

PROPOSAL FOR
MARITIME PARK PROJECT
CITY OF HOBOKEN
HUDSON COUNTY, NEW JERSEY

THE UNDERSIGNED DECLARES THAT THEY HAVE READ AND UNDERSTAND THE PLANS AND SPECIFICATIONS AND PROPOSES TO FURNISH ALL LABOR, MATERIALS AND EQUIPMENT NECESSARY TO COMPLETE IN EVERY DETAIL THE WORK INDICATED ON THE PLANS AND/OR OUTLINED IN THE SPECIFICATIONS, AT THE PRICE QUOTED HEREIN.

BASE BID

<u>LINE ITEM</u>	<u>DESCRIPTION</u>	<u>UNIT</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>EXTENDED PRICE</u>
1	MOBILIZATION	LS	1		
2	CLEARING SITE	LS	1		
3	TEMPORARY SITE POWER	LS	1		
4	PHOTOGRAPHIC DOCUMENTATION	LS	1		
5	MATERIAL TESTING AND THIRD PARTY SPECIAL INSPECTIONS	LS	1		
6	UNIFORM TRAFFIC DIRECTORS	ALL	1	\$550,000.00	\$550,000.00
7	TRAFFIC CONTROL	ALL	1	\$50,000.00	\$50,000.00
8	CONTINGENCY - UNFORESEEN CONDITIONS	ALL	1	\$750,000.00	\$750,000.00
9	CONTINGENCY - SECURITY IMPROVEMENTS SITE WORK	ALL	1	\$100,000.00	\$100,000.00
10	EXCAVATION, HANDLING, AND DISPOSAL OF NON-HAZARDOUS MATERIALS	ALL	1	\$450,000.00	\$450,000.00
11	EXCAVATION, HANDLING, AND DISPOSAL OF HAZARDOUS MATERIALS	ALL	1	\$125,000.00	\$125,000.00
12	EARTH MOVING	LS	1		
13	GROUND IMPROVEMENT	SF	14,879		
14	EXCAVATION, TEST PIT	CY	100		
15	4" PERFORATED HIGH DENSITY POLYETHYLENE PIPE, WALL SUBDRAIN	LF	204		
16	4" PERFORATED HIGH DENSITY POLYETHYLENE PIPE, PLANTING SUBDRAIN	LF	262		
17	6" SDR-35 SOLID POLYVINYL CHLORIDE SEWER PIPE SKATEPARK PIPE	LF	348		
18	6" HIGH DENSITY POLYETHYLENE PIPE	LF	94		
19	12" HIGH DENSITY POLYETHYLENE PIPE	LF	134		
20	15" HIGH DENSITY POLYETHYLENE PIPE	LF	0		
21	24" HIGH DENSITY POLYETHYLENE PIPE	LF	242		
22	24" BACKFLOW PREVENTER	UN	1		
23	24" OUTFALL SCUPPER WITH WELDED COPPER SHEETING	LS	1		

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24	DRAINAGE MANHOLE, 3' DIAMETER	UN	8		
25	DECORATIVE MANHOLE COVER	UN	8		
26	INLET, TYPE 'E'	UN	1		
27	CLEANOUT, 4"	UN	15		
28	SKATEPARK DRAIN, 10" ROUND STRAINER	UN	11		
29	YARD DRAIN, 12"	UN	5		
30	YARD DRAIN, 24"	UN	1		
31	CONNECT TO EXISTING INLET	UN	1		
32	TEMPORARY CONSTRUCTION - CAST IN PLACE CONCRETE PAVING	SY	734		
33	TEMPORARY CONSTRUCTION - CHAIN LINK FENCE, 8' HIGH, POWDER COATED BLACK	LF	17		
34	SITE UTILITY IMPROVEMENTS - WATER SITE WORK	LS	1		
35	SITE UTILITY IMPROVEMENTS - ELECTRICAL SITE WORK	LS	1		
36	SITE UTILITY IMPROVEMENTS - IRRIGATION SITE WORK AND IRRIGATION SYSTEM	LS	1		
37	SKATE PARK	LS	1		
38	SKATE PARK STEPS AND HANDRAIL	LS	1		
39	STONE UNIT PAVING	SY	169		
40	PRECAST CONCRETE UNIT PAVING	SY	206		
41	HUDSON RIVER WATERFRONT WALKWAY UNIT PAVING	SY	620		
42	COBBLE STONE	SY	20		
43	FLAGSTONE PAVER	SY	33		
44	DECOMPOSED GRANITE PAVING	SY	62		
45	STABILIZED DECOMPOSED GRANITE PAVING	SY	125		
46	DECORATIVE GRAVEL	LF	1,100		
47	CAST IN PLACE CONCRETE PAVING	SY	374		

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48	STEEL HEADER/METAL EDGE	LF	643		
49	STONE BOULDERS	UN	190		
50	STONE BLOCK	UN	10		
51	STACKED STONE WALL	LF	209		
52	DRINKING FOUNTAIN	UN	1		
53	HUDSON RIVER WATERFRONT WALKWAY POLE	UN	6		
54	PARK POLE	UN	4		
55	SKATEPARK POLE	UN	4		
56	BOLLARD (INCLUDING FOUNDATION)	UN	12		
57	SPOTLIGHT (POLE MOUNTED)	UN	12		
58	GOBO PROJECTOR (POLE MOUNTED)	UN	6		
59	SPORTS LIGHTING (POLE MOUNTED)	UN	8		
60	LIGHTING CONTROL DEVICES	LS	1		
61	ELEMENT SIGN	UN	10		
62	SKATEPARK SIGN	UN	2		
63	ENTRY SIGN	UN	1		
64	EDUCATIONAL SIGNAGE	UN	2		
65	PLANT SCHEDULE UPLAND - TREES	UN	41		
66	PLANT SCHEDULE UPLAND - SHRUBS	UN	396		
67	PLANT SCHEDULE UPLAND - FERNS	UN	67		
68	PLANT SCHEDULE UPLAND - PERENNIALS	SF	706		
69	PLANT SCHEDULE UPLAND - GROUND COVERS	SF	676		
70	PLANT SCHEDULE UPLAND - GRASSES	SF	2,414		
71	PLANT SCHEDULE TRANSITIONAL UPLAND - SHRUBS	UN	28		

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72	PLANT SCHEDULE TRANSITIONAL UPLAND - GROUND COVERS	SF	676		
73	PLANT SCHEDULE LOW MARSH - GROUND COVERS	SF	8,028		
74	PLANT SCHEDULE SHORELINE STAIR PLANTINGS - SHRUBS	UN	14		
75	PLANT SCHEDULE SHORELINE STAIR PLANTINGS - GROUND COVERS	SF	317		
76	PLANT SCHEDULE SHORELINE STAIR PLANTINGS - SEED MIX	SF	317		
77	PLANT SCHEDULE NORTH REVETMENT - SHRUBS	UN	66		
78	PLANT SCHEDULE NORTH REVETMENT - SEED MIX	SF	810		
79	PLANT SCHEDULE SOUTH REVETEMENT - SHRUBS	UN	64		
80	PLANT SCHEDULE SOUTH REVETEMENT - SEED MIX	SF	609		
81	PLANTING SOIL	SF	5,862		
82	SAND-BASED STRUCTURAL SOIL	SF	651		
83	SHORELINE PLANTING SOIL	SF	12,767		
84	WATERFOWL BARRIER FENCE	LF	510		
85	PLANT PROTECTION FENCE	LF	261		
86	MARITIME PARK GUARDRAIL	LF	113		
87	HUDSON RIVER WATERFRONT GUIDERAIL	LF	39		
88	HUDSON GET DOWN RAIL	LF	44		
89	ADA KICKRAIL	LF	16		
90	STEEL MESH FENCE	LF	229		
91	LOUNGER	UN	3		
92	HUDON RIVER WATERFRONT WALKWAY BENCH	UN	8		
93	MARITIME PARK BENCH	UN	6		
94	GUARDRAIL MOUNTED LIFE RING CABINET	UN	1		
95	ELEVATED ELECTRICAL PLATFORM	LS	1		

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96	HUDSON RIVER WALKWAY COMBI-WALL	LF	374		
97	HUDSON RIVER WALKWAY COMBI-WALL CONCRETE CAP (TYPE I, II, III & IV)	LF	374		
98	TIDAL POOL COMBI-WALL	LF	336		
99	TIDAL POOL COMBI-WALL CONCRETE CAP (TYPE V)	LF	336		
100	PRECAST ECONCRETE TIDAL POOL PANELS	LF	336		
101	SOUTHERN SEAWALL TIE-IN	LS	1		
102	NORTHERN SEAWALL TIE-IN	LS	1		
103	TIDE POOL BAFFLE	UN	2		
104	RIPRAP ARMOR STONE, D50 12"	TONS	836		
105	RIPRAP ARMOR STONE, D50 18"	TONS	22		
106	RIPRAP BEDDING STONE, 6" THICK	SY	959		
107	GEOTEXTILE	SY	1,980		
108	SANDY MARSH PLANTING MEDIUM	CY	550		
109	HUDSON RIVER WALKWAY GET-DOWN SUPPORT STRUCTURE	LS	1		
110	COIR LOG	LF	120		
111	PERFORATED CORRUGATED DRAIN PIPE, 4" DIA.	LF	264		
112	CONCRETE RETAINING WALL, TYPE I	LF	37		
113	CONCRETE RETAINING WALL, TYPE II	LF	73		
114	CONCRETE RETAINING WALL, TYPE III	LF	261		
115	SELECT GRANULAR BACKFILL FOR TIDAL POOL	CY	2,940		
116	CLEAN DRAINAGE STONE	CY	275		
117	REMOVE & DISPOSE OF EXISTING SEAWALL	LS	1		
118	REMOVE & DISPOSE OF EXISTING ISLAND DOLPHIN	LS	1		
119	CONCRETE EDGE COPING	LF	152		

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120	LIGHT POLE FOUNDATION, TYP.	UN	10		
121	LIGHT POLE FOUNDATION, TYPE YG3	UN	4		
122	ECOLOGICAL TIDE POOL UNIT	UN	5		
123	GEOTECHNICAL INVESTIGATION	LS	1		
124	DEMARCATON GEOTEXTILE	SY	19,800		

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ALTERNATE A - TEMPORARY TREE NURSERY

<u>LINE ITEM</u>	<u>DESCRIPTION</u>	<u>UNIT</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>EXTENDED PRICE</u>
A1	TEMPORARY TREE NURSERY	LS	1		

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COMPANY NAME SUBMITTING BID

AUTHORIZED OFFICIAL PRINT NAME

AUTHORIZED OFFICIAL SIGNATURE

INITIAL:

COMPANY SUBMITTING BID:

56P8

MARITIME PARK IMPROVEMENTS LIST OF TECHNICAL SPECIFICATIONS



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DIVISION 01 - GENERAL REQUIREMENTS

01 21 00	Allowances	CED
01 22 00	Unit Prices	CED
01 25 00	Substitution Procedures	CED
01 26 00	Modification Procedures	CED
01 26 13	Contractor's Request for Information	CED
01 29 00	Applications for Payment	CED
01 31 00	Project Management and Coordination:	
	Adjacent Project Coordination	CED
01 31 13	Project Management and Coordination	CED
01 31 19	Project Meetings	CED
01 32 00	Construction Progress Documentation	CED
01 33 00	Submittal Procedures	CED
01 40 00	Quality Requirements	CED
01 45 23	Testing and Inspection	CED
01 50 00	Mobilization	CED
01 52 00	Temporary Facilities and Controls	CED
01 56 29	Temporary Construction Fence and Gates	CED
01 60 00	Product Requirements	CED
01 73 00	Execution Requirements	CED
01 73 29	Cutting and Patching	CED
01 77 00	Closeout Procedures	CED
01 78 23	Operation and Maintenance Data	CED

