. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 1. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 2. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
 3. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

- D. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - 1. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - 2. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
 - 3. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
- E. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or higher: A minimum of 48 inches.
- F. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.03 SUPPORTS AND BRACING

- A. Install in accordance with applicable codes and regulations and as shown on the structural plans and details.
- B. Provide supports at each connection point, at the end of each run, and at other points to maintain spacing between supports as required by the NEC.
- C. Do not fasten supports to piping, mechanical equipment, or raceway.
- D. Do not use powder-actuated anchors.
- E. Do not drill or weld to existing structural steel members without specific permission of Engineer.
- F. Fabricate supports from steel channel, rigidly bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- G. Do not use nylon or plastic tie wraps, wood or plastic expansion inserts or adhesives as principal or secondary support means.
- H. Install enclosures and panel-boards with minimum of four anchors.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 26 05 00 – Common Work Results for Electrical
 - 2. Section 26 05 33 – Raceways and Boxes for Electrical Systems
 - 3. Section 26 05 53 – Identification for Electrical System
 - 4. Section 27 05 13 – General Communications Requirements
 - 5. Section 27 05 28 – Communications Pathways
 - 6. Section 33 71 19 – Electrical Underground Ducts and Manholes
 - 7. Section 33 79 00 – Site Grounding

1.02 SUMMARY

- A. Summary of Work: The Work of this section includes the construction, test, documentation, and warranty of a fiber optic cable and unshielded, twisted-pair (UTP) copper backbone cable in accordance with the specifications and Drawings.
- B. This Work specified in this section includes installation of backbone cabling. For this Work, the Contractor shall:
 - 1. Provide optical fiber backbone cable and associated accessories.
 - 2. Provide UTP backbone cable and associated accessories.
 - 3. Conduct testing.

1.03 SCOPE OF WORK

- A. The Contractor shall provide materials and labor required to deliver a complete backbone cable system as indicated on the Contract Drawings, schedules, and these Specifications.
- B. This Work shall include, but may not be limited to, the following tasks:
 - 1. The Contractor shall provide backbone optical fiber cable that is pre-installation tested, correctly installed and terminated, and Contractor-tested.
 - 2. The Contractor shall provide backbone copper cable that is correctly installed and terminated, and Contractor-tested.
 - 3. The Contractor shall provide patch panels, termination blocks and end point termination devices to enable the termination and identification of the backbone cable system.
 - 4. The Contractor shall provide and install cable devices and accessories, such as patch panels, in racks provided by the Contractor.
- C. Label devices, cables, and ports per Section 26 05 53 - Identification for Electrical System.
 - 1. Conduct testing on backbone cabling.

1.04 REFERENCES

- A. American National Standards Institute (ANSI):
- B. Telecommunications Industry Association/Electronics Industries Alliance (TIA/EIA):

1. EIA-440-A (Current Edition): Optic Fiber Terminology
2. TIA/EIA 455-B, Standard Test Procedure for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices and other Fiber Optic Components
3. FOTP-78 (TIA/EIA-455-78A) (Current Edition): Fiber Optic Test Procedure 78 - Spectral Attenuation Cutback Measurement for Single-Mode Optical Fibers
4. TIA/EIA 455-B (Current Edition): Standard Test Procedures for Fiber Optic Cable Fibers, Cables, Transducers, Connecting and Terminating Devices
5. TIA/EIA-526 (Current Edition): Standard Test Procedures for Fiber Optic Systems
6. TIA/EIA-568-B (Current Edition): Commercial Building Telecommunications Cabling Standard, with addenda
7. ANSI/TIA-569-B Commercial Building Standard for Telecommunications Pathways and Spaces

C. National Fire Protection Association (NFPA):

1. NFPA 70 National Electrical Code (NEC)

1.05 SUBMITTALS

A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections:

1. Product Data: For each type of product indicated.
2. Documentation that termination crafts-people are properly trained for optical fiber termination and testing. Documentation shall be from a technical school, manufacturer's school, or labor union training.
3. Discrepancy report describing existing equipment, and rack conditions that would affect the ability of the Contractor to successfully complete the Work.
4. Warranty documentation on products.

B. The Contractor shall provide the following technical submittals:

1. Manufacturer's complete product data and specifications, with drawings as applicable for materials furnished by the Contractor.
2. Backbone cable testing results in hard and soft copy formats.
3. Results of pre-installation optical fiber reel tests for Engineer review and approval.
4. Conduit fill plan indicating initial cable fill percentages and the use of innerduct.
5. Single-line schematic diagrams showing final equipment placements, cable groups, and termination details.
6. Cable Pulling Plan: The Contractor shall submit a cable pulling plan, as follows:
 - a. Indicate the installed backbone conduit layout in schematic format, including vaults and distances between vaults.
 - b. Indicate contents of each conduit.
 - c. Indicate the cable pulling calculations, conduit fill ratios and actual cable runs and tensions.
 - d. Installation of cabling shall not commence prior to approval of the pulling plan and calculations by the Engineer.

7. Contractor's test plan for the required optical fiber and metallic (copper) cable tests.
 8. Final as-built backbone wiring drawings and documentation.
- C. Contractor to provide as-built labeling information to Engineer within three (3) days of project completion.

1.06 PROJECT CONDITIONS

- A. Verification: Obtain specific cable lengths and location of racks and equipment by field measurement after contract award. Do not vary from the routes indicated in the drawings without prior approval from the Engineer.

1.07 QUALITY ASSURANCE

- A. Contractor Qualifications:
1. Manufacturer shall have a certified installer program; installers shall have valid certification from specific Manufacturer.
- B. Standards:
1. Provide system components that are Underwriters Laboratories (UL) listed and labeled when applicable.
 2. Electronics Industry Association (EIA)-455-B – Standard Test Procedures for Fiber optic Fibers, Cables, Transducers, Connecting and Terminating Devices.
 3. ANSI/TIA/EIA-568-B – Commercial Building Communications Cabling Standard, including addenda.
 4. ANSI/TIA/EIA-598-A – Optical Fiber Cable Color Coding.
 5. TIA/EIA TSB-67 – Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems.
- C. Codes and Regulations:
1. National Electrical Code (NEC) Compliance: Comply with NEC as applicable.
 2. Local Codes: Comply with state and local codes as applicable.
- D. Manufacturer's Recommendations: Install items per manufacturer's recommendations. Recommendations shall include, but not be limited to, cable handling, bending, and pulling requirements or limits; termination methods and materials; and use of specific tools and disposables.
- E. Tests: Perform tests as specified in Part 3 – Execution of this section.

1.08 DELIVERY, HANDLING, AND STORAGE

- A. Materials shall be delivered in original packages with labels intact and identification clearly marked.
- B. Storage temperature range: -40°F to 149°F (-40°C to 65°C).
- C. Protect equipment and materials from foreign objects such as dirt, dust, paint, liquids, construction debris, and other contaminants. Protect from weather, humidity, temperature, and sunlight. Protect from physical damage.
- D. Keep dust caps in place on patch panels and replace after testing. Protect 66 blocks with masking until construction is complete.

- E. Equipment damaged prior to system acceptance shall be replaced with new at no additional cost to the Port.

1.09 WARRANTY

- A. General: Refer to Division 1 General Requirements for general warranty requirements.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Backbone cabling infrastructure shall be Corning Altos loose tube, gel-free cable, single mode, or Engineer approved equal. Connectors shall be Corning FuseLite Splice-On Type LC connectors, or Engineer approved equal.
- B. Products and materials shall be new and fit the intended purpose.
- C. Damaged or defective products and components shall be replaced by the Contractor at no additional cost to the Port.
- D. Cabling and termination hardware damaged prior to system acceptance shall be replaced by the Contractor at no additional cost to the Port.
- E. Miscellaneous materials required for a complete and operational cabling system shall be provided by the Contractor.

PART 3 - EXECUTION

3.01 PRE-INSTALLATION TESTING

- A. General: The Contractor shall perform pre-installation tests on all fiber optic cables prior to installations. The Contractor shall accept only materials that pass the test.
- B. Testing:
 - 1. General: Test data shall include cable reel serial number and cable product number for identification. Report defective cables immediately to the Engineer. Repeat pre-installation tests if necessary when cable reels are stored unprotected on the job site or are mishandled. Do not install defective cables.
 - 2. Records: Cable reel serial number and cable product number shall be recorded and included in the test results for each reel. Printouts of the traces and test parameters shall be submitted to the Engineer within 5 working days of completing the test.
 - 3. Tests: The Contractor shall perform tests on 100% of fiber strands with an optical time-domain reflectometer (OTDR) at 1310 nanometers and 1550 nanometers for singlemode fibers. The OTDR shall have a loss resolution of 0.01 dB or less, and a distance resolution of one (1) foot or less. Submit images of the OTDR traces for review and approval.
 - 4. Test Criteria: A cable shall pass the test only if all strands have an attenuation no greater than the maximum attenuation stated in the manufacturer's published specifications, and if no strands have point discontinuities greater than 0.1 dB maximum for singlemode (1310 nm and 1550 nm windows).

3.02 SCHEDULING AND COORDINATION

- A. Scheduling of Work shall be coordinated with the Engineer and tenant representatives to minimize impact on operations and the traveling public.
- B. Scheduling of cable installation shall be coordinated with other trades within the Contract.

3.03 SURVEY AND PREPARATION

- A. The Contractor shall survey existing underground ducts, conduit paths and routes, and report discrepancies and issues with the use of these for cable installation. Failure to perform this inspection and submit the report holds the Contractor at cost risk for corrective actions and schedule impacts later in the Work.
- B. Contractor shall be responsible for storage of all materials until installation.

3.04 INSTALLATION OF PULL STRINGS

- A. The Contractor shall install pull strings and true tape with cable installation in existing or new conduits, underground ducts, and inner duct.
- B. Pull strings shall be left in place.
- C. In existing conduits or underground ducts with existing pull strings, the Contractor shall replace used pull strings with new pull strings.
- D. Pull strings are not required where conduit or innerduct fill is greater than 33% after installation of cable.

3.05 INSTALLATION OF PATCH PANEL AND ASSOCIATED DEVICES

- A. The Contractor shall inspect patch panels, associated devices, and materials for compliance with these Specifications and with the Contractor's orders.
- B. Patch panels and associated devices shall be installed according to manufacturer's instructions.
- C. Patch panels and termination hardware shall be installed with matching mounting screws at each location.

3.06 GENERAL CABLE INSTALLATION

- A. The system shall be installed to comply with all applicable standards, codes, and regulations. In general, where the specifications, drawings, standards, regulations, and codes conflict, the most stringent requirement shall apply; however, the Contractor shall notify the Engineer immediately of conflicts for determination of a resolution.
- B. Cables shall be installed in innerducts that are installed in conduits and underground ducts, as shown on the Drawings.
 - 1. Refer to Section 27 05 28 –Communication Pathways, PART 2 section: 2.04 for approved innerduct
- C. Backbone fiber and copper cable shall be installed with no splices.
- D. The Contractor shall protect cables from dirt and moisture by laying cables on a clean, new ground covering.
- E. The Contractor shall inspect and clean as necessary existing and new underground ducts and conduits to ensure that they are clean and free of obstructions prior to installing pull strings or pulling cable.
- F. The Contractor shall not install damaged or defective cables or components. The Contractor shall carefully inspect cable jacket for defects as cable is pulled off the reel.
- G. Cable Pulling:
 - 1. Pull cable in accordance with manufacturer's recommendations and industry-accepted practices, and within the limits of cable bend radius and pulling tension specifications.

2. Use of pulling lubricants to be compatible with the cable and per manufacturer's recommendations. Petroleum products shall not be used as cable pulling lubricant.
 3. Cables shall be hand pulled when possible or when required by manufacture. The Contractor shall use a recording tensiometer on pulls that may exceed 100 pounds pulling tension and always when a winch is used for pulling. Tensiometer printouts shall be identified by cable and submitted to the Engineer for each pull requiring use of a tensiometer.
 4. Pulling fixtures shall be attached to cable strength members. If indirect attachments are used, the grip diameter and length shall be matched to the cable diameter and characteristics, and the pulling forces shall be reduced to ensure that the fibers or copper pairs are not damaged from forces being transmitted to the strength member.
 5. Cable installation methods shall not exceed the cable manufacturer's specified pull tension for the specific cable.
 6. The mechanical stress placed upon a cable during installation shall be such that the cable is not twisted or stretched, nor shall the process kink or crush the cable.
 7. A cable feeder guide shall be used between the cable reel and the face of the underground duct or conduit to protect the cable and guide it into the underground duct or conduit as it is played off the reel.
 8. The Contractor shall follow the manufacturer's installation instructions and its specifications for minimum bend radius; the bend radius shall not exceed the manufacturer's minimum bend radius
 9. Cable fill shall not exceed NEC standard.
- H. Communication room entry
1. Optical fiber cable shall be routed from the conduit entry point in communication rooms without innerduct (when transitioning into room from installed in conduit), but in combed and tied bundles to the termination locations. Service loops of at least 5 meters in length.
 2. Copper cable shall be routed from the conduit entry point in communication rooms without innerduct, but in combed and tied bundles to the termination locations. Service loops of at least 5 meters in length.
- I. Backbone Service loops of at least 5 meters in length shall be provided at both ends of each cable and at every Manhole in OSP applications.
- J. Cable shall not be twisted, kinked, crushed, stretched, split, scarred, or otherwise damaged. Inspect cable jacket carefully for defects as cable is played off the reel. Protect cable from contaminants and physical damage at all times.
- K. All strands of fiber optic cables shall be terminated to patch panels unless indicated otherwise in the drawings. All pairs of UTP copper cables shall be terminated to patch panels or 66 blocks.
- L. Fiber optic cable and UTP copper cables shall be 100% usable after installation, termination, and testing. Replace defective or damaged cables and terminations with new at no additional cost to the Port. Repair splicing of damaged cables is not permitted.
- M. Cable Preparation and Breakout: Cables shall be dressed and routed at termination points. Cables shall be combed and each strand shall run parallel with the other strands. After combing and straightening strands, Contractor shall separate strands into bundles according to routing requirements and termination points. Bundles shall be secured with hook-and-loop cable strap material specified in Part 2 – Products of this section. Cable ties of hard polymer material shall not be used.

- N. Splices and Intermediate Terminations: Cables shall be run continuous between termination points shown on the drawings and shall NOT be spliced. Intermediate terminations or splices for the convenience of pulling or to repair a damaged or defective cable shall not be made.
- O. Routing of any metallic media cabling such as voice, data or coaxial in the same conduit as power conductors is not allowed.

3.07 CABLE TERMINATION

- A. Optical fiber cable termination
 - 1. Optical fiber terminations shall be made by personnel trained and certified by the manufacturer of the fiber and connectors and shall be installed using the appropriate tool kit and equipment approved by manufacture.
 - 2. Optical fiber shall be terminated in LC connectors.
 - 3. Optical fiber connectors shall not exceed manufacturer's acceptable loss budget.
- B. Category 5 and/or 6/6a cable termination
 - 1. Terminated cables shall meet the required performance with no degradation due to termination.
 - 2. Category 5 and/or 6/6a cables 12 pair cable shall be terminated 66-block units in T568B configuration.

3.08 SEISMIC JOINT PENETRATIONS

- A. When conduit or pathway penetrates a building expansion joint, the Contractor shall furnish and install a seismic coupling.

3.09 FIELD QUALITY ASSURANCE

- A. The Contractor shall perform inspections per Section 27 05 13 - General Communications Requirements.
- B. The Contractor shall perform horizontal cable testing as part of the field quality assurance for this Work.
- C. The Engineer may arrange for interim inspections by a manufacturer's representative as conditions deem necessary.

3.10 SYSTEM PERFORMANCE

- A. Fiber Optic Cable and Terminations: The maximum attenuation of each fiber strand, not including terminations, shall be no greater than the manufacturer's specified maximum attenuation for the cable. The maximum attenuation of a mated pair of connectors shall be no greater than the manufacturer's specified average attenuation of a mated pair of connectors plus 0.3 dB. The maximum attenuation of a fiber strand, terminated at both ends, shall be no greater than the actual measured attenuation of the fiber strand plus the manufacturer specified average attenuation of the mated connectors plus 0.5 dB. The average attenuation of all connectors on a fully terminated cable shall be no greater than the manufacturer's specified average attenuation of the mated connectors.
- B. UTP Copper Cable and Terminations: The UTP copper system, including cables and terminations, shall meet the requirements of TIA-568-B, including all applicable addenda and service bulletins.

3.11 GENERAL REQUIREMENTS FOR BACKBONE CABLING TESTING

- A. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform specified testing.
- B. Prior to testing the cable, the Contractor shall verify that the components and systems being tested have been installed in accordance with the Contract Documents.
- C. Cable testing shall be completed by the Contractor and accepted by the Engineer as a condition of Substantial Completion.

3.12 BACKBONE CABLE TEST PLAN

- A. The Contractor shall submit a general backbone cable test plan to the Engineer for review and approval 20 working days prior to the start of on-site cable installation Work, and 20 working days prior to pre-installation optical fiber reel testing.
- B. The test plan shall include:
 - 1. Schedules for the following:
 - a. Optical fiber pre-installation reel testing by the Contractor
 - b. Optical fiber terminated cable testing by the Contractor
 - c. Copper cable terminated cable testing by the Contractor
 - 2. The test plan shall include a list of the test equipment to be used by the Contractor, including model number of sample test reports and wave forms, manufacturer training certificates for technicians operating test equipment and calibration certificates, for approval by the Engineer prior to the start of testing. Test equipment shall have the latest firmware upgrades installed prior to testing. Port-specified test equipment shall be as follows:
 - a. Optical Time Domain Reflectometer (OTDR). The Contractor shall submit the OTDR model number and calibration certificates to Engineer for approval prior to testing.
 - b. Optical Fiber Power Meter. The Contractor shall submit the Power Meter model number and calibration certificates to Engineer for approval prior to testing.
 - c. Unshielded twisted pair (UTP) cable tester. The Contractor shall submit UTP cable tester model number and calibration certificates to Engineer for approval prior to testing.
 - 3. Summary of the tests that are to be performed by the Contractor, and the test results that are to be submitted.
- C. Backbone cable test results - submittals
 - 1. The Contractor shall provide test results in hard copy and soft copy format. The format, content, and graphic scales shall be submitted to the Engineer for approval prior to performing tests.
 - 2. Contractor shall furnish to the Engineer the licensed software required to view electronic copies of test results.
 - 3. Final testing shall use cable naming as indicated in the drawings, in all test records.

3.13 OPTICAL FIBER PRE-INSTALLATION REEL TESTING

- A. The Contractor shall compare factory test data with data obtained by conducting a pre-installation reel test as follows.

- B. Dual-pulse Function A fiber shall be tested at a single wavelength with two pulse widths.
- C. Two traces shall be displayed, one for each pulse width. (The short pulse provides optimal event resolution, while the longer pulse provides excellent distant measurements.)

3.14 OPTICAL FIBER TERMINATED CABLE

- A. The Contractor shall test fiber with launch and receive cables in both ways and record measurements for the following:
 - 1. Link loss. The one-way backbone link loss shall be less than 2.0 dB, measured at either 850nm or 1300nm.
 - 2. Fiber attenuation (dB/km)
 - 3. Splice and connector loss
 - 4. Reflectance and optical return loss
 - 5. Length
- B. Optical fiber cable shall comply with the following singlemode standards:
 - 1. ANSI 2136.2
 - 2. EIA-440-A
 - 3. Fiber optic test procedure (FOTP) FOTP-8 (TIA/EIA-455-8)
 - 4. FOTP-61 (TIA/EIA-455-61-A)
 - 5. FOTP-77 (TIA/EIA-455-77)
 - 6. FOTP-78 (TIA/EIA-455-78A)
 - 7. FOTP-95 (TIA/EIA-455-95)
 - 8. FOTP-171 (TIA/EIA-455-171)
 - 9. TIA/EIA-455-B
 - 10. TIA/EIA-526

3.15 CATEGORY 5 AND/OR 6/6A TERMINATED CABLE TESTING

- A. The Contractor shall test and record measurements for the following:
 - 1. TIA Category 6/6a per TIA addendum #1 to TIA/EIA-568B
 - 2. IEEE 802.3 1000 Base-T

3.16 LABELING AND COLOR CODES

- A. Identification and labeling, shall comply with Section 26 05 53 - Identification for Electrical Systems.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
1. Section 00 31 00 – Available Project Information
 2. Section 01 33 00 – Submittal Procedures
 3. Section 01 35 29 – Health, Safety and Emergency Response Procedures
 4. Section 01 35 43.19 – Export Soil Management
 5. Section 01 45 00 – Quality Control
 6. Section 01 71 23 – Field Engineering
 7. Section 01 74 19 – Construction Waste Management and Disposal
 8. Section 02 41 00 – Demolition
 9. Section 26 05 00 – Common Work Results for Electrical
 10. Section 31 23 19 – Dewatering
 11. Section 31 23 33 – Trenching and Backfilling
 12. Section 31 41 00 – Shoring and Underpinning
 13. Section 31 66 13 – Stone Columns
 14. Section 32 12 16 – Asphalt Paving
 15. Section 32 15 40 – Crushed Stone Surfacing
 16. Section 33 10 00 – Water Utilities
 17. Section 33 40 00 – Storm Drainage Utilities
 18. Section 33 44 19.19 – Utility Oil/Water Separators
 19. Section 33 44 19.23 – Off-Line Utility Storm Water Filters
 20. Section 33 71 19 – Electrical Underground Ducts and Manholes
 21. Section 35 42 37 - Riprap Bank Protection

1.02 DESCRIPTION OF WORK

- A. The work includes excavation, trenching, backfill and shoring, of upland areas associated with pier and utility demolition, building foundation construction, utility installation and paving as indicated on the Drawings and in the Specifications.
- B. This section also describes quality control procedures including testing and characterization requirements for various material sources and products.

1.03 REFERENCE STANDARDS

- A. American Society for Testing Materials (ASTM), Standard Specifications and Standard Test Methods, designated by basic reference in this section (use the most current edition at the time of bid unless otherwise indicated).

- B. The latest edition of the Standard Specifications and Standard Plans for Road, Bridge, and Municipal Construction, prepared jointly by the Washington State Department of Transportation (WSDOT) and the American Public Works Association (APWA).

1.04 QUALITY ASSURANCE

- A. On-Site Testing and Inspection: The Port will provide and pay for on-site testing and inspection services. Sampling and testing for compliance with the contract provisions will be in accordance with Section 01 45 00 – Quality Control. The Contractor shall assist in obtaining samples and may obtain copies of test results performed by the Port at no cost. Tests conducted for the sole benefit of the Contractor shall be at the Contractor's expense.
- B. Compaction Control Tests: The Port will provide and pay for laboratory and on-site field compaction control tests in accordance with the applicable provisions of these specifications.
 - 1. The compaction control density shall be the maximum density at optimum moisture content as determined by ASTM D 1557, Standard Methods for Moisture-Density Relationships of Soil and Soil Aggregates, Methods B, C or D as applicable, but shall be no less than 95% of dry density for Landside Backfill, Base Course, and Top Course, and trench backfill above the bedding zone. Compact trench bedding zone material to 90% of dry density.
 - 2. Field tests to determine in-place compliance with required densities as specified, shall be performed in accordance with ASTM D 1556, D 2167, or D 2922.
- C. Shoring shall be provided in accordance with Specification 31 41 00 – Shoring and Underpinning, applicable local, State and Federal safety codes. Design, agency approval, permits, construction, maintenance, and removal of all shoring elements are the sole responsibility of the Contractor.

1.05 SUBMITTALS

- A. Source characterization, testing, reporting, and certification for all off-site borrow materials.
- B. Written request for use of on-site borrow materials.
- C. Samples of on-site borrow material for physical and/or chemical characterization as requested by the Engineer.
- D. See Section 01 35 43.19 – Export Soil Management for requirements for Soils Management Plan submittal.

1.06 SITE CONDITIONS

- A. Subsurface investigations have been made at and near Pier 4 in connection with this Project. Review and make determinations about the anticipated soil and foundation conditions from the information and report described in Section 00 31 00 – Available Project Information.
- B. Anticipate encountering groundwater at any location within the project site. The groundwater elevation varies depending upon proximity to the shoreline, soil conditions, tidal conditions, and weather. See Section 31 23 19 – Dewatering.
- C. Verify the location of existing utilities at the site, and use an independent private locate company to assist. Those utilities which are to remain shall be protected from damage and remain operational. Damage to utilities which are to remain shall be repaired by the Contractor at its own expense.

PART 2 – PRODUCTS

2.01 CHARACTERIZATION TESTING, REPORTING, AND CERTIFICATION

- A. Materials and products shall be of the quality, size, shape, and gradation as specified in the Contract Documents, or shall be approved by the Engineer as equal.
- B. Provide and pay for source characterization, testing, reporting, and certification for all off-site borrow materials as described below. Provide documentation for the Engineer's approval demonstrating that all imported materials from a borrow pit meet the contract requirements and certify that the materials are free of regulated materials.
- C. Regulated Materials are defined as materials or combinations of materials containing hazardous or dangerous wastes as defined under state laws, federal laws, or under the Model Toxics Control Act listed in WAC 173-340-900, Table 740-1, which exceed the Method A cleanup levels for unrestricted land use.
- D. The Contractor shall provide the following information with each sample submitted:
 - 1. Material Source
 - 2. Proposed On-site Use
 - 3. Sampling dates
 - 4. Chain of custody
 - 5. Sampling locations
 - 6. Contractor's certification that the samples submitted are representative of the materials that shall be used or reused at the site.
- E. Characterization Testing shall be conducted at a laboratory accredited under WAC Chapter 173-50, and shall include the following:
 - 1. Grain Size Distribution / Sieve analysis (ASTM D 422)
 - 2. Specific gravity determined from absolute volume (ASTM D 854)
 - 3. Maximum Dry Density (ASTM D 1557)
 - 4. Priority Pollutant Metals (EPA SW 846 6010/6020/7041)
 - 5. Volatile Organic Compounds (EPA SW 846 8260)
 - 6. Semi-volatile Organic Compounds (EPA SW 846 8270)
 - 7. PCBs and Pesticides (EPA SW 846 8080)
 - 8. Petroleum Hydrocarbons (NWTPH-HCID)

2.02 ON-SITE BACKFILL SOURCE CHARACTERIZATION

- A. Excavated in-situ soils generated during site construction activities may be used or reused as backfill material, if approved by the Engineer. It is to be assumed that all excavated in-situ material will be found acceptable for reuse.
 - 1. Submit a written request for use of on-site borrow materials at least 3 weeks prior to on-site placement. Identify the source of the excavated material, proposed on-site use, and quantity of material to be used.
 - 2. Provide samples of the material for physical and/or chemical characterization as requested by the Engineer. The material shall not be reused at the site until approved by the Engineer.

3. Characterization and characterization testing of excavated materials proposed for reuse may be performed by the Port, as determined by the Engineer, to assure that backfill materials are free of regulated materials and the material meets the requirements of the contract documents.
- B. The Engineer may reject any materials that have been determined to be substandard or contain regulated materials. One or more of the tests listed in these specifications may be required prior to acceptance.

2.03 RECYCLED MATERIALS

- A. Asphalt removed by demolition activities, and asphalt grindings from milling operations, shall be taken to a Contractor selected and Port approved recycler, but shall not be reused on-site. Refer to Section 02 41 00 – Demolition, and Section 01 74 19 – Construction Waste Management and Disposal.
- B. Upon approval of the Engineer, existing wharf ballast removed during demolition activities may be reused as landside backfill material. See requirements for landside backfill material specified herein, and refer to Section 02 41 00 – Demolition.

2.04 GRAVEL BACKFILL FOR PIPE ZONE BEDDING

- A. Bedding material for pipes shall consist of crushed, processed or naturally occurring well graded granular material meeting the requirements of the WSDOT Standard Specifications, Section 9-03.12(3). This includes excavated in-situ soils generated during site construction activities, provided that the material is free from wood waste, organic material and has a maximum dimension of 1 1/2" inches per WSDOT Standard Specifications Section 9-03.12(3).
- B. Pea-gravel will not be allowed.
- C. Imported and on-site excavated bedding materials shall be characterized, tested and certified as specified herein.

2.05 LANDSIDE BACKFILL MATERIAL

- A. Material used for backfill, including in trenches, shall be geotechnically suitable excavated in-situ material generated during site construction.
- B. Geotechnically suitable material shall be clean, free-draining, sandy gravel or gravelly sand that is free from deleterious coatings and shall contain no organic matter, soft friable particles, or other performance-reducing properties, as determined by the Engineer.
 1. The material shall not have excessive moisture content, excessive fine-grained fraction passing the U.S. No. 200 sieve, or other factors rendering the material unsuitable for placement, compaction, or supporting applied loads.
 2. 100% of material shall pass a 3-inch screen.
 3. The moisture content of fill material shall be within minus 2 percent to plus 1 percent of the optimum moisture content at the time of compaction.
 4. Excavated ballast material from the existing wharf may also be stockpiled and reused for landside backfill material if it meets the requirements above. Excess material shall be removed by the Contractor.
- C. If the Engineer determines the site conditions require backfill quantities greater than the quantity available from suitable excavated in-situ material, such as in the case where there is an excess amount of unsuitable material is encountered, Contractor shall import Select Backfill after obtaining approval from the Engineer.

1. Select Backfill shall meet WSDOT Standard Specifications Section 9-03.14(2), with the exception the amount of fines passing the 200 Sieve shall not exceed 5 percent and 100% of material shall pass a 3-inch screen.
2. Characterize, and perform characterization testing and certification of imported select backfill as specified herein.
3. The Contractor will be compensated for the cost of importing Select Backfill if needed to address site conditions that require backfill quantities greater than the quantity available from suitable excavated in-situ material.

2.06 COMPRESSIBLE MATERIAL AND FILTER FABRIC

- A. Compressible material for placement between utilities, and other locations shall be radiated polyethylene foam board Youngboard Y-S-30 as manufactured by Specialty Foams or an Engineer approved equal.
- B. Geotextile indicated on the Drawings for use at the stormwater outfalls shall be Mirafi 140NL or an Engineer approved equal.
- C. Geotextile indicated on the Drawings for installation in the utility trench on the pier shall be Petromat 4598 by Propex or approved equal.

2.07 CONTROLLED DENSITY FILL – ELECTRICAL APPLICATIONS (CDF)

- A. Controlled Density Fill for electrical applications including all TPU work and all medium voltage conduit and ducting(also may be referred to as Flowable Thermal Fill or FTF) shall meet the requirements of Tacoma Power Standard C-UG-2050
- B. Testing shall be in accordance with Tacoma Power Standard C-UG-2050.

2.08 CONTROLLED DENSITY FILL (CDF)(ALL APLICATIONS EXCLUDING ELECTRICAL)

- A. Controlled Density Fill (also may be referred to as lean concrete) shall meet the requirements of the WSDOT Standard Specifications, Section 2-09.3(1) E.
- B. Mix design to have a minimum 28-day compressive strength of 50 psi and a maximum 28-day compressive strength not to exceed 300 psi.

2.09 GRAVEL BASE COURSE

- A. Gravel base course shall meet the requirements of Section 32 15 40 - Crushed Stone Surfacing.
- B. Characterize, and perform characterization testing and certification of imported gravel base course as specified herein.

2.10 STONE COLUMNS

- A. Stone column material shall meet the requirements of Section 31 66 13 – Stone Columns Paragraph 2.01.

2.11 CRUSHED STONE

- A. Crushed Stone as noted on the drawings shall be in accordance with Section 31 66 13 – Stone Columns Paragraph 2.01.

2.12 UNDERGROUND MARKING TAPE

- A. Underground marking tape shall consist of inert polyethylene plastic, 4-mil thickness that is impervious to all known alkalis, acids, chemical reagents and solvents likely to be encountered in the soil, with a metallic foil core to provide a positive detection for pipeline locators.

- B. The tape shall be color coded and shall be imprinted continuously over its entire length in permanent black ink. The message shall convey the type of line buried below and shall also have the word "Caution" prominently shown. The width of the tape shall be as recommended by the manufacturer for the depth of installation.

- C. Color coding of the tape shall conform to WSDOT Standard Specification 9-15.18.

2.13 SHORING

- A. Products that are required to accomplish, or to be incorporated into, the work of this section shall be selected by the Contractor, subject to review by the Engineer

PART 3 – EXECUTION

3.01 SUSPECT MATERIALS, SAMPLING, TESTING, AND DISPOSAL

- A. All excavated materials will be inspected and categorized as suspect or non-suspect by the Engineer or another Port representative. Soil will be considered suspect if it has an odor, sheen, or color typical of soil containing regulated materials.
- B. All suspect materials shall be stockpiled and segregated by the Contractor from other stockpiles or materials by the Contractor. The Port will provide and pay for sampling and characterization testing for all suspect materials prior to reuse or removal from the site. Allow 10 calendar days for Port testing and direction to the Contractor.
 - 1. Suspect soils characterized to be free of regulated materials, and meeting the requirements of the contract documents, may be reused on-site provided it is suitable for its intended use, as determined by the Engineer.
 - 2. Suspect soils characterized to contain regulated materials shall be loaded by the Contractor into trucks and disposed of at a Port approved disposal facility capable of receiving regulated material, as described in Section 01 35 43.19 Export Soil Management. Work and costs related to transporting and disposing of said material will be considered Changed Work.
 - 3. Surplus suspect soils characterized to be free of regulated materials, and meeting the requirements of the Contract Documents, shall be considered the same as non-hazardous excess material. Surplus / excess soils shall be loaded, transported, hauled, and disposed of off-site in accordance with the Contract Documents and applicable laws and regulations.
- C. All non-suspect soils shall be stockpiled by the Contractor, but segregated from suspect soils, and may be reused on-site provided they are suitable for the intended use, as determined by the Engineer.

3.02 EXCAVATION - GENERAL

- A. Excavate and backfill as specified herein, within the tolerances established in the Contract Documents, and conform to recognized industry standards, whichever are more stringent.
- B. Excavation: Homogeneous or mixtures of naturally occurring earth, fill, sand, gravel, stones, clays, or loam, moved to facilitate the construction of structures, utilities, trenches, and associated work.
 - 1. Excavation material shall be moved with the use of mechanical equipment, such as shovels, clamshells, loaders, bulldozers, graders, rippers, etc., but shall not require drilling and blasting or drilling and line breaking.
 - 2. Excavation by sluicing method will not be permitted.
- C. Protect excavated material, stockpiled for reuse as backfill, from contamination by other materials and from weather damage by covering with waterproof sheeting and other effective

means. Any material not properly protected which becomes unsuitable or contaminated shall be replaced at no additional cost to the Port.

- D. Separate stockpiles shall be employed for material to be reused as backfill, unsuitable material, and suspect material. At end of project, any material remaining in temporary "material acceptable for reuse" stockpiles shall be considered surplus / excess material, and following testing of material by the Port, Contractor shall haul excess material off-site to a Port approved disposal facility that is appropriate for the material being disposed. Disposal of material off-site prior to end of project, when there is still potential the material may be needed for backfill, shall first be approved by the Engineer.

3.03 EXCAVATION FOR STRUCTURES AND UTILITIES

- A. Excavate as necessary for utilities and other miscellaneous structures to the lines and grades indicated on the Drawings.
- B. Excavation below the designed depth, except as directed by the Engineer, shall be backfilled with select backfill material, and compacted as specified at the Contractor's expense.
- C. Brace and shore sides of excavations. Comply with all federal, state, and local regulations regarding shoring, bracing, and other protection requirements.
- D. Keep water out of excavated pits and trenches by pumping or other means of dewatering.

3.04 UNSUITABLE EXCAVATION AND DISPOSAL

- A. Unsuitable Structural and Trench Excavation: Shall consist of unstable materials, such as peat, muck, water-impregnated clays, swampy or other undesirable materials, including buried logs, stumps, or trash. Unsuitable excavation materials shall be removed to the depth designated by the Engineer.
 - 1. Unsuitable material excavated shall be replaced with Select Backfill as defined herein and as directed by the Engineer.
 - 2. Unsuitable materials, excess material and any excavated material not approved by the Port for use as backfill shall be tested by the Port and then transported off-site by the Contractor to a proper disposal facility.

3.05 FILL, BACKFILL AND COMPACTION FOR STRUCTURES, UTILITIES AND FILLS

- A. Beneath all underground utility structures, place a minimum of 12-inches of Gravel Base Course or more if specified on Drawings, over compacted subgrade. If subgrade is soft and cannot be adequately compacted, contact the Engineer for direction.
- B. Beneath all utility pipes, place a minimum of 6-inches of Gravel Backfill for Pipe Zone Bedding, or more if specified on Drawings, over compacted subgrade. If subgrade is soft and cannot be adequately compacted, contact the Engineer for direction.
- C. Remove water from excavated areas, by pumping or other means, before placing any backfill material.
- D. Compact subgrade, as specified below, before placing any fill or aggregate material.
- E. Pipe zone bedding material shall provide uniform support along the entire pipe barrel, without load concentration at joint collars or bells. All adjustments to line and grade shall be made by scraping away or filling in with bedding material under the body of the pipe and not by blocking or wedging. Bedding disturbed by pipe movement, or by removal of shoring movement of a trench shield or box, shall be reconsolidated prior to backfill. Pipe zone bedding shall be placed in loose layers and compacted to 90 percent maximum density. Bedding shall be placed, spread, and compacted before the pipe is installed so that the pipe is uniformly supported along

the barrel. Lifts of not more than 6 inches in thickness shall be placed and compacted along the sides of the pipe to the height shown in the Drawings. Material shall be worked carefully under the pipe haunches and then compacted. If the Engineer determines that the material existing in the bottom of the trench is satisfactory for bedding the pipe, the existing material shall be loosened, regraded, and compacted to form a dense, unyielding base.

- F. Do not place and compact any backfill material against recently poured concrete until the concrete has attained a minimum of 0.80 f'c (80% of design strength) or has set and cured a minimum of 7 days.
- G. Backfill by placing material in horizontal layers not exceeding 8-inches upon earth which has been undisturbed, stabilized, or otherwise approved by the Engineer.
 - 1. Construct in compacted layers of uniform thickness. Carry the layers up full width from the bottom. Compact with modern, efficient compacting units, or as directed by the Engineer. The compacting units may be of any type, provided they are capable of compacting each lift of the material to the specified density. The Engineer may order the use of any particular compacting unit discontinued if it is not capable of compacting the material to the required density within a reasonable time, or if the equipment may damage underlying or adjacent soils or structures.
 - 2. Unless noted elsewhere compact each layer to 95% of the maximum density as determined by compaction control tests described in Paragraph 1.04 above. Use small mechanical or vibratory compactor units to compact the layers adjacent to structures that are inaccessible to other compaction equipment.

3.06 PREPARATION FOR CRUSHED STONE SURFACING / BASE COURSE:

A. Preparation of Subgrade:

- 1. Immediately prior to placement of crushed stone surfacing or base course, clean the entire width of the area of all debris and dispose of as directed by the Engineer. All depressions or ruts which contain water shall be drained.
- 2. Shape the entire subgrade to a smooth uniform surface, true to line, grade, and cross section. Compact the subgrade material to 95% of the maximum density as determined by compaction tests ASTM D 1557. If soft or spongy material underlying the upper six inches of the area being prepared precludes satisfactory compaction of the upper six inches, loosen, aerate, or excavate, replace and compact to the required density as directed by the Engineer.
- 3. Remove and dispose of excess subgrade material. Subgrade areas deficient in materials shall be brought to grade by importing suitable materials from other areas.
- 4. Once subgrade is prepared, maintain and protect subgrade in the finished condition until the first course of aggregate has been placed.

B. Finishing Subgrades:

- 1. Before any paving material is placed, the subgrade shall be brought to the proper line, grade and cross section and shall be so maintained until the base course and paving is placed, except that extra depth of subgrade for increased thickness of the pavement, for pavement anchors, for pavement headers, and for increased thickness at the edges of the pavement may be removed just before the pavement is placed.
- 2. Compact the subgrade for pavement to 95% of maximum density as defined by the Compaction Control Tests herein.

C. Subgrade Protection:

1. Take all precautions necessary to protect the subgrade from damage; hauling over the finished subgrade shall be limited to that which is essential for construction purposes.
2. Equipment used for hauling over the prepared subgrade which causes damage to the prepared subgrade or underlying materials, or as determined by the Engineer, shall be removed from the work at the request of the Engineer.
3. Repair all cuts, ruts and breaks in the surface of the subgrade prior to placing surfacing, treated base, or paving materials at no cost to the Port.
4. Protect the prepared subgrade from both the Contractor's traffic and public traffic and maintain the subgrade by blading and rolling as frequently as may be necessary to preserve the subgrade in an undamaged and complete condition.

3.07 EXCESS MATERIAL DISPOSAL

- A. The Contractor shall be responsible for the disposal of all excess soils and those that the Engineer determines to be Excess Material. The excess soils shall be disposed at a location permitted to receive the type of excess soils to be disposed. Prior to removing from the site, the Contractor shall coordinate with the Port for testing of the material. The Port will test the material prior to disposal. See Section 01 35 43.19 – Export Soil Management for additional information. Costs associated with handling and disposal of non-regulated excess soils shall be included in the Contractor's base bid for the project.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections.
 - 1. Section 00 31 00 Available Project Information
 - 2. Section 01 33 00 – Submittal Procedures
 - 3. Section 01 45 00 – Quality Control
 - 4. Section 01 57 13 – Temporary Erosion and Sediment Control and Stormwater Pollution Prevention Plan
 - 5. Section 31 00 00 – Earthwork
 - 6. Section 31 23 33 – Trenching and Backfilling

1.02 DESCRIPTION OF WORK

- A. The work includes providing all supervision, labor, materials, and equipment required to dewater excavations, trenches, and subsurface construction at the Pier 4 site. It also includes handling, discharge, and disposal of all groundwater generated, surface runoff entering excavations, temporarily diverting stormwater from off-site terminal conveyance systems until new systems are constructed, chemically contaminated groundwater, stormwater ponds, and rinse and wash waters.

1.03 QUALITY ASSURANCE

- A. The Contractor shall obtain all necessary permits and authorizations for collecting and disposing of the dewatering discharge.
- B. It shall be the sole responsibility of the Contractor to control the rate and effect of the dewatering operations in such a manner as to avoid all settlement, subsidence, and undermining.
- C. Dewatering systems shall be designed by the Contractor. All dewatering operations shall be adequate to assure the integrity of the finished project and shall be the responsibility of the Contractor.

1.04 SUBMITTALS

- A. A Dewatering Plan including the proposed means and methods for handling the dewatering discharge and the permits required. Include the types of equipment, materials, and manufactured items to be incorporated in the dewatering system. Work affected by the plan shall not be performed until the original plan, or a revised plan, is approved by the Engineer.
- B. A Temporary Off-Site Stormwater Reroute plan including the proposed means and methods for temporarily intercepting existing off-site stormwater conveyance systems, as indicated on the Drawings, handling the dewatering discharge, and the permits required. Include the types of equipment, materials, and manufactured items to be incorporated in the temporary off-site stormwater reroute system. Work affected by the plan shall not be performed until the original plan, or a revised plan is approved by the Engineer and the approved system installed.
- C. Contractor-obtained authorizations or permits associated with dewatering and wastewater handling and discharge.
- D. All handling and discharge records or receipts for the project duration.

1.05 SITE CONDITIONS

- A. Subsurface investigations have been made at the project site. The information is available for review as described in Section 00 31 00 – Available Project Information.
- B. In general groundwater was determined to be between elevation 6 and 11 MLLW datum, see “Geotechnical Engineering Design Report Port of Tacoma Pier 4 Phase 2 Reconfiguration” for additional information. Dewatering may be required for shallow foundations, deep foundations, manholes, piping, trenching, utility vaults, and other installations. The groundwater elevation varies depending upon proximity to the shoreline, tidal conditions, and weather.
- C. The Contractor shall investigate and determine to its own satisfaction the extent and methods in which dewatering will be required to meet all required safety codes based on the nature of the existing soils and groundwater conditions.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Products required to accomplish, or to be incorporated into, the work of this section shall be selected by the Contractor, subject to review by the Engineer.
- B. Provide sufficient pumping equipment and other machinery to assure that the operation of the dewatering systems can be maintained.

PART 3 – EXECUTION

3.01 GENERAL

- A. Adequate pumping equipment shall be provided to handle and dispose of the water without damage or flooding of adjacent properties or infrastructure and in accordance with the permit authorizations. The dewatering systems shall be capable of continuous (24-hours per day) operation and for the duration of each activity requiring dewatering.
- B. Water shall be disposed of in accordance with the conditions of the Construction Stormwater General Permit, in a manner that does not disrupt adjacent tenant operations, and does not endanger public health. Coordinate disposal operations with the Engineer.
- C. Site work for excavations and pipe trenches shall be kept free from water to facilitate grading, construction of structures, laying and joining of pipe and appurtenances, placement of backfill material, and compaction. The dewatered condition shall be maintained at all times until backfill and compaction is completed.
- D. As directed by the Engineer, dewater trenches if the quantity of water reduces the stability of the excavation or prevents the proper installation of pipes, ductbanks, vaults, etc. Water in pipe trenches shall not be allowed to flow through the pipe while construction work is in progress. Adequate measures shall be implemented to prevent the entrance of material into pipes and conduits.
- E. Provide and maintain at all times during construction, multiple means and devices with which to promptly remove and properly dispose of all water entering trenches and excavations and other parts of the work, whether the water be surface water or underground water. Water shall not be discharged anywhere on the Project Site without approval of the Engineer.
- F. No piping shall be laid in water. Water shall not be permitted to rise over pipes or conduits until the concrete or mortar has set at least 24 hours or until the pipes or conduits have been adequately backfilled to prevent buoyancy.
- G. No embankment or backfill materials shall be placed in standing water.

- H. Written permission shall be secured from the Engineer before locating any wells, well points, or drain lines for purposes of dewatering within the limits of an excavation. The Engineer shall have the right to require that any abandoned dewatering well, line, or trench drains left in place within the excavation limits be filled with concrete or grout.
- I. Dewatering of excavations shall be controlled to prevent settlement damage to adjacent or nearby infrastructure caused by lowering of the groundwater table.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
1. Section 00 31 00 - Available Project Information
 2. Section 01 33 00 – Submittal Procedures
 3. Section 01 45 00 – Quality Control
 4. Section 26 05 00 – Common Work Results for Electrical
 5. Section 31 00 00 – Earthwork
 6. Section 31 23 19 – Dewatering
 7. Section 31 41 00 – Shoring and Underpinning
 8. Section 32 15 40 – Crushed Stone Surfacing
 9. Section 33 10 00 – Water Utilities
 10. Section 33 40 00 – Storm Drainage Utilities
 11. Section 33 44 19.19 – Utility Oil/Water Separators
 12. Section 33 44 19.23 – Off-Line Utility Storm Water Filters
 13. Section 33 71 19 – Electrical Underground Ducts and Manholes

1.02 DESCRIPTION OF WORK

- A. Work herein generally covers trenching, bedding, backfilling and compaction required for installation of site utilities and site storm drainage. Trench excavation and backfill shall include all excavation, backfilling, disposal of surplus and unsuitable material and all other work incidental to the construction of trenches.

1.03 SITE CONDITIONS

- A. The Port has subsurface investigations made at and near the proposed wharf in connection with this Project. Review and make determinations about the information and report described in Section 00 31 00 – Available Project Information.
- B. Anticipate encountering groundwater at any location within the project site. The groundwater elevation varies depending upon proximity to the shoreline, soil conditions, tidal conditions, and weather. See Section 31 23 19 – Dewatering.
- C. Verify the location of existing utilities at the site, and use an independent private locate company to assist. Those utilities which are to remain shall be protected from damage and remain operation throughout the Project. Damage to utilities which are to remain shall be repaired by the Contractor at its own expense.

1.04 SUBMITTALS

- A. Refer to Section 31 00 00 - Earthwork.

PART 2 – PRODUCTS

2.01 PIPE ZONE BEDDING MATERIAL

- A. Refer to Section 31 00 00 - Earthwork

2.02 LANDSIDE BACKFILL MATERIAL

- A. Refer to Section 31 00 00 – Earthwork

2.03 UNDERGROUND MARKING TAPE

- A. Refer to Section 31 00 00 – Earthwork

PART 3 – EXECUTION

3.01 STOCKPILING AND DISPOSAL

- A. Excavated material shall be stockpiled adjacent to the trench as it is removed and shall be backfilled from this position. Excess or suspect material shall be stockpiled on-site in accordance with Section 31 00 00 – Earthwork. The toe of the stockpile slope shall be located at least 2-feet from the edge of the trench. Stockpiled materials shall be located to cause minimal inconvenience to adjacent activities. Free access shall be provided to all fire hydrants, water valves, and meters; and clearance shall be left to enable free flow of storm water in gutters, conduits, or natural watercourses.
- B. Disposal of excess, unsuitable, and suspect material shall be performed in accordance with Section 31 00 00 - Earthwork.

3.02 TRENCH EXCAVATION

- A. The Contractor shall maintain, at all times during the execution of this work, safe and stable excavations. All trench excavation and preparation for trenching shall comply with applicable requirements of Section 7-08.3(1) of the WSDOT Standard Specifications.
- B. Unsuitable or suspect materials encountered during trench excavation shall be handled as specified in Section 31 00 00 - Earthwork.

3.03 TEMPORARY TRENCH COVERS

- A. Maintain vehicular traffic at and around trench work that occurs outside of the Work Area Limits shown on the Drawings (work in the container yard). Provide temporary steel plate trench covers of sufficient thickness to support the typical traffic loads present at the site based on span dimension across trenches. To facilitate coordination with the terminal operator, the Contractor shall notify the Port at least 7 days prior to the installation of trench covers in the container yard.
- B. Temporary trench covers are to be removed as soon as underground utility work is completed in accordance with the requirements of Section 7-08.3(1) of the WSDOT Standard Specifications to allow backfill and compaction work.

3.04 BEDDING AND BACKFILLING

- A. Place and compact trench Bedding and Backfill material in accordance with Section 31 00 00 - Earthwork. Compaction testing will be performed in conformance with Section 31 00 00 - Earthwork.
- B. Backfill around landside utility structures with landside backfill material as specified in Section 31 00 00 - Earthwork and as called for on the Drawings.

3.05 COMPACTION

- A. Refer to Section 31 00 00 – Earthwork.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections.
 - 1. Section 01 35 29 – Health, Safety and Emergency Response Procedures
 - 2. Section 01 50 00 – Temporary Facilities and Controls
 - 3. Section 26 05 00 – Common Work Results for Electrical
 - 4. Section 31 00 00 – Earthwork
 - 5. Section 31 23 19 – Dewatering
 - 6. Section 31 23 33 – Trenching and Backfilling
 - 7. Section 33 10 00 – Water Utilities
 - 8. Section 33 40 00 – Storm Drainage Utilities
 - 9. Section 33 44 19.19 – Utility Oil/Water Separators
 - 10. Section 33 44 19.23 – Off-Line Utility Storm Water Filters
 - 11. Section 33 71 19 – Electrical Underground Ducts and Manholes

1.02 DESCRIPTION OF WORK

- A. This section includes the work necessary to design, furnish, install, maintain, and remove shoring required for all structure and trench excavations greater than four (4) feet deep.

1.03 REFERENCE STANDARDS

- A. The current version of the Standard Specifications and Standard Plans for Road, Bridge, and Municipal Construction, prepared jointly by the Washington State Department of Transportation (WSDOT) and the American Public Works Association (APWA).
- B. International Building Code (IBC), 2012, as amended and adopted by the City of Tacoma in the Tacoma Municipal Code (TMC).
- C. The Washington Industrial Safety and Health Act (RCW Chapter 49.17, including WAC Chapter 296-155).

1.04 QUALITY ASSURANCE

- A. Design, agency approval, permits, construction, maintenance, and removal of all shoring elements are the sole responsibility of the Contractor.
- B. A Professional Engineer, licensed in the State of Washington, shall be used to design all aspects of the shoring.
- C. Shoring shall be provided in accordance with Section 2-09.3(3) D – Shoring and Cofferdams, of the WSDOT Standard Specifications and applicable local, State and Federal safety codes.

1.05 SUBMITTALS

- A. Complete detailed drawings and design calculations, sealed by a Professional Engineer, indicating all details of shoring assembly, layout, installation, and coordination with other substructure details. Include details of design criteria, material properties, loads and reactions, member sizes, connection details, and other salient features.

- B. Detailed drawings and design calculations in accordance with the reference standards shall be submitted a minimum of 10 working days prior to beginning excavation.

1.06 SITE CONDITIONS

- A. The Port has made subsurface investigations at the site in connection with this project. The information is available for review as described in Section 00 31 00 - Available Project Information.
- B. Anticipate encountering groundwater at or near the existing ground surface at any location on the project site. The groundwater elevation varies depending upon proximity to the shoreline, tidal conditions, soil conditions, and weather.
- C. Contractor shall investigate and determine to its own satisfaction the extent and methods in which shoring will be required to meet all required safety codes based on the nature of the existing soils and groundwater conditions.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Products that are required to accomplish, or to be incorporated into, the work of this section shall be selected by the Contractor, subject to review by the Engineer.

PART 3 – EXECUTION

3.01 GENERAL

- A. The method of shoring shall be according to the Contractor's design. The design, planning, installation and removal, if required, of sheeting and bracing shall be accomplished in such a manner as to maintain the required excavation or trench section and to maintain the undisturbed state of soils below and adjacent to the excavation.
- B. Repairs and replacements as a result of damage caused by installation, deflections, local failure, global failure, or removal of shoring and underpinning shall be at the Contractor's expense.
- C. In trenching operations, the use of horizontal strutting below the barrel of pipe or the use of pipe as support for trench bracing shall not be permitted.
- D. Sheet piling and timbers in trench excavations shall be withdrawn in a manner so as to prevent subsequent settlement of pipes and conduit or additional backfill loading which might overload pipes and conduit.
- E. The portion of cribbing or sheeting extending below the spring line of pipe shall be left in place unless satisfactory means of reconsolidating bedding or side support disturbed by cribbing or sheeting removal can be demonstrated.
- F. If a movable box is used in lieu of cribbing or sheeting, and the bottom cannot be kept above the spring line of the pipe, the bedding or side support shall be carefully reconsolidated behind the movable box prior to placing initial backfill.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 00 31 00 – Available Project Information
 - 2. Section 01 14 00 – Work Restrictions
 - 3. Section 02 41 00 – Demolition
 - 4. Section 03 10 00 – Concrete Forming
 - 5. Section 03 20 00 – Concrete Reinforcing
 - 6. Section 03 30 00 – Cast-in-Place Concrete
 - 7. Section 03 40 00 – Precast Concrete
 - 8. Section 03 60 00 – Grouting
 - 9. Appendix – Water Quality Monitoring and Protection Plan (WQMPP)

1.02 DESCRIPTION OF WORK

- A. The extent and location of the driven pile work is indicated on the Drawings. The work includes the requirements for furnishing, transporting, handling, and installing steel sheet piling and precast prestressed concrete piles.
- B. Work also includes the requirements for pile tolerances, record keeping, cut-offs, pile build-ups, inspections, pile driving analyzer (PDA) dynamic testing, PDA re-strikes, un-instrumented restrikes, and wave equation analysis of pile (WEAP) analyses.
- C. All pile installation work shall be performed in compliance with the work sequence and schedule constraints described in Section 01 14 00 – Work Restrictions.

1.03 REFERENCES

- A. Geotechnical report: See Section 00 31 00 – Available Project Information.
- B. ASTM D 4945-12 – Standard Test Method for High-Strain Dynamic Testing of Deep Foundations.

1.04 QUALITY ASSURANCE

- A. Provide at least one qualified person who shall have a minimum of five (5) years experience with marine conditions, all piling types, piling lengths, and installation methods to be used on the project and who shall supervise and direct all work performed under this section.
- B. Provide at least one qualified person who shall have a minimum of five (5) years of experience in marine piling inspection and who shall keep detailed driving records and logs for each pile from the time the pile is picked until installation is complete. The Contractor shall keep a complete record of each pile installed, noting the make, model, weight, dynamic force, frequency or range of frequencies, maximum eccentric moment, clamping method, pile size and length, pile penetration rate during driving, and total pile penetration below mudline. A sample pile driving log is provided at the end of this section.
- C. Retain other assistance as directed by the Engineer for observation of pile installation activities.

- D. Mark all piling at 1-foot intervals beginning at the tip and provide callouts of the length at 5-foot intervals.
- E. It is the Contractor's responsibility to install in an acceptable condition and location all the piles to the minimum tip and cut-off elevations indicated on the Drawings. The Contractor shall operate the pile driving system so that piles can be installed without damage.
- F. No piles shall be driven until the Engineer's review of proposed equipment is complete and an authorization to proceed is given.
- G. The PDA testing firm shall be an independent agency demonstrating at least five (5) years of experience with PDA instrument installation, PDA testing, PDA results interpretation, and case pile wave analysis program (CAPWAP) analysis. At least one (1) person from the firm shall be a licensed Professional Engineer in Washington State and shall supervise the work.
- H. The Port reserves the right to inspect the above-water and underwater portions of all piling after installation, and the Contractor shall make available the site, or portions thereof, to meet the Port's inspection schedule. Any reports including underwater photographs or video prepared will be made available for the Contractor's review. All observed damage or defects shall be repaired at the Contractor's expense using damage-specific or defect-specific products specified by the Engineer.

1.05 SUBMITTALS

- A. See Section 03 40 00 – Precast Concrete for concrete pile submittal requirements.
- B. Mill certificates for steel sheet piling.
- C. Documentation demonstrating the qualifications and experience of the individuals supervising pile driving and individuals keeping driving logs, as described above.
- D. Detailed pile installation plan and driving schedule showing the location of each pile to be driven. Include descriptions of proposed equipment and procedures to be used in pile driving. Provide data on crane types and capacities, lead types, lead lengths, hammer types, rated energies, cushion materials, helmet materials, modulus of elasticity, etc., for each pile type. A sample hammer data sheet is provided as a supplement at the end of this section.
- E. Order lengths for all piling.
- F. For prestressed concrete test piles, a wave equation analysis report (WEAP) for each proposed hammer, pile type, and soil profile combination, as prescribed within this section.
- G. Daily pile driving logs, as prescribed within this section: A sample pile driving form is provided as a supplement at the end of this section.
- H. Pile surveys, as prescribed within this section.
- I. PDA work plan and schedule including test methods, equipment descriptions, instrumentation, PDA agency credentials as described above, PDA agency personnel resumes, and CAPWAP or other capabilities.
- J. PDA test results, interpretations, and report for each PDA mobilization, as prescribed within this section.
- K. Re-strike results, as prescribed herein.
- L. Pile inspection reports, as prescribed herein.

1.06 SITE CONDITIONS

- A. Inherent Delays

1. The Contractor shall anticipate inherent delays while conducting pile driving work in the Blair Waterway. Inherent delays are primarily due to commercial shipping traffic within the shipping channel. Commercial shipping traffic shall have precedence over the Contractor's activities and may require them to stop, move, adjust, and/or slow down to accommodate vessel movement. The Contractor shall make allowance in its construction schedule for delays or interruptions due to vessel movement within the shipping channel in the waterway. The bid prices shall include allowances for such inherent delays.

B. Interference with Navigation

1. The Blair Waterway and Commencement Bay are active navigation corridors used for transport of deep-draft commerce activities. These activities shall take priority over the Contractor's operations. The Port's tenants and other entities using the waterway must have access along the project site for the duration of the construction contract. The Contractor shall conduct its operations in a manner that will minimize interference with those activities. In the event that the Contractor's construction equipment (tugs, floats, barges, workboats, anchors, lines, etc.) obstructs the navigable waterway so as to hinder movement of commercial vessels, the equipment shall immediately be moved to facilitate the shipping activity.
2. Any damage to the Contractor's equipment in navigation lanes due to the Contractor's failure to move when required shall be at the Contractor's sole risk and expense.

C. Security Concerns

1. For security and vessel navigation concerns, the Contractor shall give notice and receive required approval from the Engineer prior to berthing at any location along the Blair Waterway. The Contractor shall notify the Coast Guard as required to comply with Coast Guard and Port regulations for operating within the Blair Waterway and Commencement Bay.

D. Existing Facilities:

1. Drive piling at the designated locations and be prepared to encounter slope protection, riprap and/or other subsurface obstructions.
2. Any damage to the existing pier structure at the Husky Terminal and/or other existing facilities caused by the Contractor's operations, as determined by the Engineer, shall immediately be repaired to the pre-project condition at the Contractor's expense.
3. Condition Survey of Existing Structures: The Contractor and Engineer shall review, document, and verify the condition of adjacent structures and appurtenances adjacent to the work areas prior to beginning work to ascertain existing conditions. Any damage documented as a result of the Contractor's activities will be repaired at no additional cost to the Port.

E. Subsurface Conditions:

1. Subsurface conditions have been explored at the project site. See Section 00 31 00 – Available Project Information. Additional soils reports from previous projects in the vicinity are also available for review at the Port's office.
2. The Contractor shall make its own determinations and conclusions regarding the nature of the materials and the methods and procedures to be utilized in performing the pile driving work, based upon all of the available project information.
3. The Contractor shall investigate, interpret, evaluate, and plan for pile driving conditions that may be affected by existing piles or buried infrastructure, and the impacts there may be on methods of pile installation.

4. Layout in the field using permanent means piles adjacent to the existing bulkhead, existing utilities, and new utilities before commencing any work. Verify that the pile grid and utilities do not conflict. Immediately report potential conflicts to the Engineer for further direction.
- F. Equipment Restrictions: If land-based pile driving equipment is used, heavy pile driving and construction equipment shall be kept away from the crest of slopes. Heavy timber mats shall be used under the wheels or tracks of such equipment. The edge of mats shall be set back a minimum of ten (10) feet from the crest of the slope or as recommended by a Professional Engineer licensed in the state of Washington, trained in geotechnical engineering, retained by the Contractor.

PART 2 - PRODUCTS

2.01 PRODUCT HANDLING

- A. Before handling or transporting, inspect and verify that all piles are undamaged and free of defects. Provide specific details to the Engineer if any pile does not meet those criteria and obtain subsequent direction from the Engineer before transporting to the project site.
- B. Delivery, Handling, and Replacements
 1. Precast concrete piling shall be lifted and supported during manufacturing, stockpiling, transporting, and erection operations only at the lifting or supporting points, or both, as shown on the approved shop drawings, and with approved lifting devices.
 2. Transportation, site handling, and erection shall be performed with industry standard equipment and methods, and by qualified personnel.
 3. Do not damage piling during any handling and delivery operations. Handling methods shall not overstress, crack, damage, fracture, or produce impact on the units. Repair all damaged piles at no cost to the Port. Repair methods shall be approved by the Engineer prior to additional handling or driving. Piles damaged beyond repair shall be removed and replaced at no additional cost to the Port.
- C. Storage
 1. Place stored piles so that identification marks are discernible. Separate stacked members by battens across full width of each bearing area.
 2. Store all piling on timber blocking so that the axis of each pile is maintained in a straight line and that bending stresses, misalignments, and cracking are not produced. Locate the blocking of successive tiers exactly above the blocking of the lower tiers.

2.02 STEEL SHEET PILING

- A. All steel sheet piling shall be new. Steel sheet piling shall conform to the requirements of ASTM A 690, Grade 50. Individual sheets shall be supplied to the length shown on the drawings and without splices. Sheet piles meeting ASTM A 690 do not require coating.

2.03 PRESTRESSED CONCRETE PILES

- A. Precast, prestressed concrete piling shall be manufactured as indicated on the Drawings with lifting points detailed and provided by the manufacturer. See Section 03 40 00 – Precast Concrete, Section 03 30 00 – Cast-in-Place Concrete, and Section 03 20 00 – Concrete Reinforcing.
- B. Prior to delivery, verify that the piling have reached the specified concrete compressive strength indicated on the Drawings and have been cured for a minimum of twenty-eight (28) days.
- C. Inspect all piling for conformance with the Drawings, specifications, and manufacturing tolerances. Do not accept delivery of out of tolerance piling and report any such rejection to the

Engineer. Submit written notice to the Engineer that the piles have been inspected and that the piling condition is in accordance with the Drawings and specifications.

- D. Bonding adhesive for pile build-ups: Epoxy bonding adhesive shall be Concreative Liquid LPL manufactured by BASF, or Sikadur 32 HI-MOD LPL, manufactured by Sika Corporation, or equal approved by the Engineer prior to any pile driving.

PART 3 - EXECUTION

3.01 GENERAL

- A. All pile installation work shall be coordinated and performed in strict accordance with the permit requirements and the WQMPP. This specification section does not include all required protection measures, mitigation measures, and BMPs associated with this project. The Contractor shall pay particular attention to the conditions of issued permits and the WQMPP, and applicable regulations and authorizations associated with this project. All protection measures, mitigation measures, and BMPs included in these documents shall be implemented by the Contractor.
- B. For concrete pile installation, submit a WEAP report for each proposed hammer-type/pile-type/soil-profile permutation.
 - 1. A minimum of three soil profiles shall be used, one near the south end of the site, one near the middle of the site, and one near the north end of the site.
 - 2. Indicate all input parameters, assumptions, and resulting pile output and stresses for each permutation.
 - 3. For prestressed concrete piles, the maximum driving stresses shall not exceed 400 psi plus effective prestress in tension and 4,500 psi minus effective prestress in compression.
- C. It is anticipated that the concrete piles may be adequately driven with a Delmag D80 diesel pile hammer. The actual pile driving hammer shall be selected by the Contractor per the requirements of these specifications and the geotechnical information referenced in Section 00 31 00 – Available Project Information.
- D. All piles shall be driven with fixed-lead pile drivers. Leads shall be fixed at the top and bottom during pile driving operations. Leads shall be of sufficient length so that the use of a follower will not be necessary. Leads shall be adjustable.
- E. Do not drive piles within 100 feet of cast-in-place concrete until a minimum of 3 days after initial concrete set, unless otherwise approved by the Engineer.
- F. Drive all piling to the minimum tip elevation and the required ultimate load capacity shown on the drawings. Driving deeper in order to obtain the required ultimate load capacity may be required.
- G. Once driving has started, drive piles continuously until reaching the minimum tip elevation, even if the required ultimate load capacity has been achieved. Voluntary pauses or interruptions during driving shall not be allowed.
- H. Drive piles in the designated locations, remove riprap, and/or spud as necessary to obtain the required penetration and pile alignment tolerances. Adjust pile alignment and initial stab location to account for soil movement from pile driving or adjacent construction activities, so that each pile is in its designated final location after completion of all pile driving and other construction activities.
- I. Pile Surveys:

1. Survey the as-driven locations of all piling immediately after the leads have been removed. Do not erect falsework until the survey is complete for all piles in a bent. For each pile, provide a written record of horizontal (plan) location, tip elevation, and top elevation (before cut-off or before build-up if necessary) and submit it to the Engineer within twenty-four (24) hours of driving. For piles requiring cut-offs or build-ups, report the estimated plan location along the pile axis intersecting the horizontal plane at the specified top elevation. Repeat the survey upon completion at piles with cut-offs or build-ups within a bent.
 2. If the initial as-driven survey is not provided within the specified time frame, the Port may retain a surveyor to record such information and will deduct the cost of such survey work from the contract.
 3. Notify the Engineer immediately when piles do not meet the specified driving tolerances. Do not erect falsework on piles without the Engineer's approval.
 4. After pile cut-offs and/or pile build-ups, and falsework installation, but prior to concrete placement, survey and submit the final plan locations and elevations at the tops of all piles.
- J. Driving Tolerances:
1. Horizontal (Plan) Location: The top work points of all prestressed piling shall be within 4 inches of the indicated location shown on the drawings.
 2. Plumb Piles: Deviation from plumb shall not be more than 1 inch per 10 feet of pile length.
 3. Cut-off Elevation: Deviation from elevations indicated on the Drawings shall not be more than $\frac{1}{4}$ inch.
 4. Pulling, pushing, or manipulation of piles to force them into position will not be permitted.
- K. Rejected or Repaired Piles:
1. Any piling that deviate more than the driving tolerance limits specified above may be rejected by the Engineer.
 2. If subsurface conditions cause pile drifting beyond allowable tolerances, notify the Engineer immediately of the circumstances and submit proposed corrective measures for review.
 3. Any pile that does not reach the prescribed tip elevation shown on the Drawings or does not achieve the Engineer's refusal criteria may be rejected by the Engineer.
 4. Any pile damaged, as indicated by breaks, holes, or spalls deeper than $\frac{1}{4}$ inch, or visible cracks greater than or equal to 0.007 inches in width may be rejected by the Engineer. A damaged pile is also defined as any pile containing one or more cracks, visible to the naked eye, on two or more faces of the pile. The Engineer may direct that damaged piles be repaired or replaced.
 5. Rejected piles and associated remedial work will not be paid for by the Port.
 6. The Engineer may direct that a rejected pile be removed and replaced with a new pile driven in its place, or that a new pile be driven adjacent to the rejected pile. The Engineer may further direct that both new and rejected piles be incorporated into the structure.
 7. Design and construction costs resulting from rejected piling, including modifications to pile caps, crane beams, bulkheads, existing infrastructure, etc., shall be borne by the Contractor.
 8. The Engineer may direct that rejected piles be cut off at the mudline. Rejected, broken, and cut off piles shall be removed and disposed of at the Contractor's expense.

- L. Daily Pile Driving Records: For each pile driven, submit a pile driving record form. Each initial driving record and re-strike record shall be submitted daily, and shall show the information below. However, report damaged piles to the Engineer immediately.
 - 1. Date, time, and weather
 - 2. Pile location, casting date, length, type and size of pile
 - 3. Hammer used, rated hammer energy, pile cushion type and thickness
 - 4. Blows per foot of penetration, blows per minute, and number of blows in the last 6 inches
 - 5. Hammer stroke during driving obtained from an E-saximeter,
 - 6. Pile cushion final thickness
 - 7. Damage, obstructions, or any unusual occurrences during driving, and all other data on the sample pile driving form.

3.02 STEEL SHEET PILING

- A. Sheet pile installation shall occur after stone column installation is complete.
- B. Handle steel sheet piling by the use of bridles, strong backs, or other rigging which will prevent permanent deformations and coating damage.
- C. Driving:
 - 1. Drive steel sheet piling in true line and position with a vibratory hammer. The pile driving hammer shall be selected by the Contractor and shall be suitable for driving the piling in a satisfactory manner to the tip elevations indicated on the Drawings without overstressing the pile.
 - 2. Carefully plumb the pile before driving. Take care during driving to prevent any tendency of the piles to twist or rotate. The hammer shall be equipped with a suitable clamping system to fit the pile being driven and the hammer being used. Remove riprap and other debris as necessary to install sheet pile.
- D. Driving Tolerances:
 - 1. Horizontal (Plan) Location: The top work points of all steel sheet piling shall be within 3 inches of the indicated location shown on the drawings.
 - 2. Maximum variation from Vertical: 1 percent..
 - 3. Cut-off Elevation: Deviation from elevations indicated on the Drawings shall not be more than ¼ inch.
 - 4. Pulling, pushing, or manipulation of steel sheet piling to force them into position will not be permitted.

3.03 CONCRETE PILING

- A. Handling and Storing: See Section 03 40 00 – Precast Concrete.
- B. Driving:
 - 1. Do not drive prestressed concrete piling before twenty-eight (28) days of curing has elapsed and until cylinder tests, made from the concrete pour for the piling, show achievement of the specified 28-day compressive strength.
 - 2. Protect the heads of piling during driving by using helmets of approved design with a wood cushion next to the pile head. The driving helmet shall fit loosely so that the pile head is free to rotate.

3. The pile cushion shall be a composite of plywood and softwood or solid plywood. The cushion thickness shall be determined by the Contractor, subject to approval by the Engineer, and adequate to prevent damage to the piles.
4. The minimum cushion thickness shall be sixteen (16) inches. A new pile cushion shall be used for each pile; the cushion shall be replaced as necessary during driving to protect the pile. As a minimum, allow for at least one cushion replacement per pile.
5. The hammer assembly and leads may be rejected, and a new assembly shall be provided at the Contractor's expense, when any one of the following conditions occur:
 - a. The hammer supplied is not in working order or is not capable of supplying at least 90 percent of the maximum rated energy specified by the manufacturer.
 - b. If downtime due to poor hammer performance (repair and/or maintenance) occurs that affects adversely the construction schedule or the schedule of adjacent tenants.
6. Splicing of concrete piling, except pile buildups as specified, shall not be permitted.
7. The Engineer will provide driving and refusal criteria based on the Contractor's proposed equipment, driving methods, WEAP analyses (modified if necessary by local site conditions), dynamic PDA results, instrumented PDA re-strikes, un-instrumented re-strike data, previous test pile results, or other information.

C. Dynamic Pile Driving Analysis:

1. Dynamic Pile Driving Analysis (PDA) tests shall be performed in accordance with ASTM D 4945-12 using a pile driving analyzer on piles selected by the Engineer. Piles will be selected as PDA piles, by the Engineer, up to the number listed in the bid form for bid item – Dynamic Pile Driving Analysis.
2. Restrikes shall be performed on all PDA piles. PDA pile restriking shall be performed as described below in Section D – Re-strikes. PDA testing shall be performed for both initial driving and re-striking.
3. PDA test pile locations will be provided by the Engineer a minimum of 10 days in advance. PDA test piles will be located throughout the length of the project. The Contractor shall accommodate the locations selected by the Engineer for the PDA piles at no additional cost to the Port.
4. The PDA testing subcontractor shall be fully qualified and regularly engaged in PDA testing. The subcontractor shall use instrumentation consisting of transducers and accelerometers attached to the top of the pile before driving. The instrumentation shall be placed on the pile prior to driving and be connected by wires to a PDA. PDA testing shall be performed during driving of the entire length of the pile.
5. Submit a summary report of the PDA testing and results, including distribution and magnitude of driving stresses, hammer efficiency, and CAPWAP analysis. PDA results shall be delivered to the Engineer within 72 hours after PDA testing is completed.
6. The Engineer may revise the required pile tip elevations, driving criteria, and/or order lengths based on PDA results or other data.
7. CAPWAP analysis locations shall be coordinated with the Engineer prior to the analysis. For planning purposes, CAPWAP may be assumed to be performed when the pile tip is approximately 20 feet above the required tip elevation, when the pile tip is at the required tip elevation, and at the start of the pile re-strike.

D. Re-strikes:

1. Selected, non-PDA, production piling shall be re-driven, also called re-strike piles, after the minimum set-up time has elapsed.
2. The minimum set-up time shall be ninety six (96) hours, or as directed by the Engineer.
3. Piles will be selected as re-strike concrete piles, by the Engineer, up to the number listed in the bid form. Accommodating the locations selected for the bid quantity of restrikes shall be at no additional cost to the Port.
4. Relocate the pile driving rig, personnel, equipment, tools, incidentals, etc. as required to the re-strike locations. Use the same pile driving hammer and equipment as used for initial pile driving.
5. Mark each re-strike pile in one inch increments. Measure pile penetration for each re-strike using level survey techniques from stable ground or an otherwise fixed position such that the number of blows of the hammer can be recorded for each inch of penetration of the pile. Measure and record pile set to the nearest 0.01 foot. The Contractor shall provide survey equipment accurate to 0.01 feet.
6. Re-drive each re-strike pile using the same means and methods as the initial production drive. Conduct all re-strikes in such a manner that full and consistent energy from the hammer is imparted to the pile and operate the hammer at the same energy as for production piles.
7. Use compressed or used pile cushions for re-driving of piles.
8. Drive piles at least 6 inches unless otherwise directed by the Engineer. Record information as described in the paragraph "Daily Pile Driving Records."
9. Re-strike results for a pile shall be delivered to the Engineer within 24 hours after the individual re-strike is complete.
10. Based on the results of the re-strikes, or other data, the Engineer may modify the driving criteria and/or the minimum tip penetration criteria. Additional piles may be restruck at the request of the Engineer.

E. Pile Buildups:

1. It is anticipated that pile build-ups will only be necessary if required geotechnical capacity of the piles is not achieved at the design tip elevation shown on the Drawings.
2. Concrete for pile build-ups shall have a minimum 28-day compressive strength as indicated on the drawings and shall meet requirements of Section 03 30 00 – Cast-in-Place Concrete.
3. Prior to placing concrete, coat top of pile with the specified epoxy bonding adhesive (see paragraph 2.03.D). Mix and apply the bonding adhesive in accordance with the manufacturer's directions.
4. Concrete for pile build-ups shall not be placed underwater. Forms and reinforcing steel shall be thoroughly cleaned and flushed with fresh water prior to placing concrete. Coordinate cleaning and flushing with placement of epoxy bonding adhesive in order that adhesive is fully effective in accordance with manufacturer's specifications.
5. The length of the buildup shall not exceed the length shown on the drawings, except as approved by the Engineer.
6. Forms for buildups shall be left in place for a minimum ten (10) day curing period.
7. Buildups shall not be permitted on more than five (5) percent of the total number of piling, except as approved by the Engineer. If this percentage is exceeded, or if the Engineer

determines the clustered location of the buildups is undesirable, piling of insufficient length shall be replaced with longer piling. Payment for such replacement will be made as an adjustment to the contract price.

F. Pile Cutoffs:

1. Pile cutoff length is defined as the distance between the top of the pile after driving and the required cut-off elevation shown on the Drawings.
2. The pile order lengths indicated on the drawings include an allowance for cutoff. Prior to ordering, the contractor shall calculate the amount of potential cutoff based on the minimum tip elevations, prescribed cutoff elevations, and order lengths shown.
3. Each pile shall be cutoff in a manner that results in a sound and flat head.
4. Cutting, handling, and disposal of pile cutoff lengths less than or equal to 10 feet shall be considered incidental to pile installation work. Cutting, handling, and disposal of pile cutoff lengths greater than 10 feet will be compensated under Bid Item – Pile Cut-offs (lengths greater than 10 feet). It is anticipated that pile cutoffs greater than 10 feet in length will only be necessary if unexpected below-ground obstructions or hard driving conditions are encountered during pile driving that prevent the pile from being installed to the design tip elevation.

G. Inspections:

1. Install piling in conformance with the drawings and specifications, and in an undamaged condition, as defined under paragraph "Rejected Piles".
2. After installation, conduct full-height inspections of all piles, from the top of pile to the mudline, to ensure that each is undamaged and conforms to the drawings and specifications. Each inspection day, report the results to the Engineer in writing.
3. Submit for review a written inspection report detailing each pile's as-driven condition within fourteen (14) days of final driving, but before falsework installation begins. Note all crack locations, crack widths, crack lengths, spall locations, spall dimensions, other defects, or unusual features at the mudline.
4. The Engineer may inspect any or all of the piling. Any discrepancy between the Engineer's and the Contractor's inspection reports shall be resolved by a joint inspection. Inspections by the Engineer will be performed at no cost to the Contractor.

3.04 OBSTRUCTIONS

- A. Where below-ground obstructions prevent piles from being driven in the required plan location, to the required tip penetration, or to the prescribed capacity, the Engineer may direct that special methods be employed to install the piles.
- B. Special methods may include spudding, predrilling, structure modifications, techniques proposed by the Contractor, or other means developed collaboratively between the Contractor and the Engineer. Jetting or blasting shall not be permitted.
- C. Payment for special methods will be made as an adjustment to the contract price.

3.05 SUPPLEMENT

A.END OF SECTION
END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
 - 1. Section 01 33 00 – Submittal Procedures
 - 2. Section 03 10 00 – Concrete Forming and Accessories
 - 3. Section 03 20 00 – Concrete Reinforcing
 - 4. Section 03 30 00 – Cast-in-Place Concrete
 - 5. Section 31 00 00 – Earthwork

1.02 DESCRIPTION OF WORK

- A. The extent and location of the drilled shaft work for high-mast light pole foundations is indicated on the Drawings. The work shall consist of furnishing all materials, labor, tools, equipment, services, and incidentals necessary to construct the shafts.
- B. Provisions for handling the excavated materials, which may be suspect soils containing regulated materials, are provided in Section 31 00 00 - Earthwork.

1.03 REFERENCES

- A. Geotechnical report: See Section 00 31 00 – Available Project Information.
- B. American Petroleum Institute (API) Specifications, Standards, and Test Methods, designated by basic reference in this section (use the most current edition at the time of bid unless otherwise indicated).
- C. American Society for Testing Materials (ASTM), Standard Specifications and Standard Test Methods, designated by basic reference in this section (use the most current edition at the time of bid unless otherwise indicated).
- D. Standard Specifications for Road, Bridge, and Municipal Construction, M41-10, 2012 edition, by Washington State Department of Transportation (WSDOT Standard Specifications).

1.04 QUALITY ASSURANCE

- A. Shaft Construction Tolerances
 - 1. Shafts shall be constructed so that the center at the top of the shaft is within a horizontal tolerance of 4 inches.
 - 2. Shafts shall be within 1.5 percent of plumb.
 - 3. During drilling or excavation of the shaft, the Contractor shall make frequent checks on the plumbness, alignment, and dimensions of the shaft. Any deviation exceeding the allowable tolerances shall be corrected with a procedure approved by the Engineer.
 - 4. Shaft steel reinforcing bar placement tolerances shall conform to Section 6-02.3(24)C of the WSDOT Standard Specifications.
- B. Crosshole Sonic Log (CSL) Testing
 - 1. The Contractor shall perform CSL testing of 3 shafts in accordance with section 3.07 of this section.
- C. Shaft Preconstruction Conference

1. A shaft preconstruction conference shall be held at least five working days prior to the Contractor beginning any shaft construction work at the site to discuss construction procedures, personnel, and equipment to be used, and other elements of the approved shaft installation plan as specified in paragraph 1.04.B of this section.
2. The Contractor shall accommodate the crosshole sonic log testing by furnishing and installing access tubes in accordance with paragraph 3.04 of this section.
3. If synthetic slurry is used to construct the shafts, the frequency of scheduled site visits to the project site by the synthetic slurry manufacturer's representative shall be discussed.
4. Representing the Contractor shall be the superintendent, on site supervisors, and all foremen in charge of excavating the shaft, placing the casing and slurry as applicable, placing the steel reinforcing bars, and placing the concrete. If synthetic slurry is used to construct the shafts, the slurry manufacturer's representative or approved Contractor's employee trained in the use of the synthetic slurry shall also attend.
5. Representing the Port will be the Engineer, key inspection personnel, and others as designated by the Port.
6. If the Contractor's key personnel change, or if the Contractor proposes a significant revision of the approved shaft installation plan, an additional conference shall be held before any additional shaft construction operations are performed.

1.05 DEFINITIONS

- A. CSL Testing Agency: Organization hired by Contractor that provides CSL testing in accordance with the requirements of paragraph 3.07 of this section.
- B. Design Position: The location of the centroid of the shaft at final top of shaft elevation (x, y, and z coordinates) as shown.
- C. Elevations: Referenced to mean lower low water (MLLW).
- D. Permanent Casing: Casing designed as part of the shaft structure and installed to remain in place after construction is complete.
- E. Temporary Casing: Casing installed to facilitate shaft construction only, which is not designed as part of the shaft structure, and which shall be completely removed after shaft construction is complete, unless otherwise shown in the drawings.
- F. Top of Shaft Soil Excavation shall be defined as the highest existing ground point within the shaft diameter. For shafts where the top of shaft is above the existing ground line and where the drawings show embankment fill placed above the existing ground line to the top of shaft and above, the top of shaft soil excavation shall be defined as the top of shaft. Excavation through embankment fill placed above the top of shaft will not be included in the measurement.

1.06 SUBMITTALS

- A. Construction Experience
 1. Prior to the start of drilled shaft construction, the Contractor shall submit a project reference list to the Engineer for approval verifying the successful completion by the Contractor of at least three separate foundation projects with drilled shafts of diameters, depths, and ground conditions equal to or larger than those shown in the drawings. A brief description of each project and the owner's contact person's name and current phone number shall be included for each project listed.
 2. Prior to the start of drilled shaft construction, the Contractor shall submit a list identifying the on-site supervisors and drill rig operators assigned to the project to the Engineer for

approval. The list shall contain a detailed summary of each individual's experience in shaft excavation operations, and placement of assembled steel reinforcing bar cages and concrete in shafts.

3. On-site supervisors shall have a minimum two years of experience in supervising construction of drilled shaft foundations of similar size (diameter and depth) and scope to those shown in the drawings, and similar geotechnical conditions to those described in the geotechnical report and summary of geotechnical conditions. The work experience shall be direct supervisory responsibility for the on-site shaft construction operations. Project management level positions indirectly supervising on-site shaft construction operations are not acceptable for this experience requirement.
4. Drill rig operators shall have a minimum one year experience in construction of drilled shaft foundations.
5. The Engineer will approve or reject the Contractor's qualifications and field personnel within 10 working days after receipt of the submission. Work shall not be started on any drilled shaft until the Contractor's qualifications and field personnel are approved by the Engineer. The Engineer may suspend the drilled shaft construction if the Contractor substitutes unqualified personnel. The Contractor shall be fully liable for the additional costs resulting from the suspension of work and no adjustments in contract time resulting from the suspension of work will be allowed.

B. Shaft Installation Plan

1. The Contractor shall submit a shaft installation narrative for approval by the Engineer. In preparing the narrative, the Contractor shall reference the available subsurface data provided in the contract test hole boring logs and the geotechnical report(s) prepared for this project. This narrative shall provide at least the following information:
 - a. An overall construction operation sequence.
 - b. List, description and capacities of proposed equipment, including but not limited to cranes, drills, auger, bailing buckets, final cleaning equipment and drilling unit. The narrative shall describe why the equipment was selected, and describe equipment suitability to the anticipated site and subsurface conditions. The narrative shall include a project history of the drilling equipment demonstrating the successful use of the equipment on shafts of equal or greater size in similar soil conditions. The narrative shall also include details of shaft excavation and cleanout methods.
 - c. Disposal of excavation soil and debris shall be in accordance with Section 31 00 00 – Earthwork.
 - d. Details of the method(s) to be used to ensure shaft stability (i.e., prevention of caving, bottom heave, etc. using temporary casing, slurry, or other means) during excavation (including pauses and stoppages during excavation) and concrete placement. If permanent casings are required, casing dimensions and detailed procedures for permanent casing shall be provided.
 - e. Detailed procedures for mixing, using, maintaining, and disposing of the slurry shall be provided. A detailed mix design (including all additives and their specific purpose in the slurry mix), and a discussion of its suitability to the anticipated subsurface conditions, shall also be provided for the proposed slurry.
 - f. The submittal shall include a detailed plan for quality control of the selected slurry, including tests to be performed, test methods to be used, and minimum and/or maximum property requirements that must be met to ensure that the slurry functions as intended, considering the anticipated subsurface conditions and shaft construction

methods, in accordance with the slurry manufacturer's recommendations and the requirements of this section. As a minimum, the slurry quality control plan shall include the following tests:

Property	Test Method
Density	Mud Weight (Density), API 13B-1, Section 1
Viscosity	Marsh Funnel and Cup, API 13B-1, Section 2.2
PH	Glass Electrode, pH Meter, or pH Paper
Sand Content	Sand, API 13B-1, Section 5

- g. The method used to fill or eliminate all voids below the top of shaft between the plan shaft diameter and excavated shaft diameter, or between the shaft casing and surrounding soil, if permanent casing is specified.
- h. Reinforcing steel shop drawings, details of reinforcement placement, including bracing, centering, and lifting methods, and the method to assure the reinforcing cage position is maintained during construction, including use of bar boots and/or reinforcing steel cage base plates, and including placement of rock backfill below the bottom of shaft elevation provided the conditions of paragraph 3.03 of this section. The reinforcing steel assembly and installation plan shall include, as a minimum:
 - 1) Procedure and sequence of steel reinforcing bar cage assembly.
 - 2) Tie pattern, tie types, and tie wire gages for all ties on bracing.
 - 3) Number and location of primary handling steel reinforcing bars used during lifting operations.
 - 4) Type and location of reinforcing bar splices.
 - 5) Details and orientation of internal cross-bracing, including a description of connections to the reinforcing bar cage.
 - 6) Description of how temporary bracing is removed.
 - 7) Location of support points during transportation.
 - 8) Cage weight and location of center of gravity.
 - 9) Number and location of pick points used for lifting for installation, and for transport.
- i. Details of concrete placement, including proposed operational procedures for pumping methods, and a sample uniform yield form to be used by the Contractor for plotting the volume of concrete placed versus the depth of shaft for all shaft concrete placement (except concrete placement in the dry).

C. Synthetic Slurry Technical Assistance

- 1. If synthetic slurry is used to construct the shafts, the Contractor shall provide or arrange for technical assistance in the use of the synthetic slurry as specified in paragraph 3.02.A.1 of this section. The Contractor shall submit four copies of the following to the Engineer:
 - a. The name and current phone number of the synthetic slurry manufacturer's technical representative assigned to the project. The representative will visit the site for each shaft installation.
 - b. The name(s) of the Contractor's personnel assigned to the project and trained by the synthetic slurry manufacturer in the proper use of the synthetic slurry. The submittal

shall include a signed training certification letter from the synthetic slurry manufacturer for each trained Contractor's employee listed, including the date of the training.

D. CSL Testing Organization and Personnel

1. At least seven calendar days prior to beginning shaft construction, the Contractor shall submit the name of the independent testing organization, and the names of the personnel, conducting the CSL tests to the Engineer for approval. The submittal shall include documentation that the qualifications specified below are satisfied. The independent testing organization and the testing personnel shall meet the following minimum qualifications:
 - a. The testing organization shall have performed CSL tests on a minimum of three deep foundation projects in the last two years.
 - b. Personnel conducting the tests for the testing organization shall have a minimum of one year experience in CSL testing and interpretation.

- E. Waste facility to be used for disposal of spoils in contact with synthetic slurry or water slurry with polymer-based additives.
- F. Work shall not begin until all the required submittals have been approved in writing by the Engineer. All procedural approvals given by the Engineer will be subject to trial in the field and shall not relieve the Contractor of the responsibility to satisfactorily complete the work.

PART 2 – PRODUCTS

2.01 CASING

- A. All permanent casing shall be of steel base metal conforming to ASTM A 36. All permanent casing shall be of ample strength to resist damage and deformation from transportation and handling, installation stresses, and all pressures and forces acting on the casing.
- B. All temporary casing shall be a smooth wall structure of steel base metal, except where corrugated metal pipe is shown in the drawings as an acceptable alternative material. All temporary casing shall be of ample strength to resist damage and deformation from transportation and handling, installation and extraction stresses, and all pressures and forces acting on the casing. The casing shall be capable of being removed without deforming and causing damage to the completed shaft, and without disturbing the surrounding soil.
- C. The casing shall be watertight and clean prior to placement in the excavation.
- D. The outside diameter of the casing shall not be less than the specified diameter of the shaft. The inside diameter of the casing shall not be greater than the specified diameter of the shaft plus six inches, except as otherwise noted for shafts 5'-0" or less in diameter, and as otherwise noted in paragraph 3.01.C of this section for temporary telescoping casing. The inside diameter of casings for shafts 5'-0" or less in diameter shall not be greater than the specified diameter of the shaft plus 1'-0".
- E. Where the minimum thickness of the casing is specified in the drawings, it is specified to satisfy structural design requirements only. The Contractor shall increase the casing thickness as necessary to satisfy the requirements of paragraph 2.01.A of this section.

2.02 REINFORCING STEEL

- A. Reinforcing steel used in the construction of shafts shall conform to ASTM A 615. See Section 03 20 00 - Concrete Reinforcing.

- B. Steel reinforcing bar centralizers shall be steel, conforming to the details shown in the drawings. The Contractor may propose the use of alternative steel reinforcing bar devices as part of the shaft installation plan submittal subject to the Engineer's review and approval of such devices.

2.03 CONCRETE

- A. Concrete used in the construction of shafts shall be Class 4000P conforming to Section 6-02 of the WSDOT Standard Specifications. When shafts are constructed in water, the concrete used for the casing shoring seal shall be Class 4000W conforming to Section 6-02 of the WSDOT Standard Specifications.

2.04 SLURRY

- A. Slurry, if used, shall conform to one of the following:

1. Mineral Slurry conforming to the following requirements:

Property	Test	Requirement
Density (pcf) 13B-1, Section 1	Mud Weight (Density)	API 64.3 to 75
Viscosity (seconds/quart)	Marsh Funnel and Cup	API 26 to 50
PH	Glass Electrode, pH Meter,	or 8 to 11
Sand Content Prior to Final Cleaning (percent)	Sand API 13B-1, Section 5	4.0 max.
Sand Content Immediately Prior to Placing Concrete (percent)	Sand API 13B-1, Section 5	4.0 max.

- a. Use of mineral slurry in salt water installations shall not be allowed.
b. Slurry temperature shall be at least 40 degrees F when tested.

2. Synthetic Slurry conforming with the following requirements:

- a. The following synthetic slurries are approved as slurry systems, with additives that have been load tested for the California Department of Transportation (Caltrans):

Product	Manufacturer
ShorePac GCV	CETCO
SlurryPro CDP	KB International, LLC

- b. Other synthetic slurry products may be approved for use provided the product meets the acceptance criteria established by WSDOT, including status as an approved synthetic slurry (with load tested additives) with the California Department of Transportation (Caltrans).
c. The sand content of synthetic slurry prior to final cleaning and immediately prior to placing concrete shall be less than 2.0 percent, in accordance with API 13B-1, Section 5.

3. Water Slurry (with or without site soils)

- a. Water with or without site soils may be used as slurry when casing is used for the entire length of the drilled hole. Use of water slurry without full-length casing may only be used with the approval of the Engineer.
b. Water slurry shall conform to the following requirements:

Property	Test	Requirement
Density (pcf)	Mud Weight (Density)	65 max.
Sand Content (percent)	Sand API 13B-1, Section 5	1.0 max.
c. Use of water slurry in salt water installations shall not be allowed.		
d. Slurry temperature shall be at least 40 degrees F when tested.		