DIVISION 02 - EXISTING CONDITIONS

02 32 00	Geotechnical Investigation	CED
02 41 00	Demolition	CED
02 41 16	Structure Demolition	CED
02 50 00	Site Remediation	CED
02 60 00	Contaminated Site Material Removal	CED

DIVISION 03 – CONCRETE

03 10 00	Concrete Forming and Accessories	CED
03 20 00	Concrete Reinforcing	CED
03 30 00	Cast-In-Place Concrete	CED
03 41 00	Precast Structural Concrete	CED

DIVISION 05 - METALS

05 12 00	Structural Steel	CED
05 50 00	Site Metal Fabrications	SCAPE
05 52 13	Pipe and Tubing Rails	CED
05 73 00	Decorative Metal Railings	SCAPE

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

07 78 39	Project Record Documents	CED
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DIVISION 09 – FINISHES

09 97 13	Coatings for Steel Waterfront Structures	CED
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DIVISION 22 – PLUMBING

22 11 13	Facility Water Distribution Piping	CED
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DIVISION 26 – ELECTRICAL

26 00 10	Supplemental Requirements for Electrical	CED
26 05 19	Low-Voltage Electrical Power Conductors and Cables	CED
26 05 26	Grounding and Bonding Electrical Systems	CED
26 05 29	Hangers and Supports for Electrical Systems	CED
26 05 33	Raceway and Boxes for Electrical Systems	CED
26 05 53	Identification for Electrical Systems	CED
26 24 16	Panelboards	CED
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26 50 10	Architectural Lighting	LAM

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

28 23 00	Site Utility Coordination – Security	CED
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DIVISION 31 - EARTHWORK

31 10 00	Site Clearing	CED
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31 20 00	Earth Moving	CED
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31 23 19	Dewatering – Civil	CED
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31 23 19	Dewatering - Structural	CED
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31 25 00	Erosion and Sedimentation Controls	CED
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31 32 19	Ground Improvements by Rapid Impact Compaction	CED
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31 37 00	Riprap and Bedding	CED
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31 50 00	Excavation Support and Protection - Civil	CED
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31 50 00	Excavation Support and Protection - Structural	CED
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31 62 00	Driven Piles	CED
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31 62 16	Steel Piles	CED
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31 62 19	Drilled Concrete-Filled Steel Pipe Piles	CED
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DIVISION 32 – EXTERIOR IMPROVEMENTS

32 01 90	Temporary Nursery	SCAPE
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32 11 23	Aggregate Base Course	CED
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32 12 16	Asphalt Paving	CED
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32 13 16	Decorative Concrete Paving	SCAPE
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32 14 00	Unit Paving	SCAPE
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32 14 13	Precast Concrete Unit Paving	CED
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32 15 42	Aggregate Surfacing	SCAPE
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32 16 13	Concrete Vertical Curb	CED
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32 16 23	Sidewalks	CED
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32 31 13	Chain Link Fences and Gates	CED
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32 31 19	Decorative Metal Fences and Gates	SCAPE
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32 32 19	Stone Masonry	SCAPE
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32 32 23	Concrete Segmental Retaining Wall	CED
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32 33 00	Site Furnishings	SCAPE
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32 62 18	Steel Sheet Piles	CED
32 84 00	Planting Irrigation	HINES
32 91 15	Planting Soils	P&S
32 91 17	Coir Logs	EDD
32 91 20	Sandy Planting Medium	EDD
32 93 00	Planting Materials	SCAPE
32 93 11	Marsh Plug Planting	EDD
32 93 12	Upland and Shoreline Stair Planting	EDD
32 93 13	Planted Revetment	EDD
32 96 00	Salt Marsh Waterfowl Barrier	EDD

DIVISION 33 - UTILITIES

33 01 10	Site Utility Coordination – Sanitary	CED
33 10 00	Site Utility Coordination – Water	CED
33 40 00	Site Utility Coordination - Stormwater	CED
33 40 01	Video Inspection of Pipe	CED
33 41 19	Landscape Drainage	SCAPE
33 42 00	Stormwater Conveyance	CED
33 42 00	Miscellaneous Structures	CED
33 51 00	Site Utility Coordination – Gas	CED
33 70 00	Electrical Utilities	CED
33 71 00	Electrical Codes and Fees	CED
33 72 00	Electrical Tests	CED
33 74 00	Electrical Conduits	CED
33 75 00	Electrical Control	CED
33 77 00	Site Utility Coordination - Electrical	CED
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31 10 10 Site Selective Clearing	ASD
31 23 10 Site Subgrade Preparation	ASD

APPENDICES

A	NJDEP Permit Status Statement	CED
B	Geotechnical Memo	
	Prepared by Colliers Engineering & Design	CED
C	City of Hoboken PLA Agreement	CED
D	Lighting Toolbox	LAM

SECTION 01 22 00

UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for unit prices.

B. Related Requirements:

1. Section 012100 "Allowances" for procedures for using unit prices to adjust quantity allowances.

1.2 DEFINITIONS

A. Unit price is an amount incorporated into the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.

B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A schedule of unit prices is included in the Proposal. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

E. Lump Sum Prices: Contractor shall be made aware that the Contractor shall provide a schedule of values for each Lump Sum Item for the City's review and approval upon award of the Contract. These schedule of values will be utilized as a way of tracking the release of payment for each lump sum item.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

ITEM 1. MOBILIZATION:

- A. Description: MOBILIZATION shall include requirements for all activities and provisions necessary for the mobilization of the Contractor's workforce, equipment, temporary facilities, and materials to the project site. Mobilization is defined as the preparatory work and operations required to move personnel, equipment, supplies, and incidentals to the site of the work in order to initiate construction activities. Various construction activities and project management items throughout the Contract may be paid for through this section as called out in other sections, as required, in accordance with Section 01 50 00 "MOBILIZATION."
- B. Unit of Measurement: LUMP SUM.
- C. Contractor is to be made aware of various construction activities and project management items within the Contract Documents that may be paid for through this line item.
- D. **Contractor shall be made aware that the Contractor shall provide a schedule of value for this Lump Sum Price upon contract award.**

ITEM 2. CLEARING SITE:

- A. Description: CLEARING SITE shall include but is not limited to saw-cutting existing pavement, removal and disposal of concrete curb, sidewalk, driveways, bituminous pavement, pavers, pipe, inlets, sanitary sewer manholes, pipes & laterals, irrigation pipes, valves, electrical lines, fences, foundations, scoreboards, miscellaneous debris, soils, lawn, trees, tree stumps, landscaping, and any other work required to prepare the site for construction, in accordance with Section 31 10 00 "SITE CLEARING."
- B. Unit of Measurement: LUMP SUM.
- C. Contractor is to be made aware of various construction activities and project management items within the Contract Documents that may be paid for through this line item.
- D. **Contractor shall be made aware that the Contractor shall provide a schedule of value for this Lump Sum Price upon contract award.**

ITEM 3. TEMPORARY SITE POWER

- A. Description: Temporary Site Power shall consist of all the required coordination, cost, material, and labor to bring in temporary power as needed to provide for the various electrical components needed throughout the start up, duration, and closeout of the project.
- B. Unit of Measurement: Lump Sum.
- C. **Lump Sum Prices: Contractor shall be made aware that the Contractor shall provide a schedule of value for this Lump Sum Price upon contract award.**

ITEM 4. PHOTOGRAPHIC DOCUMENTATION

- A. Description: Photographic Documentation shall include but is not limited to the documentation of Preconstruction Photographs, Daily Construction Photographs, Final Completion Construction Photographs, Preconstruction Video Recordings, Live Construction Video Recordings, and Web-Based Construction Photographic Documentation.**
- B. Unit of Measurement: Lump Sum.**
- C. Lump Sum Prices: Contractor shall be made aware that the Contractor shall provide a schedule of value for this Lump Sum Price upon contract award.**

ITEM 5. MATERIAL TESTING AND THIRD PARTY SPECIAL INSPECTIONS

- A. Description: The Contractor shall be made aware that the Contractor is responsible to engage, hire, and utilize a third party for material testing and hire a Third Party for any required Special Inspections as needed to construct all items within the Contract Documents. The Contractor shall be made aware that the Contractor is responsible to engage, hire, and utilize a geotechnical firm to monitor, review, and approve the subbase of all improvements within the Contract Documents.**
- B. Unit of Measurement: Lump Sum.**
- C. Lump Sum Prices: Contractor shall be made aware that the Contractor shall provide a schedule of value for this Lump Sum Price upon contract award.**

ITEM 6. UNIFORM TRAFFIC DIRECTORS:

- A. Description: UNIFORMED TRAFFIC DIRECTORS shall be hired by the contractor. The contractor shall pay the police department for uniformed traffic directors, which costs shall be paid for under the traffic director pay item. The costs shall be directly reimbursed to the contractor at the current set hourly rate without markup of the price**
- B. Unit of Measurement: ALLOWANCE.**
- C. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 012100 "Allowances."**

ITEM 7. TRAFFIC CONTROL:

- A. Description: TRAFFIC CONTROL includes the cost for all Traffic Control items other than Uniformed Traffic Directors. All costs breakaway barricades, drums, traffic cones, construction signs, creation of traffic control plans, flaggers, traffic devices, safety fences, variable message signs, detouring, and all other work and material described in the Maintenance and Protection of Traffic Control Plans be paid for through this item.**
- B. Unit of Measurement: ALLOWANCE.**
- C. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 012100 "Allowances."**

ITEM 8. CONTINGENCY – UNFORESEEN CONDITIONS:

- A. Description: CONTINGENCY – UNFORESEEN CONDITIONS includes all costs related to unforeseen construction activities that at the approval of the City may be paid for through this allowance.
- B. Unit of Measurement: ALLOWANCE.
- C. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 012100 "Allowances."

ITEM 9. CONTINGENCY – SECURITY IMPROVEMENTS SITE WORK:

- A. Description: CONTINGENCY – SECURITY IMPROVEMENTS SITE WORK includes all costs related to any additional site work that the City may request in order to install any security features to the park during construction. Should the City wish to install security features, it may require additional site work by the general contractor for this project. This allowance would be set aside and a quote for this additional work would be reviewed and approved prior to any additional work being undertaken.
- B. Unit of Measurement: ALLOWANCE.
- C. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 012100 "Allowances."

ITEM 10. EXCAVATION, HANDLING, AND DISPOSAL OF NON-HAZARDOUS MATERIALS:

- A. Description: EXCAVATION, HANDLING, AND DISPOSAL OF NON-HAZARDOUS MATERIALS includes all costs of all activities related to, but not be limited to, excavation, handling, and disposal of non-hazardous materials. This consists of disposal of material off-site, vehicle costs, stakeout and movement of all material to meet the final grades as described on the project plans and to the satisfaction of the Engineer, and unclassified excavation for installation of all proposed site features, pavement, sidewalks, utilities, curb, etc. The contractor shall account for all soil movement activity including off-site disposal, as well as material testing, within the allotted allowance.
- B. Unit of Measurement: ALLOWANCE.
- C. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 012100 "Allowances."

ITEM 11. EXCAVATION, HANDLING, AND DISPOSAL OF HAZARDOUS MATERIALS:

- A. Description: EXCAVATION, HANDLING, AND DISPOSAL OF HAZARDOUS MATERIALS includes all costs of all activities related to, but not be limited to, excavation, handling, and disposal of hazardous materials. This consists of disposal of material off-site, vehicle costs, stakeout and movement of all material to meet the final grades as described on the project plans and to the satisfaction of the Engineer, and unclassified excavation for installation of all proposed site features, pavement, sidewalks, utilities, curb, etc. The contractor shall account for all soil movement activity including off-site disposal, as well as material testing, within the allotted allowance.
- B. Unit of Measurement: ALLOWANCE.
- C. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in

Section 012100 "Allowances."

ITEM 12. EARTH MOVING:

- A. Description: EARTH MOVING includes all costs for all excavation, borrow certified clean fill, and site grading required for the installation and construction of all proposed improvements described on the project plans, regardless of the material encountered, in conformance with the final grades provided on the project plans. The work shall also include import of clean fill as needed to develop the proposed improvements not associated with other materials in the proposal.
- B. Unit of Measurement: LUMP SUM.
- C. **Lump Sum Prices: Contractor shall be made aware that the Contractor shall provide a schedule of value for this Lump Sum Price upon contract award.**

ITEM 13. GROUND IMPROVEMENT:

- A. **Description: This item shall consist of furnishing all labor, equipment, materials, and supervision necessary to perform rapid impact compaction (RIC) to densify existing loose or fill soils in place to the specified depth and within the project limits shown on the plans. The work includes mobilization of specialized RIC equipment, field layout of treatment zones, compaction operations, and field testing to confirm achieved improvement. The RIC process shall involve repeated high-energy impacts delivered by a hydraulic hammer through a steel tamper foot to transmit energy into the ground, improving bearing capacity and reducing post-construction settlement. The contractor shall monitor and record key parameters such as impact energy, number of blows, and ground deflection at each compaction point. Work shall include coordination with the geotechnical engineer for pre- and post-treatment testing (e.g., cone penetration testing or dynamic probing) and any required surface grading or restoration following compaction. Payment under this item shall include all incidental work, materials, testing, and documentation necessary to complete the RIC operation in accordance with the contract documents.**
- B. **Unit of Measurement: SQUARE FOOT.**

ITEM 14. EXCAVATION, TEST PIT:

- A. Description: Excavation of test pits to locate existing utilities and subsurface conditions. Includes traffic control, sheeting/shoring, backfilling with compacted suitable material, and restoration of pavement or landscaping disturbed. EXCAVATION, TEST PIT includes all costs for all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended. Test pits will be directed on an if and where directed basis determined by need throughout construction as directed by the City or Engineer.
- B. Unit of Measurement: CUBIC YARD.

ITEM 15. 4" PERFORATED HIGH DENSITY POLYETHYLENE PIPE, WALL SUBDRAIN:

- A. Description: Furnishing and installing 4" Perforated High Density Polyethylene Pipe, Wall Subdrain, including trench excavation, sheeting, shoring, bedding, pipe laying,

jointing, connections, backfilling, compaction, testing, cleaning, and surface restoration. Includes fittings, couplings, and all appurtenances required for a complete installation. 4" PERFORATED HIGH DENSITY POLYETHYLENE PIPE, WALL SUBDRAIN includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 16. 4" PERFORATED HIGH DENSITY POLYETHYLENE PIPE, PLANTING SUBDRAIN:

A. Description: Furnishing and installing 4" Perforated High Density Polyethylene Pipe, Planting Subdrain, including trench excavation, sheeting, shoring, bedding, pipe laying, jointing, connections, backfilling, compaction, testing, cleaning, and surface restoration. Includes fittings, couplings, and all appurtenances required for a complete installation. 4" PERFORATED HIGH DENSITY POLYETHYLENE PIPE, PLANTING SUBDRAIN includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 17. 6" SDR-35 SOLID POLYVINYL CHLORIDE SEWER PIPE SKATEPARK PIPE:

A. Description: Furnishing and installing 6" Polyvinyl Chloride Sewer Pipe, including trench excavation, sheeting, shoring, bedding, pipe laying, jointing, connections, backfilling, compaction, testing, cleaning, and surface restoration. Includes fittings, couplings, and all appurtenances required for a complete installation. 6" POLYVINYL CHLORIDE SEWER PIPE includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 18. 6" HIGH DENSITY POLYETHYLENE PIPE:

A. Description: Furnishing and installing 6" High Density Polyethylene Pipe, including trench excavation, sheeting, shoring, bedding, pipe laying, jointing, connections, backfilling, compaction, testing, cleaning, and surface restoration. Includes fittings, couplings, and all appurtenances required for a complete installation. 6" HIGH DENSITY POLYETHYLENE PIPE includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 19. 12" HIGH DENSITY POLYETHYLENE PIPE:

A. Description: Furnishing and installing 12" High Density Polyethylene Pipe, including trench excavation, sheeting, shoring, bedding, pipe laying, jointing, connections, backfilling, compaction, testing, cleaning, and surface restoration. Includes fittings, couplings, and all appurtenances required for a complete installation. 12" HIGH DENSITY POLYETHYLENE PIPE includes all labor, equipment, materials, tools,

incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 20. 15" HIGH DENSITY POLYETHYLENE PIPE:

A. Description: Furnishing and installing 15" High Density Polyethylene Pipe, including trench excavation, sheeting, shoring, bedding, pipe laying, jointing, connections, backfilling, compaction, testing, cleaning, and surface restoration. Includes fittings, couplings, and all appurtenances required for a complete installation. 15" HIGH DENSITY POLYETHYLENE PIPE includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 21. 24" HIGH DENSITY POLYETHYLENE PIPE:

A. Description: Furnishing and installing 24" High Density Polyethylene Pipe, including trench excavation, sheeting, shoring, bedding, pipe laying, jointing, connections, backfilling, compaction, testing, cleaning, and surface restoration. Includes fittings, couplings, and all appurtenances required for a complete installation. 24" HIGH DENSITY POLYETHYLENE PIPE includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 22. 24" BACKFLOW PREVENTER:

A. Description: Furnishing and installing 24" Backflow Preventer, including fabrication, welding, fittings, anchorage, protective coatings, and integration with drainage systems. Includes excavation, pipe connections, restoration of surfaces, and testing. 24" BACKFLOW PREVENTER cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 23. 24" OUTFALL SCUPPER WITH WELDED COPPER SHEETING:

A. Description: Furnishing and installing 24" Outfall Scupper With Welded Copper Sheeting, including fabrication, welding, fittings, anchorage, protective coatings, and integration with drainage systems. Includes excavation, pipe connections, restoration of surfaces, and testing. 24" OUTFALL SCUPPER WITH WELDED COPPER SHEETING cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LUMP SUM.

C. Lump Sum Prices: Contractor shall be made aware that the Contractor shall provide a schedule of value for this Lump Sum Price upon contract award.

ITEM 24. DRAINAGE MANHOLE, 3' DIAMETER:

- A. Description: Furnishing and installing Drainage Manhole, 3' Diameter, including excavation, base preparation, precast or cast-in-place structure, frames and covers, steps, pipe penetrations, joint sealing, and backfilling. Includes connections to existing utilities, testing for watertightness, and surface restoration. DRAINAGE MANHOLE, 3' DIAMETER cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: UNIT.

ITEM 25. DECORATIVE MANHOLE COVER:

- A. Description: Furnishing and installing Decorative Manhole Cover, including excavation, base preparation, precast or cast-in-place structure, frames and covers, steps, pipe penetrations, joint sealing, and backfilling. Includes connections to existing utilities, testing for watertightness, and surface restoration. DECORATIVE MANHOLE COVER cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: UNIT.

ITEM 26. INLET, TYPE 'E':

- A. Description: Furnishing and installing Inlet, Type 'E', including excavation, base preparation, precast or cast-in-place structure, frames and covers, steps, pipe penetrations, joint sealing, and backfilling. Includes connections to existing utilities, testing for watertightness, and surface restoration. INLET, TYPE 'E' cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: UNIT.

ITEM 27. CLEANOUT, 4":

- A. Description: Furnishing and installing Cleanout, 4", including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. CLEANOUT, 4" cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: UNIT.

ITEM 28. SKATEPARK DRAIN, 10" ROUND STRAINER:

- A. Description: Furnishing and installing Skatepark Drain, 10" Round Strainer, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. SKATEPARK DRAIN, 10" ROUND

STRAINER cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 29. YARD DRAIN, 12":

A. Description: Furnishing and installing Yard Drain, 12", including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. YARD DRAIN, 12" cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 30. YARD DRAIN, 24":

A. Description: Furnishing and installing Yard Drain, 24", including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. YARD DRAIN, 24" cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 31. CONNECT TO EXISTING INLET:

A. Description: Furnishing and installing Connection to Existing Inlet, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. CONNECT TO EXISTING INLET cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 32. TEMPORARY CONSTRUCTION - CAST IN PLACE CONCRETE PAVING:

A. Description: Furnishing and installing Temporary Construction - Cast In Place Concrete Paving, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. TEMPORARY CONSTRUCTION - CAST IN PLACE CONCRETE PAVING cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: SQUARE YARD.

ITEM 33. TEMPORARY CONSTRUCTION – CHAIN LINK FENCE, 8' HIGH, POWDER COATED BLACK:

A. Description: Furnishing and installing Temporary Construction – Chain Link Fence, 8' High, Powder Coated Black, including all associated work necessary to provide a complete and functional installation, in accordance with the

Contract Documents. TEMPORARY CONSTRUCTION – CHAIN LINK FENCE, 8' HIGH, POWDER COATED BLACK cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 34. SITE UTILITY IMPROVEMENTS - WATER SITE WORK:

A. Description: Furnishing and installing Site Utility Improvements - Water Site Work, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. All materials and labor not named as a specific line item as it relates to the water improvements and details shall be included in the lump sum bid item. SITE UTILITY IMPROVEMENTS - WATER SITE WORK cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LUMP SUM.

C. Lump Sum Prices: Contractor shall be made aware that the Contractor shall provide a schedule of value for this Lump Sum Price upon contract award.

ITEM 35. SITE UTILITY IMPROVEMENTS - ELECTRICAL SITE WORK:

A. Description: Furnishing and installing Site Utility Improvements - Electrical Site Work, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. SITE UTILITY IMPROVEMENTS - ELECTRICAL SITE WORK cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended. All materials and labor not named as a specific line item as it relates to the electrical improvements and details shall be included in the lump sum bid item.

B. Unit of Measurement: LUMP SUM.

C. Lump Sum Prices: Contractor shall be made aware that the Contractor shall provide a schedule of value for this Lump Sum Price upon contract award.

ITEM 36. SITE UTILITY IMPROVEMENTS - IRRIGATION SITE WORK AND IRRIGATION SYSTEM:

A. Description: Furnishing and installing Site Utility Improvements - Irrigation Site Work And Irrigation System, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. SITE UTILITY IMPROVEMENTS - IRRIGATION SITE WORK AND IRRIGATION SYSTEM cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended. All materials and labor not named as a specific line item as it relates to the irrigation improvements and details shall be included in the lump sum bid item.