2.05 ACCESS TUBES FOR CROSSHOLE SONIC LOG (CSL) TESTING

- A. Access tubes for CSL testing shall be steel pipe of 0.145 inches minimum wall thickness and at least 1-1/2 inch inside diameter.
- B. The access tubes shall have a round, regular inside diameter free of defects and obstructions, including all pipe joints, in order to permit the free, unobstructed passage of 1.3-inch maximum diameter source and receiver probes used for the crosshole sonic log tests. The access tubes shall be watertight, free from corrosion with clean internal and external faces to ensure good bond between the concrete and the access tubes. The access tubes shall be fitted with watertight threaded PVC caps on the bottom and the top, secured in position by means as approved by the Engineer, on the top.

2.06 GROUT

- A. Grout for filling the access tubes at the completion of the crosshole sonic log tests shall be a neat cement grout conforming to Section 9-20.3 of the WSDOT Standard Specifications with a maximum water/cement ratio of 0.45.

PART 3 – EXECUTION

3.01 SHAFT EXCAVATION

- A. General
 1. Shafts shall be excavated to the required depth as shown in the drawings or as directed by the Engineer. Shaft excavation operations shall conform to this section and the shaft installation plan as approved by the Engineer, except as otherwise specified by the Engineer. Once the excavation operation has been started, the excavation shall be conducted in a continuous operation until the excavation of the shaft is completed, except for pauses and stops as noted, using approved equipment capable of excavating through the type of material expected. Pauses during this excavation operation, except for casing splicing and removal of obstructions, are not allowed.
 2. Pauses, defined as momentary interruptions of the excavation operation, shall be allowed only for casing splicing, tooling changes, slurry maintenance, and removal of obstructions. Shaft excavation operation interruptions not conforming to this definition shall be considered stops. Stops for uncased excavations (including partially case excavations) shall not exceed 16 hours duration. Stops for fully cased excavations shall not exceed 65 hours duration.
 3. If the shaft excavation is not complete at the end of the shift or series of continuous shifts, the shaft excavation operation may be stopped, provided one of the following two conditions are met. For the condition of an uncased excavation, the Contractor shall, before the end of the work day, install casing to the depth of the depth of the excavation. The outside diameter of the casing shall not be smaller than six inches less than either the Plan diameter of the shaft or the actual excavated diameter of the hole, whichever is greater. Prior to removing the casing and resumption of shaft excavation, the annular space between the casing and the excavation shall be sounded. If the sounding operation indicates that caving has occurred, the casing shall not be removed and shaft excavation

- shall not resume until the Contractor has stabilized the excavation in accordance with the shaft installation plan. For the condition of either a cased or uncased excavation, the Contractor shall backfill the hole with either CDF or granular material. The hole shall be backfilled to the ground surface if the excavation is not cased, or to a minimum of five feet above the bottom of casing (temporary or permanent), if the excavation is cased.
4. During stops, the Contractor shall stabilize the shaft excavation to prevent bottom heave, caving, head loss, or loss of ground. The Contractor bears full responsibility for selection and execution of the method(s) of stabilizing and maintaining the shaft excavation.
 5. If slurry is present in the shaft excavation, the Contractor shall conform to the requirements of paragraph 3.02.B of this section regarding the maintenance of the minimum level of drilling slurry throughout the stoppage of the shaft excavation operation, and shall recondition the slurry to the required slurry properties in accordance with paragraph 3.02 of this section prior to recommencing shaft excavation operations.
 6. The shaft casing shall be equipped with cutting teeth or a cutting shoe as required and installed by either rotating or oscillating the casing. Installing the casing by vibrating means shall not be allowed unless approved by the Engineer.
- B. The Contractor shall furnish and install casings to the elevations indicated on the drawings.
- C. The Contractor may use temporary telescoping casing for the shafts, subject to the following conditions:
1. The Contractor shall submit the request to use temporary telescoping casing to the Engineer for approval. The request shall specify the diameters of the temporary telescoping casing, and shall specify the shafts where use is requested. The Contractor shall not proceed with the use of temporary telescoping casing until receiving the Engineer's approval.
 2. The minimum diameter of the shaft shall be as shown in the drawings.
 3. The temporary telescoping casing shall conform to paragraphs 2.01.A, 2.01.B, 2.01.C, and 2.01.E of this section.
- D. The Contractor shall conduct casing installation and removal operations and shaft excavation operations such that the adjacent soil outside the casing and shaft excavation for the full height of the shaft is not disturbed. Disturbed soil is defined as soil whose geotechnical properties have been changed from those of the original in-situ soil, and whose altered condition adversely affects the structural integrity of the shaft foundation.
- E. The Contractor shall use appropriate means such as a cleanout bucket, smooth mouth grab, or air lift to clean the bottom of the excavation of all shafts. No more than 2 inches of loose or disturbed material shall be present at the bottom of the shaft just prior to placing concrete.
- F. The excavated shaft shall be inspected and approved by the Engineer prior to proceeding with construction. The bottom of the excavated shaft shall be sounded with an airlift pipe, a tape with a heavy weight attached to the end of the tape, or other means acceptable to the Engineer to determine that the shaft bottom meets the requirements of the contract documents.
- G. When obstructions are encountered, the Contractor shall notify the Engineer promptly. An obstruction is defined as a specific object (including, but not limited to, boulders, logs, and man-made objects) encountered during the shaft excavation operation which prevents or hinders the advance of the shaft excavation. The Contractor shall immediately notify the Engineer when efforts to advance past the obstruction to the design shaft tip elevation result in the rate of advance of the shaft drilling equipment being significantly reduced relative to the rate of advance for the portion of the shaft excavation in the geological unit that contains the

obstruction. The Engineer will discuss with the Contractor whether to remove, break-up, or push aside the obstruction. The method of dealing with such obstructions and the continuation of excavation shall be as proposed by the Contractor and approved by the Engineer.

1. Where below-ground obstructions prevent shafts from being driven in the required plan location, to the required tip penetration, or to the prescribed capacity, the Engineer may direct that special methods be employed to install the shafts. Jetting or blasting shall not be permitted.
 2. Payment for special methods, structure modifications, techniques proposed by the Contractor, or other means developed collaboratively between the Contractor and Engineer, will be made as an adjustment to the contract price.
- H. When permanent casing is specified, excavation shall conform to the specified outside diameter of the shaft. After the casing has been filled with concrete, all void space occurring between the casing and shaft excavation shall be filled with a material which approximates the geotechnical properties of the in-situ soils, in accordance with the shaft installation plan specified in paragraph 1.04.B.6 of this section and as approved by the Engineer.
- I. Drilling equipment shall not be operated from an existing structure.
- J. The Contractor shall use slurry, in accordance with paragraph 3.02 of this section, to maintain a stable excavation during excavation and concrete placement operations once water begins to enter the shaft excavation and remain present.

3.02 SLURRY INSTALLATION REQUIREMENTS

A. Synthetic Slurry Technical Assistance

1. If synthetic slurry is used, the manufacturer's representative, as identified to the Engineer in accordance with paragraph 1.04.C of this section, shall:
 - a. Provide technical assistance for the use of the synthetic slurry,
 - b. Be at the site prior to introduction of the synthetic slurry into each drilled hole requiring, and
 - c. Remain at the site during the construction and completion of each shaft to adjust the slurry mix to the specific site conditions.
2. If the manufacturer's representative is not present at the site, the Contractor's employee trained in the use of the synthetic slurry, as identified to the Engineer in accordance with paragraph 1.04 of this section, shall be present at the site throughout the remainder of shaft slurry operations for this project to perform the duties specified in paragraphs 3.02.A.1.a) through c) of this section.

B. Minimum Level of Slurry in the Excavation

1. When slurry is used to maintain a stable excavation, the slurry level in the excavation shall be maintained above the groundwater level the greater of the following dimensions, except as otherwise noted in paragraph 3.04.B.3 of this section:
 - a. Not less than 5 feet for mineral slurries.
 - b. Not less than 10 feet for water slurries.
 - c. Not less than ten feet for synthetic slurries
 - d. One shaft diameter
 - e. Dimension as required to provide and maintain a stable hole.

The Contractor shall provide casing, or other means, as necessary to meet these requirements.

2. The slurry level shall be maintained above all unstable zones a sufficient distance to prevent bottom heave, caving or sloughing of those zones.
3. Throughout all stops in shaft excavation operations, as specified in paragraph 3.01.A of this section, the Contractor shall monitor and maintain the slurry level in the excavation the greater of the following elevations:
 - a. No lower than the water level elevation outside the shaft,
 - b. Elevation as required to provide and maintain a stable hole.

C. Slurry Sampling and Testing

1. Mineral slurry and synthetic slurry shall be mixed and thoroughly hydrated in slurry tanks, ponds, or storage areas. The Contractor shall draw sample sets from the slurry storage facility and test the samples for conformance with the appropriate specified material properties before beginning slurry placement in the drilled hole. Mineral slurry shall conform to the material specifications in paragraph 2.04.A of this section. Synthetic slurry shall conform to the quality control plan included in the shaft installation plan in accordance with paragraph 1.06.B.5 of this section and as approved by the Engineer. A sample set shall be composed of samples taken at mid-height and within two feet of the bottom of the storage area.
 2. When synthetic slurry is used, the Contractor shall keep a written record of all additives and concentrations of the additives in the synthetic slurry. These records shall be provided to the Engineer once the slurry system has been established in the first drilled shaft on the project. The Contractor shall provide revised data to the Engineer if changes are made to the type or concentration of additives during construction
 3. The Contractor shall sample and test all slurry in the presence of the Engineer, unless otherwise directed. The date, time, names of the persons sampling and testing the slurry, and the results of the tests shall be recorded. A copy of the recorded slurry test results shall be submitted to the Engineer at the completion of each shaft, and during construction of each shaft when requested by the Engineer.
 4. Sample sets of all slurry, composed of samples taken at mid-height and within two feet of the bottom of the shaft, shall be taken and tested during drilling as necessary to verify the control of the properties of the slurry. As a minimum, sample sets of synthetic slurry shall be taken and tested at least once every four hours after beginning its use during each shift. Sample sets of all slurry shall be taken and tested at least once every two hours if the slurry is not recirculated in the drilled hole or if the previous sample set did not have consistent specified properties. All slurry shall be recirculated, or agitated with the drilling equipment, when tests show that the sample sets do not have consistent specified properties.
 5. Sample sets of all slurry, as specified, shall be taken and tested prior to final cleaning of the bottom of the hole and again just prior to placing concrete. Cleaning of the bottom of the hole and placement of the concrete shall not start until tests show that the samples taken at mid-height and within two feet of the bottom of the hole have consistent specified properties.
- D. The Contractor shall clean, recirculate, de-sand, or replace the slurry to maintain the required slurry properties.

- E. The Contractor shall demonstrate to the satisfaction of the Engineer that stable conditions are being maintained. If the Engineer determines that stable conditions are not being maintained, the Contractor shall immediately take action to stabilize the shaft. The Contractor shall submit a revised shaft installation plan which addresses the problem and prevents future instability. The Contractor shall not continue with shaft construction until the damage that has already occurred is repaired in accordance with the specifications, and until receiving the Engineer's approval of the revised shaft installation plan.
- F. When mineral slurry, conforming to this section, is used to stabilize the unfilled portion of the shaft, the Contractor shall remove the excess slurry buildup inside of the shaft diameter prior to continuing with concrete placement. The Contractor shall use the same methods of shaft excavation and the same diameter of drill tools to remove the excess slurry buildup as was used to excavate the shaft to its current depth.
- G. The Contractor shall dispose of the slurry and slurry-contacted spoils as specified in the shaft installation plan as approved by the Engineer, and in accordance with the following requirements:
 - 1. Water slurry with no additives may be infiltrated to uplands within the provided that the groundline at the disposal site is at least five feet above the current water table, and that disposal operations conform to the temporary erosion and sedimentation control (TESC) requirements established for this project. For the purposes of water slurry disposal, upland is defined as an area that has no chance of discharging directly to the water, including wetlands or conveyances that indirectly lead to wetlands or waters of Commencement Bay or adjoining waterways.
 - 2. Spoils in contact with this slurry may be disposed of as clean fill.
 - 3. Synthetic slurry and water slurry with polymer-based additives and mineral slurries shall be contained and disposed of at a waste water treatment facility or into a sanitary sewer in accordance with the Contractor's permit requirements by the Contractor at an approved facility. Spoils in contact with synthetic slurry or water slurry with polymer-based additives shall be contained and disposed of by the Contractor at an approved waste facility. Prior to beginning shaft excavation operations, the Contractor shall coordinate with the waste facility operator and the Jurisdictional Health Department (JHD) to determine requirements for shaft spoils disposal at the facility. The Contractor shall submit the location of the waste facility, requirements for disposal of shaft spoils (as approved by the waste facility operator and the JHD), copies of any permits required and obtained, and any associated test results to the Engineer prior to disposal. The Contractor shall stockpile spoils on 6-mil plastic and cover with 6-mil plastic to protect from runoff until approval from the waste facility operator and JHD is given to dispose of spoils.
 - 4. Mineral slurry shall be disposed off-site at an upland location, meeting all agency jurisdictional requirements, in an area that has no chance of discharging directly to waters of the State, including to wetlands or waters of Commencement Bay or adjoining waterways.
 - 5. Spoils in contact with mineral slurry may be disposed as excess fill in accordance Section 31 00 00 – Earthwork.
 - 6. Alternative methods may be considered by the Engineer for the handling and management of slurry and grout. The Contractor shall submit a written plan of these processes to the Engineer for review. Work shall not commence until the plan has been approved by the Engineer.

3.03 ASSEMBLY AND PLACEMENT OF REINFORCING STEEL

- A. The reinforcing steel cage shall be rigidly braced to retain its configuration during handling and construction. Individual or loose bars shall not be permitted. The Contractor shall show bracing and any extra reinforcing steel required for fabrication of the cage on the shop drawings. Shaft reinforcing bar cages shall be supported on a continuous surface to the extent possible. All rigging connections shall be located at primary handling bars, as identified in the reinforcing steel assembly and installation plan as approved by the Engineer. Internal bracing is required at each support and lift point.
- B. The reinforcement shall be carefully positioned and securely fastened to provide the minimum clearances listed below, and to ensure that no displacement of the reinforcing steel bars occurs during placement of the concrete. The steel reinforcing bars shall be securely held in position throughout the concrete placement operation. The Contractor shall submit details of the proposed reinforcing cage spacers along with the shop drawings. The reinforcing steel spacers at each longitudinal space plane shall be placed at least at the quarter points around the circumference of the steel reinforcing bar cage, and at a maximum longitudinal spacing of either 2.5 times the shaft diameter or 20'-0", whichever is less.
- C. Place bars as shown in the drawings with minimum concrete cover as indicated.
- D. Shaft excavation shall not be started until the Contractor has received approval from the Engineer for the reinforcing steel spacers required when the casing is to be pulled during concrete placement.

3.04 ACCESS TUBES FOR CROSSHOLE SONIC LOG TESTING

- A. The Contractor shall install access tubes for crosshole sonic log testing in all drilled shafts, except as otherwise noted, to permit access for the crosshole sonic log test probes. If, in the opinion of the Engineer, the condition of the shaft excavations permits shaft construction in the dry, the Engineer may specify that the access tubes be omitted.
- B. The Contractor shall securely attach the access tubes to the interior of the reinforcement cage of the shaft. One access tube shall be furnished and installed for each foot of shaft diameter, rounded to the nearest whole number, as shown in the drawings. The access tubes shall be placed around the shaft, inside the spiral or hoop reinforcement and three inches clear of the vertical reinforcement, at a uniform spacing measured along the circle passing through the centers of the access tubes. If the vertical reinforcement is not bundled and each bar is not more than one inch in diameter, the access tubes shall be placed two inches clear of the vertical reinforcement. If these minimums cannot be met due to close spacing of the vertical reinforcement, then the access tubes shall be bundled with the vertical reinforcement.
- C. The access tubes shall be installed in straight alignment and as near to parallel to the vertical axis of the reinforcement cage as possible. The access tubes shall extend from the bottom of the reinforcement cage to at least 2 feet above the top of the shaft. Splice joints in the access tubes, if required to achieve full length access tubes, shall be watertight. The Contractor shall clear the access tubes of all debris and extraneous materials before installing the access tubes. The tops of all access tubes shall be de-burred. Care shall be taken to prevent damaging the access tubes during reinforcement cage installation and concrete placement operations in the shaft excavation.
- D. The access tubes shall be filled with potable water as soon as possible after concrete placement (but no later than one day after concrete placement), and the top watertight threaded caps shall be reinstalled in a manner as approved by the Engineer. The Contractor shall keep all of a shaft's access tubes full of water through the completion of CSL testing of that shaft. When temperatures below freezing are possible, the Contractor shall protect the access tubes

against freezing by wrapping the exposed tubes with insulating material, adding anti-freeze to the water in the tubes, or other methods as approved by the Engineer.

3.05 PLACING CONCRETE

- A. Concrete placement shall commence immediately after completion of excavation and placement of steel reinforcing cage by the Contractor and inspection by the Engineer. Immediately prior to commencing concrete placement, the shaft excavation and the properties of the slurry (if used) shall conform to the requirements herein. Concrete placement shall continue in one operation to the top of the shaft, or as shown in the drawings. The Contractor shall place concrete between the upper construction joint of the shaft and the top of the shaft in the dry.
- B. During concrete placement, the Contractor shall monitor, and minimize, the difference in the level of concrete inside and outside of the steel reinforcing bar cage. The Contractor shall conduct concrete placement operations to maintain the differential concrete head as 1'-0" maximum.
- C. When placing concrete in the dry, only the top 5 feet of concrete shall be vibrated except that the entire depth of concrete placed in the shaft-column steel reinforcing bar splice zone shall be vibrated. If a temporary casing is used it shall be removed before vibration. This requirement may be waived if a temporary casing is used and removed with a vibratory hammer during the concrete placement operation. Vibration of concrete does not affect the maximum slump allowed for the concrete class specified.
- D. If water is not present, the concrete shall be deposited through the center of the reinforcement cage by a method which prevents segregation of aggregates and splashing of concrete on the reinforcement cage. The concrete shall be placed such that the free-fall is vertical down the center of the shaft without hitting the sides, the steel reinforcing bars, or the steel reinforcing bar cage bracing. The Section 6-02.3(6) restriction in the WSDOT Standard Specifications for 5'-0" maximum free-fall shall not apply to placement of Class 4000P concrete into a shaft.
- E. When placing concrete underwater, including when water in a shaft excavation exceeds three inches in depth with an infiltration rate of 12 inches of depth or more in one hour, the Contractor shall place the concrete by pressure feed using a concrete pump, with a watertight tube having a minimum diameter of 4 inches. The discharge end of the tube on the concrete pump shall include a device to seal out water while the tube is first filled with concrete. Concrete placement by gravity feed is not allowed.
- F. Throughout the underwater concrete placement operation, the discharge end of the tube shall remain submerged in the concrete at least 5 feet and the tube shall always contain enough concrete to prevent water from entering. The concrete placement shall be continuous until the work is completed, resulting in a seamless, uniform shaft. If the concrete placement operation is interrupted, the Engineer may require the Contractor to prove by core drilling or other tests that the shaft contains no voids or horizontal joints. If testing reveals voids or joints, the Contractor shall repair them or replace the shaft at no expense to the Port. Responsibility for coring costs, and calculation of time extension, shall be in accordance with paragraph 3.07.H of this section.
- G. Before placing any fresh concrete against concrete deposited in water or slurry, the Contractor shall remove all scum, laitance, loose gravel and sediment on the upper surface of the concrete deposited in water or slurry and chip off any high spots on the upper surface of the existing concrete that would prevent the steel reinforcing bar cage from being placed in the position required by the drawings. Prior to performing any of the crosshole sonic log testing operations specified in paragraph 3.07 of this section, the Contractor shall remove the concrete at the top of the shaft down to sound concrete.

- H. The Contractor's construction operation in the vicinity of a shaft excavation with freshly placed concrete and curing concrete shall conform to Section 6-02.3(6)D of the WSDOT Standard Specifications.
- I. Except for shafts where the shaft concrete is placed in the dry, the Contractor shall complete a uniform yield form, consistent with the sample form submitted to the Engineer as part of the shaft installation plan as specified herein, for each shaft and shall submit the completed form to the Engineer within 24 hours of completing the concrete placement in the shaft.

3.06 CASING REMOVAL

- A. As the temporary casing is withdrawn, a minimum 5-foot head of concrete shall be maintained to balance the foundation material and water pressure at the bottom of the casing.
- B. Tops of permanent casings for the shafts shall be removed to the top of the shaft or finished ground line, whichever is lower, unless directed otherwise by the Engineer. For those shafts constructed within a permanent body of water, tops of permanent casings for shafts shall be removed to the low water elevation, unless directed otherwise by the Engineer.
- C. The Contractor shall completely remove all temporary casings, except as noted. The Contractor may leave some or all of the temporary casing in place provided all the following conditions are satisfied:
 - 1. The Contractor shall submit the following information in writing to the Engineer:
 - a. The Contractor shall completely describe the portion of the temporary casing to remain.
 - b. The Contractor shall specify the reason(s) for leaving the portion of the temporary casing in place.
 - c. The Contractor shall submit structural calculations, using the design specifications and design criteria specified in the General Notes of the drawings, in accordance with Section 6-01.9 of the WSDOT Standard Specifications, indicating that leaving the temporary casing in place is compatible with the structure as designed in the drawings.
 - 2. The Contractor shall have received the Engineer's written approval of the submitted request to leave the temporary casing in place.

3.07 NONDESTRUCTIVE TESTING OF SHAFTS (CSL TESTING)

- A. The Contractor shall provide for crosshole sonic log testing and analysis on all completed shafts designated for testing by the Engineer. The testing and analysis shall be performed by the independent testing organization submitted by the Contractor and approved by the Engineer in accordance with paragraph 1.06.D of this section.
 - 1. The testing shall be performed after the shaft concrete has cured at least 96 hours. Additional curing time prior to testing may be required if the shaft concrete contains admixtures, such as set retarding admixture or water reducing admixture, added in accordance with Section 6-02.3(3) of the WSDOT Standard Specifications. The additional curing time prior to testing required under these circumstances shall not be grounds for additional compensation or extension of time to the Contractor.
 - 2. Crosshole sonic log testing shall be conducted at all shafts in which access tubes for test probe access have been installed (see paragraph 3.06.A of this section).
- B. After placing the shaft concrete and before beginning the CSL testing of a shaft, the Contractor shall inspect the access tubes. Each access tube that the test probe cannot pass through shall be replaced, at the Contractor's expense, with a 2-inch-diameter hole cored through the concrete for the entire length of the shaft. Unless directed otherwise by the Engineer, cored

holes shall be located approximately 6 inches inside the reinforcement and shall not damage the shaft reinforcement. Descriptions of inclusions and voids in cored holes shall be logged and a copy of the log shall be submitted to the Engineer. Findings from cored holes shall be preserved, identified as to location, and made available for inspection by the Engineer.

- C. The Contractor shall submit the results and analysis of the crosshole sonic log testing for each shaft tested to the Engineer for approval. The Engineer will determine final acceptance of each shaft, based on the CSL test results and analysis for the tested shafts, and will provide a response to the Contractor within three working days after receiving the test results and analysis submittal.
- D. Except as otherwise noted, the Contractor shall not commence subsequent shaft excavations until receiving the Engineer's approval and acceptance of the first shaft, based on the results and analysis of the crosshole sonic log testing for the first shaft. The Contractor may commence subsequent shaft excavations prior to receiving the Engineer's approval and acceptance of the first shaft, provided the Engineer approves continuing with shaft construction based on the Engineer's observations of the construction of the first shaft, including, but not limited to, conformance to the shaft installation plan as approved by the Engineer, and the Engineer's review of Contractor's daily reports and Inspector's daily logs concerning excavation, steel reinforcing bar placement, and concrete placement.
- E. If the Contractor requests, the Engineer may direct that additional testing be performed at a shaft. If subsequent testing at a shaft indicates the presence of a defect(s) in the shaft, the testing costs and the delay costs resulting from the additional testing shall be borne by the Contractor. If this additional testing indicates that the shaft has no defect, the testing costs resulting from the additional testing will be paid by the Port.
- F. For all shafts determined to be unacceptable, the Contractor shall submit a plan for further investigation or remedial action to the Engineer for approval. All modifications to the dimensions of the shafts, as shown in the drawings, required by the investigation and remedial action plan shall be supported by calculations and working drawings as specified in Section 6-01.9 of the WSDOT Standard Specifications. All investigation and remedial correction procedures and designs shall be submitted to the Engineer for approval. The Contractor shall not begin repair operations until receiving the Engineer's approval of the investigation and remedial action plan.
- G. If the Engineer determines that the concrete placed under slurry for a given shaft is structurally inadequate, that shaft will be rejected. The placement of concrete under slurry shall be suspended until the Contractor submits to the Engineer written changes to the methods of shaft construction needed to prevent future structurally inadequate shafts, and receives the Engineer's written approval of the submittal.
- H. At the Engineer's request, the Contractor shall drill a corehole in any questionable quality shaft (as determined from crosshole sonic log testing and analysis or by observation of the Engineer) to explore the shaft condition.
 - 1. Prior to beginning coring, the Contractor shall submit the method and equipment used to drill and remove cores from shaft concrete to the Engineer and receives the Engineer's written approval. The coring method and equipment shall provide for complete core recovery and shall minimize abrasion and erosion of the core.
 - 2. If a defect is confirmed, the Contractor shall pay for all coring costs. If no defect is encountered, the Port will pay for all coring costs. Materials and work necessary, including engineering analysis and redesign, to effect corrections for shaft defects shall be furnished to the Engineer's satisfaction at no additional cost to the Port.

- I. All access tubes and cored holes shall be dewatered and filled with grout after tests are completed. The access tubes and cored holes shall be filled using grout tubes that extend to the bottom of the tube or hole or into the grout already placed.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
1. Section 02 32 00 - Geotechnical Investigations
 2. Section 02 90 00 - Fugitive and Silica Dust Control Procedures
 3. Section 31 00 00 - Earthwork
 4. Section 31 23 19 – Dewatering
 5. Section 31 23 33 – Trenching and Backfilling
 6. Section 31 41 00 - Shoring and Underpinning
 7. Section 31 62 00 - Driven Piles
 8. Section 33 10 00 - Water Utilities
 9. Section 33 30 00 - Sanitary Sewer Utilities
 10. Section 33 40 00 - Storm Drainage Utilities
 11. Section 33 77 00 - Electrical Underground Ducts and Manholes
 12. Appendix – Water Quality Monitoring and Protection Plan (WQMPP)

1.02 DESCRIPTION OF WORK

- A. The work consists of constructing stone columns in accordance with the specifications and the details shown on the drawings. The work includes providing all supervision, documentation, labor, testing, materials, and equipment required to install stone columns, by the dry bottom-feed method, with optional water assist penetration, and to construct stone columns at the locations, to the depth, and to the requirements shown on the Drawings.

1.03 QUALITY ASSURANCE

- A. Institute and maintain a safety program to verify that personnel and adjacent properties are protected. The safety program shall describe the methods for protecting on-site personnel, and adjacent structures. The safety program shall be provided to the Engineer for review.
- B. Employ qualified personnel including a site foreman having a minimum of five (5) years experience performing stone column construction using the dry bottom-feed method. The foreman shall have successfully completed ten (10) projects within the past 5 years using the dry, bottom-feed method and shall direct all work associated with this section.
- C. Retain the services of an independent testing laboratory to provide the crushed stone testing required by this specification.
- D. Institute and maintain a continuous monitoring and documentation program. Furnish all labor, equipment, materials, and incidentals to document the stone column installation and densification operations. The program shall include, but is not limited to, the following:
1. Competent and qualified personnel having at least three (3) years experience in continuous observation and recording of the required data.
 2. A daily report summarizing all work items performed for each machine and shift including the following:

- a. Production hours, downtime, total hours worked, shift start times, and shift end times.
 - b. Number, location, depth, and diameter achieved for each stone column installed.
 - c. Sketch or plan drawing showing locations of stone columns installed by each machine during each shift.
 - d. Total weight and source of crushed stone delivered to job site.
 - e. Total weight of crushed stone backfill placed in the ground.
3. Tabulated data for each stone column including the following:
 - a. Stone column grid number as indicated on the drawings.
 - b. Date of installation.
 - c. Ground surface elevation at column location.
 - d. Beginning and completion times for major activities, including, time to penetrate and time to backfill column.
 - e. Top and bottom depths and elevations of treated intervals.
 - f. Weight of stone placed over representative elevation intervals, and over entire treated depth.
 - g. Equivalent column diameter over representative elevation intervals, and over entire treated depth.
 - h. Representative elevation intervals shall not be greater than 5 feet.
 - i. Length of any untreated interval(s) overlying top of stone column.
 - j. Vibratory equipment power consumption (or other indicator of resistance) during penetration and during compaction of the column.
 - k. Details of obstructions, delays, and/or any unusual conditions encountered.
 - l. Notation that the constructed stone column either is consistent with the column section detail shown on the drawings or description of deviations from that detail.
4. The daily recorded documentation shall be signed by the Contractor's representative and the Engineer's representative and be furnished to the Engineer daily. Tabulated data shall be submitted weekly.
5. At completion of the stone column work, a report that provides details of the installation methods, production rates, and stone consumption.
6. An as-built drawing showing the locations, grid numbers, and depths of the stone columns. The drawing shall be created in AutoCAD 2014 or later version, and shall show the as-constructed northing and easting of each stone column in the project coordinate system to an accuracy of 0.1 ft. Two paper copies and a compact disk containing the electronic file shall be submitted.
7. The Engineer may have a full-time or part-time representative observe and document the stone column work. The Engineer may obtain samples for testing from the stone source(s), or from the stone stockpiles at the site. The Contractor shall provide the Engineer access to the source or stockpiles as requested.

1.04 SUBMITTALS

- A. Documentation of personnel qualifications including the experience of key personnel and list of successfully completed projects as described above.

- B. Name, contact information, and qualifications of the proposed testing laboratory.
- C. Written work plan including the following:
 - 1. Specifically describe how the equipment and techniques shall be used to build the stone columns according to the specifications and drawings. Include specific descriptions of how to address variability of the subsurface stratigraphy and achieve the column diameters, elevations, and alignments relative to the pier piling.
 - 2. Specifically describe how the equipment and techniques shall be used to penetrate the soils described in the geotechnical report. See Section 00 31 00 – Available Project Information.
 - 3. Describe the refusal criteria to be applied when advancing the vibratory probe, as well as the resistance criteria (and method of measurement) to be applied when building the column in the various strata that underlie the site.
 - 4. Describe the quality control and documentation methods to be used, and submit examples of the documentation forms and reports. Provide the name, telephone numbers, and email address, for the person responsible for the Contractor's quality control.
 - 5. Describe the measurement procedures to be used for determining the tonnage or quantity of stone placed in each column.
 - 6. Describe the methods to be used for subgrade protection, preventing soil return to the ground surface, preventing water from leaving each hole, site clean-up, and grade restoration.
- D. The source(s) of crushed stone including the crushed stone backfill laboratory test results, for each proposed stone source, according to the requirements of this section.
- E. A written schedule for completing the work, revised and submitted weekly. The schedule shall show the planned number of machines, number of shifts, working hours, and the location of the work according to the grid established on the drawings.
- F. Plans for delivery, stockpiling and distribution of stone. Specific locations, sizes, and quantities shall be shown for stockpile sites. Delivery, stockpiling and haul distribution shall not begin until submittal approval.
- G. Daily Documentation:
 - 1. Load tickets of stone delivered to the site.
 - 2. At the start of each day, the daily quality assurance documentation from the previous day for each shift and each rig.
- H. Crushed Stone Test Results:
 - 1. For stone sources previously approved, supply laboratory test results for a representative sample of each 10,000 tons of crushed stone delivered to the site. The confirmation test results shall be submitted within one week of collection of the sample. The sample shall be collected within one week of its delivery to the site.
 - 2. For stone sources not previously approved, supply the laboratory test results for approval at least 10 days prior to delivery to the site.
- I. Copy of the scale certification.
- J. A copy of the Cone Penetration Test (CPT) testing program field notes immediately upon completion of each CPT. A final CPT report for pre- and post stone column installation

conditions containing all CPT test data shall be submitted no later than 10 days after the CPT tests are completed.

- K. All information required for the continuous monitoring and documentation program and the safety program outlined in Paragraph 1.03.

1.05 SITE CONDITIONS

- A. Subsurface investigations were made in connection with this project. The information is available for review as described in Section 00 31 00 – Available Project Information.
- B. Groundwater shall be anticipated at or near the existing ground surface of the project site. The groundwater elevation varies depending upon proximity to the shoreline, tidal conditions and weather.

1.06 TOLERANCES

- A. The required stone column diameters are shown on the drawings and shall be referenced in the daily reports. The achieved diameters of the columns in the representative elevation intervals shall be determined using the measured stone consumption used to fill the hole and an in-place stone density determined by ASTM C 29.
- B. The average stone column diameter over the full installation depth shall not deviate by more than +/- 2 inches from the required diameter. The average stone column diameter over any 10 foot interval or increment shall not deviate by more than +/- 6 inches from the required diameter. Immediately submit procedures and a work plan for corrective actions to bring any columns not meeting the tolerances into conformance.
- C. The center of the vibrator at the ground surface shall deviate no more than 2 inches from its specified location, unless approved by the Engineer.
- D. The vertical axis of the stone column, as indicated by the tilt of the vibrator and follower tubes, shall not be out of plumb more than 2 inches in 10 feet.
- E. The tip and top elevations of the stone columns shall not deviate by more than +/- 6 inches from the required elevations indicated on the drawings, unless approved by the Engineer.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Stone Sources: Notify the Engineer at least 14 days before operations begin, or a new source of crushed stone is used so that the Engineer may observe the Contractor's stone sampling at the source. Crushed stone shall be brought onto the site only after receiving written authorization from the Engineer. No changes or substitutions of stone sources, stone characteristics, or stone gradations will be allowed without written approval of the Engineer.
- B. Stone:
1. The stone shall consist of hard, durable, washed, and crushed rock that is free from organic or other deleterious material.
 2. The stone shall have a maximum 40 percent "Los Angeles Wear" with 500 revolutions when tested in accordance with AASHTO T 96 and a minimum degradation factor of 25% when tested in accordance with WSDOT test No. 113.
 3. The gradation of stone, measured according to ASTM D 422, shall conform to the following AASHTO No. 57 grading requirements:

<u>Sieve Size</u>	<u>Percentage Passing</u>
1.5 inch square	100

1 inch square	95 to 100
1/2 inch square	25 to 60
U.S. No.4 sieve	0 to 10
U.S. No.8 sieve	0 to 5
U.S. No.200 sieve	0

4. The maximum dimension of the stone in any direction shall be no greater than twice the minimum dimension.
5. The stone shall have a minimum specific gravity of 2.6, as determined by ASTM C 127. The unit weight of the stone shall be measured by ASTM C 29.
6. The stone shall have a weight loss of less than 10 percent when tested for sulfate soundness per ASTM C 88.

2.02 EQUIPMENT

- A. Provide well-maintained, operational equipment, tools, and machines for use in the performance of this work.
- B. The vibrating probe shall be of the bottom-feed type and shall be rated by the manufacturer to provide at least 175.0 horsepower and 25.0 tons of force gyrating about a longitudinal axis. The vibrator extension tubes shall be marked in 1-foot increments for readily determining vibrator working increments and tip elevation. Numerical identification showing depth shall be provided at 5-foot intervals on the extension tubes.

PART 3 - EXECUTION

3.01 GENERAL

- A. All stone column installation work shall be coordinated and performed in strict accordance with the permit requirements and the WQMPP. This specification section does not include all required protection measures, mitigation measures, and BMPs associated with this project. The Contractor shall pay particular attention to the conditions of issued permits and the WQMPP, and applicable regulations and authorizations associated with this project. All protection measures, mitigation measures, and BMPs included in these documents shall be implemented by the Contractor.
- B. Stone column installation shall occur ahead of dredging along the new slope such that at least 100 feet of separation is provided between stone column installation activity and dredging activity (measured along the length of the new slope). Also, a minimum lag of 14 calendar days shall be provided between stone column installation and dredging at any point along the slope.
- C. Stone column installation shall be completed prior to installation of the sheet pile wall.
- D. Stone columns installed waterward of the Ordinary High Water Mark (Elevation +12.78) shall be installed during the in-water work season.
- E. The work shall be accomplished by the dry bottom-feed method, with optional water assist penetration, vibro-displacement, and the following:
 1. Furnish all equipment, power, water, air, crushed stone, and other necessary items to the job site. Construct a working pad as necessary to access the work area.
 2. Provide shielding at all times to contain all flying aggregates, loose stone, and debris.

3. No free water shall be emitted from any hole. In addition to the temporary erosion and sediment control requirements, provide dewatering equipment with sufficient capacity to contain all water at all production rates.
 4. Provide dust suppression equipment and measures at all times. Meet the applicable regulations from the State of Washington Department of Labor and Industries (WISHA), Puget Sound Clean Air Agency (PSCAA), and other applicable federal, state, and local government regulations.
 5. Cooperate with and provide access for Engineer's inspection activities.
 6. Remove equipment, surplus materials, and all waste products off site and restore the site to the original grades and sweep all areas affected by the work of this section, or as directed by the Engineer.
 7. Comply with all local, state, and federal requirements.
- F. Cone Penetration Tests (CPTs): Perform a CPT testing program in the improvement area both before and after stone column installation. The CPT results will be used to assess changes in soil parameters and estimate the magnitude of ground improvement. CPTs will not be used as a basis for stone column acceptance or rejection. Include in the CPT testing program the following:
1. Three pre-improvement CPTs shall be advanced before starting stone column installation. All pre-improvement CPTs shall be seismic cones that provide shear wave velocity measurements. Advance one CPT between bents 29 and 30, one between bents 50 and 51, and one between bents 65 and 66 as shown on the ground improvement plans.
 2. Two post-improvement CPTs shall be advanced at each location at which pre-improvement CPTs were advanced for a total of six post-improvement CPTs after stone column installation. All post-improvement CPTs shall be seismic cones that provide shear wave velocity measurements. Locations of CPTs shall be as shown on the ground improvement plans. Generally, one post-improvement CPT shall be at the mid-point between two adjacent stone columns within a row. The other post-improvement CPT shall be at a distance equal to one-third of the center-to-center spacing between columns from the column location at which the pre-improvement CPT was taken. The two post-improvement CPTs shall be on opposite sides of a stone column along a row. Locations for these CPTs shall be within approximately 5 ft of the pre-improvement CPT locations. Post-improvement CPTs shall be advanced no sooner than 14 calendar days after completion of the stone column installation.
 3. Extend all CPTs a minimum of 10 feet below the prescribed stone column tip elevations. Conduct CPT testing in accordance with ASTM D 5778 and provide continuous measurement of tip resistance, friction, and pore pressures. A complete and accurate record of location, time, date, and test measurements shall be kept for each CPT and submitted to the Engineer including the electronic CPT data.

3.02 PENETRATION

- A. The vibrator shall be advanced to the full treatment depth as indicated on the drawings, except where obstructions are encountered, as described in this paragraph.
- B. The vibrator extension tubes shall be marked with 1-foot increments for readily determining vibrator working increments, tip elevation, and top elevation. Numerical identification showing depth shall be provided at 5-foot intervals on extension tubes.
- C. The Contractor shall refer to and interpret the geotechnical report for potentially difficult penetration layers. Additional equipment, labor, testing or materials shall be provided, at the

Contractor's expense, in anticipation of potentially difficult penetration or reduced production rates.

- D. Water assist penetration may be employed provided that adequate water management equipment and methods are used to prevent all ponding and all runoff at the ground surface. No free water shall be emitted from any hole.
- E. Predrilling methods may not be employed except as listed below for obstructions.
- F. Obstructions:
 - 1. Immediately report obstructions to the Engineer and provide a description in the daily documentation reports.
 - 2. When obstructions prevent the advancement of the vibratory probe for a single column, two adjacent columns, or multiple columns, the Engineer may authorize one or more of the following:
 - a. Adjustment of the location or spacing of the treatment grid.
 - b. Column termination at the achieved tip elevation(s).
 - c. Predrilling through obstructions.
 - d. Excavation and removal of obstructions, plus backfilling and compaction to finish grade, then re-commencement of stone column construction at planned locations.
 - 3. Compensation for costs associated with additional stone column length required due to adjustment of the depth, location, or spacing of the treatment grid and/or column termination at the achieved tip elevation(s) will be made based on the unit price indicated on the bid form for Bid Item #7 - STONE COLUMNS.
 - 4. Compensation for costs associated with adjustments to work that involve pre-drilling through obstructions and/or removal and excavation of obstructions will be made from Bid Item #34 – STONE COLUMN OBSTRUCTIONS ALLOWANCE.
 - 5. Reduced production rates or penetration rates resulting from the Contractor's equipment selection, maintenance, repairs, or downtime shall not be categorized as obstructions, differing site conditions, or unexpected site conditions, and shall not be grounds for delay or additional compensation claims.

3.03 STONE COLUMN BACKFILL

- A. After penetration of the vibrator to the full treatment depth as shown on the drawings, the vibrator shall be slowly withdrawn in 12 to 24 inch increments, to allow placement of the stone.
- B. The stone shall be placed in a manner that allows measurement of the tonnage or quantity of stone placed in the column.
- C. The vibrator shall be re-driven through each increment into the newly placed stone until the resistance to the vibrator penetration, as observed by amperage buildup or other measurements, indicates that the stone column has been built out to its intended diameter.
 - 1. The full diameter of the installed stone columns shall be built as shown on the drawings.
 - 2. Stone columns shall be installed such that each completed column is continuous throughout its length.
 - 3. Near the ground surface, prevent uplift or heave of the ground due to excess air pressure. The air pressure shall be adjusted to prevent heaving of surface soils.
 - 4. Complete the column installations in a manner that minimizes wastage of stone.

5. Excess stone shall become the property of the Contractor. Remove all excess materials and wastage from the job site.

3.04 ACCEPTANCE TESTING

A. Stone Column Backfill

1. Provide access for the Engineer to take random samples of backfill for gradation, specific gravity, and unit weight testing.

B. Stone Column Installation

1. The acceptance of stone column installation will be based on stone column diameter, and installation elevations and alignments as evidenced by daily reports.
2. Stone columns may be rejected based on means and methods of installation, if sufficient compactive effort is not used. Refusal shall be achieved during compaction of every lift.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to the work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 01 33 00 – Submittal Procedures
 - 2. Section 01 45 00 – Quality Control
 - 3. Section 02 41 00 – Demolition
 - 4. Section 31 00 00 – Earthwork
 - 5. Section 32 15 40 – Crushed Stone Surfacing

1.02 DESCRIPTION OF WORK

- A. The extent of work is indicated on the Drawings. The work includes the requirements for producing, transporting, placing, shaping and compacting of one or more courses of materials in conformance with these Specifications and the dimensions and sections indicated on the Drawings. Pavement, asphalt, asphalt pavement, ACP (Asphaltic Concrete Pavement), and HMA (Hot Mix Asphalt) are all intended to describe asphalt concrete pavement.

1.03 1.03 REFERENCES

- A. The latest edition of the Standard Specifications and Standard Plans for Road, Bridge, and Municipal Construction, prepared jointly by the Washington State Department of Transportation (WSDOT) and the American Public Works Association (APWA).

1.04 QUALITY ASSURANCE

- A. The Port will provide necessary inspection services. Sampling and testing for compliance with the Contract provisions shall be in accordance with Section 01 45 00 - Quality Control of these Specifications. The Contractor may obtain copies of results of tests performed by the Port from the office of the Port, at no cost. Tests conducted for the sole benefit of the Contractor, shall be at the Contractor's expense.
- B. HMA courses shall not be constructed when the underlying course contains free surface water. Unless otherwise directed, asphalt courses shall not be constructed when the average surface temperatures are less than that specified in the table included in Section 5-04.3(16) in the WSDOT Standard Specifications.
- C. Truck tickets for HMA shall be delivered to the Engineer daily or at the time of delivery to the site. Tickets shall clearly state mix number that corresponds with submittal information. If mix number is not shown on truck ticket, asphalt will not be allowed to be placed, and Contractor will return material at his own expense – no exceptions.

1.05 SUBMITTALS

- A. The Contractor shall submit a mix design / Job Mix Formula (JMF) for this project, taking into account the specific plan and equipment to be used, that is in accordance with WSDOT Standard Specifications Section 5-04.3(7)A1. The Contractor shall also submit certificates of Specification compliance for materials to be used, and supporting documentation showing the submitted mix design has been previously approved by WSDOT for a project within the last 12 months of when paving operations are scheduled to begin. Submittal shall include all the test data demonstrating the JMF meets the requirements of WSDOT Standard Specification

Sections 9-03.8(2) and 9-03.8(6). Contractor shall determine anti-strip requirements for the HMA, if any, in accordance with WSDOT test method T718.

- B. The work cannot proceed until the Contractor's mix design and placing methods are approved by the Engineer. Mix design shall ensure air void content is between 4 to 5 percent in laboratory compacted mixtures. Asphalt content shall not be arbitrarily increased in construction to facilitate compaction, to minimize segregation, or for any other reason.
- C. Formulas shall indicate physical properties of the mixes as shown by tests made by a commercial laboratory using materials identical to those to be provided on this project. JMF for each mixture shall be in effect until modified in writing by the Contractor and approved by the Engineer. Provide a new JMF for each source change. Submittal shall include the following as a minimum:
 - 1. Source of proportions, percent by weight, of each ingredient of the mixture.
 - 2. Correct gradation, the percentage passing each size sieve listed in Section 9-03.8(6) of WSDOT Standard Specifications.
 - 3. Effective asphalt content as percent by weight of total mix.
 - 4. Percent air voids (between 4 and 5).
 - 5. Asphalt performance grade.
 - 6. Tack Coat: Type and grade of asphalt.
- D. Truck tickets for HMA.

1.06 TESTING REQUIREMENTS

- A. Shall comply with the WSDOT Standard Specifications Sections 9-03.8(2) and 9-03.20. Aggregates for the HMA Class specified shall meet the requirements for pavements having greater than 30 million ESAL's in accordance with WSDOT Standard Specifications Section 9-03.8(2).

PART 2 – PRODUCTS

2.01 HMA PAVING CLASS

- A. HMA paving shall be Class 1/2". Materials shall be proportioned according to WSDOT Standard Specification Section 9-03.8(6).

2.02 ASPHALT MATERIALS

- A. Aggregate for HMA shall conform to the grading requirement of Section 9-03.8, and shall be tested according to Section 9-03.20 of WSDOT Standard Specifications.
- B. Asphalt: Manufacturer shall be on WSDOT approved list. Performance grade for all courses of paving shall be PG 64-22 conforming to Section 9-02.1(4) of WSDOT Standard Specifications.
- C. Joint sealer shall be paving asphalt 64-22 conforming to AASHTO Specification M 320.
- D. Tack coat shall be emulsified asphalt, CSS-1, conforming to Section 5-04 and 9-02.1(6) of the WSDOT Standard Specifications.
- E. Anti-Stripping Agent: AD-HERE LOF 65-00 manufactured by ARR-MAZ Products, Inc. or approved equal.

2.03 ASPHALT MIXING

- A. Mixing plant for preparing HMA shall conform to the specific requirements of Section 5-04.3 of WSDOT Standard Specifications.

2.04 2.04 ON-PIER UTILITY TRENCH GEOTEXTILE

- A. Geotextile shall be Pertromat® 4598 by PROPEX or approved equal.

PART 3 – EXECUTION

3.01 GENERAL - PLACING HMA

- A. The HMA shall be prepared from materials as previously described and by plants and methods conforming to the WSDOT Standard Specifications. Delivery of materials to the site shall meet the requirements of the WSDOT Standard Specifications.
- B. HMA courses shall be placed when the crushed surfacing is dry and weather is not rainy. No mix shall be placed at atmospheric temperature below 40°F unless otherwise approved by the Port. Paving shall be placed using an approved type of paving machine. Workers shall not be allowed to walk or stand on the finished mixture before it has been rolled.
- C. HMA shall be placed in lift thicknesses submitted by the Contractor and approved by the Engineer, with a tack coat between.
- D. Construction requirements of Section 5-04.3 of WSDOT Standard Specifications shall be followed.
- E. The minimum thickness of a PG 64-22 base or wearing course lift shall be 4 inches.

3.02 SAW-CUTTING EXISTING ASPHALT PAVEMENT

- A. Pavement sawcutting shall be done where indicated on the Drawings and as directed by the Engineer.

3.03 ON-PIER UTILITY TRENCH GEOTEXTILE

- A. Geotextile shall be installed as recommended by the manufacturer.

3.04 TACK COAT

- A. Tack coat of emulsified asphalt shall be applied over the entire existing surface of the asphalt or concrete pavement to be overlaid with HMA. Rate of application shall be 0.10 gal/sq. yd. Tack coat requirement between HMA lifts may be waived by the Port if the prior laid surface is kept thoroughly clean and the time lag between placement of the prior course and the following course is small. Prior to applying tack coat or placing HMA, clean the entire asphalt or concrete pavement surface in accordance with WSDOT Standard Specifications Section 5-04.3(5)A. Areas to receive tack coat must be approved by the Engineer prior to application.

3.05 COMPACTION

- A. Compaction of the HMA pavement shall conform to the requirements of WSDOT Standard Specifications Section 5-04.3(10), except that the use of pneumatic tired rollers between October 1st and March 31st may be waived by the Engineer. Density of the pavement in place shall be a minimum of 91% of the reference maximum density as determined by WSDOT Test Method 705. The reference maximum density shall be determined as the moving average of the most recent five determinations for the lot of asphalt concrete being placed.

3.06 JOINT SEAL

- A. Apply joint sealer to the edges of new paving joints, catch basins, manholes, utility structures, at the meet lines to concrete structures and as directed by the Engineer. Also apply joint sealer at interface of new and existing paving after paving operations are completed.

3.07 SURFACE SMOOTHNESS

- A. Surface smoothness of completed pavement shall conform to the specific requirements of WSDOT Standard Specifications Section 5-04.3(13).

3.08 TESTING

- A. Testing will comply with the WSDOT Standard Specifications Section 5-04.3(8)A.
- B. Finish Surface Texture of Wearing Course: Visually check final surface texture for uniformity and reasonable compactness and tightness. Final wearing course with a surface texture having undesirable irregularities such as segregation, cavities, pulls or streaks, indentations, ripples, or lack of uniformity shall be removed and replaced at the Contractor's expense.
- C. Protection: Do not permit vehicular traffic, including heavy equipment, on pavement until surface temperature has cooled to at least 120 degrees F. Measure surface temperature by approved thermometers or other satisfactory methods.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to the work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 01 33 00 – Submittal Procedures
 - 2. Section 01 45 00 – Quality Control
 - 3. Section 31 00 00 – Earthwork
 - 4. Section 32 12 16 – Asphalt Paving

1.02 DESCRIPTION OF WORK

- A. The extent of work is indicated on the Drawings. The work includes the requirements for furnishing and installing imported aggregate base. Work includes transporting, placing, shaping and compacting base courses in conformance with these Specifications and the dimensions and sections indicated on the Drawings or within the lines and grades established by the Engineer.

1.03 REFERENCES

- A. The latest edition of the Standard Specifications and Standard Plans for Road, Bridge, and Municipal Construction, prepared jointly by the Washington State Department of Transportation (WSDOT) and the American Public Works Association (APWA).

1.04 QUALITY ASSURANCE

- A. The Port will provide inspection services to the satisfaction of the Engineer. Sampling and testing for compliance with the Contract provisions shall be in accordance with Section 01 45 00 - Quality Control, of these specifications. The Contractor may obtain copies of results of tests performed by the Port from the office of the Engineer at no cost. Tests conducted for initial approval or for the sole benefit of the Contractor, shall be at the Contractor's expense.

1.05 SUBMITTALS

- A. The Contractor shall submit test reports in accordance with Section 01 33 00 - Submittal Procedures, for Contractor furnished import aggregate base as follows:
 - 1. Sieve analyses for all materials specified in accordance with WSDOT Standard Specifications, Section 9-03.9(3).
 - 2. Certified Test Results for Source Materials and In-Place Density Tests.
 - 3. Borrow Source Characterization.

PART 2 – PRODUCTS

2.01 CRUSHED STONE SURFACING

- A. Material used for crushed stone surfacing shall be imported aggregate Base Course material complying with WSDOT Standard Specifications, Section 9-03.9(3). Where Top Course is shown on Drawings above Base Course, or where allowed by project specifications, material for Top Course shall be in accordance with WSDOT Standard Specifications, Section 9-03.9(3). Crushed stone surfacing shall be characterized in accordance with the requirements of Section 31 00 00 – Earthwork.

PART 3 – EXECUTION

3.01 EQUIPMENT

- A. All equipment necessary for the satisfactory installation of crushed stone surfacing shall meet the requirements of WSDOT Standard Specifications Section 4-04.3(1), as amended to provide for the following:
 - 1. Equip grading machines or trimmers with a spirit level or other type slope indicator, which will continuously indicate the average transverse slope of the screed. Bubble or indicator movement should be no less than 1/8 inch for each 0.1 percent change in transverse slope.

3.02 PREPARATION OF SUBGRADE

- A. Prepare subgrade as specified in Section 31 00 00 – Earthwork. Obtain approval of the Engineer before placing base course materials.

3.03 PLACEMENT OF CRUSHED STONE SURFACING

- A. Equipment necessary for the satisfactory performance of this construction shall be on the project prior to beginning work.
- B. Mixing: After each layer of material is placed, mix the material by motor graders or other approved equipment until the mixture is uniform throughout. Add water as required to facilitate mixing and compacting.
- C. Placing and Spreading: Spread each layer of material by means of approved spreading equipment. Such equipment may be bottom-dump hauling equipment with transverse spreading facilities; self-propelled spreading and leveling machines; or spreader boxes equipped with wheels or so constructed as to preclude damage to the subgrade or underlying courses. Spreading in small areas of less than 2,000 square yards or in areas irregular in shape may be accomplished by other means as approved by the Engineer. Material shall be placed in layers not exceeding 6 inches.
- D. Shaping and Compacting: Immediately following spreading and final shaping, compact each layer to at least ninety five percent (95%) of the standard density before the next succeeding layer is placed thereon. When the thickness of the base course is less than 0.15 feet, density testing may not be required and the Engineer will determine the number of coverage's required for the particular compaction equipment available.
 - 1. Vibratory compactors or rollers shall be adequate in design and number to provide compaction and obtain the specified density for each layer while still moist. Apply a mist spray of water as needed to replace moisture lost by evaporation. The completed layer shall have a smooth, tight, uniform surface true to the line, grade and cross section indicated on the Drawings.
 - 2. Variations in the surface of the top course shall be a maximum of 1/4 inch in 10 feet. Shave off or fill in variations greater than the allowable, and recompact that area.
- E. Surface Maintenance: Maintain the surface of each layer of material true to line, grade and cross section by blading, watering and rolling until placing the succeeding course. Place the first course of material on all available subgrade before placing the succeeding course unless otherwise authorized by the Engineer. Should irregularities develop in any surface during or after compaction, remedy by loosening the surface and correcting the defects, then thoroughly recompact the entire area, including the surrounding surface. In the event that additional materials are necessary to make the repairs, they shall be provided at no additional cost to the Port.

- F. Route hauling equipment over the roadway in such a manner as to be most effective in the compacting of the material. Hauling over the surfacing in the process of construction will not be permitted when, in the opinion of the Engineer, the effect will be detrimental.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to the work as if specified in this section. Work related to this section is described in:
 - 1. Section 01 33 00 – Submittal Procedures
 - 2. Section 01 45 00 – Quality Control
 - 3. Section 01 71 23 – Field Engineering
 - 4. Section 32 12 16 – Asphalt Paving

1.02 DESCRIPTION OF WORK

- A. Extent of Work: The extent of work is indicated on the Drawings. The Work includes the requirements for producing and placing pavement markings in conformance with these Specifications and the dimensions and sections indicated on the Drawings or within the lines and grades established by the Engineer.
- B. Existing pavement markings on the 1987 existing Pier 4 structure shall be removed and replaced where indicated on the Drawings. Pavement markings shall also be replaced as directed by the Engineer in the following areas:
 - 1. All newly paved areas including:
 - a. Full depth pavement replacement and repair areas,
 - b. Utility installation or repair areas,
 - 2. All areas disturbed by construction related activities such as maneuvering of construction vehicles, material storage areas, and temporary erosion and control areas.
- C. "Pavement Markings" is also referred to as "Striping" herein and on the Drawings, and the terms are used interchangeably. The two terms are the same and have the same requirements.

1.03 REFERENCES

- A. The latest edition of the Standard Specifications and Standard Plans for Road, Bridge, and Municipal Construction, prepared jointly by the Washington State Department of Transportation (WSDOT) and the American Public Works Association (APWA).

1.04 SUBMITTALS

- A. The following items shall be submitted in accordance with Section 01 33 00 – Submittal Procedures:
 - 1. Product Data: Manufacturer's current technical specifications and application instructions.
 - 2. Material certificates signed by material supplier, certifying that each material item complies with or exceeds specified reference standards.
 - 3. Equipment List: Proposed equipment to be used, including descriptive data.
 - 4. Description of proposed methods for removal of drips, overspray, improper markings, striping tracked by traffic, and existing markings specified to be removed.

PART 2 –PRODUCTS

2.01 MATERIALS

- A. Paint: White, yellow, black or red traffic paint meeting the requirements of Section 9-34.2 of the WSDOT Standard Specifications.
 - 1. Color shall be as noted on the drawings.

PART 3 – EXECUTION

3.01 PREPARATION AND CLEANING

- A. Preparation and cleaning shall be in conformance with Section 8-22.3(2) of WSDOT Standard Specifications.
- B. Thoroughly clean surfaces to be marked before application of pavement marking material.
- C. Allow pavement to cure for period recommended by manufacturer prior to applying paint.
- D. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water or a combination of these methods.
- E. Completely remove rubber deposits, surface laitance, existing paint markings, and other coatings adhering to pavement with scrapers, wire brushes, sandblasting, approved chemicals, or mechanical abrasion.
- F. Scrub areas of old pavement affected with oil or grease with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application.
- G. Surfaces shall be completely free of dirt and ice, and dry of water at the time of application of materials specified herein.
- H. Oil-Soaked Areas: After cleaning, seal with cut shellac to prevent bleeding through the new paint.
- I. Reclean surfaces when the Work has ceased because of rain.
- J. Existing Pavement Markings:
 - 1. Remove existing pavement markings that may interfere or conflict with newly applied marking patterns, or that may result in a misleading or confusing traffic pattern.
 - 2. Removal of pavement markings shall be in accordance with Section 8-22.3(6) of the WSDOT Standard Specifications.
- K. Verify layout and placement of striping with the Engineer before applying the marking paint.

3.02 APPLICATION

- A. Follow the construction requirements of Section 8-22 of the WSDOT Standard Specifications, except as shown otherwise on the Drawings or specified otherwise herein.
- B. All paint striping and marking shall consist of two coats unless otherwise noted. The first coat shall be dry before the application of the second coat. The direction of application of the second coat shall be opposite that of the first coat.
- C. The location, dimensions, and colors for painted pavement markings shall be as shown on the Drawings or match existing striping to be replaced.
- D. Replace existing paint pavement markings with new paint markings in repair areas.
- E. Apply paint with mechanical equipment to produce uniform straight edges.

- F. Apply paint as shown on the Drawings and ensure color, style, and numbering matches the existing painting at the facility when applicable.

3.03 COLOR SCHEDULE

- A. Landside Striping disturbed by removal and replacement of existing pavement: Match existing striping.
- B. B. New striping/pavement markins on the Reconfigured Pier 4 shall be as shown on the Drawings.

3.04 REMOVAL OF EXISTING PAVEMENT MARKINGS

- A. Remove existing pavement markings on the 1987structure and where shown on the Drawings in accordance with Section 8-22.3(6) of WSDOT Standard Specifications. Painting over the existing striping with black paint is not allowed as a substitute for removing the existing pavement markings by acceptable means.

3.05 CLEANUP

- A. Remove paint spatters, splashes, spills, or drips.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK DESCRIBED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to the work as if specified in this section. Work related to this section is described in:
 - 1. Section 00 31 00 – Available Project Information
 - 2. Section 00 31 26 – Existing Hazardous Material Information
 - 3. Section 01 33 00 – Submittal Procedures
 - 4. Section 01 45 00 – Quality Control
 - 5. Section 01 71 23 - Field Engineering
 - 6. Section 31 00 00 - Earthwork
 - 7. Section 03 20 00 – Concrete Reinforcing
 - 8. Section 31 23 33 - Trenching and Backfilling
 - 9. Section 31 23 19 - Dewatering
 - 10. Section 03 30 00 – Cast-in-Place Concrete
 - 11. Section 31 41 00 Shoring and Underpinning

1.02 DESCRIPTION OF WORK

- A. The extent of Water Utilities work is indicated on the drawings. Work includes the requirements for providing the water system complete in place, including moving of an existing fire hydrant and placement of new piping and fittings, including excavation, bedding, backfill, compaction, installation of pipe sleeves, thrust blocking, fire hydrants and valves and valve boxes, ship service vaults, coordination with electrical work, etc., all in conformance with these specifications and the dimensions and sections indicated on the drawings or within the lines and grades established by the Engineer.

1.03 QUALITY ASSURANCE

- A. Qualification of Workers: Employ the services of a qualified utility contractor, who will be thoroughly familiar with the type of materials being installed and the best methods for their installation, and who shall direct all work performed under this section.
- B. Codes and Standards: Comply with the applicable provisions of all pertinent codes and regulations. References made herein for manufactured materials, such as pipe, fittings, valves, hydrants and specialties; refer to designations for American Water Works Association (AWWA), American National Standards Institute (ANSI) and to the latest edition of the Standard Specifications and Standard Plans for Road, Bridge, and Municipal Construction prepared jointly by the Washington State Department of Transportation (WSDOT) and the American Public Works Association (APWA).
- C. City of Tacoma: The Contractor shall coordinate with and comply with the applicable provisions of all pertinent local codes and regulations from the City of Tacoma Fire Department (TFD) concerning testing, flushing, disinfection, installation, inspection and materials used. The Contractor shall also acquire a Commercial Fire Protection System permit from TFD prior to beginning work on any part of the fire water system.

- D. All work associated with installation of the underground fire water main and hydrants shall be performed by a contractor that is licensed by the Washington State Fire Marshal's Office as a Level U Fire Protection Sprinkler System Contractor.
- E. All water system components unless noted otherwise shall be rated for a working pressure of at least 125 psi and a testing pressure of 225 psi, meet current Safe Drinking Water Act lead free requirements and be approved for potable use by National Sanitation Foundation (NSF).

1.04 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 - Submittal Procedures for the following products:
 - 1. Piping, Fittings, Valves, Accessories
 - a. Manufacturer's catalog cuts and shop drawings to demonstrate that all items conform to the specifications for the following:
 - 1) Pipe, fittings, couplings and accessories
 - 2) Valves
 - 3) Fire Hydrants
 - 4) Water vault backflow prevention assemblies
 - 5) Water vault water meters
 - 6) Water vault strainers
 - 7) Water vault pipe supports
 - 8) Blow-off assembly
 - 9) Expansion joints

The Contractor shall furnish manufacturer's installation and operations manuals, bulletins and spare parts lists for all items.
- B. Concrete Boxes and Valve Boxes
 - 1. Design and provide underground water concrete boxes and valve boxes including frames, and covers meeting the Concentrated Live Load criteria noted on Drawings S1.1 and S1.2.
 - 2. Groundwater elevation shall be assumed to be at elevation +11.8 feet MLLW for design of all proposed underground structures, unless conditions in the field indicate a higher groundwater elevation. See "Geotechnical Engineering Design Report Port of Tacoma Pier 4 Phase 2 Reconfiguration" for additional information on groundwater.
 - 3. Allowable soil bearing capacity is 2,000 PSF.
 - 4. Design calculations, shop drawings, and product information for all items related to the various structure fabrications and installations.
 - 5. Shop drawings and calculations shall be stamped by a structural engineer registered in the State of Washington shall be submitted and approved by the Engineer prior to fabrication.
- C. Certificate of Competency from the Washington State Fire Marshal's Office for the Level U Fire Protection Sprinkler System Contractor that will be performing work associated with installation of the underground fire water system.

1.05 PRODUCT HANDLING

- A. Pipe shall be handled in conformance with section 7-09.3 (13) of the WSDOT Standard Specifications. Handle pipe to prevent damage to the pipe, pipe lining, or coating. Damage to the pipe, pipe lining, or coating, if any, shall be repaired as directed by the Engineer or replaced at the Contractor's expense.
- B. At times when pipe laying is not in progress, close the open ends of the pipe with a watertight plug or by other means approved by the Engineer to ensure cleanliness inside the pipe.

PART 2 – PRODUCTS

2.01 PIPE AND FITTINGS

- A. General: Materials shall be in accordance with the applicable references within WSDOT Standard Specifications, Section 7-09.2.
- B. Ductile Iron Pipe and Fittings:
 - 1. Ductile Iron Pipe (DIP) for 10-inch fire protection service and 4-inch domestic water service shall be Class 54 per WSDOT Standard Specification Section 9-30.1(1); shall be push-on pipe per ANSI/AWWA C150 and C151, mechanical joints per AWWA C111, flanged joints per ANSI B16.1, Class 125 with full face gaskets. Pipe shall have an asphaltic outside coating for full immersion conditions and a cement mortar lining in accordance with ANSI/AWWA C104. All plain ends, including short lengths, shall be beveled and all bell ends shall have appropriate rubber gaskets. Short length pipe shall be plain end on both ends. Ductile iron pipe shall be manufactured by American Pipe, U.S. Pipe or equal. Ductile Iron Pipe shall be encased with Polyethylene encasement AWWA C105 tube type with 2-inch wide adhesive tape.
 - 2. All fittings shall be compact gray iron or ductile iron, shall meet the applicable requirements of ANSI/AWWA C110 and shall be cement mortar lined in accordance with ANSI/AWWA C104 or C153. Push-on joints for fittings shall have joint dimensions and rubber gaskets conforming with ANSI/AWWA C111.
 - 3. Manufactured joint restraints shall be per WSDOT Standard Specification Section 9-30.2(6) and be Ford, EBAA Iron, Romac Industries, Field Lock 350 by US Pipe, Flex-Ring by American Pipe or approved equal and shall be rated for 225 test pressure or better.
- C. Copper Pipe and Fittings:
 - 1. Copper pipe shall be annealed, seamless, and conform to the requirements of ASTM B88, Type K rating for both below ground pipe and for above ground pipe where specified on the plans.
 - 2. Fittings shall be wrought copper, conforming to ASTM B 75 for materials and ANSI B16.22 for dimensions, or cast bronze, conforming with ASTM B 62 for materials and ANSI B16.18 for dimensions. Solder joints with 95/5 solder and NAPP gas.
- D. HDPE Pipe and Fittings:
 - 1. High Density Polyethylene Pipe (HDPE) for on-wharf domestic water system and through pile cap at south end of Pier 4 shall be grade PE 3408(PE 4710), DR 11, and conform to the requirements of the latest AWWA C901(C906). Pipe shall be manufactured by Performance Pipe or approved equal.
 - 2. Couplings and Fittings shall be molded and in conformance with the requirements of ASTM D3350, ASTM 3261 for Butt Fusion and ASTM 2683 for Socket Fusion. PE Grade and manufacturer of all fittings shall be same as the pipe. PE Grade and manufacturer for flange adapter and stub end shall be same as for pipe. Provide epoxy coated ductile iron

backing rings for flange fittings and 316 stainless steel bolts and nuts. Transition fittings for HDPE Pipe to Copper Pipe shall be Poly-Cam Series 911.

2.02 ACCESSORIES

A. Water Meter:

1. Water meter in ship service vault shall be Badger Meter Recordall Turbo Series Meter Model 200, or approved equal, with integral strainer and flanged ends. Contractor may elect to install meter without integral strainer. If integral strainer is not installed a strainer will be required and shall be Bronze-Wye by Febco. Contractor shall confirm with the Port that meter complies with the Port meter requirements.
2. Water meters near the Restroom and Marine Buildings shall be Neptune T-10 Meters or approved equal and sized per plan. Meters shall be direct read and be NSF/ANSI 61 compliant. Strainer required for the meter by the Marine Building, but not by the Restroom Building.

B. Service Saddle and Corporation Stop:

1. Water service saddle shall in accordance with WSDOT Standard Specifications, Section 9-30.6(1) and corporation stop shall be in accordance with WSDOT Standard Specifications, Section 9-30.6(2).
2. Saddle shall be nylon coated with stainless steel straps, U-bolts and taper thread. Saddle shall be Romac Industries. Corporation stop shall be brass body conforming to AWWA C800, 300 psi working pressure as manufactured by the Ford Meter Box Company.

C. Freeze Protection Valves:

1. As temperatures fall, a thermostatic element senses water temperature and the valve modulates open. A sample of the water in the line then flows past the element. If the water temperature is sufficiently high, the valve shuts off. If the water temperature is low the valve modulates as needed to promote flow.
2. Valve is full open at 35 degrees F and below and valve will be fully closed at 40 degrees F. Stainless steel body, fittings, spring and plug. Corrosion resistant for long service life. Ram-type plug for reliable tight shutoff. Sensitive to temperature only and unaffected by pressure variations.

D. Strainers: Size 2-inch and under: Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen. Strainer shall be Bronze-Wye by Febco or approved equal.

E. Adapters, Couplings and Unions: Coupling adapters at tie-ins to existing pipes, if required, shall be Smith Blair or approved equal. Provide dielectric unions and couplings at connections between dissimilar materials.

F. Flexible Connectors:

1. Flexible expansion joints between wharf piping and landside piping shall be Flex-Tend as manufactured by EBAA-Iron or equal as approved by the Engineer.
2. Flexible Hose between Pier 3 and Pier 4 shall be approved for potable water usage and capable of bending in a minimum 4 ft radius and be rated for 250 psi usage. Hose shall be Plicord Wineline as manufactured by Continental ContiTech or approved equal. Hose shall have integral rubber flanged ends with solid metal backer rings as provided by the hose manufacturer or approved equal.

G. Heat Tracing:

1. Heat tracing in the ship service vaults and in Hot Boxes near Restroom Building: Self-regulating Low Temperature Cable for metallic pipe shall have a protective high temperature overjacket. Input shall be 120 volts, output 6 watts per foot of cable. Cable shall not be hard wired. Cable shall come with accessories, including but not limited to power connection boot, end termination boot, thermostat, mounting brackets and caution labels in full compliance with NEC. Heat tracing cable shall be 3M or as approved by the Engineer.

2.03 VALVES

A. Gate Valves 3 Inches & Larger

1. Type: Resilient seat valves, ANSI/AWWA C509, WSDOT Standard Specifications Section 9-30.3(1)
2. Rating: 200 psi
3. Opening: Counter clockwise
4. Body: Ductile iron epoxy coated
5. Ends: Flanged, mechanical joint
6. Stem: Non-rising high strength bronze
7. Stem seals: O-ring
8. Body-bonnet connections: Bolted with corrosion-resistant material.
9. Manual Operator: Hand wheel for valves in structures, 2-inch square operating nut for buried valve box installation
10. Manufacturer: M&H Valve Model C509/C515, Clow Valve Model 2639/2640, American Flow Control Series 2500, or approved equal.

B. Gate Valves 2-1/2 Inches & Smaller: 1. MSS SP-80; Class 125, 200-psi cold working pressure (CWP), or Class 150, 300-psi CWP; ASTM B 62 cast-bronze body and bonnet, solid-bronze wedge, copper-silicon alloy rising stem, teflon-impregnated packing with bronze packing nut, threaded or soldered end connections; and with aluminum or malleable-iron hand wheel.

C. Ball Valves:

1. Size: Two (2) inches and smaller
2. Material: Bronze
3. Rating: 600 psi W.O.G.
4. Ball and Stem: 316 Stainless steel
5. Seats: reinforced Teflon
6. Connection: Threaded
7. Manufacturer: Watts, Series FBV-3, or approved equal.

D. Air Release Valves:

1. Combination air release/air vacuum valves shall be designed to operate with potable water under pressure to permit discharging a surge of air from an empty line when filling and relieve the vacuum when draining the system. The valves shall also release an accumulation of air when the system is under pressure. This shall be accomplished in a single valve body designed to withstand 300 psi. The body and cover shall be cast iron conforming to ASTM A48, Class 30. Floats shall be stainless steel conforming to ASTM

A240 and designed to withstand 1,000 psi. Seats shall be Buna N rubber. Internal parts shall be stainless steel or bronze.

2.04 BACKFLOW PREVENTION ASSEMBLIES

A. 2-inch

1. Type: Reduced Pressure Principle
2. Design: Check valves shall be ductile iron and loaded to one psi in the direction of flow. A pressure differential relief valve shall be located between the two check valves.
3. Accessories: Ball Valves and Test Cocks
4. Working pressure: Max. 175 psi
5. Hydrostatic Test Pressure: 350 psi
6. Approvals: By State and Local Authorities
7. Body: Bronze
8. Ends: Threaded or Flanged, see Drawings
9. Servicing: provide unions for removal or assembly outside of ball valves.
10. Manufacturer: FEBCO Series 825Y, Watts LF909, or approved equal.

B. 4-inch and Larger

1. Type: Reduced Pressure Principle
2. Design: Check valves shall be ductile iron and loaded to one psi in the direction of flow. A pressure differential relief valve shall be located between the two check valves.
3. Accessories: Ball Valves and Test cocks
4. Working pressure: Max. 175 psi
5. Hydrostatic Test Pressure: 350 psi
6. Approvals: By State and Local Authorities
7. Body: Bronze
8. Ends: Flanged
9. Manufacturer: Watts LF909 or approved equal.

C. Hot Boxes

1. Hot Boxes shall be sectional aluminum enclosures certified to ASSE 1060 with removable doors and the capability to be completely removed for maintenance. Insulation shall be R10 and a minimum of 1 ½" thick, and be unicellular, non-wicking, polyisocynate, sprayed in place to form a monolithic bond. Drains shall be sized for full port backflow discharge and designed to prohibit the intrusion of debris and/or vermin. Enclosure shall be anchored to a concrete slab from within the enclosure with steel anchors and shall be lockable. Hot Boxes shall be of the size indicated on the Drawings and shall be manufactured by Hot Box, Jacksonville, FL or approved equal.

2.05 FIRE HYDRANTS

- A. Type: Dry-Barrel Fire Hydrants, AWWA Standard C502.
- B. Manufacturer: Medallion by CLOW Valve Company

- C. Rating: Minimum working pressure of 250 psi
- D. The dimensions and details of hydrant and nozzles shall be as follows:
 - 1. Hydrant connection pipe size, inside diameter 6 inches
 - 2. Standpipe, minimum inside diameter.....7 inches
 - 3. Valve opening, minimum diameter.....5-1/4 inches
 - 4. Auxiliary gate valve.....6 inches
 - 5. Hose nozzle.....2 @ 2-1/2" NST
 - 6. Nozzle threads.....7-1/2 per inch
 - 7. Outside diameter finished nozzle.....3.0625 inches
 - 8. Diameter at root of thread.....2.8715 inches
 - 9. Thread pattern.....60° V thread
 - 10. Threaded length of male nipple.....1 inch
 - 11. "Steamer" nozzle Pacific Coast Pumper Thread.1@4inches
 - 12. "Steamer" nozzle threads.....6 per inch
 - 13. Outside diameter finished nozzle.....4.828 inches
 - 14. Diameter at root of thread.....4.580 inches
 - 15. Thread pattern.....P.C.P. std.
 - 16. Threaded length of male nipple.....P.C.P. std.
 - 17. Storz 5" Steamer Port Hydrant Adaptors with blind cap and cable.
- E. Painting: Below the ground use Coal Tar Epoxy in accordance with SSPC-Paint 16 and referenced standards, with a minimum dry film thickness of 70 mils. Above ground paint in accordance with AWWA C502 and Tacoma Fire Department Requirements.

2.06 CONCRETE BOXES

- A. Concrete vault for blow-off assembly shall be pre-cast concrete. Box, frame and covers and shall meet the loading criteria shown on the Drawings and listed in Article 1.04. of this specification. Cover Plates and Frame shall be hinged and locking.
- B. Provide galvanized steel pipe supports and brackets, securely attached to the concrete structure to support all pipes and fittings.

2.07 VALVE BOX AND COVERS

- A. Valve Box shall be in accordance with WSDOT Section 9-30.3(4), rated for loading criteria specified in Article 1.04. Frame and Lid shall be tested for accuracy of fit. Castings and extensions shall be hot-dipped in asphaltic varnish Royston Roskote #612XM. Manufacturer: Olympic Foundry, or approved equal.

2.08 CONCRETE FOR THRUST BLOCK AND GATE VALVE PADS

- A. Concrete compressive strength shall be minimum 3,000 psi at 28 days and in conformance with the requirements of Section 03 30 00 – Cast-in-Place Concrete

2.09 RELOCATED FLUSH HYDRANT

- A. Flush Hydrant shall be removed from its existing location and reinstalled in the location indicated on the Drawings. Care shall be taken to not damage the hydrant in anyway during either the removal or installation. Engineer shall be notified of any existing damage prior to removal. The Contractor shall be responsible for any damage not brought to the Engineer's attention prior to removal and shall repair or replace to the Engineer's satisfaction at no additional cost to the Port.

PART 3– EXECUTION

3.01 TRENCHING, BEDDING AND BACKFILL

- A. All earthwork related to water piping shall conform to the requirements of Section 31 00 00 – Earthwork, Section 31 23 33 - Trenching and Backfilling and Section 31 23 19 - Dewatering and the details and notes on the Drawings. Provide shoring as necessary to support existing items noted to remain in place.
- B. In the event that water is encountered or accumulates in the trench, it shall be removed during the pipe-laying operation and be maintained in a water-free condition until the ends of the pipe are sealed and provisions are made to prevent floating of the pipe. At no time allow trench water to enter the pipe.

3.02 COORDINATION WITH OTHERS

- A. Prior to starting work coordinate shut downs, demolition, testing, flushing, disinfection and reopening water supply with the Port, Tacoma Water, Tacoma Fire Department and others as required by permit.

3.03 HANDLING THE PIPE

- A. During installation, handle the pipe as specified in paragraph 1.05 above. Pipe that has become damaged or contaminated shall be removed from the trench, cleaned, and repaired as required and re-laid.

3.04 LAYING PIPE

- A. General: Construction shall conform to manufacturer instructions and requirements in accordance with WSDOT Section 7-09.3. Fully extend each joint of restrained joint piping during installation.
- B. Rubber Gasket of Joint on Ductile Iron Pipe:
 - 1. Cleaning and Assembling Joint: Clean the inside of the bell to remove oil, grit, tar (other than standard coating) and other foreign material from the joint. Flex the circular rubber gasket inward and insert in the gasket seat provided in the socket, then release with the gasket fitting over the bead in the gasket seat. Apply a thin film of gasket lubricant to the inside surface of the gasket. Gasket lubricant shall be as supplied by the pipe manufacturer and approved by the Engineer.
 - 2. Clean the spigot end of the pipe and enter into the rubber gasket in the socket, using care to keep the joint from contacting the ground. Complete the joint by forcing the plain end to the bottom of the socket using a device approved by the Engineer. Pipe that is not furnished with a depth mark shall be marked before assembly to ensure that the spigot end is inserted to the full depth of the joint.

3.05 VALVE INSTALLATION

- A. Inspect all valves upon delivery in the field to ensure proper working order before installation. Set and joint to the pipe in the manner set forth in the AWWA Standards for the type of

connection ends furnished. Inspect the valves carefully for damage to the outer protective coatings. Where the coating has been ruptured or scraped off, clean the damaged area thoroughly to expose the iron base installation, and recoat the cleaned area with two or more field coats of Quigley Triple A-1 0, Triple A-20, or approved equal.

- B. Install valves in the positions shown on the drawings and provide with a valve box, where required, so arranged that no load or shock will be transmitted to the valve. Center the box over the operating nut, and set the box cover flush with the finished paved surface.
- C. After installation, all valves shall be subjected to the field test for piping. If defects in design, materials, or workmanship appear during these tests, correct such defects with the least possible delay as directed by the Engineer.
- D. Valve boxes shall be positioned during backfill to be in a plumb alignment. Valve box shall not rest directly on the body of the valve, or the water main. Set the upper casting flush with finish pavement and align to match grade.
- E. Concrete pad with rebar as shown on the valve details shall be constructed where indicated on the Drawings. Construction, materials and finished of the concrete shall conform to section 03 30 00 – Cast-in-Place Concrete. The concrete pad shall be set flush with the immediately surrounding finished grade.

3.06 SETTING FIRE HYDRANTS

- A. Fire hydrants shall be installed at the locations indicated on the Drawings and in accordance with the details on the Drawings and WSDOT Standard Specification Section 7-14.3.

3.07 THRUST BLOCKS FOR BURIED DUCTILE IRON PIPE

- A. Concrete thrust blocking shall be constructed in accordance with the details on the drawings and WSDOT Standard Specifications Section 7-09.3(21).

3.08 BLOWOFF ASSEMBLIES

- A. Blowoff assemblies shall be constructed at the locations indicated on the Drawings and in accordance with the WSDOT Standard Plans.

3.09 MOVING EXISTING HYDRANTS

- A. Existing hydrants shall be moved where shown on the Drawings and in accordance with the requirements of WSDOT Standard Specification Section 7-14.3(4).

3.10 FIELD TESTS

- A. Test all piping and appurtenances in accordance with the requirements of WSDOT Standard Specifications Section 7-09.3 (23), Tacoma Water and Tacoma Fire Department.
- B. Test copper pipe on wharf in accordance with pipe and fitting manufacturer's requirements.

3.11 FLUSHING & DISINFECTION OF POTABLE WATER LINES

- A. Before being placed in service, flush and disinfect all new, repaired portions, or extensions of potable water lines in accordance with the requirements of WSDOT Standard Specifications Section 7-09.3(24) and 7-09.3(24)A and Tacoma Water. Dispose of test water in accordance with applicable regulations.

3.12 FLUSHING OF FIRE WATER LINES

- A. Before being placed in service, flush all new, repaired portions, or extensions of fire water lines in accordance with the requirements of WSDOT Standard Specifications Section 7-09.3(24)A, Tacoma Water and Tacoma Fire Department. Dispose of test water in accordance with applicable regulations.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK DESCRIBED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to the work as if specified in this section. Work related to this section is described in:
 - 1. Section 00 31 00 – Available Project Information
 - 2. Section 00 31 26 – Existing Hazardous Material Information
 - 3. Section 01 33 00 – Submittal Procedures
 - 4. Section 01 45 00 – Quality Control
 - 5. Section 01 71 23 - Field Engineering
 - 6. Section 31 00 00 - Earthwork
 - 7. Section 03 20 00 – Concrete Reinforcing
 - 8. Section 31 23 33 - Trenching and Backfilling
 - 9. Section 31 23 19 - Dewatering
 - 10. Section 03 30 00 – Cast-in-Place Concrete
 - 11. Section 31 41 00 - Shoring and Underpinning
 - 12. Section 33 32 13 – Sewage Lift Station

1.02 DESCRIPTION OF WORK

- A. The location and extent of "Sanitary Sewage Utilities" work is indicated on the drawings. The work includes the requirements for furnishing and installing sanitary sewer pipe and sanitary sewer structures. Sanitary lift station and force main are covered under 33 32 13 Sewage Lift Station.

1.03 QUALITY ASSURANCE

- A. Qualification of Workers: Employ the services of a qualified utility contractor, who will be thoroughly familiar with the type of materials being installed and the best methods for their installation, and who shall direct all work performed under this section.
- B. Codes and Standards: Comply with the applicable provisions of all pertinent codes and regulations. References made herein for manufactured materials, such as pipe, fittings, valves, hydrants and specialties; refer to designations for American Water Works Association (AWWA), American National Standards Institute (ANSI) and to the latest edition of the Standard Specifications and Standard Plans for Road, Bridge, and Municipal Construction prepared jointly by the Washington State Department of Transportation (WSDOT) and the American Public Works Association (APWA).

1.04 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 - Submittal Procedures for the following products:
 - 1. The Contractor shall design and provide underground structures including frames, grates, lids and covers for the following loading criteria:

- a. Design and provide underground water concrete boxes and valve boxes including frames, and covers meeting the Concentrated Live Load criteria noted on Drawings S1.1 and S1.2.
 - b. Groundwater elevation shall be assumed to be at elevation +11.8 feet MLLW for design of all proposed underground structures, unless conditions in the field indicate a higher groundwater elevation. See "Geotechnical Engineering Design Report Port of Tacoma Pier 4 Phase 2 Reconfiguration" for additional information on groundwater.
 - c. Allowable soil bearing capacity is 2,000 PSF.
 - d. Design calculations, shop drawings, and product information for all items related to the various structure fabrications and installations.
 - e. Shop drawings and calculations shall be stamped by a structural engineer registered in the State of Washington shall be submitted and approved by the Engineer prior to fabrication.
- B. Manufacturer's literature and cut sheets for pipes and fittings including couplings and gaskets.
- C. Manufacturer's literature on manholes, cleanouts, covers, lids, grates and frames.

1.05 PRODUCT HANDLING

- A. Pipe shall be handled in conformance with section 7-09.3 (13) of the WSDOT Standard Specifications. Handle pipe to prevent damage to the pipe, pipe lining, or coating. Damage to the pipe, pipe lining, or coating, if any, shall be repaired as directed by the Engineer or replaced at the Contractor's expense.
- B. At times when pipe laying is not in progress, close the open ends of the pipe with a watertight plug or by other means approved by the Engineer to ensure cleanliness inside the pipe.

PART 2 – PRODUCTS

2.01 PIPE AND FITTINGS

- A. Ductile Iron Pipe and Fittings:
1. Ductile Iron Pipe (DIP) and fittings shall be Class 54; shall be in accordance with WSDOT Standard Specifications Section 9-05.13. and approved for sanitary sewer use. Pipe shall have an asphaltic exterior coating for full immersions conditions and a cement mortar lining in accordance with ANSI/AWWA C104.

2.02 MANHOLES

- A. Manholes shall be of precast concrete with ductile iron castings. Materials shall be in accordance with the applicable references within WSDOT Standard Specifications Section 7-05.2.
1. Manhole rings and covers shall be non-locking heavy duty ductile iron castings of the size and style indicated on the Drawings. Covers shall be embossed 3" high with "SEWER" in the center.
 2. Provide watertight rubber gaskets at matching segments of precast units.
 3. Manhole steps shall be copolymer polypropylene plastic manufactured by Lane International or approved equal.

2.03 ACCESSORIES

- A. Adapters and Couplings: Coupling adapters at tie-ins to existing pipes, if required, shall be Smith Blair or approved equal.

PART 3– EXECUTION

3.01 TRENCHING, BEDDING AND BACKFILL

- A. All earthwork related to sanitary sewer piping shall conform to the requirements of Section 31 00 00 – Earthwork, Section 31 23 33 - Trenching and Backfilling and Section 31 23 19 - Dewatering and the details and notes on the Drawings. Provide shoring as necessary to support existing items noted to remain in place.
- B. In the event that water is encountered or accumulates in the trench, it shall be removed during the pipe-laying operation and be maintained in a water-free condition until the ends of the pipe are sealed and provisions are made to prevent floating of the pipe. At no time allow trench water to enter the pipe.

3.02 COORDINATION WITH OTHERS

- A. Prior to starting work coordinate shut downs, demolition, potholing and other activities with the Port, Tenant and Engineer.

3.03 HANDLING THE PIPE

- A. During installation, handle the pipe as specified in paragraph 1.05 above. Pipe that has become damaged shall be removed from the trench, cleaned, and repaired as required and re-laid.

3.04 LAYING PIPE

- A. Furnish all necessary machinery for the Work and pump, bail or otherwise remove water which accumulates in the trench. Perform all Work necessary to keep the trench clear of water while the foundation and masonry are being constructed or the pipe is being laid.
 - 1. Placing: Place the pipe on appropriate bedding graded to conform with the grades and alignment indicated on the drawings and prepared as specified. Exercise care that the pipe has a full, solid bearing along its entire length. Make small depressions for pipe bells when utilized. Make minor adjustments to line and grade by scraping away, or filling in bedding material. Do not support pipes on blocks or mounds of any nature.
 - 2. Ductile Pipe: Join and install ductile-iron pipe with ductile-iron or cast-iron push-on joint fittings and rubber gaskets in accordance with AWWA C600, except that anchorages are not required.

3.05 MANHOLES

- A. Furnish all necessary machinery for the Work and pump, bail or otherwise remove water which accumulates in the trench. Perform all Work necessary to keep the trench clear of water while the foundation and masonry are being constructed or the pipe is being laid.
 - 1. Place manholes at the elevation and location indicated on the drawings, upon the appropriate bedding prepared in accordance with Section 31 00 00 - Earthwork.
 - 2. Construct cast-in-place manholes in accordance with the drawings. Concrete and reinforcing steel shall conform to the requirements of Division 3 - Concrete.
 - 3. Carefully place precast manholes on the prepared bedding to be fully and uniformly supported in true alignment, and ensure that all entering pipes can be inserted on the proper grade.
 - 4. Thoroughly wet all lift holes and all joints between precast elements; completely fill with mortar and smoothed and pointed both inside out, to ensure watertightness.
 - 5. Place and align precast sections to provide vertical sides and vertical alignment of the ladder rungs. The completed manhole shall be rigid, true to dimensions and watertight.

6. In precast manhole sections where steel loops have been provided in lieu of lift holes, remove the loops flush with the inside wall surface after the manhole has been completed. No sharp cutoff protrusions will be permitted. If concrete spalling occurs as a result of the loop removal, restore the spalled area with mortar to a uniform smooth surface.
7. Grade Adjustments: Initially construct manholes of the type noted on the project drawings so as to provide adjustment space for setting cover fastenings to a finished grade. The manhole grade furnished by the Engineer for manhole construction indicates the approximate top grade for the manhole plus or minus two-tenths foot, and the final grade will be set by the Engineer after backfilling has been completed to the grade established by the Engineer.
8. Where Work is in paved areas which have been brought to grade, provide not less than eight inches or more than 16 inches between the top of the cone or slab and the underside of the manhole casting ring for adjustment of the casting ring to grade.
9. Pipe Connections: Place all un-reinforced pipes entering or leaving the manhole on firmly compacted bedding, particularly within the area of the manhole excavation, which normally is deeper than that of the sewer trench. Take special care to see that the openings through which pipes enter the structure are completely and firmly rammed full of mortar to ensure watertightness.
10. Backfill: Hand-place backfill around the manhole and extending at least one pipe length into each trench and tamp with selected material up to an elevation of six inches above the crown of all entering pipes. Work shall conform to the applicable provisions of Section 31 00 00 - Earthwork.

3.06 ACCEPTANCE TESTING

- A. After completion of the following, authorization from the Engineer shall be required before the Contractor can perform initial camera work:
 1. Acceptable placement of applicable pipe, bedding and backfill material.
 2. Acceptable completion of all applicable manhole channels and grout work.
 3. Acceptable debris removal, cleaning and flushing of all applicable pipes and structures.
- B. Testing shall be as in WSDOT section 7-17.3(2) Cleaning and Testing. Infiltration testing will be required for pipe installed below the ground water elevation.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
1. Section 00 31 00 – Available Project Information
 2. Section 00 31 26 – Existing Hazardous Material Information
 3. Section 01 33 00 – Submittal Procedures
 4. Section 01 45 00 – Quality Control
 5. Section 01 71 23 – Field Engineering
 6. Section 31 00 00 – Earthwork
 7. Section 31 23 33 – Trenching and Backfill
 8. Section 31 23 19 – Dewatering
 9. Section 03 40 00 – Precast Concrete
 10. Section 31 41 00 – Shoring and Underpinning
 11. Section 33 30 00 – Sanitary Sewage Utilities

1.02 DESCRIPTION OF WORK

- A. The location and extent of the Sewage Lift Station work is indicated on the Drawings. The work includes the furnishing of a complete sewage lift station including pumps, controllers and appurtenances as well as any associated electrical and force main work.

1.03 QUALITY ASSURANCE

- A. The Port will provide testing and inspection service to the satisfaction of the Engineer. The Contractor may obtain test results from the Engineer at no cost. Tests conducted for the sole benefit of the Contractor, or before a product is approved, shall be at the Contractor's expense.
- B. Qualifications of Workmen: Employ at least one person who shall be present at all times during execution of this portion of the work, shall have all portions of the Drawings and Specifications applicable to the portion of the Contract, shall be thoroughly familiar with the types of materials being installed and the best methods for their installation, and shall direct all work performed under this Section.
- C. Codes and Standards: The Contractor shall comply with the applicable provisions of all pertinent codes and regulations including but not limited to:
1. ANSI A21.10 force main fittings
 2. ANSI A21.50/AWWA C150 force main thickness
 3. ANSI A21.51/AWWA C151 force main ductile iron
 4. NEMA 3 weatherproof duplex control panel, dead-front enclosure
 5. UL-approved control panel
 6. U.L. Class 1, Group D label submersible electric motors

1.04 SUBMITTALS

- A. Submit materials data in accordance with of Section 01 33 00 - Submittals. Furnish manufacturers' technical literature, standard details, product specifications, and installation instructions for all products. No piecemeal submittals will be accepted. Submittals shall include the following:
1. Submit shop drawings of the lift station.
 2. Product Data: Submit to the Engineer manufacturer's standard drawings or catalog cuts for all pipe, fittings, structures, valves, pumps, and controls noted under "Products" in this section. The pump supplier shall certify that the electrical control information submitted is coordinated with the mechanical equipment prior to submittal.
 3. Certificates of Conformance: Submit to the Engineer manufacturer's Certificate of Conformance for each of the materials which are specified to conform to publications referenced under "Products" in this section.
 4. Submit a list of spare parts to be provided.
 5. Test Results: Submit to the Engineer all test results required by this specification.