B. Unit of Measurement: LUMP SUM.

- C. Lump Sum Prices: Contractor shall be made aware that the Contractor shall provide a schedule of value for this Lump Sum Price upon contract award.**

ITEM 37. SKATE PARK:

- A. Description: Furnishing and installing Skate Park, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. SKATE PARK cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended. All work as stated within the ASD Contract Documents shall be included within this item.
- B. Unit of Measurement: LUMP SUM.
- C. Lump Sum Prices: Contractor shall be made aware that the Contractor shall provide a schedule of value for this Lump Sum Price upon contract award.**

ITEM 38. SKATE PARK STEPS AND HANDRAIL:

- A. Description: Furnishing and installing Skate Park Steps and Handrail, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. SKATE PARK STEPS AND HANDRAIL cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended. All work as stated within the ASD Contract Documents shall be included within this item.
- B. Unit of Measurement: LUMP SUM.
- C. Lump Sum Prices: Contractor shall be made aware that the Contractor shall provide a schedule of value for this Lump Sum Price upon contract award.**

ITEM 39. STONE UNIT PAVING:

- A. Description: Furnishing and installing Stone Unit Paving, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. STONE UNIT PAVING cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: SQUARE YARD.

ITEM 40. PRECAST CONCRETE UNIT PAVING:

- A. Description: Furnishing and installing Precast Concrete Unit Paving, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PRECAST CONCRETE UNIT PAVING cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: SQUARE YARD.

ITEM 41. HUDSON RIVER WATERFRONT WALKWAY UNIT PAVING:

- A. Description: Furnishing and installing Hudson River Waterfront Walkway Unit Paving, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. HUDSON RIVER WATERFRONT WALKWAY UNIT PAVING cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: SQUARE YARD.

ITEM 42. COBBLE STONE:

- A. Description: Furnishing and installing Cobble Stone, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. COBBLE STONE cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: SQUARE YARD.

ITEM 43. FLAGSTONE PAVER:

- A. Description: Furnishing and installing Flagstone Paver, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. FLAGSTONE PAVER cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: SQUARE YARD.

ITEM 44. DECOMPOSED GRANITE PAVING:

- A. Description: Furnishing and installing Decomposed Granite Paving, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. DECOMPOSED GRANITE PAVING cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: SQUARE YARD.

ITEM 45. STABILIZED DECOMPOSED GRANITE PAVING:

- A. Description: Furnishing and installing Stabilized Decomposed Granite Paving, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. STABILIZED DECOMPOSED GRANITE PAVING cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: SQUARE YARD.

ITEM 46. DECORATIVE GRAVEL:

- A. Description: Furnishing and installing Decorative Gravel, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. DECORATIVE GRAVEL cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: LINEAR FOOT.

ITEM 47. CAST IN PLACE CONCRETE PAVING:

- A. Description: Furnishing and installing Cast In Place Concrete Paving, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. CAST IN PLACE CONCRETE PAVING cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: SQUARE YARD.

ITEM 48. STEEL HEADER/METAL EDGE:

- A. Description: Furnishing and installing Steel Header/Metal Edge, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. STEEL HEADER/METAL EDGE cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: LINEAR FOOT.

ITEM 49. STONE BOULDERS:

- A. Description: Furnishing and installing Stone Boulders, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. STONE BOULDERS cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: UNIT.

ITEM 50. STONE BLOCK:

- A. Description: Furnishing and installing Stone Block, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. STONE BLOCK cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: UNIT.

ITEM 51. STACKED STONE WALL:

A. Description: Furnishing and installing Stacked Stone Wall, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. STACKED STONE WALL cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 52. DRINKING FOUNTAIN:

A. Description: Furnishing and installing Drinking Fountain, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. DRINKING FOUNTAIN cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 53. HUDSON RIVER WATERFRONT WALKWAY POLE:

A. Description: Furnishing and installing Hudson River Waterfront Walkway Pole, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. HUDSON RIVER WATERFRONT WALKWAY POLE cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 54. PARK POLE:

A. Description: Furnishing and installing Park Pole, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PARK POLE cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 55. SKATEPARK POLE:

A. Description: Furnishing and installing Skatepark Pole, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. SKATEPARK POLE cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 56. BOLLARD (INCLUDING FOUNDATION):

A. Description: Furnishing and installing Bollard (Including Foundation), including all

associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. BOLLARD (INCLUDING FOUNDATION) cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 57. SPOTLIGHT (POLE MOUNTED):

A. Description: Furnishing and installing Spotlight (Pole Mounted), including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. SPOTLIGHT (POLE MOUNTED) cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 58. GOBO PROJECTOR (POLE MOUNTED):

A. Description: Furnishing and installing Gobo Projector (Pole Mounted), including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. GOBO PROJECTOR (POLE MOUNTED) cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 59. SPORTS LIGHTING (POLE MOUNTED):

A. Description: Furnishing and installing Sports Lighting (Pole Mounted), including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. SPORTS LIGHTING (POLE MOUNTED) cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 60. LIGHTING CONTROL DEVICES:

A. Description: Furnishing and installing Lighting Control Devices, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. LIGHTING CONTROL DEVICES cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LUMP SUM.

C. Lump Sum Prices: Contractor shall be made aware that the Contractor shall provide a schedule of value for this Lump Sum Price upon contract award.

ITEM 61. ELEMENT SIGN:

- A. Description: Furnishing and installing Element Sign, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. ELEMENT SIGN cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: UNIT.

ITEM 62. SKATEPARK SIGN:

- A. Description: Furnishing and installing Skatepark Sign, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. SKATEPARK SIGN cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: UNIT.

ITEM 63. ENTRY SIGN:

- A. Description: Furnishing and installing Entry Sign, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. ENTRY SIGN cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: UNIT.

ITEM 64. EDUCATIONAL SIGNAGE:

- A. Description: Furnishing and installing Education Signage, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. EDUCATIONAL SIGNAGE cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: UNIT.

ITEM 65. PLANT SCHEDULE UPLAND – TREES:

- A. Description: Furnishing and installing Plant Schedule Upland - Trees, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PLANT SCHEDULE UPLAND - TREES cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: UNIT.

ITEM 66. PLANT SCHEDULE UPLAND – SHRUBS:

- A. Description: Furnishing and installing Plant Schedule Upland - Shrubs, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PLANT SCHEDULE UPLAND - SHRUBS cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 67. PLANT SCHEDULE UPLAND – FERNS:

- A. Description: Furnishing and installing Plant Schedule Upland - Ferns, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PLANT SCHEDULE UPLAND - FERNS cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 68. PLANT SCHEDULE UPLAND – PERENNIALS:

- A. Description: Furnishing and installing Plant Schedule Upland - Perennials, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PLANT SCHEDULE UPLAND - PERENNIALS cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: SQUARE FOOT.

ITEM 69. PLANT SCHEDULE UPLAND – GROUND COVERS:

- A. Description: Furnishing and installing Plant Schedule Upland – Ground Covers, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PLANT SCHEDULE UPLAND – GROUND COVERS cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: SQUARE FOOT.

ITEM 70. PLANT SCHEDULE UPLAND – GRASSES:

- A. Description: Furnishing and installing Plant Schedule Upland - Grasses, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PLANT SCHEDULE UPLAND - GRASSES cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: SQUARE FOOT.

ITEM 71. PLANT SCHEDULE TRANSITIONAL UPLAND – SHRUBS:

- A. Description: Furnishing and installing Plant Schedule Transitional Upland - Shrubs, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PLANT SCHEDULE TRANSITIONAL UPLAND - SHRUBS cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 72. PLANT SCHEDULE TRANSITIONAL UPLAND – GROUND COVERS:

- A. Description: Furnishing and installing Plant Schedule Transitional Upland – Ground Covers, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PLANT SCHEDULE TRANSITIONAL UPLAND – GROUND COVERS cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: SQUARE FOOT.

ITEM 73. PLANT SCHEDULE LOW MARSH - GROUND COVERS:

- A. Description: Furnishing and installing Plant Schedule Low Marsh - Ground Covers, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PLANT SCHEDULE LOW MARSH - GROUND COVERS cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: SQUARE FOOT.

ITEM 74. PLANT SCHEDULE SHORELINE STAIR PLANTINGS – SHRUBS:

- A. Description: Furnishing and installing Plant Schedule Shoreline Stair Plantings - Shrubs, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PLANT SCHEDULE SHORELINE STAIR PLANTINGS - SHRUBS cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 75. PLANT SCHEDULE SHORELINE STAIR PLANTINGS - GROUND COVERS:

- A. Description: Furnishing and installing Plant Schedule Shoreline Stair Plantings - Ground Covers, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PLANT SCHEDULE SHORELINE STAIR PLANTINGS - GROUND COVERS cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: SQUARE FOOT.

ITEM 76. PLANT SCHEDULE SHORELINE STAIR PLANTINGS – SEED MIX:

- A. Description: Furnishing and installing Plant Schedule Shoreline Stair Plantings – Seed Mix, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PLANT SCHEDULE SHORELINE STAIR PLANTINGS – SEED MIX cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: SQUARE FOOT.

ITEM 77. PLANT SCHEDULE NORTH REVETMENT – SHRUBS:

- A. Description: Furnishing and installing Plant Schedule North Revetment - Shrubs, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PLANT SCHEDULE NORTH REVETMENT - SHRUBS cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: UNIT.

ITEM 78. PLANT SCHEDULE NORTH REVETMENT – SEED MIX:

- A. Description: Furnishing and installing Plant Schedule North Revetment – Seed Mix, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PLANT SCHEDULE NORTH REVETMENT – SEED MIX cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: SQUARE FOOT.

ITEM 79. PLANT SCHEDULE SOUTH REVETMENT – SHRUBS:

- A. Description: Furnishing and installing Plant Schedule South Revetment - Shrubs, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PLANT SCHEDULE SOUTH REVETMENT - SHRUBS cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: UNIT.

ITEM 80. PLANT SCHEDULE SOUTH REVETMENT – SEED MIX:

- A. Description: Furnishing and installing Plant Schedule South Revetment – Seed Mix, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PLANT SCHEDULE NORTH REVETMENT – SEED MIX cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: SQUARE FOOT.

ITEM 81. PLANTING SOIL:

- A. Description: Furnishing and installing Planting Soil, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PLANTING SOIL cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: SQUARE FOOT.

ITEM 82. SAND-BASED STRUCTURAL SOIL:

- A. Description: Furnishing and installing Sand-Based Structural Soil, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. SAND-BASED STRUCTURAL SOIL cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: SQUARE FOOT.

ITEM 83. SHORELINE PLANTING SOIL:

- A. Description: Furnishing and installing Shoreline Planting Soil, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. SHORELINE PLANTING SOIL cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: SQUARE FOOT.

ITEM 84. WATERFOWL BARRIER FENCE:

- A. Description: Furnishing and installing Waterfowl Barrier Fence, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. WATERFOWL BARRIER FENCE cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: LINEAR FOOT.

ITEM 85. PLANT PROTECTION FENCE:

- A. Description: Furnishing and installing Plant Protection Fence, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PLANT PROTECION FENCE cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: LINEAR FOOT.