PART 2 - PRODUCTS

2.01 SINGLE SOURCE RESPONSIBILITY

- A. All products associated with the wet well and pumps shall be sourced from a single supplier to ensure compatibility and functionality as a single unit. Products must be preassembled prior to delivery to the project site to ensure compatibility and clearances. Single source supplier shall be responsible for the proper function of all equipment supplied regardless of the manufacturer. The Contractor is not relieved of responsibility to coordinate and install nor is the Contractor relieved of any guarantees required for workmanship.

2.02 PIPE AND FITTINGS

- A. Force main sanitary sewer pipe shall be flanged or mechanical joint centrifugally cast, ductile iron conforming to ANSI A21:51/AWWA C151. Thickness shall conform to ANSI A21.50/AWWA C150. Fittings shall conform to ANSI A21.10.

2.03 WET WELL

- A. Wet well shall be of precast concrete and shall be a One Lift Pump Station manufactured by Oldcastle Precast or approved equal.
- B. Wet well and provided lids, frames, rings, etc. shall be designed to withstand HS20 loading requirements.

2.04 LIFT PUMPS

- A. The sewage lift pumps shall be as noted on the plans, or approved equal, and shall be a duplex non-clog sewer system of the submersible quick-disconnect type. The system shall be designed to permit ground level removal of pumping units from the wet well for inspection or service without disconnection or disturbing the discharge piping and for automatic reinstallation when they are lowered into place by positively locking the volute in position.
- B. The system shall include heavy-duty, submersible, non-clog sewage pumps with submersible electric motors which shall be designed for use in raw sewage applications. Each pump shall have a cast iron volute and a non-clog impeller designed to pump raw, unscreened sewage and waste products. The quick-disconnect feature shall provide a positive hydraulic seal by means of a neoprene sealing "O" ring, located on the volute.

- C. Each pump shall be furnished with a base plate with quick-disconnect discharge elbow, discharge piping, check valve, base-welded pipe sleeve, standard sensor cable holder, rail-guided lifting assembly and galvanized chain to raise and lower pump.
- D. Motor controls for the system shall consist of a duplex control panel in a NEMA 3, weatherproof, dead-front enclosure. The panel shall contain circuit breakers, magnetic starters with ambient compensated overload relays and quick trip heaters, electric pump alternator, hand-off-auto selector switches, moisture-sensing relays, reset push buttons, panel alarm lights, externally mounted flashing red light with weatherproof enclosure and alarm bell (alarm circuit shall be equipped with a silencing button). The control panel shall be pre-wired and factory tested and shall be UL-approved.
- E. Pump level controls and high-level alarm shall be by weighted float-type mercury switches which shall be sealed in solid polyurethane floats. All controls in the pump manhole shall be explosion proof or low voltage, suitable for hazardous atmosphere. Controls and components shall be suitable for the purposes intended and shall be acceptable to the City/State electrical inspector.
- F. Pumps shall be Flygt F-3068 as manufactured by Flygt/Xylem or approved equal and shall have characteristics listed on the Drawings.

2.05 CONTROLLERS

- A. The electrical control systems shall operate in conjunction with the wet well level sensing system to control the operation of the pumps with variations of levels in the wet well.
- B. The pump station controller shall be Flygt model APP 521 with a HAND-OFF-AUTO selector switch or approved equal.
- C. The pump controller shall change the sequence of pump operation on the completion of each pump cycle. Provisions shall be made for the standby pump to operate in parallel with the base pump should the level in the wet well continue to rise above the starting level for the base pump. The standby pump shall shutdown before the base pump with a falling level in the wet well. Control settings are indicated on the Drawings.
- D. An elapsed time meter shall be provided and mounted near the pump controller for each pump. Meters shall be G.E. type 236 or approved equal.

2.06 LEVEL SENSORS

- A. Provide level sensors of the float switch type. Level sensing system shall be adjustable through all levels of the wet well and capable of complete removal from the wet well without requiring entry to the well. The level sensors shall be Flygt ENM-10 float switch system or approved equal. Set as shown on the Drawings.

2.07 CHECK VALVES

- A. Check valves shall have a heavy-duty body of ASTM A126 Class B iron with integral flanges faced and drilled to ANSI B16.1 Class 125 for horizontal installation as indicated on the Drawings. Valve clapper shall swing completely clear of the waterway when valve is fully open, permitting full flow through the valve equal to nominal pipe diameter. Check valves shall comply with AWWA C508. The valve shall have a bolted and gasketed cover to allow for clapper access without removing the flanges valve from the line.
- B. Pressure ratings: Class 125 flanged valve body shall be rated for a shell pressure of 250 psi.
- C. The check valve shall be supplied with adjustable outside lever and weight.
- D. Manufacturer shall factory paint all interior and exterior ferrous surfaces with fusion bonded epoxy coating, AWWA C550 manufacturer standard color.

- E. Check valve shall be Matco-Norco, mod. 120WC or approved equal.

2.08 PLUG VALVE

- A. Plug valves shall be of the non-lubricated, quarter-turn, eccentric type with flanged ends and lever operated in full conformance with AWWA C517.
- B. Valves shall have a minimum 175 psi pressure rating. Plug valve shall be round ported.
- C. Flange diameter, thickness and drilling shall conform to ANSI B16.1 Class 125.
- D. Valve shaft seals shall be of the self-adjusting U-cup design and be replaceable without removing the cover from the valve.
- E. Valves shall have bodies and covers of ductile iron per ASTM A536. Valves shall have body seats of 95% welded nickel or applied directly to the body and machined to a smooth finish. Sprayed, plated, or removable seats are not acceptable. Valves shall have plugs made from ductile iron per ASTM A536 with a vulcanized synthetic rubber seat facing tested per ASTM D429.
- F. Valves shall be provided with stainless steel thrust bearings on the upper and lower plug shaft. Grit seals shall be provided on the upper and lower bearing journals.
- G. Valves shall be factory coated internally and externally with 6-8 mils NSF approved two part epoxy paint for corrosion protection.
- H. Plug valves shall be Golden Anderson Figure 517 "ECO-Centric" or approved equal.

2.09 GASKETS, NUTS, BOLTS

- A. For flange joints, gaskets shall be a minimum of 1/8" full faced gasket. Gaskets shall be of a composition suitable to exposure to fluids within the pipe. Gaskets shall meet AWWA C110, C111, and C115 performance standards.
- B. Flange joints shall be bolt-assemble utilizing full faces gasket. Bolting hardware, number and size, shall conform to the same ANSI standard as the flange. Bolts and nuts shall be 316 stainless steel, heavy hex grade B conforming to ASTM A493/494.

2.10 STATION VENT

- A. A passive station vent shall be supplied using 4" Sch80 PVC pipe and fittings and a stainless steel insect screen.

2.11 INTERIOR JUNCTION BOXES

- A. The lift station shall be supplied with interior junction boxes for pump power/control and float conductor connections. The pump power/control junction boxes shall be rated NEMA 7 explosion-proof and shall require one junction box for each pump. The float junction box shall be rated NEMA 4X and constructed of polypropylene. The interior junction boxes shall be positioned together and accessible from the hatchway/manhole at grade. Interior conduits and fittings shall be utilized for passage of pump power/control and level control conductors to the junction boxes.
- B. Pump and level control SJO jacketed cables shall be properly supported within the lift station via stainless strain reliefs (Kellums Grip) or other methods, so that the cable weight is not transferred to the junction boxes.
- C. Interior conduits and fittings between the wall-embedded electrical couplings and the interior junction boxes will be RGS construction and shall be factory mounted. Interior conduit support assembly shall be a fabricated type 304 stainless steel Unistrut frame with type 316 stainless steel fasteners.

2.12 PUMP RAIL SYSTEM

- A. The lift station shall be supplied with a stainless steel guide rail pump removal system, to facilitate emergency and routine maintenance in removing and re-installing the submersible pumps from the top of the station. The guide rail system shall include lower guide brackets incorporated into the pump base elbow, 316 stainless steel upper guide brackets, 316 stainless intermediate guide brackets may be required per the pump manufacturer, and 304 stainless Sch40 guide rails of size and quantity as dictated by the pump manufacturer.
- B. Guide rail components shall be assembled and installed plumb to the pump station structure and shall allow for pump removal and re-installation without interfering with the access to the lift station. All assembly hardware shall be 316 stainless.

2.13 ALUMINUM VAULT LADDER

- A. The valve vault shall be supplied with an aluminum (6061-T6) wall-mount access ladder. The ladder shall be fastened to the concrete with 316 stainless expansion bolts and shall meet OSHA standard 1910.27 requirements.
- B. The ladder rails and supports shall be all welded aluminum construction. Rails and wall supports shall be solid 3/8" x 2 1/2" flat stock, and rungs shall have a 1 1/4" diameter with serrated surface extruded into the rung for slip resistance. The minimum design live load shall be a single concentrated load of 200lbs.
- C. Rung spacing shall be uniform and not exceed 12", the minimum clear length of rungs shall be 15 1/4", and the distance from the center line of the rung to the nearest permanent object shall not be less than 7".
- D. The aluminum ladder shall be manufactured by EJ, East Jordan, MI, or approved equal.

2.14 DUCTILE IRON PIPE AND FITTINGS

- A. All ductile iron pipe shall be designed in accordance with ANSI A21.50 and shall be manufactured in accordance with ANSI A21.51. Pipe for use with grooved end couplings shall have grooved ends in accordance with AWWA C606.
- B. Pipe thickness class shall be Class 53 for use with threaded flanges or grooved ends.
- C. Flanged joints shall conform with ANSI A21.15 utilizing long-hub flanges which shall be screwed on tight by the foundry before they are faced and drilled.
- D. Fittings shall conform to the requirements of ANSI A21.10 and shall be of a pressure classification at least equal to that of the pipe with which they are used. Flanged fittings shall be faced and drilled in accordance with ANSI A21.10
- E. All ductile iron piping and fittings shall be double-thick cement mortar lined and have a bituminous seal coat on the outside all in accordance with ANSI/AWWA A21.4/C104.

2.15 FLANGE TYPE COUPLINGS

- A. Flange couplings shall be mounted on each pump base elbow to ensure proper pressure seal while providing a minimum of assembly flexibility. The flange couplings shall be fusion bond epoxy coated and supplied with 304 stainless assembly and mounting hardware for harsh and wet environments. The pipe gaskets and O-ring seals shall be Nitrile (Buna N) NFS 61 Listed.
- B. All flange couplings shall be furnished by the pipe supplier and be of the pressure rating of at least that of the pipeline in which they are to be installed.
- C. Flange couplings shall be Smith-Blair model 912 or approved equal.

2.16 GROOVED COUPLINGS

- A. Grooved couplings shall conform to AWWA C606.
- B. The housing coating shall be coal tar epoxy; the gasket shall be Nitrile (red color code) and bolting hardware of 304 stainless.
- C. Grooved couplings shall be Victaulic style 31/307 or approved equal.

2.17 PIPE SUPPORTS

- A. Piping shall be supported in the valve vault by means of an adjustable stainless steel floor support stands which cradle the pipe/valve flanges. The support stands shall be floor mounted with 316 stainless expansion bolting hardware. Where piping enters and exits the vault structure aluminum wall support angles with 304 stainless U-bolts and 316 stainless expansion bolt wall mounting hardware shall be utilized.
- B. Piping shall be supported in the lift station by means of a common 304 stainless fabricated angle brace spanning the width of the station and mounted with wall brackets and 316 stainless hardware. Both vertical discharge pipe shall be supported from the brace by means of individual 316 stainless U-bolts and bolting hardware.
 - 1. (1) Common pipe support assembly at mid length shall be required when the vertical discharge pipe lengths exceed 10'-0".
 - 2. (2) Common pipe support assemblies at equal spacing shall be required when the vertical discharge pipe lengths exceed 14'-0".

2.18 WALL PENETRATIONS

- A. Where wall penetrations are called for on the Drawings; mechanical piping shall utilize cast or cored openings with flexible manhole boots. Boots shall consist of EPDM polymer compounds meeting ASTM C923 material performance requirements. Expansion banding and strap shall be 304 stainless material and the connection between the boot and structure shall utilize and expansion wedge system with 304 stainless wedge and hardware components.
- B. Electrical conduit penetrations shall utilize galvanized electrical coupling assemblies with 2" wide minimum waterstop embedded in the structure at casting or cored openings with mechanical rubber seals to fill the annular space between the conduit and concrete wall. Mechanical seals shall be Link Seal or approved equal and shall utilize 304 stainless assembly hardware.

2.19 SPARE PARTS

- A. Provide a complete tool kit containing all necessary non-standard tools to dismantle pump and replace seals.
 - 1. Provide the following spare parts for each pump
 - a. (2) Complete replacement mechanical seal assemblies
 - b. (2) Volute gaskets
 - c. (6) Complete and bound operating and maintenance instructions, including electrical wiring diagrams, shall be provided to the Port. A complete lubrication and maintenance chart shall be furnished. Instructions shall include complete parts lists for all equipment and detailed instructions for changing pump seals. The complete operating instructions shall accompany the lift station when delivered to the Project Site.

PART 3 - EXECUTION

3.01 ALIGNMENT AND GRADE

- A. Layout the sewer mains for alignment and grade as shown on the project drawings.

3.02 TRENCHING FOR PIPE

- A. Excavate trenches to the alignments and depths indicated on the Drawings. See Section 31 00 00 - Earthwork of these specifications.

3.03 BACKFILL AND UTILITIES BEDDING

- A. Install backfill and bedding as indicated on the Drawings and as specified in Section 31 00 00 - Earthwork. Do not backfill trenches until all tests and inspections have been made.

3.04 ELECTRICAL

- A. All electrical work shall be conducted in strict accordance with the requirements of Division 16 – Electrical and manufacturer's written instructions and recommendations.

3.05 TESTING AND ADJUSTING

- A. Test operation of the lift station upon completion of installation and make all adjustments as required to ensure proper operation.
- B. Perform test of sanitary mains in accordance with Section 33 30 00 - Sanitary Sewer Utilities of these Specifications.
- C. Perform hydrostatic testing of the wet well to ensure watertightness.
- D. Instruct personnel designated by the Owner in the proper use, operation and maintenance procedures for sewage lift station and its components.

3.06 SURFACE RESTORATION

- A. Restore to original condition.

3.07 GUARANTEE

- A. Complete lift station shall be guaranteed for a period of one year from final acceptance against defective materials and workmanship. This requirement does not reduce any warranties or guarantees made by individual manufacturers or vendors.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
1. Section 00 31 00 – Available Project Information
 2. Section 00 31 26 – Existing Hazardous Material Information
 3. Section 01 33 00 – Submittal Procedures
 4. Section 01 45 00 – Quality Control
 5. Section 01 71 23 - Field Engineering
 6. Section 31 00 00 - Earthwork
 7. Section 03 11 00 - Concrete Forming
 8. Section 03 22 00 - Concrete Reinforcing
 9. Section 31 23 33 - Trenching and Backfilling
 10. Section 31 23 19 - Dewatering
 11. Section 03 30 00 - Cast-In-Place Concrete
 12. Section 03 40 00 - Precast Concrete
 13. Section 31 41 00 Shoring and Underpinning
 14. Section 33 44 19.19 Utility Oil/Water Separators
 15. Section 33 44 19.23 - Off-Line Utility Storm Water Filters
 16. Appendix – Water Quality Monitoring and Protection Plan (WQMPP)

1.02 DESCRIPTION OF WORK

- A. The location and extent of the Storm Drainage Utilities work is indicated on the drawings. The work includes the requirements for furnishing and installing storm drain pipes, and storm drain structures.

1.03 QUALITY ASSURANCE

- A. Except as specified in Section 3.09, the Port of Tacoma will provide testing and inspection service to the satisfaction of the Engineer. The Contractor may obtain test results from Engineer at no cost. Tests conducted for the sole benefit of the Contractor, or before a product is approved, shall be at the Contractor's expense.
- B. Qualification of Workmen: Employ at least one person who shall be present at all times during execution of this portion of the work, shall have all portions of the Drawings and Specifications applicable to that portion of the Contract, shall be thoroughly familiar with the type of materials being installed and the best methods for their installation, and shall direct all work performed under this section.
- C. Codes and Standards: The Contractor shall comply with the applicable provisions of all pertinent codes and regulations. References made herein for manufactured materials such as pipes, fittings, and specialties refer to designations for the latest edition of materials published by the American Association of State Highway and Transportation Officials (AASHTO), the American Society for Testing Materials (ASTM), the American Water Works Association

(AWWA), and the Standard Specifications and Standard Plans for Road, Bridge, and Municipal Construction prepared jointly by the Washington State Department of Transportation (WSDOT) and the American Public Works Association (APWA).

- D. City of Tacoma: The Contractor shall coordinate with and comply with the applicable provisions of all pertinent local codes and regulations from the City of Tacoma concerning testing, cleaning, installation, inspection and materials used.

1.04 SUBMITTALS

- A. Submit the following in accordance with 01 33 00 - Submittal Procedures for the following products:
 - 1. The Contractor shall design and provide underground drainage structures including manholes, catch basins, flow splitters, frames, grates, and covers for the following criteria:
 - a. Concentrated Live Load for container handling equipment shown on drawing S1.1 and S1.2.
 - b. Groundwater elevation shall be assumed to be at elevation +11.8 feet MLLW for design of all proposed underground structures, unless conditions in the field indicate a higher groundwater elevation. See "Geotechnical Engineering Design Report Port of Tacoma Pier 4 Phase 2 Reconfiguration" for additional information on groundwater.
 - c. Allowable soil bearing capacity of 2,000 PSF.
 - d. Submit design calculations, shop drawings, and product information for all items related to the structure fabrications and installations.
 - e. Shop drawings and calculations shall be stamped by a structural engineer registered in the State of Washington shall be submitted and approved by the Engineer prior to fabrication.
 - 2. Manufacturer's literature on materials used for piping and fittings.
 - 3. Manufacturer's literature on the manholes, catch basins, and geotextile fabric, including cut sheets with inverts, covers, grates and frames.
 - 4. Manufacturer's literature on the elastomer tidal check valves that includes information on the performance and operation of the valve, materials of construction, dimensions and weights, elastomer characteristics, flow data, headloss data, and pressure ratings. Provide shop drawings that clearly identify the valve dimensions.

PART 2 - PRODUCTS

2.01 STORM DRAINAGE PIPING

- A. All storm drainage piping shall be reinforced concrete pipe (RCP), Class V, unless noted otherwise on the Drawings. Reinforced concrete storm drainage pipe shall be in accordance with WSDOT Standard Specifications Section 9-05.7(2). For all classes of pipe, except Class 1, which are of a diameter less than the minimum for the particular class set forth in AASHTO Designation M 170, the minimum wall thickness shall be 1-3/4 inches and the steel area shall not be less than 0.06 square inch per linear foot of pipe barrel.
 - 1. The end designs for reinforced concrete storm sewer pipe shall conform to the applicable requirements of AASHTO Designation M198 for rubber gasketed joints. The planes of the ends of the pipes shall be perpendicular to their longitudinal axes.
 - 2. The basis for acceptance of reinforced concrete pipe 60 inches in diameter and smaller shall be determined by the results of the three edge bearing test for the load to produce a 0.01 inch crack and testing to the ultimate load will ordinarily not be required, except as

necessary to obtain samples for making the absorption test in lieu of broken pieces of pipe obtained as above provided, four inch diameter cores from pipe sections selected by the Engineer may be furnished for performing the absorption test. Sections of pipe which have been tested to the actual 0.01-inch crack will ordinarily not be further load tested; and such sections that meet or exceed the required strength and workmanship standards may be accepted for use.

3. Reinforced concrete storm drainage pipe may be shipped when it meets all test requirements. Unless it is tested and accepted at an earlier age, it shall not be considered ready for shipment sooner than 28 days after manufactured when made with standard Portland cement, nor sooner than seven days when made with high-early-strength Portland cement.
4. In lieu of marking circular pipe with elliptical reinforcement in accordance with AASHTO Designation M 170, the location of the top of the pipe shall be indicated by three inch wide, waterproof, painted stripes on the inside and outside of the pipe for a distance of two feet from each end of the section. At the option of the Contractor, a lift hole or lift holes may be provided at the top of the pipe in lieu of the painted stripes. If one lift hole is provided, it shall be at the balance point of the pipe; and if two lift holes are provided, they shall be spaced equidistant to each side of the balance point. Such holes shall not interfere with the reinforcement. After placing, any open lift holes shall be filled with mortar or concrete plugs before backfilling.
5. Beveled concrete end sections shall conform to the applicable sections of AASHTO Designation M170, with the design requirements as listed in Table II, Wall B, Circular Reinforcement in circular pipe.
6. Joints in concrete sewer pipe shall be made watertight by the use of integral bell and spigots and flexible rubber gaskets conforming to the applicable requirements of AASHTO Designation M198. Joint ties shall be as indicated on the drawings.

2.02 MANHOLES AND CATCH BASINS

- A. Manholes, catch basins and flow splitters shall be of precast concrete with ductile iron castings. Materials shall be in accordance with the applicable references within WSDOT Standard Specifications, Section 7-05.
 1. Manhole Rings and Covers shall be non locking, heavy duty, ductile-iron castings of the size and style indicated on the drawings. Covers shall be embossed 3" high with "STORM" in the center.
 2. Provide watertight rubber gaskets at matching segments of precast units.
 3. Manhole steps shall be copolymer polypropylene plastic manufactured by Lane International or approved equal.
 4. Openings surrounding pipes entering manhole, catch basin or vault structures shall be completely filled with either a non-shrink grout and shall be made flush with the remaining manhole concrete surface to ensure watertightness, or a Kor-n-Seal boot.
 5. Flow Splitter riser tee and elbow shall be constructed of corrosion resistant polyvinyl chloride (PVC) pipe.
 - a. PVC pipe shall be SDR35 conforming to ASTM D3034.
 6. Flow splitter pipe support materials shall be as indicated on the Drawings.

2.03 BACKFLOW PREVENTOR

- A. Elastomer Check Valves are to be all rubber of the flow operated check type with a slip-on connection. The Check Valve is designed to slip over the specified pipe outside diameter and attached by means of vendor furnished stainless steel clamps and as shown on the drawings. The end of the check valve shall contour down to a duckbill which shall allow passage of flow in one direction while preventing reverse flow. The valve shall be one piece rubber construction with nylon reinforcement. The bill portion shall be thinner and more flexible than the valve body, and formed into a curve of 180°.
- B. Manufacturer must have available flow test data from an accredited hydraulics laboratory to confirm pressure drop data. Company name, plant location, valve size and serial number shall be bonded to the check valve.
- C. All valves shall be of the Series TF-1 as manufactured by the Tideflex Technologies Co., Inc. of Pittsburg, PA 15205 or approved equal.

2.04 COMPRESSIBLE MATERIAL AND GEOTEXTILE

- A. Compressible material for placement between concrete encased outfall and steel sheet pile wall shall be radiated polyethylene foam board Youngboard Y-S-30 as manufactured by Specialty Foams or approved equal.
- B. Geotextile shall be Mirafi 140NL or approved equal.

2.05 NON-SHRINK GROUT

- A. Non-shrink grout shall be Grout Type 2 in accordance with WSDOT Standard Specifications Section 9-20.3(2).

PART 3 - EXECUTION

3.01 GENERAL

- A. All stormwater outfall construction work shall be coordinated and performed in strict accordance with the permit requirements and the WQMPP. This specification section does not include all required protection measures, mitigation measures, and BMPs associated with this project. The Contractor shall pay particular attention to the conditions of issued permits and the WQMPP, and applicable regulations and authorizations associated with this project. All protection measures, mitigation measures, and BMPs included in these documents shall be implemented by the Contractor.
- B. It shall be the Contractor's responsibility to verify the actual locations (horizontal and vertical) of all utilities prior to beginning trench excavation. If utilities are to remain in place, provide protection from damage during construction operations.

3.02 TRENCHING, BEDDING AND BACKFILL

- A. All earthwork related to storm drain piping shall conform to the requirements of Section 31 00 00 - Earthwork and Section 31 23 33 - Trenching and Backfilling and the Details and Notes on the Drawings. Provide shoring as necessary to support existing items noted to remain in place.

3.03 COORDINATION WITH OTHERS

- A. Prior to starting work coordinate shut downs, demolition, and reopening service pipes with the Port and others as required by permit.

3.04 INSTALLATION OF UNDERGROUND PIPE

- A. Furnish all necessary machinery for the work and pump, bail, or otherwise remove water which accumulates in the trench. Perform all work necessary to keep the trench clear of water while

the foundation and masonry are being constructed or the pipe is being laid. Construction requirements shall be in accordance with WSDOT Standard Specifications Section 7-04.3 and 7-8.3, AWWA C600, and the requirements shown below.

1. Survey Line and Grade: Setting alignment and grade of sloped gravity drainage piping shall be performed by Contractor using laser beam and methods described in WSDOT Standard Specifications Section 7-08.3(2)A.
2. Placing: Place the pipe on appropriate bedding graded to conform with the grades and alignment indicated on the Drawings and prepared as Specified. Exercise care that the pipe has a full, solid bearing along its entire length. Make small depressions for pipe bells when utilized. Make minor adjustments to line and grade by scraping away, or filling in bedding material. Do not support pipes on blocks or mounds of any nature.
3. Jointing: Take care to properly align the pipe and clean the bell and spigot or tongue of the pipe. Gaskets must be straight, properly lubricated and without twist. Partially support the pipe by hand, sling, or crane, as required, to minimize lateral pressure on the gasket and to maintain concentricity until the pipe has been forced into final longitudinal position in accordance with the manufacturer's recommendations. Carefully control pipe handling, after the gasket has been affixed, to avoid bumping the gasket knocking it out of position, or loading it with dirt or other foreign material. Remove gaskets so disturbed, and clean, relubricate, and replace before jointing is reattempted.
4. Apply sufficient restraint to the line to ensure that the joints, once home, are held so by tamping fill material under and alongside the pipe. At the end of the day's work, block the last pipe in such a manner as may be required to prevent creep during down time.
5. Linear measure references to be measured from the center of the beginning structure to the center of the next inline structure and include the direction of flow.

3.05 INSTALLATION OF MANHOLES AND CATCH BASINS

- A. Furnish all necessary labor, materials, or equipment to pump, bail, or otherwise dewater the trench or pit for the duration of the construction and backfill period. Construction requirements shall be in accordance with WSDOT Standard Specifications Section 7-05.3 and the requirements shown below.
 1. Manholes/Catch Basins
 - a. Place manholes/catch basins at the elevation and location indicated on the Drawings upon the appropriate bedding prepared in accordance with Section 31 00 00 - Earthwork.
 - b. Carefully place precast manholes on the prepared bedding to be fully and uniformly supported in true alignment, and ensure that all entering pipes can be inserted on the proper grade.
 - c. Thoroughly wet all lift holes and all joints between precast elements; completely fill with mortar, and smoothed and pointed both inside out, to ensure watertightness.
 - d. Place and align precast sections to provide vertical sides and vertical alignment of the ladder rungs. The completed manhole shall be rigid, true to dimensions and watertight.
 - e. In precast manhole sections where steel loops have been provided in lieu of lift holes, remove the loops flush with the inside wall surface after the manhole has been completed. No sharp cutoff protrusions will be permitted. If concrete spalling occurs as a result of the loop removal, restore the spalled area with mortar to a uniform smooth surface.

- f. Manhole Steps: Manhole Steps or Ladder Rungs shall be installed as described in Section 7-05.3 of the WSDOT Standard Specifications.
- g. Flow Splitter Riser and Pipe Support: Flow splitter riser and pipe support shall be constructed, and installed as indicated on the Drawings.
- h. Grade Adjustment: The manhole/catch basin casting frame or casting ring may be either cast into a concrete collar or set flange down on pre-cast concrete adjustment rings and mortared, as directed by the Engineer. It shall not, in any case, be grouted to final grade until the final elevation of the pavement in which it is to be placed has been established and permission has been given by the Engineer to grout the casting in place. Provide not less than eight inches or more than 16 inches between the top of the cone or slab and the underside of the manhole casting ring for adjustment of the casting ring to grade. Bricks for grade adjustment shall not be used. Location of catch basins will be staked by the Contractor.
- i. Pipe Connections: Place all unreinforced pipes entering or leaving the manhole on firmly compacted bedding, particularly within the area of the manhole excavation, which normally is deeper than that of the sewer trench. Take special care to see that the openings through which pipes enter the structure are completely and firmly rammed full of mortar to ensure watertightness.
- j. Backfill: Hand-place backfill around the manhole and extending at least one pipe length into each trench and tamp with selected material up to an elevation of six inches above the crown of all entering pipes.

3.06 INSTALLATION OF ELASTOMER TIDAL CHECK VALVE

- A. Valve(s) shall be installed in accordance with Manufacturer's Installation and Operation Manual and approved submittals.

3.07 ACCEPTANCE TESTING

- A. After completion of the following, authorization from the Engineer shall be required before the Contractor can perform the initial television camera work:
 - 1. Acceptable placement of applicable pipe, bedding, and backfill material.
 - 2. Acceptable completion of all applicable manhole channels and grout work.
 - 3. Acceptable debris removal, cleaning, and flushing of all applicable pipes and structures.
- B. Cleaning and Testing shall be performed in accordance with WSDOT Standard Specifications Section 7-17.3 (2).

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to the work as if specified in this section. Work related to this section is described in:
1. Section 01 33 00 – Submittal Procedures
 2. Section 01 45 00 – Quality Control
 3. Section 01 70 00 – Execution and Closeout Procedures
 4. Section 33 40 00 - Storm Drainage Utilities

1.02 DESCRIPTION OF WORK

- A. The oil-water separator system shall be housed within a rectangular, precast reinforced concrete vault. Within the precast concrete vault, parallel-corrugated plate coalescing media shall be utilized to provide enhanced gravity separation of oil and water mixtures. The separator shall include a baffled inlet compartment, separation chamber, and clean water outlet chamber.

1. INLET COMPARTMENT

- a. The inlet compartment shall be of sufficient volume to effectively reduce influent suspended solids, dissipate energy and begin separation. The inlet shall be comprised of a non-clog diffuser to distribute the flow across the width of the separation chamber. A sludge baffle will be provided to retain settleable solids and prevent sediment from entering the separation chamber. The forebay or inlet compartment shall be 1/3 the total length of the vault to meet regulatory requirements.

2. SEPARATION CHAMBER

- a. The oil separation chamber shall contain coalescing media. The parallel corrugated plates shall be at a 45° angle with respect to longitudinal axis of the plate corrugations, and spaced 1/2-inch apart for removal of free oil 60 microns in size or greater, and settleable solids. System configuration shall not promote solids buildup on the plates, which may increase velocities and result in the discharge of an effluent of unacceptable quality.
- b. Laminar flow with a Reynolds Number of less than 500 at the maximum designed flow rate shall be maintained throughout the coalescing media, including entrance and exit so as to prevent reentrainment of oils with water. Flow through the coalescing media shall be cross-flow perpendicular to plate corrugations so that the oil collects and coalesces at the high point of corrugations and rises to the top of the media pack without clogging.
- c. Minimum treatment flowrate capacity shall be 400 gpm for Oil Water Separator #1 and 350 gpm for Oil Water Separator #2.

3. CLEAN WATER OUTLET CHAMBER

- a. An oil retention baffle or inverted T-pipe section shall be provided to prevent free-floating oil from exiting the system.

4. PIPE CONNECTIONS

- a. Internal Inlet and Outlet pipe with sampling tee shall extend through vault wall with sealed penetration and connected to exterior piping system with a Fernco type coupling.

1.03 QUALITY ASSURANCE

- A. Except as otherwise specified, the Port of Tacoma will provide testing and inspection service to the satisfaction of the Engineer. The Contractor may obtain test results from the Engineer at no cost. Tests conducted for the sole benefit of the Contractor, or before a product is approved, shall be at the Contractor's expense.
1. Qualification of Workmen: Employ at least one person who shall be present at all times during execution of this portion of the work, shall have all portions of the Drawings and Specifications applicable to that portion of the Contract, shall be thoroughly familiar with the type of materials being installed and the best methods for their installation, and shall direct all work performed under this Section.
 2. Codes and Standards: The Contractor shall comply with the applicable provisions of all pertinent codes and regulations. References made herein for manufactured materials such as pipes, fittings, and specialties refer to designations for the latest edition of materials published by the American Association of State Highway and Transportation Officials (AASHTO), the American Society for Testing Materials (ASTM), and the Standard Specifications and Standard Plans for Road, Bridge, and Municipal Construction prepared jointly by the Washington State Department of Transportation (WSDOT) and the American Public Works Association (APWA).
 3. The Contractor shall coordinate with and comply with the applicable provisions of all pertinent local codes and regulations from the City of Tacoma concerning testing, cleaning, installation, inspection and materials used.
 4. The quality of materials, the process of manufacture, and the finished sections shall be subject to inspection by the Engineer. Such inspection may be made at the place of manufacture, or on the work site after delivery, or at both places, and the sections shall be subject to rejection at any time if material conditions fail to meet any of the specification requirements, even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the site shall be marked for identification and shall be removed from the site at once. All sections that have been damaged beyond repair during delivery will be rejected and, if already installed, shall be repaired to the Engineer's acceptance level, if permitted, or removed and replaced, entirely at the manufacturer's expense.
 5. All sections shall be inspected for general appearance, dimensions, soundness, etc. The surface shall be dense, close-textured and free of blisters, cracks, roughness and exposure of reinforcement.
 6. Imperfections may be repaired, subject to the acceptance of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final acceptance. Cement mortar used for repairs shall have a minimum compressive strength of 4,000 psi at the end of 7 days and 5,000 psi at the end of 28 days when tested in 3-inch by 6-inch cylinders stored in the standard manner. Epoxy mortar may be utilized for repairs.

1.04 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 - Submittal Procedures for the following products:
1. The Contractor shall design and provide vaults including grade rings, frames, covers and lids for the following criteria and as specified herein and on the Drawings:
 - a. Concentrated Live Load for container handling equipment shown on Drawing S1.2.

- b. Groundwater elevation shall be assumed to be at elevation +11.8 feet MLLW for design of all proposed underground structures, unless conditions in the field indicate a higher groundwater elevation. See "Geotechnical Engineering Design Report Port of Tacoma Pier 4 Phase 2 Reconfiguration" for additional information on groundwater.
- c. Allowable soil bearing capacity of 2,000 PSF.
- d. Submit design calculations, shop drawings, and product information for all items related to the structure fabrications and installations.
- e. Shop drawings and calculations shall be stamped by a structural engineer registered in the State of Washington shall be submitted and approved by the Engineer prior to fabrication.
- f. Shop and installation drawings shall include all dimensions, location of piping, and vault foundation.
- g. Material cut sheets for coalescing media and sealants.
- h. Manufacturer's literature on the Oil-Water Separator treatment system that includes information on the performance and operation of the units, materials of construction, dimensions, hydraulic capacity calculations including flow and head-loss data.
- i. Submit copies of the Oil-Water Separator treatment system Operation and Maintenance manual to the Engineer as per Section 01 70 00 - Execution and Closeout Requirements.

PART 2 - PRODUCTS

2.01 MATERIALS AND DESIGN

- A. Loading criteria shall be as listed in Paragraph 1.04. Concrete for the precast concrete vault shall conform to ASTM C 857 and C 858 and meet the following additional requirements:
 - 1. Sections shall have tongue-and-groove joints or shiplap joints and be sealed with a butyl mastic sealant designed to be resistant to fuel and oil such as ConSeal™ Brand CS-440 or approved equal.
 - 2. Cement shall be Type II Portland cement, or approved equal, conforming to ASTM C 150.
 - 3. All precast concrete sections shall be cured by an approved method. Sections shall not be shipped until the concrete has attained a compressive strength of 4,000 psi or until 5 days after fabrication and/or repair, whichever is longer.
- B. Coalescing media shall be manufactured by Facet International and be made of calcium carbonate filled polypropylene corrugated plates, with corrugation angles no less than 45° with respect to longitudinal axis of the plate corrugations. Plates shall be spaced at 1/2-inch intervals and be stacked and bound together with sturdy rods and supports to form modular plate packs.
- C. Polyurethane elastomeric sealant shall comply with ASTM 0-412 and GSA Specification TT-S-00230C, Type II, Class A and ASTM C-920, Type S, Grade NS.
- D. Metal frames and lids shall be ductile iron and capable of supporting the maximum loading criteria listed in Paragraph 1.04.
- E. Precast concrete rings used to build the casting frames to grade shall conform to ASTM C 32 or ASTM C 139 and shall be installed in conformance with all local requirements.

2.02 PERFORMANCE

- A. The oil-water separator systems, with the performance specifications as described below, shall remove essentially all free and dispersed, nonemulsified oil and settleable solids from an

oil/water mixture at the specified flow rates and operating temperatures. The system design shall utilize the difference in specific gravity between oil and water (i.e., buoyancy force) to separate these fluids. The separation process shall be enhanced through the use of coalescing media. The separator shall be designed to receive non-emulsified oily water by gravity and shall process it on a once through basis.

B. System Specifications:

Oil Water Separator #1

Treatment Flow Rate	400 gpm min
Effluent Target Quality	15 mg/L at any time or 10 mg/l on a 24-hr average

Oil Water Separator #2

Treatment Flow Rate	350 gpm min
Effluent Target Quality	15 mg/L at any time or 10 mg/l on a 24-hr average

2.03 MANUFACTURER

- A. The manufacturer of the oil-water separator system shall have been regularly engaged in the engineering design and production of systems for the physical treatment of stormwater runoff for a minimum of 5 years.
- B. The oil-water separator system shall be manufactured by Utility Vault, CONTECH Stormwater Solutions, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installer Qualifications: Engage an experienced Installer who has at least three years' experience and has completed at least five projects with same material and of similar scope to that indicated for this Project with a successful construction record of in-service performance.
- B. Each oil-water separator system shall be constructed according to the sizes shown on the Drawings and as specified herein. Install at elevations and locations shown on the Drawings or as otherwise directed by the Engineer.
- C. Place the precast base unit on a crushed stone subbase of minimum thickness of 12 inches after compaction or of greater thickness and compaction if specified elsewhere. The subbase shall be checked for level prior to setting and the precast base section of the trap shall be checked for level at all four corners after it is set. If the slope from any corner to any other corner exceeds 0.5% the base section shall be removed and the subbase material re-leveled.
- D. Prior to setting subsequent sections place mastic sealant, in conformance with ASTM C 990-91, along the construction joint in the section that is already in place in such a manner that no gaps or voids are present.
- E. After setting the precast roof section of the oil-water separator system, set precast concrete manhole riser sections, to the height required to bring the cast iron manhole covers to grade, so that the sections are vertical and in true alignment with a 1/4-inch maximum tolerance allowed. Backfill in a careful manner, bringing the fill up in 6-inch lifts on all sides. If leaks appear, clean the inside joints and caulk with lead wool to the satisfaction of the Engineer. Precast sections

shall be set in a manner that will result in a watertight joint. In all instances, installation of the oil-water separator system shall conform to ASTM specification C 891 "Standard Practice for Installation of Underground Precast Utility Structures."

- F. Holes made in the concrete sections for handling or other purposes shall be plugged with a non-shrink grout or by using grout in combination with concrete plugs.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
1. Section 01 33 00 – Submittal Procedures
 2. Section 01 45 00 – Quality Control
 3. Section 01 70 00 – Execution and Closeout Procedures
 4. Section 31 00 00 - Earthwork
 5. Section 31 23 29 - Dewatering
 6. Section 31 41 00 - Shoring and Underpinning
 7. Section 33 40 00 - Storm Drainage Utilities

1.02 DESCRIPTION OF WORK

- A. The location and extent of the Storm Water Treatment work is indicated on the Drawings. The work includes the requirements for furnishing and installing all items and components of two completed Storm Water Treatment Systems that meet the Enhanced Treatment requirements set forth by the Washington State Department of Ecology. Contractor shall furnish and install two Modular Subsurface Flow Wetland® stormwater treatment systems (MSFWS) manufactured, without exception, by:
- Bio Clean Environmental Services
P.O. Box 869
Oceanside, CA 92049
Phone: (760) 433-7640
- B. The MSFWS is a pre-engineered biofiltration system composed of a below ground precast concrete vault. Within the vault is a pretreatment chamber containing filter cartridges, a horizontal flow biofiltration chamber with a peripheral void area and a centralized and vertically extending underdrain, the biofiltration chamber containing sorptive media mix, a flow control baffle wall, and a discharge chamber. Treated water flows horizontally in series through the pretreatment chamber cartridges, biofiltration chamber, over flow control baffle wall and through the discharge chamber.
1. The MSFWS shall not contain any plant establishment media or above ground plantings.
 2. The pretreatment filter cartridges and biofiltration chamber sorptive mix shall be removable and replaceable.
 3. Each MSFWS shall be designed to treat the Peak Treatment Flow Rate as indicated on the Drawings.

1.03 QUALITY ASSURANCE

- A. Except as otherwise specified, the Port will provide testing and inspection service to the satisfaction of the Engineer. The Contractor may obtain test results from the Engineer at no cost. Tests conducted for the sole benefit of the Contractor, or before a product is approved, shall be at the Contractor's expense.

1. Qualification of Workmen: Employ at least one person who shall be present at all times during execution of this portion of the work, shall have all portions of the Drawings and Specifications applicable to that portion of the Contract, shall be thoroughly familiar with the type of materials being installed and the best methods for their installation, and shall direct all work performed under this Section.
2. Codes and Standards: The Contractor shall comply with the applicable provisions of all pertinent codes and regulations including the local codes from the City of Tacoma. References made herein for manufactured materials such as pipes, fittings, and specialties refer to designations for the latest edition of materials published by the American Association of State Highway and Transportation Officials (AASHTO), the American Society for Testing Materials (ASTM), Standard Specification for Municipal Public Works Construction, and the Standard Specifications for Road, Bridge, and Municipal Construction, prepared jointly by Washington State Department of Transportation (WSDOT) and the American Public Works Association (APWA).
3. The quality of materials, the process of manufacture, and the finished sections shall be subject to inspection by the Engineer. Such inspection may be made at the place of manufacture, or on the work site after delivery, or at both places, and the sections shall be subject to rejection at any time if material conditions fail to meet any of the specification requirements, even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the site shall be marked for identification and shall be removed from the site at once. All sections that have been damaged beyond repair during delivery will be rejected and, if already installed, shall be repaired to the Engineer's acceptance level, if permitted, or removed and replaced, entirely at the manufacturer's expense.

1.04 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 - Submittal Procedures for the following products:
 1. The Contractor shall design and provide vaults including grade rings, frames, and covers for the following criteria:
 - a. Structures shall be designed to adequately handle Concentrated Live Load for container handling equipment shown on drawing S1.1 and S1.2.
 - b. Allowable soil bearing capacity of 2,000 PSF.
 - c. Groundwater elevation shall be assumed to be at elevation +11.8 feet MLLW for design of all proposed underground structures, unless conditions in the field indicate a higher groundwater elevation. See "Geotechnical Engineering Design Report Port of Tacoma Pier 4 Phase 2 Reconfiguration" for additional information on groundwater.
 - d. Submit design calculations, shop drawings, and product information for all items related to the concrete vault and manhole structure fabrications and installations.
 - e. Shop Drawings and calculations shall be stamped by a structural engineer registered in the State of Washington shall be submitted and approved by the Engineer prior to fabrication.
 - f. Shop and installation drawings shall include all dimensions, filter and media placement, drainage cells and drain down system, flow control baffle wall, location of piping, and vault foundation.

2. Manufacturer's design and literature on the Modular Subsurface Flow Wetland® Stormwater Treatment Systems MWS-L-8-12-UG-V, that includes information on the performance and operation of the units, materials of construction, dimensions, etc.
3. Submit copies of the Modular Subsurface Flow Wetland® stormwater treatment system Operation and Maintenance manual to the Engineer as per Section 01 70 00 - Execution and Closeout Requirements.

PART 2 - PRODUCTS

2.01 INTERNAL COMPONENTS

- A. All internal components including pretreatment filter cartridges, water transfer system, and biofiltration chamber sorptive media shall be designed by the manufacture per the treatment requirements indicated on the Drawings. All internal components shall be supplied by the manufacturer.

2.02 PRECAST CONCRETE VAULT

- A. Precast concrete vault shall be provided according to ASTM C 857 and C 858. Loading criteria shall be as listed in Paragraph 1.04. Flow control baffle wall design shall be by the Manufacturer.
- B. Vault joint sealant shall be Conseal CS-101 or approved equal.
- C. Baffle walls shall be sealed to the interior vault walls and floor with a polyurethane construction sealant rated for use below the waterline, SikaFlex 1a or equal. Contractor to provide sealant material and installation unless completed prior to shipment.
- D. Metal frame and grate or cover for manholes shall be ductile iron of the size and style indicated on the drawings and capable of supporting the maximum loading criteria listed in Paragraph 1.04.
- E. Steps shall be constructed of copolymer polypropylene conforming to ASTM D 4101. Steps shall be driven into preformed or drilled holes once concrete is cured. Steps shall meet the requirements of ASTM C 478 and AASHTO M199. The 112 inch Grade 60 deformed reinforcing bar shall meet ASTM A 615.
- F. Ladders shall be constructed of aluminum and steel reinforced copolymer polypropylene conforming to ASTM D 4101. Ladder shall bolt in place. Ladder shall meet all ASTM C 497 load requirements.
- G. Vaults shall be configured as shown on the Drawings and as determined by the Manufacturer to accommodate the required internal equipment and fittings.

2.03 OTHER COMPONENTS

- A. All Contractor-provided components shall meet the requirements of this Section, the Drawings, Specifications, and Contract Documents. In the case of conflict, the more stringent Specification shall apply.
 1. Silicone Sealant shall be pure RTV silicone conforming to Federal Specification Number TT S001543A or TT S00230C or Engineer approved.
 2. Grout shall be non-shrink grout meeting the requirements of Corps of Engineers CRD-C588. Specimens molded, cured and tested in accordance with ASTM C 109 shall have minimum compressive strength of 6,200 psi. Grout shall not exhibit visible bleeding.

PART 3 - EXECUTION

3.01 GENERAL

- A. It shall be the Contractor's responsibility to verify the actual locations (horizontal and vertical) of all utilities prior to beginning excavation. If utilities are to remain in place, provide protection from damage during construction operations.

3.02 EARTHWORK

- A. Excavation, bedding, and backfilling shall be as specified in
 1. Section 31 00 00 - Earthwork of these Specifications.

3.03 PRECAST CONCRETE VAULT

- A. Installer Qualifications: Engage an experienced Installer who has at least three years' experience and has completed at least five projects with same material and of similar scope to that indicated with a successful construction record of in-service performance.
- B. Set precast vaults on gravel base course material that has been placed in maximum 6-inch lifts, loose thickness, and compacted to at least 95-percent of the maximum dry density as determined by the standard Proctor compaction test, ASTM D 698, at moisture content of +/-2% of optimum water content.
- C. Inlet and outlet pipes shall be stubbed in and connected to pre-cast concrete vault shown on the Drawings. If grout is used, Contractor to grout all inlet and outlet pipes flush with or protruding up to 2 inches into interior of vault.

3.04 CLEAN UP

- A. Remove all excess materials, rocks, roots, or foreign material, leaving the Site in a clean, complete condition approved by the Engineer. All filter components shall be free of any foreign materials including concrete and excess sealant.

3.05 INTERNAL COMPONENTS

- A. All internal components shall be delivered with the vault. Contractor shall take appropriate action to protect the components from damage, sediment and other debris during construction. Methods for protecting the components include but are not limited to those shown below. The method ultimately selected shall be at Contractor's discretion and Contractor's risk.
 1. Remove internal components from vaults and store in a covered and dry location. Components shall be reinstalled to operate as originally installed.
 2. Leave internal components in the vaults and plug inlet and outlet pipe to prevent storm water from entering the vault.
- B. Modular Subsurface Flow Wetland® System shall not be placed in operation until the vault is clean and the Project Site is clean, and substantially complete. The Project Site includes any surface that contributes storm drainage to the MSFWS. All impermeable surfaces shall be clean and free of dirt and debris. All catch basins, manholes and pipes shall be free of dirt and sediments. Contact the manufacturer to assist with system activation and/or inspect the system for proper installation once site is clean and stabilized.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 26 05 00 – Common Work Results for Electrical
 - 2. Section 26 05 13 – Medium Voltage Cables and Accessories
 - 3. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
 - 4. Section 26 05 33 – Raceways and Boxes for Electrical Systems
 - 5. Section 26 05 53 – Identification for Electrical System
 - 6. Section 26 12 14 – Transformers (Oil Filled)
 - 7. Section 26 24 16 – Panelboards
 - 8. Section 26 56 36 – Flood Lighting Fixtures
 - 9. Section 33 77 00 – Medium Voltage Switchgear and Protection Devices
 - 10. Section 33 79 00 – Site Grounding
 - 11. Section 31 00 00 – Earthwork
 - 12. Section 31 23 33 – Trenching and Backfilling

1.02 REFERENCES

- A. ASTM (American Society for Testing and Materials).
- B. NFPA 70 (National Fire Protection Association) – National Electrical Code.
- C. WSDOT/APWA Specifications, Section 6-02.3.
- D. Polyvinyl chloride (PVC) coated Rigid Steel Conduit: NEMA RN 1, UL 6, ANSI C80.1, and NFPA 70.
- E. Non-metallic, PVC, schedule 80: NEMA TC-2; UL 651, and NFPA 70.
- F. PVC Fittings for Use with Rigid PVC Conduit and Tubing: NEMA TC-3.

1.03 QUALITY ASSURANCE

- A. Listing and Labeling: Provide products Listed and Labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Authority Having Jurisdiction, and marked for intended use for the location and environment in which they are installed.
- B. Comply with NFPA 70, as adopted and administered by the Authority Having Jurisdiction.
- C. ANSI C2 “National Electrical Safety Code” for components and installation.

1.04 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections:
 - 1. Product data for metal accessories for manholes/vaults, conduit and duct, duct bank materials, and miscellaneous components.

2. Record Documents: Show dimensioned locations of underground ducts, and manholes/vaults from nearest building or permanent structure.
3. Shop drawings showing details and design calculations for precast manholes/vaults including reinforcing steel. All loading shall be Type 1 container equipment loading unless otherwise indicated. Provide stamped drawings and calculations with State of Washington seal of registered professional structural engineer.
4. Certificate for concrete and steel used in underground precast concrete utility structures, according to ASTM C 858.
5. Inspection report for factory inspections, according to ASTM C 1037.
6. Record Documents: Show dimensional locations of underground ducts and manholes/vaults from nearest building or permanent structure.

1.05 DEFINITIONS

- A. Duct: Electrical conduit and other raceway, either metallic or nonmetallic, used underground, below wharf deck, embedded in earth or concrete.
- B. Ductbank: Two (2) or more conduits or other raceway installed underground in the same trench or concrete envelope.
- C. Handhole: An underground pullbox in a duct or ductbank.
- D. Manhole / Vault: An underground utility structure, large enough for a person to enter, with facilities for installing and maintaining wiring.
- E. Cable Rack: Heavy Duty Non-metallic wall mounted cable support racks, with stanchions, arms and cable ties to support cables.

1.06 COORDINATION

- A. Coordinate layout and installation of ducts and manholes/vaults with final arrangement of other utilities as determined by field verification. Revise locations and elevations from those indicated but required to suit field conditions and ensure duct runs drain to manholes/vaults.

1.07 SAFETY REQUIREMENTS

- A. Perform work in accordance with the safety requirements of the Department of Labor Occupational Safety and Health Administration, Volume 36, Number 75, Part II, Subpart P, "Excavations, Trenching, and Shoring," and with Section 7 of the Manual of Accident Prevention in Construction as published by the Association General Contractors of America, Inc.
- B. Educate supervisors and employees on safety requirements and practices to be followed during the course of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Store precast concrete units at site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.
- B. Lift and support precast concrete units only at designated lifting or supporting points.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manholes/Vaults: Subject to compliance with requirements, provide products by one of the following:
 1. Utility Vault Company - Custom

2. H2 Precast - Custom
3. Approved Equal

2.02 CONDUIT AND DUCTS

- A. Metallic Conduit: PVC Coated Rigid Steel Conduit (PVRSC): UL 6, ANSI C80.1.
 1. Use for below grade transition of PVC Schedule 80 to above grade exposed conduit.
- B. Nonmetallic conduit:
 1. Rigid Plastic Conduit: NEMA TC 2, UL 651A, Schedule 80 PVC, rated for use with 90°C conductors under all installation conditions and labeled for underground use.

2.03 CONDUIT FITTINGS

- A. Steel Fittings: PVC-coated, cast malleable, ferrous metal, threaded fittings, with neoprene cover gasket on each fitting installed outdoors.
- B. PVC Conduit and Tubing Fittings: NEMA TC 3. PVC Schedule 80 fittings shall be solvent welded type.
- C. All conduit elbows 30 degrees or greater shall be factory made, PVC coated rigid steel conduit. All 90 degree elbows shall be a minimum radius of 24" or greater.
- D. "Mogul Fittings": Provide "Mogul" size fittings for all conduit.
- E. Seal Bushings: O.Z. compound bushing on each conduit entering a building from outside underground and on each conduit passing from one space into another, which is normally at a lower temperature.
- F. Hubs: Appleton "Hub" or "Hub-U" series or Thomas & Betts "370" series hub on each conduit terminating in a box where a hub was not previously provided.
- G. Unions: Appleton Type "EC" or Thomas & Betts "Erickson Coupling" conduit unions where necessary.

2.04 HANDHOLES

- A. General: Precast concrete with the following standard features:
 1. Cover with insert or other device to facilitate lifting.
 2. Cover with locking devices similar to REA or FARGO.
 3. Term-a-duct in sides of adequate number and spacing to accommodate ductbanks shown.
 4. Handholes shall be bottomless.
 5. Provide weep hole on two sides of the handhole, near bottom of handhole wall.
 6. Provide grounding insert on one wall of the handhole. Bond to all metal components in handhole.
- B. Cover shall incorporate an all 316 stainless steel nitrogen gas spring, to achieve one-man lift capability, with a 20lb. maximum opening force through the 90 degree opening range. The cover latch shall be 316 stainless steel recessed handle with no above-grade protrusions, spring loaded handle return to closed position automatically. Concealed mounting hardware, all stainless steel construction.
- C. A self-engaging hold-open bar shall be provided to safely hold the cover in the open position and to protect against cover over-travel while opening.

2.05 MANHOLES / VAULTS

- A. Precast Concrete Units: Rated minimum 125 KIP, Interlocking, mating sections, complete with accessory items, hardware, and features as indicated on Drawings. Include term-a-ducts for conduit entrances and sleeves for ground rods.
- B. Design structure according to ASTM C 858.
- C. Joint Sealant: Continuous extrusion of asphaltic butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand the maximum hydrostatic pressures at the installation location with the ground water level at grade.
- D. Source Quality Control: Inspect structures according to ASTM C 1037. Units shall be capable of supporting designed loads.
- E. Manhole/Vault Covers: Cast iron, capable of supporting minimum 125 KIP designed loads. Cast iron cover with cast-in legend "ELECTRIC" or "COMMUNICATION" as appropriate. Machine cover-to-frame bearing surfaces.
- F. All manholes/vaults shall be set level on 12 inches of pea gravel except where otherwise specifically directed by the Engineer. Contractor shall be responsible for measuring and calculating elevations which will result in top of manhole/vault flush with final asphalt paving grade. Contractor to provide riser extensions and/or grade rings to adjust for manhole depths as indicated in the ductbank profiles as shown on the Civil drawings. In the event the manhole/vault installation does not conform to the foregoing criteria, the contractor shall remove and re-install the manhole/vault. The surrounding area shall be repaved in accordance with the foregoing criteria and the paving specifications, all at no additional cost to the Port of Tacoma. Raising the manhole/vaults top section and blocking with brick and/or grout will not be accepted. The contractor shall perform the above at no additional cost to the owner. See Civil/Structural drawings and specifications for all wheel load requirements for electrical and communications manholes/vaults.
- G. All manholes/vault lids over frames shall be field stamped with drawing ID.

2.06 ACCESSORIES

- A. Duct Supports shall be rigid PVC spacers selected to provide minimum NEC 2014 duct spacings. All horizontal spacers shall be staggered a minimum of 12 inches.
- B. Manhole/Vault Lifting Means
 - 1. Pulling Eyes in Walls: Eyebolt with reinforcing bar fastening insert. 2-inch diameter eye, 1-inch by 4-inch bolt. Working load with 6 inch embedment in 4000 psi concrete: 13,000 pounds minimum tension.
 - 2. Pulling and Lifting Irons in Floor: 7/8-inch-diameter, hot-dipped galvanized, bent steel rod, stress relieved after forming, and fastened to reinforced rod. Exposed triangular opening. Ultimate yield strength: 40,000 pounds shear and 60,000 pounds tension.
- C. Sump Frame and Grate: Comply with FS RR-F-621, Type VII for frame and Type I for cover. Provide ground stud on frame and cover.
- D. Bolting Inserts for Cable Racks: Flared, threaded inserts of noncorrosive, chemical resistant, nonconductive thermoplastic material 3'-0" on center; 1/2-inch internal diameter by 2-3/4 inches deep, flared to 1-1/4 inch minimum at base. Tested ultimate pull-out strength: 12,000 pounds minimum.
- E. Expansion Anchors for Installation After Concrete is Cast: Zinc-plated carbon steel wedge type with stainless-steel expander clip, 1/2-inch bolt size, 5300-pound rated pull-out strength, and 6800-pound rated shear strength minimum.

- F. Manhole/Vault Hardware: Cables shall be well supported on walls by imbedded cable racks. The cable racks shall consist of a stanchion that attaches to the manhole/vault wall in accordance with the manufacturer's recommendations and adjustable arms that lock into the stanchion.
 - 1. At least three (3) stanchions shall be installed on each eight foot manhole/vault wall, two (2) stanchions on each six foot manhole/vault wall, and one (1) stanchion on each four foot manhole/vault wall.
 - 2. Minimum cable arm length shall be eleven inches. Cable rack arm lengths shall be appropriate for the manhole/vault size and amount of cable being installed.
 - 3. At least two spare arms shall be installed at each stanchion position.
- G. Cable Rack: Stanchions and arms shall be heavy duty non-metallic 50% glass reinforced nylon or other non-metallic material having equal mechanical strength, thermal resistance, chemical resistance, dielectric strength and physical properties. The Stanchion shall be 36 inches long, shall incorporate multiple arm mounting holes that are 4 inches apart and recessed bolt mounting holes. Slots shall be provided in the arms for cable wire ties. The cable racks shall meet or exceed the 350 lb working load rating and shall be marked with the manufacturer's name, plant location and date manufactured. Cable rack components and accessories shall be Underground Devices Incorporated or equal.
- H. Ground Rods: Solid copper clad steel, 3/4-inch diameter by 10-feet length.
- I. Ground Wire: Stranded bare copper, #2 AWG minimum.
- J. Duct Sealing Compound: Nonhardening, safe for human skin contact, not deleterious to cable insulation, workable at temperatures as low as 35°F withstands temperature of 300°F without slump, and adheres to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and the common metals.

2.07 BACKFILL MATERIAL

- A. Comply with Specification Section 31 00 00 Earthwork.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine site to receive ducts, manholes/vaults for compliance with installation tolerances and other conditions affecting performance of the underground ducts. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Existing Utilities: Locate all existing utilities in the area prior to performing any excavation.

3.02 EARTHWORK

- A. Comply with Specification Section 31 00 00 Earthwork.

3.03 RACEWAY APPLICATIONS

- A. Refer to Specifications and Drawings for raceway materials. Where not specified otherwise, use PVC coated rigid steel conduit for elbows underground, embedded in Wharf, and in bullrail vaults.
- B. Nonmetallic conduit: PVC Schedule 80, use underground only.
 - 1. Underground Direct Burial: For medium-voltage and low-voltage applications. Use Schedule 80 Rigid Plastic Conduit as standard. Use PVC coated rigid steel conduit on turns 30° or greater.

- C. Use PVC fittings for PVC conduit and suitable water-tight connections where PVC conduit connects to galvanized steel conduit.

3.04 CONDUIT AND DUCT INSTALLATION

- A. Install conduit and ducts as indicated on Drawings and according to manufacturer's written instructions.
- B. Slope: Pitch ducts minimum of two inches per 100 feet to drain toward manholes, vaults and handholes and away from buildings and equipment. Slope ducts from a high point in runs between manholes/vaults to drain in both directions.
- C. Curves and Bends: Use PVC coated rigid steel conduit on turns of 30 degrees or greater with a minimum radius of 36 inches for communications and 24 inches for electrical conduits. Galvanized rigid steel elbows shall be $\frac{1}{2}$ lap wrapped with corrosion resistant tape. Use manufactured PVC rigid steel elbows for stubups at equipment and into buildings. Do not exceed 22 degrees for field bends without field review and approval by Engineer. Contractor shall field stake bend radius for field review prior to conduit installation for bends greater than 22 degrees.
- D. Make joints in ducts and fittings watertight according to manufacturer's instructions. Stagger couplings so those of adjacent ducts do not lie in the same plane.
- E. Duct Entrances to Vaults and Manholes: Space end bells approximately 10 inches on center for 5-inch ducts and varied proportionately for other duct sizes. Change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line. Grout end bells into vault/manhole and handhole walls from both sides to provide watertight entrances. Grout to be per specification Section 03 60 00 "Grouting".
- F. Separation Between Direct-Buried, Non-Encased Ducts: Provide 2 inches minimum separation for like services, and 12 inches minimum between power and signal ducts, unless indicated otherwise on the drawings.
- G. Stub-Ups: Use PVC coated rigid steel conduit for stub-ups through concrete to equipment. Install insulated grounding bushings at the conduit terminations.
- H. Use PVC coated rigid steel for all exposed conduit for equipment mounted on outdoor concrete pads.
- I. Provide metallic line-warning tape per Specification 26 05 53 Identification for Electrical System. Bury warning tape approximately 12 inches above all ductbanks. Align tape parallel to and within 3 inches of centerline of ductbank. Provide an additional warning tape for each 18-inch increment of ductbank width over a nominal 18 inches. Space additional tapes 18 inches apart, horizontally.
- J. Pulling Cord: Install 150-pound- test nylon cord with distance markings in empty conduits, and conduits with conductors.
- K. Pull a properly sized mandrel through each conduit prior to installation of conductors or pull-lines to remove any materials trapped within the conduit run. Medium voltage conduits embedded in flowable thermal fill shall have a mandrel pulled within 24 hours of flowable thermal fill pour.
- L. Provide bell ends for all conduits entering and leaving existing or new precast concrete manholes/vaults, handholes, and pullboxes.
- M. All below grade conduit runs with two or more conduits shall be provided with manufactured conduit saddles.
- N. Minimum conduit size shall be 2" trade size for underground conduits, unless noted otherwise.

3.05 BACKFILLING

- A. Comply with Specification Section 31 00 00 Trenching and Earthwork.

3.06 MANHOLE / VAULT AND HANDHOLE INSTALLATION

- A. Install as indicated on Drawings, according to manufacturer's written instructions and ASTM C 891.
 - 1. Install units plumb and level and with orientation and depth coordinated with arrangement of connecting ducts to minimize bends and deflections required for proper entrances.
 - 2. Support manhole/vault units on a level bed of pea gravel, graded from the 1-inch sieve to the No. 4 sieve and compacted to the same density as the adjacent undisturbed earth.
 - 3. Drainage: Manholes/vaults shall have drain holes in the bottom. Provide sixteen inches minimum of pea gravel below the manhole/vault.
- B. Grounding:
 - 1. Provide two ground rods through floor in vaults and manholes with the top of ground rods protruding 6 inches above the floor. Provide four ground rods in manholes/vaults with larger than 8-feet by 10-feet clear interiors.
 - 2. Ground all exposed metal components and metal hardware within the manhole/vault with #2 AWG bare copper ground conductor. This requirement includes the cover and frame.
- C. Hardware: Install removable hardware, including pulling eyes, cable racks stanchions, cable arms, and insulators, as required for installation and support of cable and conductors and as indicated on Drawings.
 - 1. Field-Installed Bolting Anchors: Do not drill deeper than 3-7/8 inches for field-installed anchor bolts. Use a minimum of 4 anchors for each cable stanchion.
- D. Train cables neatly around corners and secure to cable racks using nylon wire ties.

3.07 IDENTIFICATION

- A. Identify raceways, cables and equipment as specified in Division 26, Section 26 05 53 "Identification for Electrical Systems."
- B. Provide warning and caution signs as required by the Authority Having Jurisdiction and these specifications.
- C. Label raceways entering concealed locations from exposed locations as to the destination via the concealed area.
- D. Manhole/vault cast iron lids and frames provide field stamped identification corresponding to Drawing ID as indicated on final field and clean As-Built Drawings.

3.08 TESTING AND CLEANING

- A. Pull brush through full length of ducts. Use round bristle brush with a diameter 1/2-inch greater than internal diameter of duct. Clean internal surfaces of vaults, manholes and handholes, including sump.
- B. Duct Integrity: Swab out ducts with a mandrel 1/4 inch smaller in diameter than internal diameter of ducts.

- C. Grounding: Test manhole grounding to ensure electrical continuity of bonding and grounding connections. Measure ground resistance at each ground rod and document results. Use an instrument specifically designed for ground-resistance measurements.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
1. Section 26 01 26 – Acceptance Testing of Electrical Systems
 2. Section 26 05 00 – Common Work Results for Electrical
 3. Section 26 05 13 – Medium Voltage Cables and Accessories
 4. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
 5. Section 26 05 33 – Raceways and Boxes for Electrical Systems
 6. Section 26 05 53 – Identification for Electrical System
 7. Section 26 05 73 – Overcurrent Protective Device Coordination Study
 8. Section 26 09 13 – Electrical Power Monitoring and Control
 9. Section 26 24 16 – Panelboards
 10. Section 26 27 26 – Wiring Devices
 11. Section 33 71 19 – Electrical Underground Ducts and Manholes
 12. Section 33 79 00 – Site Grounding
 13. Section 03 10 00 – Concrete Forming and Accessories
 14. Section 03 20 00 – Concrete Reinforcing
 15. Section 03 30 00 – Cast-In-Place Concrete
 16. Section 03 60 00 - Grouting

1.02 WORK INCLUDED:

- A. Provide 15KV switchgear line up, rated 1200 Amps, complete with accessories and ratings as indicated.
- B. Switchgear line-up shall be NEMA 1 indoor type, arc-resistant per ANSI/IEEE C37.20.7, with 1200 Amp metal enclosed isolating load break switch, metal clad stacked vacuum circuit breaker units in separate compartments, complete with copper bus throughout the switchgear line-up. The entire 15KV switchgear line up shall be provided within a UL labeled, walk-in, ANSI type 316 stainless steel, weather tight enclosure with enclosed base, man doors, panic hardware, equipment access doors, branch circuit panel, metering cabinet with equipment, battery back-up lighting fixture, surface fluorescent ceiling lights, light switches, exhaust fans, air vents, reverse acting thermostat, and 120V, 20A GFI receptacles.
- C. Power monitoring, control equipment and cabling shall be factory installed as part of the switchgear line-up and power distribution switchgear enclosure. See Specification Section 26 09 13

1.03 SUBMITTALS: POWER DISTRIBUTION SWITCHGEAR ENCLOSURE (PDSE) AND 15KV SWITCHGEAR EQUIPMENT

- A. Equipment manufacturer shall provide a complete submittal/shop drawing package with scaled (1/4"=1'-0") enclosure/switchgear equipment floor plans, and interior/exterior elevation within 14 days of contract award to permit contractor to accurately coordinate site and foundation work.

Contractor shall provide building concrete foundation/slab drawings prepared by a Washington State licensed professional structural engineer and submit drawings to the Engineer for review. These costs shall be included in the contractors bid.

- B. Power Distribution switchgear enclosure (PDSE) and 15KV switchgear line-up shall be delivered to the job site. Offloading, site preparation, building foundations, shims, field assembly and testing shall be provided by contractor. Provide stainless steel shims required for leveling the building on site. Equipment supplier shall coordinate and provide necessary information to contractor's structural engineer for design of concrete foundations. Contractor shall include cost of foundation/slab work in the bid.

1.04 APPLICABLE CODES AND STANDARDS

- A. The applicable codes and standards listed below should be considered as part of this specification. The latest revision in effect at time of inquiry shall apply for all standards referenced.
 - 1. National Electrical Manufacturers Association (NEMA).
 - 2. Institute of Electrical and Electronic engineers (IEEE).
 - 3. National Electric Code (NEC).
 - 4. City of Tacoma Electrical Code
 - 5. Washington State Administrative Code (WAC)
 - 6. American National Standards Institute, Inc. (ANSI).
 - 7. Occupational Safety and Health Administration (OSHA).
 - 8. Underwriters Laboratories (UL).
 - 9. City of Tacoma – International Building Code (IBC)
- B. It shall be the manufacturer's responsibility to be knowledgeable of these standards and codes.

1.05 SERVICE AND ENVIRONMENTAL CONDITIONS

- A. Unless otherwise specified this equipment is intended for use in ambient temperatures that do not exceed a maximum of 40C (104F) or a minimum of -30C (-22F).

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

- A. Schneider Electric (Square D)
- B. General Electric
- C. ABB
- D. Cutler-Hammer
- E. Siemens
- F. Approved Equal

2.02 CONSTRUCTION STANDARDS:

- A. The entire switchgear assembly shall meet or exceed applicable ANSI, IEEE, UL and NEMA Standards.

2.03 QUALIFICATION AS ACCEPTABLE INSTALLER:

- A. The subcontractor installing the materials specified in this section shall meet the following qualifications:
 - 1. Organization has installed similar 13.8KV voltage systems.
 - 2. Foreman and journeyman doing the installation are trained high voltage lineman.
 - 3. Organization has proper tools for high voltage work.
 - 4. Above information shall be submitted for Engineers review and approval by the Engineer as part of the shop drawing review process.

2.04 POWER DISTRIBUTION SWITCHGEAR ENCLOSURE (PDSE)

- A. The roof, siding, and all exposed fastenings and accessories shall be non-rusting ANSI type 316 stainless steel metal. The structure shall be self-supporting and free standing. All metal work shall be free from burrs and sharp edges. Walk-in enclosure shall be manufactured per latest Washington State Labor & Industries Gold Seal requirements.
- B. All PDSE accessories shall be suitable for industrial or utility service and for salty air at the Port of Tacoma.
- C. The PDSE base shall be constructed of structural steel members sized by design structural calculations and reinforced to meet or exceed specified static and dynamic loads. Structural members shall be located to coordinate with the enclosed equipment so as to properly support it and allow maximum access to equipment floor openings for cable penetration and access to rear of metal clad switchgear line-up through removable exterior panels.
- D. The PDSE base shall be designed with base lifting lugs capable of lifting the fully equipped structure at the specified lifting points with deflection not to exceed maximum requirements of local regulatory authorities.
- E. The steel floor plate shall be minimum ¼" steel plate stitch welded to the structural base assembly.
- F. The installed structure shall be capable of supporting a minimum floor loading of 250 pounds per square foot.
- G. Structure walls, ceiling, and roof shall be insulated between the inner and outer walls with Foam insulation (Bead Board) 2 ½ inches thick minimum (R10.25).
- H. Structure walls shall be able to withstand a wind loading of 125 miles per hour.
- I. The pitched roof shall be able to withstand a minimum live load of 40 pounds per square foot.
- J. It shall be the manufacturer's responsibility to coordinate all necessary alignment and interconnection between component sections. The entire assembly must be electrically and mechanically assembled into one single line-up at factory prior to final inspection and shipment.
- K. The PDSE must be shipped complete, without missing components or "ship shorts". Purchaser may waive this requirement upon request prior to shipment.
- L. Minimum of two 4' x 8' doors, with hands free exit hardware located one at each end of the PDSE, is required to meet NEC electrical room requirements. Provide a hinged door, access panel behind each section of switchgear for wiring and service complete with hasps for padlocks (padlocks by Owner).
- M. The PDSE shall be ventilated with screened, rain tight intake air louvers, exhaust fan and reverse acting thermostat set at 80°F. Ventilation equipment shall be sized to keep enclosure

below 120°F ambient. Provide standard furnace type air filters on air intakes. Seal all gaps in PDSE including floor area under switchgear line-up to prevent entrance of rodents.

- N. Provide rain gutters the length of the PDSE over access doors and access panels. Provide downspouts at each building corner with splash guards.
- O. Removable lifting lugs shall be provided with the PDSE for off loading purposes.
- P. Switchgear and other electrical equipment shall be installed within the PDSE as specified. The equipment shall be electrically and mechanically functional after installation. Sufficient aisle space per the NEC and NESC shall be provided to withdraw removable elements and otherwise properly maintain and service the equipment.
- Q. The PDSE shall have a 150A, 120/240V, 1Ph, 3W Main Breaker, 30 circuit, 10,000 AIC power panel with TVSS protection for enclosure services. Provide required branch circuit breakers, including 2 20/1P circuit breakers for loads external to Substation area, and 3 spare 20/1P and conduit/wire within the PDSE. The PDSE service power shall be from an internal source and shall serve lighting, fans, receptacles, heaters, etc. Each medium voltage switchgear compartment shall contain a 250 watt integral thermostat heater with a disconnect switch at the heater. Each heater shall have a dedicated over current (fuse or circuit breaker).
- R. The interconnection of all installed equipment, drawings and documentation attached shall be the responsibility of the manufacturer. All documentation shall be provided for review as part of the shop drawing review process. Three sets of bound approved documentation packages shall be provided with PDSE delivery to the site.
- S. All equipment shall be functionally tested at the factory after installation within the PDSE.
- T. Certified production test reports indicating satisfactory completion of all inspection and test procedures shall be available upon request.
- U. Upon request the equipment shall be made available for customer inspection prior to shipment.
- V. Finish for, the exterior structural steel members, the interior and under floor steel surfaces (except stainless steel) shall be as follows.
 - 1. All structural steel surfaces shall be cleaned by blasting with steel shot to remove all oil, grease, dirt, mill scale, rust, corrosion, oxides, paint or other foreign matter, The surface finish shall comply with "nearly white" specifications of the Steel Structures Painting Council Standards (SSPC-SP-10). By-products from the blasting process shall be "blown off" with dry, compressed air. Prime coating shall proceed immediately after shot blasting. Should rust form on the surface prior to coating, the entire surface shall be re-blasted.
 - 2. Coating Application: The steel surfaces shall be completely prime coated from top to bottom with nominal thickness of 1.5 mils of a rust inhibiting PPG red oxide alkyd primer. The steel surfaces shall be prime coated with an electrostatically applied wet coat of a one component, moisture cure, zinc rich, polyurethane coating in a single coat application with a normal thickness of 3 mils dry finish thickness(DFT). The steel surfaces shall be finish painted with an electrostatically applied wet coat of a 2.5 mils of a standard gray similar to the switchgear line-up.
 - 3. The paint finish shall exceed a minimum of 5000 hours salt spray testing and have a 5 year warranty from date of substantial completion.

2.05 15KV SWITCHGEAR LINE-UP DETAILS:

- A. Switchgear line-up shall consist of these assemblies, and as indicated on the drawings:
 - 1. Source 15KV Switchgear line-up, arc-resistant per ANSI/IEEE C37.20.7, with 1,200A Bus

2. 1200 Amp, 15kV metal enclosed, isolating load break switch.
3. 1200 Amp frame, 15KV metal/clad, vacuum main circuit breaker with potential transformers (PT's) and current transformers (CT's) ratings as indicated on the drawings.
4. 1,200 Amp frame, 15KV metal/clad, fused switch.
5. 1200A frame, 15KV metal/clad, vacuum circuit breakers with trip unit rating, PT's and CT's ratings as indicated on the drawings.
6. Power transformer (PT) to power the circuit breaker operators, heaters, and three (3) metering PT's to serve power monitors and trip relays.
7. Circuit breaker control relays, types as indicated on the drawings.
8. Ground-fault / ground-check monitors, Startco SE-134C, or equal.

Provide raceway in switchgear line-ups for data wiring to metering cabinet located remote (within 30') from switchgear. Provide metering cabinet, equipment, metering software, and touch screen computer. See Specification Section 26 09 13 – Electrical Power Monitoring and Control.

2.06 15KV SWITCHGEAR RATINGS:

- A. The complete switchgear line-up shall comply with these electrical ratings:

Circuit Breaker Interrupting 500MVA

Design Voltage	15KV
System Voltage	13.8KV
BIL	95KV
Momentary Rating	25kA RMS SYM. (40kA ASYM)
Main Bus Rating	1200A, 15KV
Fault Closing	25000A RMS Symetrical (40000A Assymetrical)
Isolation Load Break Switch	1200A 15KV

- B. The 13.8 KV system is a 3 wire plus solidly grounded neutral system served from Tacoma Power substation. Insulation shall be rated "15KV – Ungrounded"; all loads shall be phase-to-phase. Tacoma Power rotation is "C-A-B". Contact Tacoma Power prior to connection and energizing system.
- C. The potential transformers serving the switchgear controls and monitors shall be connected for proper installation without a primary neutral connection. Provide a 13.8KV primary delta/wye connection with a 120/208 volt grounded neutral secondary. A complete wiring and controls diagram of the actual connections shall be provided with the shop drawings

2.07 ENCLOSURE CONSTRUCTION:

- A. Each switch or drawout circuit breaker bay shall be separately constructed to form a rigid free standing unit. Adjacent bays shall be securely bolted together to form an integrated rigid structure. Each individual bay shall be braced to prevent distortion under normal operating conditions as well as during the interruption of short circuit currents.
- B. Each cubicle shall have a flanged front door over the circuit breaker assembly and contain sufficient cabling space to permit cable installation without routing of line and load side connections in front of circuit breaker compartment.

- C. All enclosure openings shall be screened to prevent the entrance of small animals, and barriered to inhibit the entrance of dust, sand, etc.
- D. Each circuit breaker shall have a trip relay flush mounted on the enclosure door. All 15KV circuit breakers shall have a ground continuity monitor flush mounted on the enclosure door.
- E. The 15KV switchgear line-up shall be fully assembled and tested at the factory prior to shipment. Large line-ups may be split to permit normal shipping and handling as well as for ease of rejoining at the job site. Each section shall be provided with adequate lifting means and shall be capable of being rolled or lifted into installation position and bolted to a concrete slab or foundation.
- F. All 13.8KV wiring shall enter and exit through the bottom of cubicles.
- G. Provide grounding studs in all cubicles.
- H. Provide portable lift truck for removal and installation of vacuum circuit breakers.

2.08 BUS AND CONNECTIONS:

- A. All bus shall be copper. Bolted contact surfaces shall be plated with tin or silver. Insulators and compartment thru-wall bushings shall be glass polyester.
- B. The design of the bus, connections and supports shall be consistent with the mechanical stresses produced by a short circuit current equivalent to the interrupting current rating of the associated circuit breaker at service voltage. All hardware used on conductors shall have high tensile strength and anti-corrosive plating.
- C. A code size ground bus shall run continuously through each line-up and be securely connected to the steel frame of each bay. Provide lug provisions for code size ground conductor connections. Provide ground studs in all compartments.
- D. Provisions shall allow convenient extension of both the main bus and the ground bus to future adjacent bays.

2.09 METAL ENCLOSED ISOLATING LOAD BREAK SWITCH

- A. Switch shall be mounted in a self-standing steel structure with incoming lugs for underground service and custom 1200 Amp copper bus for load side connection to attached metal clad switchgear's main vacuum breaker.
- B. Operation shall be by a permanently installed long operating handle, up for closed and down for open mounted on the front of the switch. Handle shall operate a quick-make, quick-break over-toggle operating mechanism linked to operate all three phases simultaneously.
- C. The contact closing arc shall occur at the ends of the switch blades, not on the main contact area. Closing force shall securely close the switch even into short circuit forces.
- D. Attached spring operated arcing blades shall direct the opening current arc through arc chutes. Arcing surfaces shall be tungsten.

E. Ratings:

Medium Voltage	13.8kV, Max. Voltage 15.0kV
Impulse Withstand	95kV
60 Cycle Withstand	36kV
Continuous Current	1200 Amps
1200 Amp Switching	10 Operations

Momentary Amps	61,000 ASYM.
2 Second Amps	38,000 ASYM.
Fault Closing Amps	61,000 ASYM.
S.C. Rating	900 MVA
Mechanical Endurance	250 Operations

F. Acceptable Manufacturers:

1. Square D
2. ABB
3. Siemens
4. General Electric
5. Cutler-Hammer
6. Or Engineer approved equal

2.10 METAL CLAD VACUUM CIRCUIT BREAKERS:

- A. Vacuum Circuit Breakers shall be rated 15 KV (see drawings) –ungrounded, with ampere ratings as shown on the drawings, and 500 MVA short circuit rating.
- B. Vacuum Circuit Breakers shall each include a tripping power source without batteries.
- C. All vacuum circuit breakers shall be draw-out type.
- D. Provide a tripping relay on the door of each vacuum breaker. Controls shall coordinate trip settings with the feeder breaker and Tacoma Power protection. Coordinate with Tacoma Power prior to shop drawing submittal. Provide both over-current and ground – fault sensing and tripping with solid state adjustable relays; provide trip curves for the relays. Trip relays shall have selectable long time trip curves, short time amperes and time settings and instantaneous current settings for phase currents, time delay and current settings for ground fault currents, and zone selective interlocking to delay tripping of the main breaker when any feeder breaker senses the fault current. Relays shall be Schweitzer 351A, or Engineer approved equal.
- E. Ground Continuity Monitor
 1. Provide a ground continuity monitor and relay on the door. Provide internal wiring in switchgear to route sensing wires to terminal block on the side wall of the respective rear compartment for connection to power cable ground check conductors. Tripping the ground check relay shall cause the breaker relay to trip.
- F. Instrumentation and controls for each vacuum breaker:
 1. Each breaker shall have an open/close switch, plus red and green pilot lights for closed/open position, a tripping relay, all on the front of the drawout breaker door. They shall also have a C/T shorting device and an anti-pumping relay mounted inside behind the breaker door.
 2. Special for this project: Provide data wiring from switchgear line-up tripping relays to the metering cabinet located remotely approximately 30' from switchgear. See specification Section 26 09 13
- G. Potential Transformers (PT's)
 1. Provide one drawout PT for closing circuit breakers. Provide three (3) drawout PT's for tripping relays.

H. Current Transformers (CT's)

1. Provide three (3) C/T's for each vacuum breaker.
2. The current transformers on each vacuum breaker shall be rated as follows:
 - a. Main breaker size as indicated on the drawings: Burden B0.5, accuracy 0.3, class C50.
 - b. Branch breaker sizes as indicated on the drawings: Burden B0.5, accuracy 2.4, class C20.

2.11 POWER TRANSFORMER

- A. The power transformer shall be rated 25kVA, 13.8kV-120/240V, 1-phase, 3-wire, 60 Hz. The transformer primary shall have copper windings, with a cast epoxy primary and resin impregnated secondary windings, or approved equal. Transformer shall have (2) taps, (1) at +2.5%, and (1) at -2.5%.

2.12 NAMEPLATES:

- A. Provide engraved phenolic nameplates for electrical equipment identification for each cubicle, instrument and disconnect device for the entire switchgear line-up. The central nameplate for the switchgear shall include, voltage, phase and short circuit rating. Each circuit breaker nameplate shall include load designation, circuit breaker size and type. Furnish complete list with submittal. Provide all OSHA required labels.
- B. Provide one job nameplate on the main feeder line-up with the following information:
 1. Port of Tacoma Terminal #4
 2. Elcon Associates, Inc. – Seattle, WA
 3. Electrical Contractor's Name
 4. Year of manufacture

2.13 PRIMARY RISER DIAGRAM:

- A. Provide a primary system riser diagram(s) that shows switchgear line up, bussing and wiring connections. Diagram shall utilize non-fading ink and paper sealed in plastic and mounted to the exterior of the main feeder line-up within the PDSE in a plexi-glass front frame. Submit preliminary draft to project Engineer for approval prior to final fabrication.

2.14 WARRANTY

- A. Provide an equipment warranty for the 15KV switchgear line-up. This equipment warranty shall cover a twelve (12) month period after date of substantial completion.

2.15 DOCUMENTATION

- A. Drawings
 1. Prior to fabrication of the 15KV switchgear, the following drawings shall be submitted by the manufacturer for approval.
 2. Elevation views.
 3. Base plan including mounting details, cable entry area, and door swing requirements.
 4. Enclosure services electrical diagram.
 5. Component bill of material indicating quantity, description, and part number.
 6. Detailed electrical interconnection diagram for all equipment installed.

7. Diagrams shall be based upon data sheets, interconnection documents, and system design requirements attached to this specification.
8. After the return of approval drawings or after any changes made to previously approved drawings, the manufacturer shall submit a record copy of any and all drawings that contained revisions.
9. After completion of the inspection and testing procedures the manufacturer shall submit a complete set of "as built" drawings. These drawings shall function as a record of the final construction of the equipment at the time it left the factory.

2.16 SHORT CIRCUIT ANALYSIS AND COORDINATION STUDY

- A. The 15KV equipment supplier shall contact Tacoma Power for data associated with primary side short circuit availability and over current protection coordination.
- B. The 15KV equipment supplier shall contact the 13.8kV crane supplier through the Engineer for data associated with the 13.8kV cranes.
- C. The 15KV equipment supplier shall prepare and provide a short circuit analysis and coordination study, recommended protective device settings including ground fault as required per NEC 250.188 with representative curves for engineers review.
- D. Provide a minimum of three (3) copies (owner/engineer/contractor) as part of the shop drawing review.
- E. As part of the final submittal (corrected shop drawing submittal). Provide seven (7) copies. These will be used for owner/engineer/ contractor/independent testing agency/ O&M Manuals.

PART 3 - EXECUTION

3.01 MOUNTING:

- A. The 15KV switchgear line-up shall be provided within a weather tight, insulated, heated (40 degree Fahrenheit), lighted, stainless steel, walk-in enclosure with floor to be installed on a reinforced concrete base or slab suitable for the enclosure and meeting Washington State and local building codes.
- B. Screen or seal all switchgear compartment openings after cable installation.
- C. All switchgear equipment shall be secured to prevent overturning from earthquakes with 1/2" x 8" minimum steel foundation anchor J bolts or approved equal. Bolts shall be set in the sub-base decking and/or exterior pad and extend through the pad with sufficient threads to attach the equipment.

3.02 WIRING:

- A. Shall conform to the National Electrical Code and Industry Standards.
- B. Shall be secured to switchgear enclosure with cleats. Maximum spacing shall not exceed 24 inches.

3.03 SPACE:

- A. Verify space available with equipment sizes and code required working clearances prior to submittal of shop drawings. Equipment supplier shall include scaled equipment layout with dated signature stating spaces have been verified. Lack of this information with submittal will be grounds for rejection and require re-submittal.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 26 01 26 – Acceptance Testing of Electrical Systems
 - 2. Section 26 05 00 – Common Work Results for Electrical
 - 3. Section 26 05 13 – Medium Voltage Cables and Accessories
 - 4. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
 - 5. Section 26 05 33 – Raceways and Boxes for Electrical Systems
 - 6. Section 26 05 53 – Identification for Electrical System
 - 7. Section 26 12 14 – Transformers (Oil Filled)
 - 8. Section 26 22 13 – Dry Type Transformers
 - 9. Section 26 24 13 – Low-Voltage Switchboards
 - 10. Section 26 24 16 – Panelboards
 - 11. Section 26 27 26 – Wiring Devices
 - 12. Section 26 56 36 – Flood Lighting Fixtures
 - 13. Section 33 71 19 – Electrical Underground Ducts and Manholes
 - 14. Section 33 77 00 – Medium Voltage Switchgear and Protection Devices

1.02 SUMMARY

- A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.
- B. Related Documents: The provisions and intent of the Contract, the General and Supplementary Conditions, and Division 1 Specification Sections, apply to the Work as if specified in this Section.

1.03 REFERENCES

- A. ASTM B8.
- B. NFPA 70 (National Fire Protection Association) – National Electrical Code.
- C. ANSI/UL 467 - (Underwriter's Laboratory) - Grounding and Bonding Equipment.

1.04 QUALITY ASSURANCE

- A. Listing and Labeling: Provide electrical components, devices, and accessories that are Listed and Labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Authority Having Jurisdiction, and marked for specific types, sizes, and combinations of conductors and connected items.
- B. Comply with IEEE 837 and UL 467.
- C. Comply with IEEE Std. 142 (Green Book).
- D. Comply with NFPA 70.

- E. Comply with IEEE C2 for medium-voltage underground construction.

1.05 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections:
 - 1. Product Data: For each type of product indicated.
- B. Field Test Reports: Submit written test reports to include the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Grounding Conductor Fittings:
 - a. Erico Inc.
 - b. Chance/Hubbell.
 - c. Copperweld Corp.
 - d. Erico Inc.; Electrical Products Group.
 - e. Framatome Connectors/Burndy Electrical.
 - f. Ideal Industries, Inc.
 - g. ILSCO.
 - h. Kearney/Cooper Power Systems.
 - i. Lyncole XIT Grounding.
 - j. O-Z/Gedney Co.
 - k. Racor, Inc.; Division of Hubbell.
 - l. Thomas & Betts, Electrical.
 - m. Or Approved Equal
 - 2. Grounding Connectors and Rods:
 - a. Erico.
 - b. ILSCO.
 - c. Lyncole XIT Grounding.
 - d. O-Z/Gedney.
 - e. Racor, Inc.; Division of Hubbell.
 - f. Thomas & Betts
 - g. Or Approved Equal

2.02 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 26, Section 26 05 19 Low Voltage Electrical Power Conductors and Cables.
- B. Material: Copper.
- C. Equipment Grounding Conductors: Insulated with green-colored insulation.
- D. Grounding Electrode Conductors: Stranded cable.
- E. Underground Conductors: Bare, tinned, stranded.
- F. Bare Copper Conductors: Assembly of stranded conductors, ASTM B 8.
- G. Copper Bonding Conductors:
 - 1. Bonding Conductor: #4 or #6 AWG, stranded copper conductor.
 - 2. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- H. Bonding Straps: Soft copper.
- I. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.03 CONNECTORS

- A. Pressure Connectors: High-conductivity-plated units.
- B. Bolted Connectors: Heavy-duty, bolted-pressure-type.
- C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.04 GROUNDING ELECTRODES

- A. Ground Rods: Solid copper clad steel, 3/4-inch diameter by 10-feet length.

2.05 GROUND BUS

- A. Ground bus: Copper, mounted on stand-off insulators. Size and location as shown on drawings.

2.06 GROUND-FAULT / GROUND-CHECK MONITOR

- A. See specification Section 33 77 00 "Medium Voltage Switchgear and Protection Devices", 2.05.A.8.

PART 3 - EXECUTION

3.01 APPLICATION

- A. Copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
- B. In raceways, use insulated equipment grounding conductors.
- C. Exothermic-Welded Connections: Use for connections to structural steel, rail, rebar and for underground connections.
- D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.
- E. Ground Rod Clamps at Manholes and Vaults: Use bolted pressure clamps with at least two bolts.
- F. Grounding Bus: Install in electrical and communications equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Use insulated spacer; space 1 inch from wall and support from wall 18 inches above finished floor, unless otherwise indicated.

3.02 EQUIPMENT GROUNDING CONDUCTORS

- A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B. Install equipment grounding conductors in all feeders and branch circuits unless otherwise noted.
- C. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
- D. Nonmetallic Raceways: Install an equipment grounding conductor in all nonmetallic raceways unless they are designated for telephone or data cables.
- E. Heat-Tracing, and Antifrost Heating Cables: Install a separate equipment grounding conductor to each electric heat-tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.

3.03 INSTALLATION

- A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
 1. Drive ground rods until tops are 2 inches below final grade, unless noted otherwise.
 2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds. Make connections without exposing steel or damaging copper coating.
- B. Grounding Conductors: Route along shortest and straightest paths possible. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment.
 1. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp.
 2. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts.
 3. Install straps only in locations accessible for maintenance.
- D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from main service equipment, or grounding bus, to all metal water service locations on the wharf.
 1. Connect grounding conductors to main metal water service pipes by grounding clamp connectors.
 2. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting.
 3. Bond metal grounding conductor conduit or sleeve to conductor at each end.
- E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.
- F. Install one ground test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade.

3.04 CONNECTIONS

- A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding Conductor Terminations: For #8 AWG and larger, use pressure-type grounding lugs. #10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing.
 - 1. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing.
 - 2. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and ground rods.
- F. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values.
- G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the grounding conductor.
- H. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.05 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

- A. Ductbanks: Provide a copper ground conductor within each CDF (concrete) encased medium-voltage duct bank, with size as noted on the drawings.
- B. Vaults, Manholes and Handholes: Install 2 driven ground rods at corners of each manhole. Set rod depth so 6 inches will extend above finished floor. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating

sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, non-shrink grout. Provide continuous #2 AWG bare copper ground loop conductor all around vault, manhole and attached to all ground rods. Locate loop at plus 6 inches above manhole floor.