ITEM 86. MARITIME PARK GUARDRAIL:

A. Description: Furnishing and installing Maritime Park Guardrail, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. MARITIME PARK GUARDRAIL cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 87. HUDSON RIVER WATERFRONT GUIDERAIL:

A. Description: Furnishing and installing Hudson River Waterfront Guiderail, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. HUDSON RIVER WATERFRONT GUIDERAIL cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 88. HUDSON GET DOWN RAIL:

A. Description: Furnishing and installing Hudson Get Down Rail, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. HUDSON GET DOWN RAIL cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 89. ADA KICKRAIL:

A. Description: Furnishing and installing ADA Kickrail, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. ADA KICKRAIL cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 90. STEEL MESH FENCE:

A. Description: Furnishing and installing Steel Mesh Fence, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. STEEL MESH FENCE cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 91. LOUNGER:

A. Description: Furnishing and installing Lounger, including all associated work

necessary to provide a complete and functional installation, in accordance with the Contract Documents. LOUNGER cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 92. HUDSON RIVER WATERFRONT WALKWAY BENCH:

A. Description: Furnishing and installing Hudson River Waterfront Walkway Bench, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. HUDSON RIVER WATERFRONT WALKWAY BENCH cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 93. MARITIME PARK BENCH:

A. Description: Furnishing and installing Maritime Park Bench, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. MARITIME PARK BENCH cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 94. GUARDRAIL MOUNTED LIFE RING CABINET:

A. Description: Furnishing and installing Guardrail Mounted Life Ring Cabinet, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. GUARDRAIL MOUNTED LIFE RING CABINET cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 95. ELEVATED ELECTRICAL PLATFORM:

A. Description: Furnishing and installing Elevated Electrical Platform, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. ELEVATED ELECTRICAL PLATFORM cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LUMP SUM.

C. Lump Sum Prices: Contractor shall be made aware that the Contractor shall provide a schedule of value for this Lump Sum Price upon contract award.

ITEM 96. HUDSON RIVER WALKWAY COMBI-WALL:

- A. Description: Furnishing and installing Hudson River Walkway Combi-Wall, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. HUDSON RIVER WALKWAY COMBI-WALL cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 97. HUDSON RIVER WALKWAY COMBI-WALL CONCRETE CAP (TYPE I, II, III & IV):

- A. Description: Furnishing and installing Hudson River Walkway Combi-Wall Concrete Cap (Type I, II, III & IV), including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. HUDSON RIVER WALKWAY COMBI-WALL CONCRETE CAP (TYPE I, II, III & IV) cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 98. TIDAL POOL COMBI-WALL:

- A. Description: Furnishing and installing Tidal Pool Combi-Wall, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. TIDAL POOL COMBI-WALL cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 99. TIDAL POOL COMBI-WALL CONCRETE CAP (TYPE V):

- A. Description: Furnishing and installing Tidal Pool Combi-Wall Concrete Cap (Type V), including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. TIDAL POOL COMBI-WALL CONCRETE CAP (TYPE V) cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 100. PRECAST ECONCRETE TIDAL POOL PANELS:

- A. **Description: Furnishing and installing Precast Econcrete Tidal Pool Panels, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PRECAST ECONCRETE TIDAL POOL PANELS cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.**

B. **Unit of Measurement: LINEAR FOOT.**

ITEM 101. SOUTHERN SEAWALL TIE-IN:

- A. Description: Furnishing and installing Southern Seawall Tie-In, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. SOUTHERN SEAWALL TIE-IN cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: LUMP SUM.
- C. **Lump Sum Prices: Contractor shall be made aware that the Contractor shall provide a schedule of value for this Lump Sum Price upon contract award.**

ITEM 102. NORTHERN SEAWALL TIE-IN:

- A. Description: Furnishing and installing Northern Seawall Tie-In, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. NORTHERN SEAWALL TIE-IN cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: LUMP SUM.
- C. **Lump Sum Prices: Contractor shall be made aware that the Contractor shall provide a schedule of value for this Lump Sum Price upon contract award.**

ITEM 103. TIDE POOL BAFFLE:

- A. Description: Furnishing and installing Tide Pool Baffle, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. TIDE POOL BAFFLE cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.
- B. Unit of Measurement: UNIT.

ITEM 104. RIPRAP ARMOR STONE, D50 12":

- A. **Description: Furnishing and installing Riprap Armor Stone, D50 12", including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. RIPRAP ARMOR STONE, D50 12" cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.**
- B. **Unit of Measurement: TONS.**

ITEM 105. RIPRAP ARMOR STONE, D50 18":

- A. Description: Furnishing and installing Riprap Armor Stone, D50 18", including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. RIPRAP ARMOR STONE, D50 18" cost

includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: TONS.

ITEM 106. RIPRAP BEDDING STONE, 6" THICK:

A. Description: Furnishing and installing Riprap Bedding Stone, 6" Thick, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. RIPRAP BEDDING STONE, 6" THICK cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: SQUARE YARD.

ITEM 107. GEOTEXTILE:

A. Description: Furnishing and installing Geotextile, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. GEOTEXTILE cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: SQUARE YARD.

ITEM 108. SANDY MARSH PLANTING MEDIUM:

A. Description: Furnishing and installing Sandy Marsh Planting Medium, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. SANDY MARSH PLANTING MEDIUM cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: CUBIC YARD.

ITEM 109. HUDSON RIVER WALKWAY GET-DOWN SUPPORT STRUCTURE:

A. Description: Furnishing and installing Hudson River Walkway Get-Down Support Structure, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. HUDSON RIVER WALKWAY GET-DOWN SUPPORT STRUCTURE cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LUMP SUM.

C. Lump Sum Prices: Contractor shall be made aware that the Contractor shall provide a schedule of value for this Lump Sum Price upon contract award.

ITEM 110. COIR LOG:

- A. Description: Furnishing and installing Coir Log, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. COIR LOG cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 111. PERFORATED CORRUGATED DRAIN PIPE, 4" DIA.:

- A. Description: Furnishing and installing Perforated Corrugated Drain Pipe, 4" Dia., including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. PERFORATED CORRUGATED DRAIN PIPE, 4" DIA. cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 112. CONCRETE RETAINING WALL, TYPE I:

- A. Description: Furnishing and installing Concrete Retaining Wall, Type I, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. CONCRETE RETAINING WALL, TYPE I cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 113. CONCRETE RETAINING WALL, TYPE II:

- A. Description: Furnishing and installing Concrete Retaining Wall, Type II, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. CONCRETE RETAINING WALL, TYPE II cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 114. CONCRETE RETAINING WALL, TYPE III:

- A. Description: Furnishing and installing Concrete Retaining Wall, Type III, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. CONCRETE RETAINING WALL, TYPE III cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 115. SELECT GRANULAR BACKFILL FOR TIDAL POOL:

- A. Description: Furnishing and installing Select Granular Backfill For Tidal Pool,**

including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. SELECT GRANULAR BACKFILL FOR TIDAL POOL cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: CUBIC YARD.

ITEM 116. CLEAN DRAINAGE STONE:

A. Description: Furnishing and installing Clean Drainage Stone, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. CLEAN DRAINAGE STONE cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: CUBIC YARD.

ITEM 117. REMOVE & DISPOSE OF EXISTING SEAWALL:

A. Description: Furnishing and installing Remove & Dispose of Existing Seawall, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. REMOVE & DISPOSE OF EXISTING SEAWALL cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LUMP SUM

C. Lump Sum Prices: Contractor shall be made aware that the Contractor shall provide a schedule of value for this Lump Sum Price upon contract award.

ITEM 118. REMOVE & DISPOSE OF EXISTING ISLAND DOLPHIN:

A. Description: Furnishing and installing Remove & Dispose of Existing Island Dolphin, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. REMOVE & DISPOSE OF EXISTING ISLAND DOLPHIN cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LUMP SUM.

C. Lump Sum Prices: Contractor shall be made aware that the Contractor shall provide a schedule of value for this Lump Sum Price upon contract award.

ITEM 119. CONCRETE EDGE COPING:

A. Description: Furnishing and installing Concrete Edge Coping, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. CONCRETE EDGE COPING cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LINEAR FOOT.

ITEM 120. LIGHT POLE FOUNDATION, TYP.:

A. Description: Furnishing and installing Light Pole Foundation, Typ., including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. LIGHT POLE FOUNDATION, TYP. cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 121. LIGHT POLE FOUNDATION, TYPE YG3:

A. Description: Furnishing and installing Light Pole Foundation, Type YG3, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. LIGHT POLE FOUNDATION, TYPE YG3 cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 122. ECOLOGICAL TIDE POOL UNIT:

A. Description: Furnishing and installing Ecological Tide Pool Unit, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. ECOLOGICAL TIDE POOL UNIT cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: UNIT.

ITEM 123. GEOTECHNICAL INVESTIGATION:

A. Description: Furnishing and installing Geotechnical Investigation, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. GEOTECHNICAL INVESTIGATION cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LUMP SUM.

C. Lump Sum Prices: Contractor shall be made aware that the Contractor shall provide a schedule of value for this Lump Sum Price upon contract award.

ITEM 124. DEMARCATION GEOTEXTILE:

A. Description: Furnishing and installing Demarcation Geotextile, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. DEMARCATION GEOTEXTILE cost

includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: SQUARE YARD.

ITEM A1. TEMPORARY TREE NURSERY

A. Description: Furnishing and installing Temporary Tree Nursery, including all associated work necessary to provide a complete and functional installation, in accordance with the Contract Documents. TEMPORARY TREE NURSERY cost includes all labor, equipment, materials, tools, incidentals, delivery, installation, testing, restoration, safety measures, overhead, insurance, and profit required to complete the Work as intended.

B. Unit of Measurement: LUMP SUM.

C. Lump Sum Prices: Contractor shall be made aware that the Contractor shall provide a schedule of value for this Lump Sum Price upon contract award.

END OF SECTION 01 22 00

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance.
- B. Product options.
- C. Product substitution procedures.

1.2 QUALITY ASSURANCE

- A. **Contractor's bid cost is to be based on the basis of design products and standards noted in the Contract Documents. Contractor shall not submit bid based on any anticipated substitution requests. Any substitution requests or requests for consideration of as equal products will only be evaluated with a requisite value engineering proposal for review and approval by the Engineer.**
- B. Products specified define standard of quality, type, function, dimension, appearance, and performance required.
- C. Substitution Proposals: Permitted for specified products except where specified otherwise. Do not substitute products unless substitution has been accepted and approved in writing by Owner.

1.3 PRODUCT OPTIONS (NOT USED)

1.4 PRODUCT SUBSTITUTION PROCEDURES

- A. Engineer will consider requests for substitutions upon discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
- B. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.
- C. Document each request with complete data, substantiating compliance of proposed substitution with Contract Documents, including:
 - 1. Manufacturer's name and address, product, trade name, model, or catalog number, performance and test data, and reference standards.
 - 2. Itemized point-by-point comparison of proposed substitution with specified product, listing variations in quality, performance, and other pertinent characteristics.
 - 3. Reference to Article and Paragraph numbers in Specification Section.
 - 4. Cost data comparing proposed substitution with specified product and amount of net change to Contract Sum.
 - 5. Changes required in other Work.

6. Availability of maintenance service and source of replacement parts as applicable.
7. Certified test data to show compliance with performance characteristics specified.
8. Samples when applicable or requested.
9. Other information as necessary to assist Engineer's evaluation.

D. A request constitutes a representation that Contractor:

1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
2. Will provide same warranty for substitution as for specified product.
3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension that may subsequently become apparent.
5. Will coordinate installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.
6. Will reimburse Owner for review or redesign services associated with reapproval by authorities having jurisdiction.

E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals without separate written request or when acceptance will require revision to Contract Documents.

F. Substitution Submittal Procedure:

1. Submit requests for substitutions on CSI Form 13.1A Substitution Request-After the Bidding/Negotiating Stage.
2. Submit three copies of Request for Substitution for consideration. Limit each request to one proposed substitution.
3. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
4. Engineer will notify Contractor in writing of decision to accept or reject request.

1.5 INSTALLER SUBSTITUTION PROCEDURES

A. Engineer will consider requests for substitutions upon discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

B. Document each request with:

1. Installer's qualifications.
2. Installer's experience in work similar to that specified.
3. Other information as necessary to assist Engineer's evaluation.