- C. Connections to Vault/Manhole Components: Connect all exposed-metal parts, such as inserts, cable racks, pulling irons, cover frame, cover, sump ladders, and cable shields within each manhole to ground loop conductor.
1. Make connections with #2 AWG minimum, stranded, hard-drawn copper conductor.
 2. Train conductors level or plumb around corners and fasten to manhole walls.
 3. Make connection to cable shield as recommended by manufacturer of splicing and termination kits.
 4. Connect equipment grounding conductor in each conduit to ground loop.

3.06 IDENTIFICATION

- A. Identify grounding system components as required by the Authority Having Jurisdiction and as specified in Division 26, Section 26 05 53 Identification for Electrical Systems.

3.07 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:
1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
 - a. Measure ground resistance without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Test by one of the following methods for resistance measurement:
 - 1) Perform fall of potential test per IEEE Standard No. 81, Section 9.04 on the main grounding electrode or system for each substation and building.
 - 2) Perform the two-point method test per IEEE No.81 Section 9.03 to determine the ground resistance between the main grounding system and all major electrical equipment frames, system neutral and/or derived neutral points.
 - 3) Alternate Method: Perform ground continuity test between main ground system and equipment frame, system neutral and/or derived neutral point. Conduct test by passing a minimum of ten amperes dc current between ground reference system and the ground point to be tested. Measure voltage drop and calculate resistance by voltage drop method.
 - c. Test Requirements:
 - 1) Equipment Rated and manhole/handhole grounds: 10 ohms.
 - d. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.
 2. Record test results on a Ground Resistance Test Report form for inclusion with O & M Manuals.
- B. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes.

1. Identify each ground rod by letter in alphabetical order, and key to the record of tests and observations.
2. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
 - 1. Section 03 30 00 – Cast-in-Place Concrete
 - 2. Section 03 60 00 – Grouting
 - 3. Section 05 50 00 – Metal Fabrications
 - 4. Section 09 96 00 – High Performance Coatings
 - 5. Section 32 12 16 – Asphalt Paving

1.02 DESCRIPTION OF WORK

- A. The work includes furnishing all material, labor, testing, and equipment for providing crane rails complete with all appurtenances necessary for a fully operable set of rails in conformance with the drawing and specifications.

1.03 REFERENCE STANDARDS

- A. American Railway Engineering and Maintenance-of-Way Association (AREMA), Manual for Railway Engineering, 2013, except as otherwise indicated.
- B. American Society for Testing Materials (ASTM), Standard Specifications and Standard Test Methods, designated by basic reference in this section (use the most current edition at the time of bid unless otherwise indicated).
- C. American Welding Society (AWS) D1.1 – 2010, Structural Welding Code – Steel.

1.04 QUALITY ASSURANCE

- A. Provide at least one person having at least five (5) years experience in crane rail installations who shall be present at all times during execution of work, who shall be thoroughly trained with all work performed under this section, and shall direct all work performed under this section.
- B. A representative of the crane rail assembly manufacturer shall be on site during installation of the sole plates, rail, rail pad, clips, grout, anchor bolts, and nuts. The representative shall verify that the installation is in compliance with the manufacturer's requirements and recommendations.
- C. Welders shall be currently certified by the American Welding Society (AWS), Washington Association of Building Officials (WABO), or the City of Tacoma for structural welding.
- D. Welding procedures, operations, and welders shall be qualified in accordance with AWS D1.1.
- E. Nondestructive testing (NDT) and inspection of all shop welds shall be performed in accordance with AWS D1.1 by an independent testing agency and paid for by the Contractor. Welds failing to comply shall be repaired or replaced at the Contractor's expense.
- F. The Engineer may inspect and test any welds or materials after delivery to the site. All inspection and testing will be paid for by the Port, except for testing requested by the Contractor, which shall be at its expense.

1.05 SUBMITTALS

- A. Shop drawings indicating all details of crane rail mounting assembly, layout, and operation. Include a complete materials list of crane rail components and overall rail geometry noting the locations of splices, seismic joints, rail clips, lateral slip clips, and crane stops.
- B. Crane rail installation plan noting the crane rail mounting system manufacturer's requirements, including a narrative of sequence, drawings, and/or photographs. Include the following.
 - 1. Details on methods and procedures of anchor bolt installation, soleplate/rail leveling and aligning, soleplate grouting, clip welding, rail welding, clip installation and tightening
 - 2. Details on applying mastic to the rail, and filling the rail pocket.
- C. Weld Procedure Specifications (WPS's) proposed for use on the project. Submit supporting Procedure Qualification Records (PQR's) for all WPS's not prequalified by AWS.
- D. Welder qualifications and certifications.
- E. Mill certification reports on controlled cooling, chemical analysis, welded joint and physical inspection of all rail and accessories. Quality control system for rail manufacture.
- F. Existing crane rail survey and crane rail installation survey as specified herein.
- G. Letter of certification from the crane rail assembly manufacturer that the crane rail assembly has been installed in accordance with their requirements based on site observations by a representative employed by the crane rail assembly manufacturer.

PART 2 – PRODUCTS

2.01 PRODUCT HANDLING

- A. Protect and prevent damage to the materials before, during, and after installation. Protect and prevent damage to the installed work and materials from activities of other trades.
- B. In the event of damage, immediately make all repairs and replacements necessary subject to the approval of the Engineer and at no additional cost to the Port.
- C. Store materials, including epoxy and grout, as specified by the manufacturers and at temperatures recommended by the manufacturers.

2.02 CRANE RAIL

- A. All rail and accessories shall be new.
- B. Rail shall be 175 pounds per yard rail, conforming to ASTM A 759-2010 and meeting the supplementary chemistry and mechanical requirements listed below for Advanced Head Hardened steel rail.
 - 1. Carbon 0.84 to 0.92 percent
 - 2. Manganese 0.70 to 1.30 percent
 - 3. Phosphorus 0.04 percent maximum
 - 4. Sulfur 0.05 percent maximum
 - 5. Silicon 0.10 to 0.70 percent
- C. Rail mechanical properties shall be within the following ranges.
 - 1. Brinell Harness Number = 370 to 390 (per ASTM D 10 and E 140)
 - 2. Yield Strength = 120,000 to 135,000 psi

- 3. Tensile Strength = 180,000 to 195,000 psi
- D. Provide all finished crane rails from a continuously cast bloom that realizes a minimum 20:1 reduction of the initial area of the cast product when divided by the final area of the wrought product during rail manufacture.
- E. If electric arc welds are to be used, rail shall conform to ASTM A 759 Supplementary Requirement S3.1 in addition to the requirements above.
- F. Rail shall be continuously welded except where noted on the drawings to be connected with bolted splices or other means.
- G. Cut rail to length with saws. Burning or shearing of crane rail shall not be permitted. Where required, provide rail with end holes drilled at the mill or at a qualified fabricator shop. Do not use a torch to create any holes. Perform drilling in compliance with the hole location requirements of ASTM A 759.
- H. Sections of rail required to be straight shall have no lateral or vertical bends.
- I. Sections of rail required to be curved shall be pre-bent to the radii noted on the drawings or to match existing alignment and shall have no vertical bends.

2.03 RAIL HARDWARE

- A. All rail hardware and accessories shall be new.
- B. Anchor bolts and nuts shall be hot-dip galvanized to ASTM F 2329 and conform to ASTM F 1554, Grade 55.
- C. Sole plates shall conform to ASTM A 572, Grade 50.
- D. Weldable rail clips shall be rubber nosed, single-bolt, and welded base with minimum lateral force resistance of 24 kips per clip at 100,000 load cycles. Weldable rail clips shall be Weldlok 24 (WL24/175P) by Gantrex, Cranrail 8119/15/40 by Atlantic Track, or approved equal.
- E. Soft mount rail pad shall be steel reinforced elastomeric pad with ¼-inch nominal thickness, or approved equal. Rail pad shall be Gantrex Mark 6-150RFS, Atlantic Track Cranrail MK-VII, or approved equal.
- F. Stainless steel rail pad plate shall be continuous plate conforming to ASTM A 316
- G. Crane rail grout shall be per Section 03 60 00 – Grouting.
- H. Rail clips and sole plates shall be as shown on the drawings and hot-dip galvanized as specified in Section 05 50 00 – Metal Fabrications.
- I. Grounding cable shall be as specified under Division 26 – Electrical.

2.04 BOLTED RAIL SPLICES

- A. Bolted crane rail splices shall only be used at locations indicated in the drawings.
- B. Bolted crane rail splices shall use six-bolt splice bars.
- C. Clearance between rails at splices shall be 1/8-inch maximum.
- D. Splice bars shall be low carbon steel conforming to the requirements of ASTM A 3, Grade 1.
- E. Splice bolts shall be medium carbon, heat treated steel per ASTM A 449. Nuts shall be heavy hex meeting the requirements of ASTM A 563, Grade B. Bolted splices shall include alloy steel lock washers or lock nuts without washers.

2.05 FOAM AT ISOLATION JOINT

- A. Foam each side of rail on each side of seismic joint shall conform to ASTM C 578, Type X.

PART 3 – EXECUTION

3.01 GENERAL

- A. Crane rail construction shall be in conformance with AREMA standards, unless otherwise indicated, to produce a finished installation true to line and grade as indicated on the drawings and within the tolerances specified.
- B. Methods and sequences shall be in accordance with the crane rail assembly manufacturer's recommendations.

3.02 INSTALLATION

- A. Crane rails shall be continuously welded in accordance with AREMA standards, except where otherwise indicated. Thermite welds or electric-flash butt welds shall be installed for all field welds. Provide a full-time onsite Certified Welding Inspector (CWI) for all welding.
- B. Submit the proposed materials, methods, and procedures to be used for welding the crane rails. Include the manufacturer's trade name for the welding process, method for cutting rail, spacing tolerances between rail ends, preheating methods and temperatures, methods used to finish weld to final contour, test reports, and welding records.
- C. Provide square, milled, or ground rail ends for welding as required by the approved welding procedure specification. Field cutting rail shall be by saw. Torch cutting shall not be permitted. Do not weld the rail to the soleplate and protect the rail pad from damage.
- D. Follow recommendations of the rail manufacturer for welding heat-treated or high-strength rails.
- E. Prior to welding, all rail surfaces within 6 inches of the welded joint shall be free of grease, dirt, oil, moisture, and other deleterious substances.
- F. Prior to grouting the rails, the Engineer will perform 100% visual and ultrasonic testing (UT) of all crane rail welds by an independent testing agency in accordance with AWS D1.1. Acceptance criteria shall meet that for cyclically loaded non-tubular connections, under both tension and compression. Factory joints may be subject to additional testing by the Engineer prior to installation.
- G. The rail web shall be painted in legible characters at least 1-1/2 inches high at each field weld with the following information and submitted to the Engineer:
 - 1. Date of weld (MM/DD/YY)
 - 2. Initials of welder (ABC)
 - 3. Air temperature, °F, at time of weld (AT XXX)
 - 4. Rail temperature, °F, at time of weld (RT XXX)
 - 5. Example: 02/15/10 ABC AT75 RT100
- H. The base of the new rail shall be cleaned prior to laying. Rail shall be laid without bumping, striking, or damaging adjacent infrastructure.
- I. All welds shall be ground smooth on the top, bottom, and on the sides. Welds shall be straight. Remove sharp edges, burrs, and chimneys. Offset blending shall be permitted at the rate of 0.010 inches per inch.
- J. Shop-fabricate and weld bottom portion of the rail clips to sole plates in accordance with the manufacturer's instructions. Galvanize according to Section 05 50 00 – Metal Fabrications.

- K. Crane rail anchor bolts shall be installed using a timber or steel template that matches the anchor bolt configuration of the sole plates.
- L. Install sole plates using leveling bolts as shown on the drawings. Leveling nuts or plastic nuts under the sole plate shall not be permitted.
- M. Before grouting, verify that the plan locations and elevations of the crane rails meet the specified tolerances. Verify that sufficient anchor bolt threads are exposed for nuts and washers so that the rail can be installed at the design profile. Make adjustments as necessary with the approval of the Engineer.
- N. Corrective work required to address crane rail installation that is not in compliance with the requirements of the contract documents shall be performed by the Contractor at the direction of the Engineer and at no additional cost to the Port.

3.03 GROUTING

- A. Crane rails shall not be grouted in place until after a check has been made on the completed installation by the Engineer. Notify the Engineer at least 48 hours in advance of planned grouting operations. Make arrangements for the crane rail grout manufacturer to be on-site during all crane rail grouting.
- B. Grouting materials including aggregate shall be temperature conditioned so that the materials are between 70 degrees F and 90 degrees F, unless otherwise recommended by the manufacturer, at the time of installation. Up to 72 hours of controlled temperature conditioning may be required.
- C. All substrate surfaces in contact with grout shall be temperature pre-conditioned and maintained between 60 degrees F and 90 degrees F for at least 24 hours before grout installation.
- D. The substrate surfaces shall be temperature pre-conditioned using indirect exposure and heated enclosures that are both windproof and weatherproof. Heaters shall not be permitted to unevenly heat surfaces in contact with grout.
- E. Grouting shall be performed in continuous 20-foot sections using grout dams and head boxes. Grout shall be placed under the sole plates from one side only until the grout flows freely to the opposite side and in accordance with the manufacturer's recommendations.
- F. Leveling bolts shall be backed off two turns after the grout has set a minimum of 24-hours, or as recommended by the grout manufacturer. Tighten upper clip bolts to the torque recommended by the manufacturer.
- G. Grout temperature shall be maintained above 60 degrees F until the grout reaches the manufacturer's reported 7-day compressive strength.
- H. Crane rail grout will be tested by the Port in accordance with Section 03 60 00 – Grouting.

3.04 GROUNDING CABLE

- A. Grounding cable shall be installed as indicated on the electrical drawings, in accordance with Division 26 – Electrical, and in accordance with Section 33 79 00 – Site Grounding, of these specifications.

3.05 PROTECTIVE COATING

- A. An asphalt mastic (bitumastic) coating, as specified in Section 09 96 00 – High Performance Coatings of these specifications shall be applied on the sides of the crane rails after installation is completed and prior to placement of asphalt concrete.

3.06 SURVEY AND TOLERANCES

- A. For new rails, maximum field weld tolerance variations, based upon using a 36-inch straight edge, are as follows:
1. Rail Head:

Vertical Offset:	0.020 inches
Horizontal Offset:	0.040 inches
Vertical Crown:	0.030 to 0.045 inches
Horizontal Kink:	0.020 inches
 2. Rail Base:

Horizontal Offset:	0.060 inches
Offset Bending:	0.010 inches per inch
- B. New rails shall be laid with a maximum allowable alignment or grade tolerances as follows:
1. Slope: Plus or minus 1/8 inch in any 10-foot length.
 2. Elevation: Plus or minus 3/8 inch from design elevation. Plus or minus 1/4 inch differential between waterside and landside rails at any station.
 3. Gauge (distance between centerline of rails): Plus 1/8 inch, minus 0 inches at any point along the rail.
 4. Alignment: Within 1/2 inch of design location, however, the distance between the centerline of the waterside and landside rails shall not exceed the tolerance required for Gauge indicated above.
- C. Prior to grouting, with rails bolted down, perform a complete rail survey of new rails and southernmost 200 feet of adjoining existing Pier 3 rails to demonstrate that crane rails have been installed within the tolerances specified. Furnish results showing plan alignment, profile, and gauge of the rails, and provide the electronic point data to the Engineer for review. Maximum spacing between survey shots shall be 10-ft along the rail. Include survey data at the same frequency along the waterside face of bullrail.
- D. Within 14 days of grout installation, perform a complete post-installation rail survey to show that the new and existing rails have been installed within the tolerances specified. Furnish results showing plan alignment, profile, and gauge of the rails, and provide the electronic point data to the Engineer for review. Maximum spacing between survey shots shall be 10-ft along the rail.

END OF SECTION

PART 1- GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
1. Section 00 31 00 – Available Project Information
 2. Section 00 45 13 – Responsibility Detail Form
 3. Section 01 10 00 - Summary
 4. Section 01 14 00 – Work Restrictions
 5. Section 01 35 29 - Health, Safety and Emergency Response Procedures
 6. Section 01 45 00 - Quality Control
 7. Section 01 71 23 - Field Engineering
 8. Section 01 74 19 –Waste Management
 9. Section 02 41 00 - Demolition
 10. Section 31 00 00 – Earthwork
 11. Section 31 66 13 – Stone Columns
 12. Section 35 42 37 – Riprap Bank Protection
 13. Appendix – DMMP Suitability Determination
 14. Appendix – USEPA Section 401 Water Quality Certification
 15. Appendix – Water Quality Monitoring and Protection Plan (WQMPP)

1.02 DESCRIPTION OF WORK

- A. The work consists of bank cut-back dredging required to construct the reconfigured Pier 4 and shall be sequenced with stone column installation work as described in Section 31 66 13 – Stone Columns. The work also consists of dredging along the pierhead line at the north end of the reconfigured Pier 4, partially filling the existing scour hole with dredge material as shown on the Drawings, and segregating debris from dredged sediment through the use of a debris screen. A portion of the slope was dredged to remove contaminated sediment as part of Phase 1 of the project. Reference documents for Phase 1 dredge work are indicated in Section 00 31 00 – Available Project Information.
- B. Riprap and debris for upland disposal is located on the surface of the dredge area as shown on the Drawings. This material may be removed using either land-based equipment or with water-borne mechanical dredging equipment. Riprap and debris must be removed prior to removal of sediment and may not be disposed of in open water.
- C. All sediment within the project area shall be dredged using water-borne mechanical dredging equipment. All sediment to be dredged has been determined suitable for open-water disposal. All sediment shall be transported by bottom-dump barge to the Commencement Bay Open Water Dredged Material Disposal Site (DMMP Site).
- D. Slope protection shall be placed on the finished slope as shown on the Drawings and as described in Section 35 42 37 – Riprap Bank Protection.

- E. The Contractor shall furnish all labor, materials, tools, equipment and supervision necessary to mechanically dredge the areas shown on the Drawings to the required elevations and grades, dispose of the materials, and dress the post-dredge slope as described on the Drawings and these specifications and in strict compliance with the permits.

1. Construction Period

- a. The work described in the following paragraphs shall be performed in compliance with the work sequence and schedule constraints described in Section 01 14 00 – Work Restrictions.

2. Dredging and Disposal

- a. Dredging Prism: The required dredge elevations are shown on the Drawings. Final dredge elevations shall be no higher than those shown on the Drawings. The maximum allowable over-dredge depth (depth below Required Dredging shown on the Drawings) is 2 feet. See paragraph 1.05 – Definitions for additional information regarding maximum allowable over-dredge depth and payable over-dredge depth.
- b. The Contractor shall use all available means to prevent material from reentering the water once it has been dredged and shall be responsible for dredging any deposition of material outside of the dredge area that occurs from spillage during dredging as determined based on pre- and post-dredge surveys.
- c. The finished shoreline slope shall be configured as shown on the Drawings. Over-excavating the bank slope is not permitted.
- d. **Disposal of sediment at the Commencement Bay Open Water Dredged Material Disposal Site:** The dredged material shall be loaded onto bottom-dump barges and transported to the Washington Department of Natural Resources (DNR) Commencement Bay Open Water Dredged Material Disposal Site for disposal ("DMMP disposal site"). Debris and riprap as defined herein shall not be disposed of at the DMMP site.

3. Slope Protection

- a. Unprotected slopes that are exposed to erosion shall be maintained by the Contractor until placement of slope armoring materials is complete. Any slope damage or failure due to erosion shall be repaired at the Contractor's expense.

1.03 QUALITY ASSURANCE

- A. See Section 00 45 13 – Responsibility Criteria for experience requirements for Dredging.

1.04 REFERENCE STANDARDS

- A. US Army Corps of Engineers (ACOE) EM-1110-2-1003 – Hydrographic Surveying

1.05 DEFINITIONS

A. Debris:

1. Debris is defined as any solid waste materials other than sediment excavated as part of the dredging operations, such as riprap, logs, wire, cable, steel bands, anchors, lumber, trash, timber piles, concrete, concrete piles, concrete pile cutoffs, steel pipe, ecology blocks, etc. In accordance with the DMMP Suitability Determination, debris shall not be disposed of at the DMMP disposal site. Debris shall be disposed at a Port approved upland landfill facility in accordance with applicable local, state and/or federal regulations.

B. Debris Screen:

1. Per the requirements of the DMMP Suitability Determination, a Debris Screen shall be used to separate debris from dredged sediment where indicated in the Drawings and Specifications, and as directed by the Engineer. The Debris Screen shall meet the following minimum requirements:
 - a. Maximum mesh opening clear dimension of 12 inches by 12 inches. The mesh shall be rigid and shall not open or expand to greater than the maximum clear dimension while in use.
 - b. Debris Screen shall be used on the dredge disposal barges or dump scows and shall be designed and constructed to contain all material deposited by the dredge bucket. During use of the debris screen, the entire bucket load of dredged material shall be deposited on the screen for separation of debris. Spillage of dredged material over the edges of the screen is not permitted.
 - c. Screen shall be designed by the Contractor to accommodate separating debris from dredge material and shall be compatible with the Contractor's proposed work plan, means, methods, and equipment used for dredging. The screen shall be durable and capable of resisting the loads associated with segregating and removing debris from large quantities of dredged sediment.
 - d. The screen shall be designed for the anticipated characteristics of the dredge sediment as described in the geotechnical engineering reports referenced in Section 00 31 00 – Available Project Information.
 - e. The debris screen shall remain onsite, maintained, and ready for use throughout the entire duration of dredging activity.
- C. Required Dredging:
 1. Required Dredging includes the removal of material, including associated side slopes, to the minimum elevation within the dredge area as shown on the Drawings.
- D. Payable Over-dredge Depth:
 1. Dredging up to 1 foot below the depth of Required Dredging will be paid for to account for equipment tolerances. Payment will not be made for removal and disposal of material deeper than 1 foot below the depth of Required Dredging. Additional filter blanket material placed to provide the required slope grade in areas of payable over-dredging shall be provided at no cost to the Port.
- E. Maximum Allowable Over-dredge Depth:
 1. The maximum allowable over-dredge depth (depth below Required Dredging shown on the Drawings) is 2 feet. Dredging more than 2 feet below the depth of Required Dredging is considered Excessive Dredging. The Contractor will not be paid for dredging and disposal of material between the Payable Over-dredge Depth and the Maximum Allowable Over-dredge Depth. Additional filter blanket material placed to provide the required slope grade in areas of maximum allowable over-dredging shall be provided at no cost to the Port.
- F. Excessive Dredging:
 1. Dredging of material outside of the dredging limits and/or deeper than the Maximum Allowable Over-dredge Depth is considered Excessive Dredging. Excessive dredging shall be repaired by filling with additional slope protection materials (filter blanket) to achieve the required bank slope grade at no cost to the Port. The Contractor will not be paid for excessive dredging and will be responsible for any required corrective action as a result of excessive dredging, including, but not limited to, replacing material or slope stabilization

and fines or penalties that may be levied by regulatory agencies due to excessive dredging.

G. Side slope:

1. The side slope is the slope to be excavated between the outer edge of the dredge cut at design depth (toe) and the intersect point at original ground level (daylight line) or to the intersection point of an adjacent dredge cut. Not all side slopes are indicated on the Drawings. All Contractor-created side slopes shall be no steeper than (2) Horizontal to (1) Vertical (2H:1V) from the top of the slope to elevation -14.5 ft MLLW and no steeper than (1.75) Horizontal to (1) Vertical (1.75H:1V) from elevation -14.5 ft MLLW to the toe of the slope, unless otherwise indicated on the Drawings.

H. Pay Volume:

1. Pay Volume is the quantity of dredged material calculated on an in-situ basis using pre- and post-dredge survey information.

1.06 PRE-CONSTRUCTION SUBMITTALS

A. Dredging and Disposal Work Plan (DDWP):

The Contractor shall submit a detailed written Dredging and Disposal Work Plan (DDWP) to address activities associated with dredge work. The DDWP shall be submitted to the Engineer at least 60 days prior to dredging. Dredging shall not begin until: 1) the Plan has been reviewed and approved by the Port and applicable DMMP regulatory agencies; 2) agency-required notifications have been completed in accordance with the permits and the DMMP Suitability Determination; and 3) the Contractor schedules and attends a Pre-dredge Meeting with the Port and the DMMP agencies as required by the permits and the DMMP Suitability Determination, and receives agency approval to begin dredging as a result of that meeting.

At a minimum, the DDWP shall contain the following:

1. Work Sequence and Equipment
 - a. Order in which the work is to be performed indicating the work sequence.
 - b. A construction schedule shall be prepared that identifies the timing and sequencing of the major activities and milestones of the dredge work. These shall include, but not be limited to, mobilization, start of dredging, surveying, duration of dredging and disposal, demobilization, and cleanup. The construction schedule shall include consideration of the dredge production rate associated with using the Debris Screen in the area defined in the drawings and specifications and for the duration of time indicated on the Bid Form for Bid Item #37 – Screened Dredging Premium Allowance.
 - c. Number, types and capacity of equipment to be used, including names of dredge(s) and other marine vessels to be used (tugs, bottom dump barges, survey vessels, etc.).
2. Means and Methods for Dredging, Transport, Handling, and Disposal
 - a. Methods, procedures, and equipment to be used for removal and transport of riprap and debris from the surface of the dredge area.
 - b. Methods, procedures and equipment to be used for transport and disposal of sediment at the DMMP site, including methods to be used to track the position of the barge during disposal operations and record exact position (latitude and longitude to the nearest one-thousandths of a minute) at the initiation and completion of discharge.
 - c. Methods to be used for record keeping related to transport and disposal of sediment at the DMMP site.

- d. Methods, procedures and controls to protect existing Port facilities and structures against damage.
- e. Methods, procedures and controls to be used to segregate, handle, transport and dispose of debris to an appropriate disposal facility in accordance with applicable regulations.
- 3. Positioning, Surveys, Environmental Monitoring and Spill Containment
 - a. Hydrographic surveyor qualifications. See Section 01 71 23 – Field Engineering.
 - b. Methods, procedures, equipment, and controls for performing dredge surveys.
 - c. Layout of the work and positioning of dredge equipment.
 - d. A schedule of surveys that clearly illustrates how surveys will relate to dredging sequence of work.
 - e. Procedures and equipment for positioning dump barges at the dredging and disposal site. Positioning equipment must be capable of tracking the position of the barge during the tow.
 - f. Notification procedures to United States Coast Guard (USCG) for barge operations within the Blair Waterway and Commencement Bay.
 - g. Environmental monitoring, including procedures for emergency spill containment and removal operations.
 - h. Coordinates of the DMMP Disposal Site
- 4. Debris Removal
 - a. Procedures and equipment for collecting and disposing of submerged and floating debris encountered during dredging operations.
 - b. Procedures and equipment for offloading, stockpiling (if necessary), transport, and disposal of debris separated from the dredged material. This shall include methods to prevent spillage of material back into the water and cleanup of the barge and materials to allow for proper disposal.
 - c. Design drawings for construction of the Debris Screen. Design drawings shall clearly indicate the concept for construction of the Debris Screen, including materials to be used, assembly details, and means for lifting, handling, and placement on the disposal barge or dump scow.
 - d. Procedures and equipment associated with use of the Debris Screen on disposal barges or dump scows, including removal of debris from the screen.
- 5. Prevention of Interference with Navigation
 - a. Notification and procedures to be used for moving dredging equipment to accommodate inbound and outbound commercial vessel traffic using the surrounding waterway. The operations of commercial business shall have precedence over related bid items of work in accordance with Section 01 14 00 – Work Restrictions.
- 6. Contractor Quality Control Plan
 - a. Organization chart with key personnel and supervisory chain. At a minimum, the Contractor shall identify the following key personnel: superintendent, quality assurance representative, health and safety representative, dredge operator(s), water quality monitoring lead (or firm that the Contractor has hired to conduct monitoring), hydrographic survey lead (or firm that the Contractor has hired to perform progress

surveys), and other key personnel deemed necessary by the Contractor for the successful implementation and completion of this work. Contact information shall be provided for the project superintendent and the dredge superintendent.

b. Quality control methods and procedures.

7. Water Quality Protection, Monitoring, and Notification Procedures

a. The Contractor shall be subject to the requirements and procedures specified in the Water Quality Monitoring and Protection Plan (WQMPP) and the DMMP Suitability Determination. Provide written acknowledgement of understanding of all requirements and procedures contained in these documents with respect to water quality monitoring, best management practices (BMPs), debris management, and notification procedures associated with dredge operations. Written acknowledgement shall be provided in the form of a signed letter from the Contractor to the Port of Tacoma.

b. Proposed methods and procedures for monitoring water quality in strict compliance with the WQMPP.

c. The personnel and equipment that will be used to monitor water quality during the course of the project.

d. Contingency measures to be implemented if water quality violations occur.

B. Washington State Department of Natural Resources (DNR) "Plan of Operation for Use of Open Water Disposal Site" certification form to be submitted to the Port by the Contractor. The Port will submit the Plan of Operations with the DNR Site Use Authorization directly to DNR.

1.07 1.07 CONSTRUCTION SUBMITTALS

A. DNR Disposal Site Use Reports

B. DNR Monthly Disposal Statements

C. Disposal logs for open water disposal of dredge material

D. Daily Dredge Reports

E. Weekly Dredge Reports (including water quality monitoring summary report and forms)

F. Dredge Closure Report

G. Pre-dredge Survey data

H. Data for Post-Dredge Survey performed after Required Dredging is completed

I. Dredge bucket coverage map for first pass of dredging within the area at the south end of the site that requires the use of a debris screen.

1.08 SITE CONDITIONS

A. Character of Materials

1. Subsurface investigation reports are available as reference documents as indicated in Section 00 31 00 – Available Project Information. The Contractor shall satisfy itself regarding the nature of materials present at the site, including review of the reference documents prior to bidding.

2. Hard material in its natural state is defined as material requiring blasting, and includes boulders or fragments too large to be removed in one piece by the dredging equipment. With the exception of riprap and concrete debris, hard material is not anticipated to be encountered under this contract.

B. Riprap and Debris

1. The reference documents indicate an approximately 2 foot deep layer of riprap armoring on the surface of the south end of the dredge area. Known riprap and debris from Phase 1 construction located elsewhere on the surface of the dredge area is indicated on the Drawings. Undocumented debris may also be located on top of, or within, the riprap layer or elsewhere on, or within, the dredge area. Riprap and debris shall not be disposed of at the DMMP disposal site.

C. Inherent Delays

1. The Contractor shall anticipate inherent delays while conducting dredging operations in the waterway or disposal operations in Commencement Bay. Inherent delays are primarily due to commercial shipping traffic within the shipping channel. Commercial shipping traffic shall have precedence over the Contractor's activities and may require them to stop, move, adjust, and/or slow down to accommodate vessel movement. The Contractor shall make allowance in its construction schedule for delays or interruptions due to vessel movement within the shipping channel in the waterway. The bid prices shall include allowances for such inherent delays.

D. Interference with Navigation

1. The Blair Waterway and Commencement Bay are active navigation corridors used for transport of deep-draft commerce activities. These activities shall take priority over the Contractor's operations. The Port's tenants and other entities using the waterway must have access along the project site for the duration of the construction contract. The Contractor shall conduct its operations in a manner that will minimize interference with those activities. In the event that the Contractor's construction equipment (dredge, dump scows, tug, floats, barges, workboats, anchors, lines, etc.) obstructs the navigable waterway so as to hinder movement of commercial vessels, the equipment shall immediately be moved to facilitate the shipping activity.
2. Any damage to the Contractor's equipment in navigation lanes due to the Contractor's failure to move when required shall be at the Contractor's sole risk and expense.

E. Protection of Existing Facilities

1. Any damage to the existing pier structure at the Husky Terminal and/or other existing facilities caused by the Contractor's operations, as determined by the Engineer, shall immediately be repaired to the pre-project condition at the Contractor's expense.
2. The Contractor's Dredging and Disposal Work Plan shall include methods, procedures, and controls for the above protections.
3. Condition Survey of Existing Structures: The Contractor and Engineer shall review and verify the condition of adjacent structures and appurtenances adjacent to the work areas prior to beginning work to ascertain existing conditions. Any damage documented as a result of the Contractor's activities will be repaired at no additional cost to the Port.

F. Security Concerns

1. For security and vessel navigation concerns, the Contractor shall give notice and receive required approval from the Engineer prior to berthing at any location along the Blair Waterway. The Contractor shall notify the Coast Guard as required to comply with Coast Guard and Port regulations for operating within the Blair Waterway and Commencement Bay.

1.09 MISPLACED MATERIAL

- A. Should the Contractor, during the execution of the work, lose, dump, throw overboard, sink or misplace any material, dredge, barge, machinery, or appliance, the Contractor shall promptly recover and remove the same. The Contractor shall give immediate verbal notice, followed by written confirmation, of the description and location of such obstructions to the Engineer and shall mark and buoy such obstructions until they are removed. Should the Contractor refuse, neglect, or delay compliance with this requirement, such obstructions may be removed by the Port or its agents, and the cost of such operations may be deducted from any money due to the Contractor, or may be recovered from the Contractor's bond. The Contractor shall be responsible for any fees, fines, penalties or other costs resulting from misplaced materials. The Contractor shall also be responsible for removing accumulated spilled dredged materials in the waterway even if the material is located beyond the project dredging limits.

1.10 DREDGING AND DISPOSAL REGULATORY COMPLIANCE

- A. Permits and Compliance. The Contractor shall be responsible to adhere and conform to all applicable provisions, conditions and requirements of the permits and the DMMP Suitability Determination.:
1. Permits that include conditions for dredging in the Blair Waterway, disposal of dredged materials, and associated activities are included in the Appendix of these Specifications.
 2. The Contractor is responsible for notifying various regulatory agencies prior to commencing dredging, as required by the project permits. These notifications typically include the USACE and the Washington Departments of Natural Resources, Ecology, and Fish and Wildlife. Examples of typical notification requirements are shown in the example permits appended to these specifications. The Contractor shall copy the Engineer on all Agency notifications.
 3. For open water disposal of sediment, the Port will obtain Washington State Department of Natural Resources (DNR), Disposal Site Use Authorization to Utilize Open Water Disposal Site prior to the start of dredging:
 - a. Upon execution of this contract, the Port will endorse the DNR "Open Water Disposal Site Use Authorization" permit as "Grantee". Upon execution of this contract, the Port will transfer the permit to the Contractor and, as a part of this Contract, the Contractor shall assume all duties, obligations, and liabilities imposed herein.
 - b. Operational requirements do not prohibit discharge operations of dredge material at the DMMP site from dusk to dawn; however any proposed night time disposal operations must be coordinated with and approved by the Port, USACE, and the Tribe. The Contractor shall request approval for a disposal operations schedule at the Pre-dredge Meeting.
 - c. At least 30 days prior to dredging, the Contractor shall complete the DNR "Plan of Operation for Use of Open Water Disposal Site" certification form and submit it to the Port for submittal to DNR.
 - d. The Contractor shall comply with all DNR disposal regulations and reporting requirements, including but not limited to, the following:
 - 1) The Contractor shall become familiar with and adhere to DNR disposal site discharge procedures and reporting requirements.
 - 2) The Contractor shall notify DNR 24 hours prior to disposal at the open water site.

- 3) The Contractor shall verify and record barge location at the initiation and completion of discharge, including the horizontal distance from the center of the disposal site.
 - 4) The Contractor shall complete "Disposal Site Use Reports" at the time of each disposal event and "Monthly Disposal Statement" forms as required by DNR.
 - 5) The DNR reporting week begins on Monday and ends the following Sunday. Disposal Site Use Report forms must be filled out in their entirety and submitted to the Engineer by noon on Monday of the week following the week being reported.
 - 6) Monthly Disposal Statement forms must be completely filled out and submitted to the Engineer with a transmittal letter, no later than the 19th day of the month following the month being reported.
 - 7) Failure to provide forms in accordance with the above schedule may result in suspension or termination of the Site Use Authorization. The Contractor will be held responsible and liable for any damages, penalties, and/or delay costs incurred by the Port as a result of suspension or termination of the Site Use Authorization.
 - 8) The Contractor shall provide the Engineer with the originals of all disposal site use reports and forms to be submitted to DNR.
 - 9) The Port will pay directly to DNR all fees associated with the permit and dumping operation except that Contractor shall pay for any penalty or damage fees imposed by DNR for material dumped off-site, or other unauthorized disposal operations.
- B. Any conflicts between these contract specifications and issued permits will be brought to the attention of the Engineer. Nothing whatsoever shall be deemed to authorize violation of project permits.
- C. The Contractor shall grant access to its dredge derrick, barge(s), tug(s), and all other equipment mobilized for the project for inspection purposes, to the Port or to any Port-designated representative, and to representatives of the State and Federal agencies issuing the aforementioned permits.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 ORDER OF WORK

- A. The Contractor shall remove and dispose of sediment within the project area to the required elevations and grades as shown on the Drawings in compliance with the work sequence and schedule constraints described in Section 01 14 00 – Work Restrictions. All required dredging and slope protection work, including performance and submittal of final surveys, shall be completed 15 days prior to the end of the in-water work period to allow sufficient time to review the post-dredge and slope protection surveys and to perform any required cleanup and/or high spot removal prior to the end of the in-water work period.
- B. Dredging work shall be sequenced with stone column installation work as described in Section 31 66 13 – Stone Columns.
- C. The Contractor shall remove and dispose of all riprap and debris located on the surface of the dredge area as shown on the Drawings and before performing any other dredging.

- D. The Contractor shall perform the Pre-Dredge Survey after removal of riprap and debris from the surface of the dredge area has been completed and prior to the start of any sediment dredging operations.
- E. Once required dredging and partial filling of the scour hole with dredged material is completed, the Contractor shall conduct a post-dredge survey and submit this survey to the Port for determination that required elevations and grades have been met. If the Engineer confirms that the required elevations and grades are met, then the Contractor may proceed with placement of slope protection.
- F. If the Contractor proposes to place slope protection on areas of the slope prior to completion of all dredging work elsewhere on the slope, then post-dredge verification surveys shall be performed to demonstrate that required elevations and grades have been met in the area where slope protection material is to be placed. The Contractor shall be responsible for all costs and schedule impacts associated with the performance of post-dredge verification surveys.
- G. If the post-dredge survey indicates that high spots remain above the required dredge elevations, then the Contractor shall remove such high spots to the satisfaction of the Engineer. The Contractor shall also maintain existing bottom depths within 200 feet waterward of the eastern dredge limit and shall remove any high spots or accumulations of materials resulting from the Contractor's operations. The Contractor shall restore the area within the 200-foot-zone to pre-construction conditions at no cost to the Port.

3.02 DREDGE SURVEYS

A. General

- 1. All survey work shall be performed by the Contractor.
- 2. All dredge survey work shall be referenced to existing horizontal and vertical survey control monuments and survey control baselines used during project design.
- 3. All hydrographic surveying shall be performed in accordance with ACOE EM-1110-2-1003 – Hydrographic Surveying.
- 4. Accuracy for measured depth shall be +/- 0.5 feet; accuracy of horizontal position shall be +/- 3 feet at the 95 percent confidence interval.
- 5. See Section 01 71 23 – Field Engineering for additional survey requirements.

B. Progress Surveys

- 1. The Contractor shall provide hydrographic progress surveys on a weekly basis showing cross-sections through the previous week's work. Sounding data for progress surveys shall be collected using acoustic single beam or full-coverage multi-beam equipment. If single beam equipment is used, surveyed cross sections shall run perpendicular to the shoreline and shall be spaced at 25 foot intervals or less. Progress surveys shall extend from the top of bank to a point 50 feet beyond the dredge area.
- 2. Progress survey results may be used to adjust dredging procedures to assure that the configuration of the dredging site conforms to the requirements of the Drawings and project permits. The Engineer may direct the Contractor to adjust its dredging procedure to assure compliance with the Contract Documents, at no additional expense to the Port.
- 3. For progress surveys, the Contractor shall compute estimated dredge volumes to the nearest cubic yard by comparing the progress survey to the pre-dredge survey. If single beam equipment is used to survey the 25-foot interval cross-sections, then dredge volume shall be estimated using the Average End Area (AEA) method. If multi-beam equipment is used, then dredge volume shall be estimated using AutoCAD TIN (Triangulated Irregular

Network) method. Dredge volume estimates computed from progress surveys will be used to evaluate progression of dredge work and to estimate percent complete for dredging. Progress survey information will not be used as a basis for quantity calculations for final payment or for final acceptance of work.

C. Pre- and Post-Dredge Surveys

1. All pre- and post-dredge surveys shall be performed by the Contractor and will be used by the Port as the basis for determining pay volumes and acceptance of the work. Pay volumes shall be calculated by the Contractor to the nearest cubic yard using AutoCAD TIN (Triangulated Irregular Network) method. The Contractor shall provide a copy of the hydrographic soundings and the quantity calculations to the Engineer for review and approval. The Port will perform its own calculations to verify quantities computed by the Contractor.
2. Hydrographic surveying using full-coverage acoustic multi-beam equipment shall be performed for portions of the slope and channel below elevation -2 feet (MLLW). Field-run surveying may be performed in lieu of hydrographic surveying for portions of the slope above elevation -2 feet (MLLW). Field-run surveys above elevation -2 feet (MLLW) shall be performed along track lines running perpendicular to the shoreline and spaced at 25-foot intervals. Hydrographic and field-run survey data shall be combined into one file that represents the survey for the entire area surveyed.
3. Pre-Dredge Survey
 - a. The pre-dredge survey shall be performed after removal of riprap and debris from the surface of the dredge area and no earlier than 3 weeks prior to the beginning of sediment dredging operations. The pre-dredge survey will be used as the baseline for quantity calculations. The survey shall be provided to the Port for review and approval at least (7) business days prior to the start of sediment dredging. The survey must be approved prior to the start of dredging.
4. Post-Dredge Survey, including Post-Dredge Verification Surveys
 - a. A post-dredge survey shall be performed upon completion of dredging to required dredge elevations. The Port will review the post-dredge survey to determine whether dredging has been satisfactorily completed and for payment purposes. If all of the Required Dredging has not been satisfactorily completed, as determined by the Engineer, the Contractor shall correct the deficiencies indicated in the survey. The areas shall be resurveyed by the Contractor at no additional cost to the Port. Each additional post-dredge survey must be reviewed and approved by the Port prior to final acceptance of work. Placement of the riprap slope protection system shall not begin until the satisfactory completion of dredging in the area where riprap is to be placed, as determined by the Engineer.
5. The pre-dredge survey and final post-dredge survey (performed after completion of all required dredging) shall extend to a minimum of 200 feet waterward of the eastern dredge limit and 50 feet beyond all other dredge limits. The Contractor shall be responsible for maintaining existing bottom depths within the 200-foot zone as defined in the Pre-Dredge Survey and shall remove any high spots or accumulations of material and restore the area within the 200-foot zone to the pre-dredge condition, at no cost to the Port.
6. The pre-dredge survey, post-dredge verification surveys, the final post-dredge survey (performed after completion of all required dredging), and all progress surveys shall be included in the Contractor's base bid under Bid Item "Field Engineering".

3.03 CONDUCT OF WORK

A. Layout of Work

1. The Contractor shall furnish, set and maintain in good order, all ranges, buoys and other markers necessary to define the Work and to facilitate inspection. The Contractor shall also establish and maintain gages (tide boards) in locations where they may be clearly seen at all times during operations and inspection. The tide gauge shall provide a continuous recording of tidal change for every 15-minute interval or each 0.1-foot change, whichever occurs first. Tidal changes shall be visually provided to the dredge operator at all times during the dredging process to allow proper adjustment of dredge depth. The Contractor may be required to suspend dredging when the gages or ranges cannot be seen.
2. An accurate method of horizontal and vertical control shall be established by the Contractor before dredging may begin. The proposed method and maintenance of the horizontal and vertical control system shall be subject to the approval of Engineer and if, at any time, the method fails to provide accurate location for the dredging operations, and the Engineer's inspection, the Contractor may be required to suspend its dredging operations at no additional cost to the Port.
3. It shall be the responsibility of the Contractor to maintain all points established for the work until authorized to remove them. If such points are destroyed by the Contractor or disturbed through its negligence prior to an authorized removal, they shall be replaced by the Contractor at its own expense.

B. Positioning Equipment and Methods

1. The Contractor shall employ a Differential Global Positioning System (DGPS) to locate and control horizontal dredging position. Accuracy of horizontal dredge position shall be within +/- 3 feet at the 95 percent confidence interval. In addition to a tug-mounted DGPS receiver, the Contractor shall provide a DGPS receiver on the barge to record its location at the initiation and completion of discharge at the DMMP site.

C. Riprap and Debris Removal from the Surface of the Dredge Area at South End of Site

1. As noted herein and on the Drawings, the Contractor shall remove and dispose of all riprap and debris from the surface of the dredge area at the south end of the site before performing the pre-dredge survey and before performing any other dredging. Per the requirements of the DMMP Suitability Determination, no debris shall be disposed of in open water. As required by the DMMP agencies, to confirm that riprap and debris greater than 12 inches in size has been removed from the portion of the existing slope at the south end of the site, the Port will perform a visual inspection of the area as follows:
 - a. For the portion of the slope at the south end of the dredge area above 0 feet MLLW, above-water inspection of the surface of the slope will be performed at low tide to confirm that no contiguous areas of riprap or debris remain on the slope.
 - b. For the portion of the slope at the south end of the dredge area below 0 feet MLLW, under-water inspection of the surface of the slope will be performed via a dive survey. The dive survey will consist of a diver swimming transects across the face of the slope at approximately 10-foot intervals. The diver will note where riprap is present if more than a few isolated and non-contiguous rocks are present.
2. If the results of the Port's inspection indicate that contiguous areas of riprap remain on the slope, then the Contractor shall remove the remaining material to the satisfaction of the Engineer and at no additional cost to the Port. Additional inspection by the Port will be performed after each round of material removal.

3. The Port will hire the diver and will pay for up to (1) day of dive inspection services. Costs associated with additional dive days required to resurvey the area due to the Contractor's inability to remove riprap and debris from the slope shall be borne by the Contractor.
4. The Contractor shall not proceed with the pre-dredge survey until receiving confirmation from the Engineer that removal of riprap and debris is complete.
5. The Contractor shall accommodate the Port's inspection of the slope in the construction schedule. The Port will not be responsible for delays associated with multiple rounds of material removal and inspection.
6. Following satisfactory removal of riprap and debris from the surface of the slope and completion of the pre-dredge survey, a debris screen shall be used during the first pass of dredging in that area. See Section F below for additional information.

D. Dredging

1. Dredging shall be performed using mechanical methods only.
2. The Contractor shall excavate the required dredge prism to the lines, grades, slopes and elevations shown on the Drawings. Each pass of the clamshell bucket shall be complete and there is to be no stockpiling of sediment underwater. Leveling of the completed dredging surface by dragging a beam or sweeping the clamshell bucket will not be permitted unless approved by the Port.
3. The Contractor shall pay particular attention to the conditions of issued permits, applicable regulations, and authorizations requiring minimizing turbidity and loss of suspended sediments during dredging and transport operations and adherence to water quality requirements.
4. If dredging is conducted at dusk or at night, the Contractor shall ensure that sufficient light is provided for visual monitoring of the dredge prism for turbidity, as well as visual inspection for debris and large rocks within the disposal barge.
5. The Contractor shall make the cut, including the slope and keyway, to the lines and grades shown on the Drawings. No undercutting (i.e., excessive dredging) at toes of cuts will be allowed. Dredging from the top down is required to prevent uncontrolled slope failures that may occur as a result of undercutting at the toe of the excavation.
6. Upon completion of the work, but not until final acceptance by the Engineer, the Contractor shall promptly remove the dredging plant and associated equipment, including ranges, buoys, piles, and other markers or obstructions placed by the Contractor in the water or on shore.

E. Placement of Dredged Material in Existing Scour Hole

1. The existing scour hole at the toe of the slope shall be partially filled with dredge material as shown on the Dredge Plan. Dredge material shall be placed in the hole using a clamshell bucket lowered to within 5 feet of the bottom of the hole. The top 5 feet of the scour hole shall be filled with light rock riprap per the Drawings and Section 34 42 37 – Riprap Bank Protection.

F. Use of Debris Screen

1. Use of Debris Screen at south end of dredge area:
 - a. A debris screen shall be used to separate debris from dredged sediment during the first pass of dredging along the portion of the slope at the south end of the site. The area where the debris screen is required to be used shall be the same area where riprap and debris was removed as described in Section C above. A debris screen shall

- be used in this area until it has been demonstrated that the first pass of dredging has been performed over the entire surface of the area.
- b. The first pass of dredging is defined as complete bucket coverage of the entire surface of the area with a minimum depth of bucket penetration of 1 foot. The Contractor shall submit to the Engineer a bucket coverage map that indicates the position of each bucket drop on the slope and that indicates that the first pass of dredging has been performed over the entire surface of the area. The Engineer will provide permission to discontinue use of the debris screen only when the Contractor has demonstrated complete bucket coverage of the area.
 - c. All costs associated with the use of the debris screen during the first pass of dredging within the portion of the slope at the south end of the dredge area shall be considered incidental to Bid Item #9 – Dredging and Disposal. Costs associated with construction of the debris screen shall be included in Bid Item #33 – All Other Work.
2. Use of Debris Screen at all other locations within the dredge prism:
- a. The debris screen shall be used at all other locations within the dredge prism when debris is encountered during dredging and at the direction of the Engineer. The Contractor shall notify the Engineer if debris is encountered during unscreened dredging. Upon notification, the Engineer may direct the Contractor to implement the use of the debris screen until debris is no longer encountered.
 - b. Premium costs associated with the use of the debris screen at all other locations within the dredge prism will be paid for as part of Bid Item #37 – Screened Dredging Premium Allowance based on the time (hours) in which the debris screen is used and on the unit cost indicated by the Contractor on the bid form. Bid Item #37 will be paid in addition to Bid Item #9 – Dredging and Disposal during the time that the debris screen is used. Costs for handling, processing, and disposal of debris captured on the screen after being placed either upland or on a debris barge will be compensated under Bid Item #35 – Unforeseen Dredging Debris Removal Allowance.
 - c. Costs associated with use of the debris screen during removal of the buried timber bulkhead wall shall be considered incidental to Bid Item #6 – Removal of Buried Timber Bulkhead Wall.
 - d. Payment for Bid Item #37 - Screened Dredging Premium Allowance shall be based on the length of time that the debris screen is actually used during dredging operations to separate debris from sediment and will not include time for the Contractor to setup the screen for use or down time due to equipment maintenance or failure, repositioning of dredge equipment, shift changes, or non-working hours. The Contractor is encouraged to have the screen on the disposal barge during all dredging operations to avoid delays. The Engineer will document the start and stop times for screened dredging. Cost and schedule impacts associated with setup of the screen or down time due to equipment maintenance or failure, repositioning of dredge equipment (including the screen), shift changes, or non-working hours shall be the responsibility of the Contractor.
3. The Contractor shall be responsible for all costs and delays associated with maintenance, repair, or replacement of the screen.
4. Use of the debris screen during dredging shall be considered by the Contractor when preparing the construction schedule and planning the work. No additional contract time will be provided to the Contractor due to use of the debris screen if the total payable time of use in areas other than the first pass at the south end of the dredge prism, as documented by the Engineer, is less than that indicated on the Bid Form.

3.04 TRANSPORTATION AND DISPOSAL OF DREDGED MATERIALS

A. Use of Commencement Bay Open Water Dredged Material Disposal Site (DMMP Disposal Site)

1. The Port will obtain a Disposal Site Use Authorization from DNR for disposal of suitable sediments at the DMMP Site. Suitable material shall be loaded onto bottom-dump haul barges and transported to the DMMP Site. The use of any type of barge other than a bottom dump barge is prohibited. For DNR reporting requirements, the barge dump will be considered to start at initiation of bottom-dump or split hull opening. The end of the dump will be that time when all materials have exited the barge. No materials shall be dumped unless approved positioning equipment is operational. Overflow will not be permitted from haul barges at any time during loading, transportation, and disposal of dredged material. The haul barges must have tightly sealing doors and compartments to minimize leakage of material during transit. Any barge that exhibits more than minor leakage shall be removed from the equipment utilized on the project until satisfactory repairs are made. All DNR disposal fees will be paid directly by the Port.

B. Vessel Traffic Service (VTS)

1. The Contractor shall contact the USCG VTS by radio before disposal for positioning and verification of location within the surface target zone. Disposal may not commence until verification is received from U.S. Coast Guard. The Contractor must also report the vessel position, tug, barge, skipper's name, DNR permit number and the time dumping begins and ends.
2. Signal lights shall be displayed and operations shall be conducted in accordance with the regulations of local port and harbor authorities and by the applicable regulations of Code of Federal Regulations, Title 33 – Navigation and Navigable Waters, as required by the Department of the Army and the U.S. Coast Guard.

C. Disposal Log

1. The Contractor shall maintain a disposal log of all dumps at the DMMP disposal site. The log shall include: the date, time, operator's name, time when approval was received from VTS and initials of person giving approval, coordinates at the beginning and end of each dump, vessel fathometer reading, and the calculated distance from the center of the disposal site. The distance from the center of the disposal site shall be calculated at the beginning and ending of each dump to verify that material has been dumped completely within the disposal site limits. A printout from the Contractor on-board navigational system shall be generated at the time of each dump and shall be submitted weekly to the Engineer along with the disposal log. The log and printouts shall be prepared in addition to the "Monthly Disposal Statement" and the "Disposal Site Use Report" required by DNR.

3.05 WATER QUALITY MONITORING

- A. The Contractor is responsible for meeting Water Quality criteria as defined in the WQMPP (located in the Appendix).
- B. Water quality reports shall be submitted to the Port as part of the Weekly Dredge Report.

3.06 DREDGE REPORTS

- A. Daily Dredge Report: The Contractor shall keep a daily record of the area(s) dredged, the estimated quantity of material dredged, the estimated quantity and type of debris removed, the number of scow trips to the disposal sites, the estimated quantity of dredged materials transported to the DMMP Site, progress surveys, and a summary of other details of the work. A map showing the barge position during each dump and coordinates for each dump shall be included in the daily reports. This daily record shall be submitted to the Engineer with a

transmittal letter the morning following completion of work on the date of the Daily Report. The Daily Report shall be signed by the Contractor's dredging superintendent or quality control manager.

- B. Weekly Dredge Report: The Contractor shall summarize the week's work in a weekly report to be submitted to the Engineer the following Monday morning. The weekly report shall identify work completed to date, anticipated work to be completed in the present week, results from water quality monitoring, and present the latest progress survey.
- C. Dredge Closure Report: The Contractor shall prepare a closure report that summarizes all the weekly reports and identifies Contractor estimates of dredge volume, dredge volume disposed at the DMMP Site, and debris & riprap volume/tonnage disposed of at the Port-approved upland landfill facility.

3.07 DEBRIS MATERIAL

- A. Anchors, chains, straps, and other articles or debris brought to the surface during the course of the dredging operations shall remain the property of the Contractor and shall be disposed of at an approved off-site location per Section 01 74 19 –Waste Management. Hazardous material/waste, consisting of creosote piles, batteries, PCB's and the like shall be disposed of in accordance with applicable Federal, State and local regulations. When such material/waste is encountered, the Contractor shall immediately notify the Engineer to determine the course of action to be taken. The Contractor will be compensated for costs associated with handling and disposal of debris encountered during dredging through Bid Item #35 – Unforeseen Dredging Debris Removal Allowance.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE:

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
 - 1. Section 01 33 00 – Submittal Procedures
 - 2. Section 01 45 00 - Quality Control
 - 3. Section 01 50 00 - Temporary Facilities and Controls
 - 4. Section 01 57 00 - Temporary Controls
 - 5. Section 01 71 23 - Field Engineering
 - 6. Section 31 00 00 - Earthwork
 - 7. Section 35 20 23 – Dredging
 - 8. Appendix – Water Quality Monitoring and Protection Plan (WQMPP)

1.02 DESCRIPTION OF WORK:

- A. The work includes furnishing of all material, labor and equipment necessary for construction of slope protection including Filter Blanket, Light Rock Riprap, and Heavy Rock Riprap as specified in the Contract Documents. The work also includes placement of light rock riprap in the upper 5 feet of the existing scour hole as shown on the Drawings. The intent is to leave the dredged and prepared surface exposed for as short a duration as possible prior to placing the filter blanket and leaving the filter blanket exposed for as short a duration as possible prior to placing the riprap.
- B. Dredging, slope protection construction, and associated verification surveys shall be sequenced so that the completed dredge surface and keyway are exposed for as short of a duration as possible prior to placing slope protection materials.

1.03 QUALITY ASSURANCE:

- A. The Contractor is to provide the results of physical and chemical testing of imported slope protection materials in accordance with Section 31 00 00 - Earthwork to assure that the quality of materials meets the Specifications herein and shall provide surveys to assure that slope protection materials are placed as shown on the Drawings and described in these Specifications.
- B. The Engineer maintains the right to reject any materials that have been determined to be substandard for any reason. In the event of rejection, it shall be the responsibility of the Contractor to remove all stockpiles of rejected material from the site.

1.04 REFERENCES:

- A. Standard Specifications: The Standard Specifications referenced in this section shall be the 2014 edition of the Standard Specifications for Road, Bridge, and Municipal Construction as prepared jointly by the Washington State Department of Transportation (WSDOT) and the American Public Works Association (APWA).
- B. The latest edition of the American Association of State Highway and Transportation Officials (AASHTO), Standard Specifications for Transportation Materials and Methods of Sampling and Testing.

1.05 SUBMITTALS:

A. Riprap Slope Protection Work Plan (RSWP):

The Contractor shall submit a detailed written Riprap Slope Protection Work Plan (RPWP) to address activities associated with placement of slope protection material on the dredged slope. The RPWP shall be submitted to the Engineer at least 30 days prior to start of slope protection work. Slope protection work shall not begin until the Plan has been reviewed and approved by the Port.

At a minimum, the RPWP shall contain the following:

1. Work Sequence and Equipment
 - a. Order in which the work is to be performed indicating the work sequence.
 - b. A construction schedule shall be prepared that identifies the timing and sequencing of the major activities and milestones of the slope protection work. These shall include, but not be limited to; mobilization, delivery of slope protection material, start of slope protection work, duration of slope protection work, and demobilization. Demonstrate that slope protection work, including associated survey work, is sequenced with dredging work such that the completed dredge surface and keyway are exposed for as short of a duration as possible prior to placing slope protection materials.
 - c. Number, types and capacity of equipment to be used, including names of derrick barges, material barges, tugs, survey vessels and other marine vessels to be used.
2. Means and Methods for Slope Protection Work
 - a. Methods, procedures, and controls to be used for delivery of slope protection material to the site.
 - b. Methods, procedures, and controls to be used for placement of each layer of the slope protection system.
 - c. Methods to be used for record keeping related to placement of slope protection material.
 - d. Methods, procedures and controls to protect existing Port facilities and structures against damage.
3. Positioning, Surveys, Environmental Monitoring and Spill Containment
 - a. Hydrographic surveyor qualifications if different from those submitted as part of the Dredge and Disposal Work Plan (DDWP) submitted under Section 35 20 23 - Dredging . See Section 01 71 23 – Field Engineering.
 - b. Methods, procedures, equipment, and controls for performing slope protection surveys.
 - c. Layout of the work and positioning of slope protection equipment.
 - d. Notification procedures to United States Coast Guard (USCG) for barge operations within the Blair Waterway and Commencement Bay.
 - e. Environmental monitoring, including procedures for emergency spill containment and removal operations.
4. Prevention of Interference with Navigation
 - a. Notification and procedures to be used for moving equipment to accommodate inbound and outbound commercial vessel traffic using the surrounding waterway. The

operations of commercial business shall have precedence over related bid items of work in accordance with Section 01 14 00 – Work Restrictions.

5. Contractor Quality Control Plan
 - a. Organization chart with key personnel and supervisory chain. At a minimum, the Contractor shall identify the following key personnel: superintendent, quality assurance representative, health and safety representative, equipment operator(s), water quality monitoring lead (or firm that the Contractor has hired to conduct monitoring), hydrographic survey lead (or firm that the Contractor has hired to perform progress surveys), and other key personnel deemed necessary by the Contractor for the successful implementation and completion of this work. Contact information shall be provided for the project superintendent and the slope protection superintendent.
 - b. Quality control methods and procedures.
6. Water Quality Protection, Monitoring, and Notification Procedures
 - a. The Contractor shall be subject to the requirements and procedures specified in the Water Quality Monitoring and Protection Plan (WQMPP). Provide written acknowledgement of understanding of all requirements and procedures contained in the WQMPP with respect to water quality monitoring, best management practices (BMPs), and notification procedures associated with slope protection work. Written acknowledgement shall be provided in the form of a signed letter from the Contractor to the Port of Tacoma.
 - b. Proposed methods and procedures for monitoring water quality in strict compliance with the WQMPP.
 - c. The personnel and equipment that will be used to monitor water quality during the course of the project.
 - d. Contingency measures to be implemented if water quality violations occur.
- B. Submit characterization reports as specified in Section 31 00 00 - Earthwork and surveys as specified in Section 01 71 23 - Field Engineering for the following:
 1. Heavy Rock and Light Rock Riprap
 2. Filter Blanket
- C. Characterization requirements described in Section 31 00 00 - Earthwork may be waived by the Engineer if the Contractor demonstrates that the material is from a known source of natural origin and supplied by a commercial material supplier that certifies in writing that the material is free of chemical contaminants and provides certified laboratory data results representative of the source material.
- D. Submit a schedule of surveys that clearly illustrates how surveys will relate to the slope protection sequence of work. Surveys shall be as specified in Section 01 71 23 - Field Engineering.
- E. Submit survey results as specified herein and in Section 01 71 23 – Field Engineering.
- F. Weight Scale Tickets: Copies of certified scale tickets and certified records of slope protection material weights shall be submitted during progress of work and prior to payment being made for slope protection material delivered by land.
 1. Each scale ticket or record shall include gross weight, tare, and net weight of material.
 2. Copies of scale tickets and records shall accompany each load of material for all methods of transportation and a copy shall be delivered to the Engineer upon delivery.

- G. Certified displacement weight records from barge displacement weight data shall be submitted during progress of work and prior to payment being made for slope protection material delivered by barge.
- H. Certified barge displacement tables.

1.06 SITE CONDITIONS

A. Inherent Delays

- 1. The Contractor shall anticipate inherent delays while conducting slope protection work in the Blair Waterway. Inherent delays are primarily due to commercial shipping traffic within the shipping channel. Commercial shipping traffic shall have precedence over the Contractor's activities and may require them to stop, move, adjust, and/or slow down to accommodate vessel movement. The Contractor shall make allowance in its construction schedule for delays or interruptions due to vessel movement within the shipping channel in the waterway. The bid prices shall include allowances for such inherent delays.

B. Interference with Navigation

- 1. The Blair Waterway and Commencement Bay are active navigation corridors used for transport of deep-draft commerce activities. These activities shall take priority over the Contractor's operations. The Port's tenants and other entities using the waterway must have access along the project site for the duration of the construction contract. The Contractor shall conduct its operations in a manner that will minimize interference with those activities. In the event that the Contractor's construction equipment (tugs, floats, barges, workboats, anchors, lines, etc.) obstructs the navigable waterway so as to hinder movement of commercial vessels, the equipment shall immediately be moved to facilitate the shipping activity.
- 2. Any damage to the Contractor's equipment in navigation lanes due to the Contractor's failure to move when required shall be at the Contractor's sole risk and expense.

C. Protection of Existing Facilities

- 1. Any damage to the existing pier structure at the Husky Terminal and/or other existing facilities caused by the Contractor's operations, as determined by the Engineer, shall immediately be repaired to the pre-project condition at the Contractor's expense.
- 2. The Contractor's Riprap Slope Protection Work Plan shall include methods, procedures, and controls for the above protections.
- 3. Condition Survey of Existing Structures: The Contractor and Engineer shall review, document, and verify the condition of adjacent structures and appurtenances adjacent to the work areas prior to beginning work to ascertain existing conditions. Any damage documented as a result of the Contractor's activities will be repaired at no additional cost to the Port.

D. Security Concerns

- 1. For security and vessel navigation concerns, the Contractor shall give notice and receive required approval from the Engineer prior to berthing at any location along the Blair Waterway. The Contractor shall notify the Coast Guard as required to comply with Coast Guard and Port regulations for operating within the Blair Waterway and Commencement Bay.

1.07 MEASUREMENT FOR PAYMENT

- A. Each material placed as part of the slope protection system shall be measured by the ton (2,000 pounds), as stated in Section 01 20 00 - Price and Payment Procedures.

- B. Deductions to measured quantity of slope protection material will be made for material placed outside the tolerances of the design cross section. The overbuilt tonnages will be converted from survey volume cubic yards by using the following formula: $\text{Tons/CY} = 1.5$. No payment will be made for material placed outside the tolerances indicated herein.
- C. Progress payments will be based on progress surveys and records of weight of material upon delivery.
- D. Final payment will be based on surveys performed after placement of slope protection material is complete and records of weight of material upon delivery for quantities not previously paid as a progress payment.
- E. Weighting of material delivered by land:
 - 1. Material delivered by land shall be weighed on certified scales. Copies of weight certification shall be submitted to the Engineer. The tare weight shall be provided to determine the net weight of material delivered per each certificate.
 - 2. The tare weight of each truck shall be established as often as requested by the Engineer, but at a minimum of every two weeks.
 - 3. The Engineer will have the right to inspect and test the scales at any time. If the scales are found to be defective, then material deliveries shall cease until the scales have been placed in certified condition. If the scales are found to be defective in weight by five percent or more, and if the weights so obtained are greater than the correct weight, the percent defectiveness shall be deducted from tonnage of material delivered between the time the scale was discovered to be defective and the last prior time it was verified accurate. No correction in tonnage will be made for defective scales if the weights obtained are less than the correct weight.
 - 4. Vehicles used for delivery of slope protection material shall be plainly identified by unique numbers or symbols agreed upon by the Contractor and the Engineer prior to delivery of material. Such identification shall not be changed except by consent of the Engineer during the term of the work.
- F. Weighing of material delivered by barge:
 - 1. Facilities for verifying displacement and for determining the relation between draft tonnage, depth of water in the hold and bilges, and net rock tonnage shall be placed on the vessels by the Contractor in locations approved by the Engineer.
 - 2. Each vessel shall have not less than four protected gauge pads, at or near, the four vessel corners.
 - 3. Gauging and calibrating of the vessels shall be done in the presence of the Engineer. Calibrating shall be done at the start of the work and redone whenever there are changes in the vessels.
 - 4. Unloaded displacement shall be determined in still water, as close to the work as practicable. A certified displacement table, prepared by a licensed Professional Engineer or Marine Surveyor, shall be furnished to the Engineer for each vessel before it is used on the work.
 - 5. Fore and aft displacement, due to load, shall not differ more than one foot from the mean of the fore and aft gauge readings.
 - 6. Alteration of loading by transfer of crew supplies or pumping, will not be permitted while material is being discharged or between gauge readings.

PART 2 - PRODUCTS

2.01 MATERIALS AND PRODUCTS SHALL BE OF THE QUALITY, SIZE, SHAPE, AND GRADATION AS SPECIFIED IN THE CONTRACT DOCUMENTS, OR SHALL BE APPROVED BY THE ENGINEER AS EQUAL.

2.02 HEAVY ROCK RIPRAP:

- A. Heavy rock riprap shall consist of broken stone from an approved source that is hard, sound, dense, and durable. It shall be free from seams, cracks, and other defects that reduce its resistance to weather and seawater. Dry unit weight shall not be less than 160 pounds per solid cubic foot. Heavy rock riprap shall meet the following requirements:
 - 1. Specific Gravity (AASHTO T-85) 2.55 minimum
 - 2. LA Wear (AASHTO T-96) 50% maximum
 - 3. Degradation (WSDOT 113) 15 minimum
 - 4. Absorption (AASHTO T-85) 3% maximum
- B. Heavy rock riprap shall meet the requirements for "Heavy Loose Riprap" as defined in Section 9-13.1(1) of the WSDOT Standard Specifications.

2.03 LIGHT ROCK RIPRAP:

- A. Light rock riprap shall consist of broken stone from an approved source that is hard, sound, dense, and durable. It shall be free from seams, cracks, and other defects that reduce its resistance to weather and seawater. Dry unit weight shall not be less than 160 pounds per solid cubic foot. Light rock riprap shall meet the following requirements:
 - 1. Specific Gravity (AASHTO T-85) 2.55 minimum
 - 2. LA Wear (AASHTO T-96) 50% maximum
 - 3. Degradation (WSDOT 113) 15 minimum
 - 4. Absorption (AASHTO T-85) 3% maximum
- B. Light rock riprap shall consist of rock approximately 12 to 15 inches in size, with a maximum length of 18 inches in any dimension. The rock shall be angular, each piece having its greatest dimension not greater than three times its least dimension. Rock riprap shall be mixed with smaller rock meeting the requirements of filter blanket/ballast overlay material. Approximately one cubic yard of filter blanket/ballast material shall be required per three cubic yards of rock riprap.
- C. The size and grading of the rock may be varied if approved by the Engineer.

2.04 FILTER BLANKET:

- A. Filter Blanket material shall be crushed rock manufactured from rock of the same quality as rock for riprap, meeting the gradation requirements for "Gravel Borrow" as defined in Section 9-03.14(1) of the WSDOT Standard Specifications.

PART 3 - EXECUTION

3.01 SLOPE PROTECTION SURVEYS

- A. Contractor shall develop and make all detailed surveys necessary for construction of riprap slope protection, including progress surveys and pre- and post-placement surveys of the keyway and slope to verify that the slope protection materials have been placed in accordance with the lines and grades shown on the Drawings.

- B. The keyway at the toe of the slope shall be surveyed prior to riprap placement. The survey must be reviewed and approved by the Engineer prior to placement of riprap in the keyway. The keyway shall also be surveyed after all riprap placement is completed and after all piles have been installed to verify that the keyway has been constructed in accordance with the Drawings and has not been impacted by riprap sloughing during pile placement. The design elevation for the keyway is as shown on the Drawings with a tolerance of +0 / -1 feet. Contractor is responsible for maintaining the keyway elevation for the duration of the project.
- C. The slope shall be surveyed prior to and following placement of riprap slope protection as required herein to verify that the materials have been placed in accordance with the Drawings. The tolerance for riprap on the slope is +/-1.0 feet. Contractor is responsible for maintaining the riprap on the slope for the duration of the project.
- D. All hydrographic surveying shall be performed in accordance with ACOE EM-1110-2-1003 – Hydrographic Surveying.
- E. Accuracy for measured depth shall be +/- 0.5 feet; accuracy of horizontal position shall be +/- 3 feet at the 95 percent confidence interval.
- F. Hydrographic surveying using full-coverage acoustic multi-beam equipment shall be performed for portions of the slope below elevation -2 feet (MLLW). Field-run surveying may be performed in lieu of hydrographic surveying for portions of the slope above elevation -2 feet (MLLW). Field-run surveys above elevation -2 feet (MLLW) shall be performed along track lines running perpendicular to the shoreline and spaced at 25-foot intervals. Hydrographic and field-run survey data shall be combined into one file that represents the survey for the entire area surveyed.
- G. The final surveys for acceptance of the slope and keyway shall be completed by a certified Hydrographer.
- H. All Slope Protection Surveys shall be included in the Contractor's base bid under Bid Item "Field Engineering".
- I. See Section 01 71 23 – Field Engineering for additional survey requirements.

3.02 PLACEMENT:

- A. All riprap slope protection work shall be coordinated and performed in strict accordance with the permit requirements and the WQMPP. This specification section does not include all required protection measures, WQMPP mitigation measures, and BMPs associated with this project. The Contractor shall pay particular attention to the conditions of issued permits and the WQMPP, and applicable regulations and authorizations associated with this project. All protection measures, mitigation measures, and BMPs included in these documents shall be implemented by the Contractor.
- B. The intent of this work is to provide a compact blanket of rock riprap over indicated areas as shown on the Drawings. Placement of all slope protection materials shall be completed and the final surveys shall be submitted to the Port at least 15 days prior to the end of the in-water work period to allow time for any required reworking and/or high spot removal.
- C. The embankment slopes and keyway shall be dressed to the required line and grade by dredging, and surveyed prior to placement of slope protection materials. The post-dredge survey (see Section 35 20 23 – Dredging) shall be submitted to and approved by the Port prior to placement of filter blanket material. The Port will review the post-dredge survey and provide acceptance or disapproval within two (2) business days after submittal.
- D. All slope protection materials shall be placed starting from the lower elevations and working towards the higher elevations.

- E. Filter blanket material shall be placed on the prepared slopes to the full thickness and limits specified on the Drawings using methods that will not cause segregation of particle sizes or cause excessive mixing with the underlying prepared surface. The filter blanket thickness shown on the Drawings is a minimum thickness. Actual filter blanket thickness may exceed that shown on the Drawings to accommodate the dredged surface of the slope if over-dredging has occurred up to the maximum allowable over-dredge depth. Materials shall be uniformly deposited over the prepared slopes such that the surface of the layer is even and free from mounds or windrows. Dumping above the waterline for underwater placements shall be prohibited. Filter blanket material shall not be left exposed for more than four (4) calendar days after placement, including the time required for Port approval of the post-placement survey.
- F. Filter blanket material shall be surveyed to verify that the required minimum thickness and surface profile has been achieved prior to rock placement. The survey shall be submitted to and approved by the Port prior to placement of rock riprap. The Port will review the survey of Filter Blanket and provide acceptance or disapproval within two (2) business days after submittal of the survey.
- G. Place light rock riprap over filter blanket material in a manner that will not displace the underlying filter material, with the largest rock against the slope and the remainder of the rocks placed in progressively smaller sizes such that the smaller rock will key into the larger rock to form a tight blanket of protection against movement and erosion. Dress riprap to a uniform thickness as indicated on the Drawings.
- H. Place light rock riprap within the top 5 feet of the existing scour hole as indicated on the Drawings.
- I. Place heavy rock riprap over light rock riprap in a manner that will not displace the underlying material. The rock shall be placed so they form a tight blanket of protection.
- J. Riprap thicknesses shall be verified by surveying after rock placement. The Port will review the survey of rock riprap and provide acceptance or disapproval within two (2) business days after submittal.
- K. If the Contractor's placement methods do not provide satisfactory results as specified, as determined by the Engineer, then the Contractor shall change his placement methods to achieve satisfactory results. Changes to placement methods or reworking of placed materials shall occur at no additional cost to the Port. The Contractor shall update the RPWP to reflect changes and shall submit the updated RPWP to the Engineer.

3.03 MAINTENANCE:

- A. The Contractor shall maintain the accepted riprap blanket through the duration of construction and any material displaced by any cause shall be replaced to the lines and grades shown on the Drawings at no additional cost to the Port.

END OF SECTION

PART 1– GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following.
 - 1. Section 01 25 00 – Substitution Procedures
 - 2. Section 03 30 00 – Cast-in-Place Concrete
 - 3. Section 05 50 00 – Metal Fabrications
 - 4. Section 09 96 00 – High Performance Coatings

1.02 DESCRIPTION OF WORK

- A. The work includes designing, manufacturing, transporting, and installing a complete fender system (including 1 spare fender assembly) and all necessary materials, labor, and equipment to accomplish the work.
- B. Marine fenders consist of coated steel fender panels attached to energy-absorption rubber cone fenders and galvanized connection hardware as shown on the Drawings and in accordance with the specifications.
- C. The work includes covering the steel fender panels with an ultra high molecular weight polyethylene (UHMW-PE) facing, all bolts and miscellaneous connection hardware, shear chains, weight chains, tension chains, shackles; U-anchors; spacers, and embedded anchorages.

1.03 REFERENCES

- A. American Bureau of Shipping (ABS) “Rules for Building and Classing Steel Ships, Part 2 – Materials and Welding”.
- B. American Society for Testing Materials (ASTM), Standard Specifications and Standard Test Methods, designated by basic reference in this section (use the most current edition at the time of bid unless otherwise indicated).
- C. Permanent International Association of Navigation Congresses (PIANC), “Guidelines for the Design of Fender Systems: 2002”, Report of Working Group 33 – MARCOM, and “Appendix A – Procedure to Determine and Report the Performance of Marine Fenders” (PIANC 2002).
- D. Society for Protective Coatings (SSPC) Painting Manual, Volume II, 2008 Edition, “Systems and Specifications”.

1.04 QUALITY ASSURANCE

- A. The Port will provide inspection service for all site work in this section. Tests conducted for the sole benefit of the Contractor, or before a product is approved, shall be at the Contractor's expense.
- B. The fender manufacturer shall have a minimum of five years experience manufacturing rubber marine fenders of sizes similar to those specified and show proof thereof with installation references in accordance with this specification.
- C. Testing and reporting of fender performance shall be in accordance with PIANC 2002.
- D. Fender Performance Verification:

1. The performance of the fender shall be determined through testing and expressed by the value of the energy absorbed at the maximum value of the reaction load generated when the fender is compressed to its rated or maximum deflection.
2. In the performance testing of the fenders, compression shall be applied toward the top face of the fender. The compression speed shall follow current PIANC Fender Performance Testing guidelines and shall be recorded during testing. The fender is to be cycled for three times up to the designed deflection. Let the fender stand for at least one hour. Then, a fourth deflection cycle is to be performed using constant or decreasing velocity compression. The fourth cycle shall determine the fender performance. The room temperature at the time of the tests shall be recorded. Correction factors for the fender performance shall be determined per PIANC for a contact angle of approach of 10 degrees and the temperature recorded at the time of the test. The fenders shall achieve a performance within plus or minus 10 percent of the stated nominal design performance.
3. Performance tests must be conducted in the United States on 10% of the fenders from each Lot that are to be delivered to the jobsite by a testing agency independent to the manufacturer with a minimum of five years experience testing rubber marine fenders. The tested fenders shall be track-able by Lot number and match the Lot numbers of the remaining fenders regardless of when they are delivered to the jobsite. Failure to provide proof of tracking will be considered grounds for rejection. Acceptable fender performance testing agencies include the following:
 - a. University of Washington
Structural Research Laboratory
201 More Hall
Seattle, WA 98195
206-616-3530
Contact: Jeffrey Berman
 - b. Lehigh University
Fritz Engineering Laboratory
117 ATLSS Drive
Bethlehem, PA 18015
610-758-3497
Contact: Robin Hendricks
4. If any of the tested fenders fail to meet the performance required by the project specifications, then all of the remaining fenders shall be tested at the manufacturer's expense. All fenders that fail to meet the performance required by the specifications shall be rejected.
5. The specimens for testing and inspection of the materials, dimensions, and performance shall be sampled as specified below. The specimen to be used for the material tests shall be taken directly from the product or the rubber prepared in the quality check and under the condition of the same vulcanization process.
 - a. Break-in Cycle: All fenders.
 - b. Material: One set from the lot of compound for the manufacture of the fenders.
 - c. Dimensions: All fenders.

- d. Performance: 10% of all fenders.
- E. All panels shall be pressure tested and results must be approved by the Engineer prior to delivery of the panels.

1.05 SUBMITTALS

- A. The Contractor shall prepare bids based on the products and performance requirements indicated on the drawings and in this specification. Submit all data and test reports necessary to demonstrate product equivalence and achievement of performance requirements.
- B. The fender system submittal shall be presented in, or converted to, English units. Incomplete submittals or submittals without English units and appropriate reference standards will not be reviewed.
 - 1. List of at least 5 installations in the United States within the past five years demonstrating the experience required under the paragraph, "Quality Assurance". Provide project name, owner, contact name, email address, and telephone number for a minimum of 5 installations.
 - 2. Retain a Professional Engineer registered in the State of Washington who shall design the fender system and stamp the drawings, shop drawings, and design calculations.
 - 3. Shop drawings and catalog cuts of the fender units and coated steel fender panels showing complete fender system subassemblies such as chain systems, anchorage to the pier, relationships to bullrail, crane beam, pile cap reinforcement, etc.
 - 4. Proposed attachments or modifications of the fender system required to make connections of the cone fender to the panel and to the concrete face shall be shown on the shop drawings and be coordinated with the Contractor.
 - 5. Fender system selection and performance verification and testing data, including fender supplier, model number, size, performance curves showing energy and reaction load versus deflection for the range of contact angles specified, etc. Performance data shall be based on test results of the actual fender unit proposed, including size and grade of rubber. Test results shall not be adjusted for rate of loading different from that used in testing nor extrapolated from prototypical or scaled representations of the proposed fender unit. Performance curves for the fender elements showing energy and reaction as a function of displacement. Include performance characteristics of the unit fenders under shear and angular berthing conditions.
 - 6. Test results for the rubber and UHMW-PE demonstrating material compliance with the requirements herein.
- C. Qualifications of the independent testing laboratory for testing of rubber.
- D. Submit manufacturer verification that all fenders have undergone at least one break-in cycle as described herein.
- E. Documentation identifying the proposed coating system, meeting the requirements of Section 05 50 00 – Metal Fabrications and Section 09 96 00 – High Performance Coatings, including written confirmation from the manufacturer that the coating system is suitable for an aggressive marine environment in the Pacific Northwest.
- F. Furnish a written warranty stating that all components of each fender assembly, including anchorage hardware, are free of defects in material and workmanship for a minimum period of five (5) calendar years from the date of project substantial completion, and that all defects evident during that period shall be removed and replaced, without cost to the Port, within 90 days of notification.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Fender systems shall include rubber fender, protective fender panel, UHMW-PE facing, back cover plate, mounting plate, stiffeners, fittings, fasteners, metal fabrications, embedded anchorages, spacers, chains, and anchor bolts in accordance with the contract documents. If a backup stub is used, it shall be removable by means of mechanical fasteners.
- B. Each fender system assembly as depicted on the drawings is based on the performance, dimensions and material characteristics of a single Fender Team SPC 1200 G2.0 Super Circle Fender. The system proposed shall be equivalent to the Fender Team system. Submit all information, test reports, and product data necessary to demonstrate equivalence. The cost of all labor including any testing necessary to demonstrate equivalence shall be at the Contractor's expense.

2.02 RUBBER FENDER ELEMENTS

- A. Break-in each rubber fender before delivery to the site by subjecting it to one (1) complete compression cycle to its rated deflection. Provide manufacturer verification that all fenders have undergone at least one break-in cycle.
- B. The fender system shall meet the following requirements:
 - 1. Absorbing the full energy of the design vessels identified on Sheet S1.2 of the drawings when applied to any unit single fender assembly.
 - 2. Rubber fenders shall be cone-type fenders each with a minimum rated energy of 618 kip-ft (838 kN-m) and a maximum rated reaction per element of 300 kips (1335 kN). The maximum deflection at the rated values shall not exceed 72% of the total element height.
 - 3. Limit the hull reaction pressure to no more than 5.0 kips/sq ft (240 kN/sqm).
 - 4. Absorb the required energy when the fender face is compressed to its rated deflection, and skewed/rotated parallel with any approach angle between 0 and 10 degrees.
 - 5. There shall be no contact between the fender panel at its rated deflection and the pier structure.
- C. Install the fenders at the locations shown in the drawings with the standoff distance as indicated. All rubber fender elements shall be identical. The fender elements shall be sized to fit within the geometric constraints shown on the drawings and shall meet the performance criteria and material requirements.

2.03 RUBBER PROPERTIES

- A. Natural rubber or styrene butadiene rubber conforming to the following:

Property	Test Standard	Condition	Requirement
Tensile Strength	ASTM D 412, Die C	Original	16 MPa (min)
	ISO 37, 188	Aged for 96 hours at 70° C	12.8 MPa (min)
Elongation at Break	ASTM D 412, Die C	Original	400% (min)
	ISO 37, 188	Aged for 96 hours at 70° C	320% (min)

Hardness	ASTM D 2240	Original Aged for 96 hours at 70° C	78° Shore A (max) Original value + 8° points increase
Compression Set	ASTM D 395, Method B	Aged for 22 hours at 70° C	30% (max)
Tear Resistance	ASTM D 624, Die B	Original	70 kN/m (min)
Ozone Resistance	ASTM D 1149	50 pphm at 20% strain at 40° C for 100 hours	No visible cracking
Seawater Resistance	DIN 86076; Section 7.7	28 days in artificial seawater at 95° C $\pm$ 2° C	Hardness: $\pm$ 10° (max) Shore A $\pm$ 10° Vol. +10%, -5%
Abrasion Resistance	DIN 53516	Original	100 mm ³ (max)

- B. Test results furnished under different specifications than those listed above shall be accompanied by the fender manufacturer's documentation explaining how the furnished test results meet or exceed the test requirements listed above. Test results without this documentation shall be out of compliance with the section and will be rejected by the Engineer.

2.04 UHMW POLYETHYLENE FACING

- A. The ultra high molecular weight polyethylene (UHMW-PE) facing shall have minimum thickness, wear surface, and bearing area as shown on the drawings. UHMW-PE shall be made of 2-1/2% UV stabilized virgin resin conforming to ASTM D 4020 having UV-stabilized dyes and conforming to the following:
- B. Not Applicable

Property	Test Method	Acceptance Requirements
Specific Gravity	ASTM D 792	0.93 g/cm ³ (min)
Ultimate Tensile Strength	ASTM D 638	6,300 psi (min)
Izod Impact, Double Notch	ASTM D 256A	23-29 ft-lbs/notch
Abrasion	Sand Slurry	16
Water Absorption	ASTM D 570	Nil
Coefficient of Friction	ASTM D 1894	0.20 (max)
Hardness	ASTM D 785	63-68
Thermal Expansion	ASTM D 648	9.0x10 ⁻⁵ in/in/°F
Color	Not Applicable	Black

2.05 CHAINS AND SHACKLES

- A. Galvanized Grade 3 stud link chain in accordance with ABS. Provide each chain with compatible shackles and special links to adjust the length. Associated hardware shall conform with ABS requirements.

- B. Shackles shall be galvanized, drop-forged, with a working load limit greater than the chain using a minimum safety factor of 2.0 on chain working loads. Shackles shall be sized to connect all items and shall have a galvanized bolt, nut and cotter pin.
- C. Galvanized chains, shackles, turnbuckles, U-bolts, and their anchorages to both the concrete structure and the steel panel shall be sized to resist the appropriate design forces with a minimum factor of safety of 2.0. The design of the chains shall be based on the full contact pressure from paragraph 2.02.C.3 and a minimum friction coefficient, $\mu = 0.30$, for vertical (up and down) and horizontal (side to side) movement.

2.06 BOLTS AND MISCELLANEOUS HARDWARE

- A. The fender units and chains shall be fastened to the concrete structure with hot dip galvanized anchor bolts meeting ASTM F 1554 Grade 55, unless otherwise specified.
- B. Design and detail fender anchor bolts and anchor assemblies to not interfere with the reinforcing steel or other attachments. Embedded or surface mounted anchor assemblies shall be constructed of hot dip galvanized ASTM A 36, or ASTM A 572 steel. Minimum steel thickness shall be 1/2-inch. Design, supply, and install any additional reinforcing steel that may be needed, locally or otherwise, to transfer forces between the frontal panel and the pier structure.
- C. Fender panels shall be a closed, watertight, internally-stiffened, box-type design. Construct fender panels of ASTM A 36, or ASTM A 572, steel. Minimum steel thickness shall be 1/2-inch for exterior plates and 3/8-inch for interior stiffeners.
- D. UHMW-PE facing shall be attached to the fender panel with minimum 5/8" diameter AISI Type 316 stainless steel threaded studs. Size individual pieces of UHMW-PE facing such that the maximum distance between any adjacent fasteners, along perpendicular lines is 12 inches. Configure the fasteners such that the distance between any fastener centerline to the edge of the UHMW-PE piece is at least 1 1/2 inches and no more than 3 inches.
- E. Bevel all edges of the fender panel to provide a continuous bevel at the face. Configure the bevel so that it does not hook or catch a six (6) inch radius half-round belt. Provide a maximum 45-degree angle between the beveled face and flat face of the panel. Provide details on the shop drawings to show how this is accomplished.

2.07 SPARE PARTS

- A. Provide one spare complete fender assembly consisting of one steel fender panel with UHMW-PE facing and connectors for chains and cables, one rubber fender element, and all fender and panel mounting hardware.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install fenders at the locations shown on the drawings in an undamaged condition. Coordinate the fender design and fabrication with requirements for installing the fenders at connections in the concrete pier. Supply and use wooden or steel templates to accurately locate and align all elements to be embedded in concrete, including bullrail and pile cap reinforcing steel.
- B. Do not damage, cut, or tear the rubber or the fender assembly during installation. Canvas slings, wood cradles or other protective devices as recommended by the manufacturer shall be used. Hoisting and slinging by the rubber section may be permitted only when approved by the manufacturer and the Engineer.
- C. Protective UHMW-PE facing shall be pre-attached to the fender panel. The UHMW-PE thickness under the bolt head shall be a minimum of 1-inch. Individual protective facing panels

shall be chamfered a minimum of 3/4-inch on all 4 sides. Fender panels shall be set at the elevation indicated on the drawings.

- D. Coat fender panels in accordance with Section 09 96 00 – High-Performance Coatings.
- E. The fender units will be inspected after installation and be subject to approval by the Engineer. Damaged coatings shall be repaired in accordance with the coating supplier's recommendations.
- F. All chains and shackles shall be installed as indicated on the shop drawings. Chains shall be installed taut, with no slack.
- G. Expansion bolts for anchorage to concrete shall not be used. Drilled epoxy bonded anchor bolts or cast-in-place bolts shall be installed in accordance with the fender manufacturer's instructions and the approved shop drawings.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to the work as if specified in this section. Work related to this section is described in:
 - 1. Section 03 30 00 - Cast-in-Place Concrete
 - 2. Section 03 60 00 - Grouting
 - 3. Section 26 01 26 - Acceptance Testing of Electrical Systems
 - 4. Section 26 05 00 - Common Work Results for Electrical
 - 5. Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables
 - 6. Section 33 79 00 – Site Grounding

1.02 DESCRIPTION OF WORK

- A. The work under this section includes furnishing all materials, equipment, labor, supervision, tools and items necessary for the construction, installation, connection, testing and operation of all mechanical/electrical work for the capstan, as shown on the drawings and defined in this specification.

1.03 QUALITY ASSURANCE

- A. Substitutions: Conform to requirements in Section 01 25 00 - Substitution Procedures.
- B. Qualifications: Use sufficient journeyman and competent supervisors having at least five (5) years' experience in execution of the work to ensure proper and adequate installation.

1.04 SUBMITTALS

- A. Material Data Sheets for the following:
 - 1. Capstan and electric motor (AC).
 - 2. Electronic controls and motor starter.
 - 3. Reversing motor foot switch.
 - 4. Conductors and connectors
 - 5. Grounding conductors and connectors
- B. Dimensional shop drawings for the following:
 - 1. Capstan, foot switch with base plate and shield, and control box.
 - 2. Mounting and anchoring details including bolt pattern and materials.

1.05 WARRANTY

- A. Provide warranty certificate for each capstan system to be free from defects in material, equipment and workmanship under normal use and service up to one (1) year from date of project substantial completion, with repair or replacement at no cost to the Port, any material, equipment or workmanship found to be defective. The date of project substantial completion shall be recorded on a warranty certificate for each unit. The certificate is to be included in the Operation and Maintenance Manual as per Section 01 70 00 - Execution and Closeout Requirements.

- B. Provide a service contract to the Port that covers the schedule and costs for maintenance service and replacement, for an additional four (4) years after the one (1) year warranty has expired, that includes all capstan gear boxes, motors, motor starters, motor controls, and foot switches furnished under this contract warranted to be free from defects in material and workmanship under normal use and service.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. As a minimum the capstan shall have an electric drive, have a starting line pull of 10,000 lbs and a running line pull of 5,000 pounds with a rope speed of 75 feet per minute.
 - 1. Capstan motor shall be explosion proof, 3 phase - 60 Hertz - 480 Volts with a minimum power output of 15 horsepower.
 - 2. Electronic controls and motor starter shall have 120 VAC control voltage for forward and reverse and shall include an overload with reset, and an emergency stop pushbutton.
 - 3. Reversing motor foot switch shall be twin pedal, multi-directional forward and reverse, on separate SPDT circuits. Electrical rating shall be heavy pilot duty 250 VAC Max, momentary contact. Model shall be explosion proof and shall have an integral base plate and protective shield. The unit shall be supplied with a 3/4"-14 N.P.T. threaded rigid metal conduit entry and mounting provisions in the base plate.
 - 4. Anchor bolts shall be 1-1/2 inch x 38 inch, ASTM F1554, Grade 105, headed.

2.02 MANUFACTURERS

- A. Capstan: Washington Chain model FSC-15.
- B. Foot Switch: Line Master model 607 EX

PART 3 - EXECUTION

3.01 ELECTRICAL

- A. All electrical work, conduit, boxes and devices in connection with control wiring as required to install the control equipment as specified herein or shown on the drawings shall be furnished and installed by the Division 26 Contractor.
- B. All electrical work performed under this section of the specifications shall conform to all applicable portions of the Division 26 specifications and shall conform to all governing codes.
- C. All equipment shall be factory wired to the motor starter for connection to electrical service.
- D. Supply and install wiring from the electrical panel to the motor starter.

3.02 INSTALLATION

- A. Anchor bolts shall be pre-set for the capstan prior to placing concrete.
- B. Coordinate the location of the foot switch with the Port before installation. Drill holes for the anchor bolts and install the switch and shield in conformance with manufacturer's recommendations.
- C. Install the capstan with motor and motor starter, and controls as a complete and functioning system in compliance with all local, State and Federal codes.

3.03 TESTING

- A. Test the motor and equipment in conformance with Section 26 01 26 - Acceptance Testing of Electrical Systems.

3.04 SPARE PARTS

- A. Provide a case of oil per manufacturer's literature.

END OF SECTION