C. Substitution Submittal Procedure:

1. Submit three copies of Request for Substitution for consideration. Limit each request to one proposed substitution.
2. Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 01 25 00

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes administrative and procedural requirements for documenting the progress of construction during performance of the work, including but not limited to, the following:
 - 1. Preliminary Construction Schedule.
 - 2. Contractor's Construction Schedule.
 - 3. Submittals Schedule.
 - 4. Daily construction reports.
 - 5. Material location reports.
 - 6. Field condition reports.
 - 7. Special reports.
 - 8. Construction photographs.

1.3 RELATED SECTIONS

- A. Project Management and Coordination - Section 01 31 13.
- B. Project Meetings - Section 01 31 19.
- C. Submittal Procedures - Section 01 33 00.
- D. Closeout Procedures - Section 01 77 00.

1.4 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
 - 2. Predecessor activity is an activity that must be completed before a given activity can be started.

- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by the Engineer.**
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- D. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time belongs to Owner.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- H. Major Area: A story of construction, a separate building, or a similar significant construction element.
- I. Milestones: A key or critical point in time for reference or measurement.
- J. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.5 INFORMATIONAL SUBMITTALS

- A. Startup construction schedule.**
 - 1. Approval of cost loaded, startup construction schedule will not constitute approval of schedule of values for cost loaded activities.**
- B. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.**
- C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.**
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.**
- D. Qualification Data: For firms and persons specified in "Quality Assurance" Article and in-house scheduling personnel to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Engineers and owners, and other information specified.
- E. Submittals Schedule: Contractor to submit a PDF copy of initial submittals schedule and then

update every two weeks.

Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
 2. Specification Section number and title.
 3. Submittal category (action or informational).
 4. Name of subcontractor.
 5. Description of the Work covered.
 6. Scheduled date for Engineer's final release.
- F. Preliminary Construction Schedule: Submit PDF.
- G. Preliminary Network Diagram: Submit PDF.
- H. Construction Schedule Updating Reports: Submit with Applications for Payment.
- I. CPM Reports: Concurrent with CPM schedule, submit three printed copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float.
1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 3. Total Float Report: List of all activities sorted in ascending order of total float.
 4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.
- J. Daily Construction Reports: Submit weekly intervals.
- K. Material Location Reports: Submit at weekly intervals.
- L. Site Condition Reports: Submit at time of discovery of differing conditions.
- M. Special Reports: Submit at time of unusual event.
- N. Construction Photographs: Submit within seven days of taking photographs.
1. Format: Digital.
 2. Identification:
 - a. Name of Project.
 - b. Name and address of photographer.
 - c. Name of Engineer.
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

3. Submit Flash Drive of photographs.

- O. Qualification Data: For scheduling consultant.

1.6 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting.
- B. Photographer Qualifications: An individual of established reputation who has been regularly engaged as a professional photographer for not less than three years.
- C. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013113 "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:
 1. Review software limitations and content and format for reports.
 2. Verify availability of qualified personnel needed to develop and update schedule.
 3. Discuss constraints, including work stages, area separations, interim milestones, and partial Owner occupancy.
 4. Review delivery dates for Owner-furnished products.
 5. Review schedule for work of Owner's separate contracts.
 6. Review time required for review of submittals and resubmittals.
 7. Review requirements for tests and inspections by independent testing and inspecting agencies.
 8. Review time required for completion and startup procedures.
 9. Review and finalize list of construction activities to be included in schedule.
 10. Review submittal requirements and procedures.
 11. Review procedures for updating schedule.

1.7 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 1. Secure time commitments for performing critical elements of the Work from parties involved.
 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.
- C. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities including temporary lighting.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
 - 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
 - 2. Initial Submittal: Submit concurrently with preliminary network diagram. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for commencement of the Work to date of Final Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Engineer.
 - 2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 - 4. Startup and Testing Time: Include not less than 10 days for startup and testing.
 - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Engineer's administrative procedures necessary for certification of Substantial Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.
 - 1. Phasing: Arrange list of activities on schedule by phase.
 - 2. Work Under More Than One Contract: Include a separate activity for each contract.
 - 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.

4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date. Delivery dates indicated stipulate the earliest possible delivery date.
5. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
6. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Startup and placement into final use and operation.
7. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Completion of bulkhead installation.
 - b. Completion of living shoreline.
 - c. Completion of Henry Hudson Walkway.
 - d. Completion of Skate Park.
 - e. Completion of electrical installation.
 - f. Completion of water service installation.
 - g. Substantial Completion.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
- F. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.
- G. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.
- H. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

2.3 STARTUP CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule:** Submit startup horizontal bar-chart-type construction schedule within seven days of date established for Notice of Award.
- B. Preparation:** Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt Chart Schedule:** Submit a comprehensive, fully developed, horizontal, Gantt chart type, Contractor's construction schedule within 30 days of date established for the Notice of Award. Base schedule on the startup construction schedule and additional information received since the start of Project.
- B. Preparation:** Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 - 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.**

2.5 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General:** Prepare network diagrams using AON (activity-on-node) format.
- B. Preliminary Network Diagram:** Submit diagram within 14 days of date established for commencement of the Work. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule:** Prepare Contractor's Construction Schedule using a cost and resource loaded, time scaled CPM network analysis diagram for the work. Scheduling software shall be Primavera P6 V 22 or later.
 - 1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for commencement of the Work.**
 - 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.**
 - 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.**
 - 4. Use "one workday" as the unit of time.**
- D. CPM Schedule Preparation:** Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.
 - 1. Activities:** Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.**
 - b. Purchase of materials.**
 - c. Delivery.**
 - d. Fabrication.**

- e. Installation.
- 2. Processing: Process data to produce output data or a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
- 3. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Sub-networks on separate sheets are permissible for activities clearly off the critical path.
- E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
 - 1. Contractor or subcontractor and the Work or activity.
 - 2. Description of activity.
 - 3. Principal events of activity.
 - 4. Immediately preceding and succeeding activities.
 - 5. Early and late start dates.
 - 6. Early and late finish dates.
 - 7. Activity duration in workdays.
 - 8. Total float or slack time.
 - 9. Average size of workforce.
 - 10. Dollar value of activity (coordinated with the Schedule of Values).
- F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
 - 1. Identification of activities that have changed.
 - 2. Changes in early and late start dates.
 - 3. Changes in early and late finish dates.
 - 4. Changes in activity duration in workdays.
 - 5. Changes in the critical path.
 - 6. Changes in total float or slack time.
 - 7. Changes in the Contract Time.
- G. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
 - 1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
 - 2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.

3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
 - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
 - b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.6 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. High and low temperatures and general weather conditions.
 5. Accidents.
 6. Meetings and significant decisions.
 7. Unusual events (refer to special reports).
 8. Stoppages, delays, shortages, and losses.
 9. Meter readings and similar recordings.
 10. Emergency procedures.
 11. Orders and requests of authorities having jurisdiction.
 12. Change Orders received and implemented.
 13. Construction Change Directives received.
 14. Services connected and disconnected.
 15. Equipment or system tests and startups.
 16. Partial Completions and occupancies.
 17. Substantial Completions authorized.
- B. Material Location Reports: At monthly intervals, prepare a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.
- C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.7 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. **Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.**
 - 1. **In House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.**
 - 2. **Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.**
- B. **Contractor's Construction Schedule Updating: At two week intervals, update schedule to reflect actual construction progress activities. Issue schedule one week before each regularly scheduled progress meeting.**
 - 1. **Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.**
 - 2. **Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finished, and activity durations.**
 - 3. **As the work progresses, indicate final completion percentage for each activity.**
- C. **Distribution: Distribute copies of approved schedule to Engineer Owner, sparate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need to know schedule responsibility.**
 - 1. **Post copies in Project meeting rooms and temporary field offices.**
 - 2. **When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the work and are no longer involved in the performance of construction activities.**

3.2 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified commercial photographer to take construction photographs.
- B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the work. Photographs with blurry or out-of-focus areas will not be accepted.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in the file name for each image.
- D. Preconstruction Photographs: Before starting construction, take four (4) color photographs of Project site and surrounding properties from different vantage points, as directed by Engineer. Show existing conditions adjacent to property.
- E. Periodic Construction Photographs: Take four color photographs monthly, coinciding with cutoff date associated with each Application for Payment. Photographer shall select vantage points to best show status of construction and progress since last photographs were taken.
- F. Final Completion Construction Photographs: Take eight color photographs after date of Substantial Completion for submission as Project Record Documents. Engineer may direct photographer for desired vantage points.

END OF SECTION 01 32 00

SECTION 01 50 00

MOBILIZATION

PART 1 – GENERAL

1.1 SUMMARY

This Section includes requirements for all activities and provisions necessary for the mobilization of the Contractor's workforce, equipment, temporary facilities, and materials to the project site. Mobilization is defined as the preparatory work and operations required to move personnel, equipment, supplies, and incidentals to the site of the work in order to initiate construction activities. Various construction activities and project management items throughout the Contract may be paid for through this section as called out in other sections.

1.2 RELATED SECTIONS

- Section 013100 – Project Management and Coordination
- Section 015200 – Temporary Facilities and Controls
- Section 017700 – Closeout Procedures

1.3 REFERENCES

- Construction Drawings and Project Manual
- Applicable Local, State, and Federal Regulations
- OSHA Standards

1.4 SUBMITTALS

- Mobilization Plan: Submit a detailed plan outlining equipment, personnel, routes of access, and sequence of activities.
- Schedule: Submit a schedule indicating anticipated mobilization start and completion dates, and integration with overall project schedule.
- Temporary Facilities Layout: Submit layout drawings of proposed staging areas, temporary offices, and storage locations.
- Permits and Approvals: Submit all required permits, licenses, and approvals prior to commencing mobilization.

1.5 QUALITY ASSURANCE

- Ensure all mobilization activities comply with project requirements and regulatory standards.
- Supervise and inspect mobilization operations to ensure safety, environmental compliance, and minimal disruption to surrounding areas.

1.6 SAFETY REQUIREMENTS

- Comply with all OSHA and local safety requirements during mobilization.
- Implement site-specific safety plans addressing traffic control, equipment operation, and personnel protection.

1.7 ENVIRONMENTAL REQUIREMENTS

- Protect existing vegetation, structures, and utilities during mobilization activities.
- Implement erosion and sediment control measures as required.
- Properly manage and dispose of waste and debris generated during mobilization.

1.8 COORDINATION

- Coordinate mobilization activities with the Owner, Architect/Engineer, and other contractors on site.
- Provide advance notice of mobilization schedule and any activities that may affect site access or operations.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- Provide all necessary materials, equipment, and temporary facilities for the mobilization phase, including but not limited to:
- Temporary fencing and barriers
- Construction signage
- Temporary utilities (power, water, sanitation)
- Staging and storage facilities
- Temporary office/trailer
- Lighting for security and safety
- First aid and emergency equipment

2.2 DELIVERY, STORAGE, AND HANDLING

- Deliver equipment and materials in a manner that protects them from damage and ensures timely readiness for construction activities.
- Store materials in designated areas, secure from theft, weather, and vandalism.
- Handle all equipment in accordance with manufacturer guidelines and industry best practices.

2.3 FIELD OFFICE

- **This Section describes the requirements for set up and maintenance of the Resident Engineer's construction field office. Store materials in designated areas, secure from theft, weather, and vandalism, which will be handled**
- **The Field Office shall comply Section 155 of the New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, 2019.**
- **The Contractor shall provide at a minimum Field Office Type A, as shown in Table 155.03.01-1.**
- **All costs related to the set up and maintenance of the Field Office shall be paid for through the cost of Mobilization.**

PART 3 – EXECUTION

3.1 PREPARATION

- Verify site conditions and locate existing utilities and structures prior to mobilization.
- Install temporary facilities and controls as detailed in the Mobilization Plan.
- Prepare access roads and staging areas to support anticipated construction traffic and loads.

3.2 SEQUENCE OF OPERATIONS

- Mobilize in accordance with the approved schedule and in coordination with the overall construction plan.
- Install necessary signage, fencing, and safety barriers.
- Establish site access points and control measures for entry and exit.
- Set up temporary utilities and facilities to support early construction activities.

3.3 INSPECTION AND ACCEPTANCE

- Request inspection of mobilization activities by Owner's Representative and/or Architect/Engineer prior to commencement of construction operations.
- Document all mobilization activities, including verification of proper installation of temporary facilities and readiness to proceed.

3.4 MAINTENANCE AND PROTECTION

- Maintain temporary facilities, access roads, and security measures throughout the mobilization period.
- Repair or replace any facilities or equipment damaged during mobilization.
- Protect the site and surrounding areas from hazards associated with mobilization operations.

3.5 DEMOBILIZATION

- Upon completion of mobilization and commencement of construction, remove or relocate temporary facilities as specified or as required for construction progress.
- Restore areas used for mobilization to their original condition or as specified in the contract documents.
- Dispose of all waste, debris, and temporary installations in accordance with regulatory requirements.

PART 4 – MEASUREMENT AND PAYMENT

- **Measurement and payment for Mobilization shall be in accordance with New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, 2019, Section 154.**

END OF SECTION 015000

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SITE CONDITIONS

SECTION 02 00 10 SITE CONDITIONS

PART 1 GENERAL

1.01 RELATED INFORMATION

- A. Related information and requirements are included in the General and Supplementary Conditions with regards to existing underground utilities.

1.02 INFORMATION ON SITE CONDITIONS

- A. All information obtained by the Landscape Architect regarding site conditions, subsurface information, groundwater elevations, existing constructions of site facilities, and existing underground utilities and similar data are shown on the plans or provided herein.
- B. Information derived from inspection of topographic maps, or from plans showing locations of utilities and structures will not in any way relieve Prime General Contractor from any risk, or from properly examining the site and making such additional investigations as they may elect, or from properly fulfilling all the terms of the contract documents.

1.03 CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor shall satisfy themselves as to the nature and location of the work and the general and local conditions.
- B. The Prime General Contractor further shall satisfy themselves as to the character, quality, and quantity of surface and subsurface materials to be encountered by reviewing Soils Report (if applicable) and reviewing any other pertinent information. Any new exploratory work must be approved by the Owner. The failure of the Contractor to acquaint themselves with the site and all available information will not relieve them of the responsibility for properly estimating the difficulty or cost of completing the work.

The Owner will not be responsible for inspections. Contractor to provide third party inspections.

- C. The Prime General Contractor shall anticipate underground obstructions such as utility lines, concrete, water table and variation hereof due to rainfall, soil conditions and debris. No extra payment will be allowed for the removal, replacement, repair, or possible increased cost caused by underground obstructions. Any such lines or obstructions indicated on the map show only the approximate location and must be verified in the field by the Contractor. The Owner and Landscape Architect will endeavor to familiarize the contractor with all known underground obstructions, but this will not relieve the Contractor from full responsibility in anticipating and locating all underground obstructions.
- D. Additional information
 - 1. Prior to construction, the Prime General Contractor shall make their own subsurface investigations subject to time schedules and arrangements approved in advance by the Owner. Before any subsurface test holes are excavated, contractor shall verify any permits necessary from the governing agency to perform such work and obtain at their cost.

END OF SECTION 02 00 10

SECTION 02 32 13

GEOTECHNICAL INVESTIGATION – SUBSURFACE DRILLING AND SAMPLING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements for subsurface exploration and preparation of a Geotechnical Data Report (GDR) for use in design confirmation prior to king pile wall installation.

B. Work includes:

1. Mobilization, access preparation, traffic control, and site restoration.
2. Drilling of soil borings at locations and depths shown on the *Boring Location Plan*.
3. Collection, logging, classification, and laboratory testing of soil and groundwater samples.
4. Preparation of a Geotechnical Data Report summarizing field and laboratory findings.

A.2 REFERENCES

- A. ASTM D420 – Guide for Site Characterization for Engineering Design and Construction Purposes.
- B. ASTM D1586 – Standard Test Method for Standard Penetration Test (SPT).
- C. ASTM D2487 – Unified Soil Classification System (USCS).
- D. ASTM D1587 – Thin-Walled Tube Sampling of Fine-Grained Soils.
- E. ASTM D2216 – Determination of Water (Moisture) Content of Soil.
- F. ASTM D4318 – Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- G. ASTM D7263 – Laboratory Determination of Density of Soil Specimens.
- H. ASTM D3080 – Direct Shear Test of Soils Under Consolidated Drained Conditions.
- I. ASTM D2113 – Rock Core Drilling and Sampling of Rock for Site Investigation
- J. ASTM D2488 – Description and Identification of Soils (Visual-Manual)
- K. USACE EM 1110-1-1906 – Soil Sampling

1.3 SYSTEM DESCRIPTION

- A. Provide data on subsurface materials through conventional hollow stem auger or mud-rotary drilling methods, undisturbed samples collection, and rock core drilling.
- B. Drive Sample Borings: Mechanically driven samplers; perform SPT per ASTM D-1586. Sample frequency will be continuous to 12 feet below existing grade then at a standard 5-foot interval until testing boring completion.
- C. Undisturbed tube samples: Will be collected in accordance with ASTM D-1587. Sample disturbance to be kept to a minimum during field and transportation to the laboratory for testing per EM 1110-1-1906.
- D. Rock Core Drilling: Will be advanced in accordance with r ASTM D-2113 to required depths.
- E. Laboratory testing program will be established at the completion of the test borings with the engineer and contractor.
- F. Sequencing: Work plan required prior to drilling. Deviations require Engineer approval.

1.4 SUBMITTALS

- A. Work Plan: Prior to field work, submit a drilling and testing work plan describing equipment, methods, and schedule.
- B. Field Logs: Provide daily boring logs including sample depths, recovery, blow counts, groundwater observations, and visual classifications.
- C. Laboratory Results: Provide all test data and supporting calculations.
- D. Geotechnical Data Report (GDR): Final report signed and sealed by a licensed NJ Professional Engineer specializing in Geotechnical Engineering. The report shall include:
 - 1. Test boring location plan, coordinates and elevations corresponding to field survey.
 - 2. Individual boring logs showing strata, SPT N-values, sample depths, and groundwater conditions.
 - 3. Summary tables of soil classification and index properties.
 - 4. Laboratory test results and interpreted engineering parameters.
 - 5. Description of subsurface stratigraphy, groundwater, and anomalies encountered.

1.5 QUALITY ASSURANCE

- A. Work shall be performed under the direction of a Professional Engineer licensed in the State of New Jersey.
- B. Field sampling , logging, and testing shall comply with ASTM standards listed herein.
- C. Calibrate and maintain all drilling and testing equipment in accordance with manufacturer and ASTM requirements.
- D. Comply with all applicable Federal, State, and local laws and regulations.
- E. Obtain and submit required permits and licenses prior to work.
- F. Provide qualifications and experience of personnel performing the work.

1.6 DELIVERY, STORAGE, AND HANDLING

- 1. Preserve all samples in good condition. Keep labels legible. Samples are to be stored at the construction site until the project is completed.
- 2. Undisturbed Samples: Protect from damage, weather, temperature extremes, and delay. Ship in approved containers, horizontally stored, and not more than one week after collection.

1.7 PROJECT/SITE CONDITIONS

- 1. Environmental Requirements: Comply with all environmental regulations. Prevent pollution of water sources with drilling materials.
- 2. Field Measurements: Contractor to establish exact hole locations and elevations in the field. Access costs shall be included in the lump sum bid item.

PART 2 - PRODUCTS

2.1 CONTAINERS

- A. Sample Jars: 1 pint, wide-mouth glass with moisture-tight screw tops.
- B. Shipping Boxes: Corrugated cardboard, max 12 jars per box.
- C. Tubes and Crates: Shelby tubes in wooden crates.
- D. Rock Core Boxes: Longitudinally partitioned, hinged wooden core boxes. 5-foot long.

2.2 LABELS

- A. Jar Labels: Waterproof, printed or typewritten.
- B. Shipping Box Labels: Project, hole number, station, sample depth, description.

- C. Rock Core Box Labels: Provide durable stenciled labels on each box showing Project name/number, Borehole ID, Box X of Y, Depth interval contained, Date, Driller, and Geologist/Logger, plus Core Run ID, Percent Recovery (CR%), and RQD (%) for each run contained in the box. Mark Top/Bottom and Uphole arrow on each tray. Include orientation marks if collected.

2.3 EQUIPMENT AND SUPPLIES

- A. Auger Boring: Continuous flight augers, ≥ 4 in. inside diameter.
- B. Drive Sampling: 2 in. OD split barrel, 140 lb hammer, approved power rigs per ASTM D-1586.
- C. Undisturbed Sampling: Hydraulic feed rig, Shelby tubes, Denison barrel or equivalent.
- D. Rock Core Drilling: 2 in. diameter, double-tube core barrel, approved drilling equipment.

PART 3 – EXECUTION

3.1 TEST BORING LOCATIONS AND DEPTHS

- A. Perform borings at the locations indicated on the Boring Location Plan.
- B. Adjustments to boring locations may be made only with written approval from the Engineer.
- C. Drill to the minimum depths indicated.
 - 1. For king pile evaluation – test borings to extend at least 5 feet below minimum pile tip in to rock.
 - 2. For Skate Park: Test borings to extend minimum of 17 feet below existing grade.

3.2 FIELD EXPLORATION PROCEDURES

- A. Advance boreholes using rotary wash or hollow-stem auger methods suitable for site conditions.
- B. Perform Standard Penetration Tests (SPT) at 2.0-foot intervals in upper 12 feet and 5-foot intervals thereafter, unless otherwise directed
- C. Obtain representative disturbed and undisturbed samples for laboratory analysis for each split spoon or Shelby tube.
- D. Record all field data in permanent field logs including: elevation, depth, hammer energy, soil type, groundwater depth, and sample ID. Document strata changes with depth on the test boring logs.

3.3 LABORATORY TESTING

- A. Conduct testing as required to determine:
 - 1. Grain-size distribution and Atterberg limits.

2. Moisture content and dry density.
3. Unconfined compressive strength or direct shear parameters, if deemed necessary by the engineer.
4. Soil classification in accordance with ASTM D2487 (USCS).

3.4 SITE RESTORATION

- A. Backfill boreholes immediately after completion using cuttings or approved material in accordance with NJDEP requirements.
- B. Restore disturbed areas to pre-existing condition.
- C. Backfill all holes after measurement.
- D. Grout from bottom to 2 ft below surface; top with compacted soil.

3.5 DELIVERABLES

- A. Submit draft GDR within 3 weeks of field completion; final report within 2 weeks after Engineer's comments.
- B. Provide one (1) electronic PDF copy and three (3) bound hard copies.

END OF SECTION

SECTION 02 60 00

CONTAMINATED SITE MATERIAL REMOVAL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies environmental requirements for the excavation, storage, transportation, and disposal of non-hazardous materials, such as “historic fill material”, including soil and fill / debris, which is generated during the project.
- B. The Contractor will perform the following work in areas where the “historic fill materials” are encountered and will be removed for off-site disposal.
- C. **Hazardous soils or wastes are not expected to the present. Should disposal characterization testing be required, it shall be conducted by a NJ-certified laboratory retained by the Contractor to determine that hazardous soils are present, the Contractor must immediately notify the Engineer, the City and the Licensed Site Remediation Professional (LSRP) of Record for the site. Soil testing costs shall be included in the price of this contract, and shall not be paid for by the City.**
- D. The Work in this section specifies the requirements and to be followed during the removal of non-hazardous materials. Restoration of areas where such materials are removed shall be in accordance with the requirements specified in other Sections of these specifications.
- E. The method of disposal shall be removal off-site for ultimate disposal or recycling at a properly permitted facility or facilities.
- F. The Contractor shall identify permitted facilities that will accept the non-hazardous materials, including the “historic fill materials”, and gain approval of the chosen facility or facilities from the Engineer, the City and the LSRP of Record.
- G. The Work of this Section shall be performed in conformance with all applicable local, county, state, and federal regulations, including the A-901 NJ State requirements, as applicable.
- H. The Work of this Section shall be coordinated with, and directed by the Engineer, the City and the LSRP retained for the site.
- I. The procedures and descriptions included in this Section constitute the minimum requirements for handling and disposal of the non-hazardous materials, and additional requirements may apply. No information included in this document shall be construed as final. Revisions or changes in NJDEP regulations, policies or guidance documents pertaining to solid waste management or site remediation effective after this specification was prepared shall be taken into consideration and implemented, as directed or as appropriate.

1.3 DEFINITION

- A. "Clean Fill" shall mean material that meets all soil remediation standards, site-specific alternative standards, or site-specific interim standards, does not contain extraneous debris of solid waste, and does not contain free liquids. This definition shall be consistent with the NJDEP definition provided in N.J.A.C. 7:26E-1.8.
- B. "Disposal" shall mean the removal of the excavated non-hazardous materials, including "historic fill materials", from the construction site and placement of any solid or other wastes, including soil, at facilities with valid permits from NJDEP, the U.S. Environmental Protection Agency (USEPA), or the state within which the facility is located. Disposal includes acceptance of the generated materials at a facility permitted for recycling such solid or other wastes.
- C. "Excavated Materials Storage Area" shall mean the area(s) designated by the Engineer at the construction site where excavated non-hazardous materials are temporarily placed pending waste classification and facility acceptance if conditions preclude pre-characterization and pre-classification for disposal. If excavated materials are determined to meet a "hazardous waste" designation, those materials shall be segregated from the non-hazardous materials and staged in a manner preventing contact with rainwater and impacting runoff or other environmental media.
- D. "Hazardous Soil" and "Hazardous Waste" shall mean materials including, but not limited to, granular soil, clay, organic materials, debris, and solid waste which contain a hazardous waste as defined in the NJDEP Solid Waste regulations, N.J.A.C. 7:26-1.4, that is further defined as hazardous waste pursuant to the Hazardous Waste Regulations, N.J.A.C. 7:26G, and shall be managed as such when contaminants at levels exceeding non-hazardous waste limits are identified. These soils must be managed as hazardous waste in accordance with N.J.A.C. 7:26-1 et seq. Hazardous soils and hazardous wastes must be managed (transported and disposed) off-site as a hazardous waste. Under the jurisdiction of NJDEP or USEPA, hazardous waste requires disposal in an approved, permitted treatment, storage, or disposal facility (TSDF).
- E. "Historic Fill Material" means non-indigenous material, deposited to raise the topographic elevation of the site, which was contaminated prior to emplacement, and is in no way connected with the operations at the location of emplacement and which includes, without limitation, construction debris, dredge spoils, incinerator residue, demolition debris, fly ash, or non-hazardous solid waste. Historic fill material does not include any material that is substantially chromate chemical production waste or any other chemical production waste or waste from processing of metal or mineral ores, residues, slag or tailings. In addition, historic fill material does not include a municipal solid waste landfill site.
- F. "Non-hazardous Materials" shall mean materials, including, but not limited to, granular soils, clay, organic materials, debris, solid waste, and "historic fill material", that are considered non-hazardous when the following criteria are met:
 - 1. The contaminant levels are above the most stringent soil remediation standards (SRS) established by NJDEP in N.J.A.C. 7:26D
 - 2. The materials are not classified as a hazardous waste. The non-hazardous materials would be classified according to the NJDEP Solid Waste Types [N.J.A.C. 7:26-2.13(g)] such as ID 13C (Construction and Demolition Waste) or ID 27 (Dry Industrial Waste) if disposal is the selected option
 - 3. All debris and "historic fill materials" excavated from the site, including soils that are impacted by the excavated materials.

- G. "Solid Waste Facility" (SWF) shall mean any system, site, equipment or building that is duly permitted and utilized for the storage, collection, processing, transfer, transportation, separation, recycling, or disposal of non-hazardous soil material.
- H. "Containment" means actions to limit or prevent discharges or the spread of contamination.

1.4 REGULATORY REQUIREMENTS

- A. In addition to the requirements of the Section of the Specification entitled "Laws and Ordinances" of Division 1 - GENERAL PROVISIONS, comply with all applicable provisions of the following:
 - 1. U.S. Environmental Protection Agency (USEPA) Regulations: 40 CFR Part 261 - Hazardous Waste Management.
 - 2. U.S. Department of Transportation (USDOT) Regulations: 49 CFR Part 171 - Hazardous Materials Transportation.
 - 3. State of New Jersey Department of Environmental Protection (NJDEP) Regulations: N.J.A.C. 7:26, Solid Waste Management.
 - 4. State of New Jersey Department of Environmental Protection (NJDEP) Regulations: N.J.A.C. 7:26G, Hazardous Waste Management.
 - 5. Occupational Safety and Health Administration (OSHA) Regulations: 29 CFR 1910.120 - Safety and Health for Construction.
- B. Where the requirements of this Section of the Specifications and the above regulations differ, the stricter requirement shall control.
- C. Reference in this Section to laws, codes, ordinances, regulations, standards, or other Federal, State, county, municipal, local, or other departmental legal requirements shall be deemed to mean the latest version or revision thereof or successor thereto, notwithstanding any change in numbering, designation, or titles.

1.5 WORK AREA CONDITIONS

- A. The Engineer will provide full-time inspection of excavations.
- B. Throughout the Work of this Section, representatives of governmental agencies, including the NJDEP and OSHA, may be present at the construction site. The Contractor shall cooperate with such representatives as directed by the Engineer.
- C. If required in Appendix A of this Section, the Contractor's Safety Officer shall be present at the site at all times of performance of Work of this Section.

1.6 QUALITY ASSURANCE

- A. Employ for work of this Section workers trained in accordance with OSHA 29 CFR 1926.32(e).
- B. If required in Appendix A of this Section, the Contractor's Safety Officer designated for Work of this Section shall hold the following current, valid certifications:
 - 1. OSHA [29 CFR 1910.120 (e) (4)] Training or EPA Training Course 165.5 entitled "Hazardous Materials Incidental Response Operations".
 - 2. OSHA [29 CFR 1910.120 (e) (4)] Management and Supervisor Training.
- C. The Contractor or its approved Subcontractor(s) shall hold current, valid transportation permits stipulated in Appendix B of this Section.

- D. The Contractor shall provide for Work conducted under this Section a site specific Health and Safety Plan (HASP). Such plan shall conform to the requirements of OSHA 29 CFR 1910.120 (d)(4) and shall, at a minimum:
1. Be reviewed and approved by a qualified person and read and signed by all affected personnel.
 2. Identify key personnel responsible for site safety, including the name and qualifications of the Safety Officer.
 3. Address the level of personnel protection to be employed during Work, setting forth specific criteria for choices of protective clothing and equipment.
 4. Identify, provide location, and telephone number of, route to, and list arrangements with, the nearest medical facility.
 5. Set forth procedures for decontamination of personnel, materials and equipment, and procedures for the sampling and disposal of any decontamination wastes.
- E. The disposal facility utilized by the Contractor for receipt of materials transported from the site shall hold current valid permits and licenses as stipulated in Appendix B to this Section - "Transportation and Disposal Requirements for Excavated Materials" and is subject to the review and approval of the Engineer, the City and the LSRP of Record.

1.7 SUBMITTALS

- A. Within fifteen (15) calendar days after receipt of the acceptance and receipt of a signed contract and notice to proceed, the Contractor shall submit to the Engineer the following for approval:
1. In accordance with 1.05 A. herein, submit evidence of current valid permits for the entity performing off-site transportation.
 2. In accordance with 1.05 B. herein, submit training certifications for all workers who will be engaged in Work of this Section.
 3. In accordance with 1.05 C. herein, certification of training for the Safety Officer.
 4. In accordance with 1.05 D. herein, the written site-specific Health and Safety Plan (HASP).
 5. List of names of all proposed subcontractors identifying each task to be performed by each subcontractor proposed for Work under this Section.
 6. **In accordance with 1.05 E. herein, provide the name, location, contact person, telephone number and permit(s) of all facilities proposed to be used for the disposal of non-hazardous materials, and provide a plan for sampling and characterizing the non-hazardous materials and arranging for disposal of these materials in a manner that will not require on-site staging of the excavated non-hazardous materials. The plan shall include a contingency plan for halting work, or staging soil materials, in the event that potentially hazardous conditions are encountered. The submittal shall also contain copies of all permits and licenses required by Appendix B, "Transportation and Disposal Requirements for Excavated Materials", and a complete listing of any notices of violations, citations, or administrative complaints issued by any Federal, State, or local agency for the facilities described.**
- B. Submit to the Engineer one copy (in both paper and electronic formats) of the following:
1. Executed non-hazardous waste disposal receipts for each load of non-hazardous material transported from the construction site.
 2. Executed non-hazardous waste disposal receipts signed by a responsible party of the disposal facility.
 3. NJDEP-required documentation for each load of imported clean fill.

4. Laboratory analytical reports (NJDEP Tier 2 deliverables) and electronic data deliverables (EDD) per NJDEP's Site Remediation Program for each waste characterization sample collected and analyzed by the Contractor and its Subcontractor(s).

PART 2 - PRODUCTS

- A. Protective Clothing: For all personnel who will potentially be in direct contact with hazardous or non-hazardous materials, including soil and "historic fill", furnish protective work clothing and equipment in accordance with 29 CFR 1926.629(d)(2).

PART 3 - EXECUTION

3.1 GENERAL

- A. Materials excavated during performance of Work shall be loaded into trucks and transported that same day from the site to the disposal facility.
- B. Temporary stockpiling of non-hazardous waste materials pending laboratory analysis and acceptance by a disposal/recycling facility may be permitted with the consent of the Engineer and the City.
- C. Transport and dispose of any non-hazardous waste materials, including impacted soil, following receipt of soil characterization sampling and excavation.

3.2 PREPARATION

- A. Prior to starting Work of this Section, conduct a site inspection accompanied by the Engineer to determine the physical condition of any adjacent existing surface and subsurface structure(s) or construction that is to remain.
- B. Select the locations for characterization sampling.
- C. The Contractor shall prepare and submit to the Engineer for approval a written description of such conditions including photographic documentation when requested by the Engineer, and a site plan or sketch showing the locations for the soil characterization sampling. The sampling locations are subject to Engineer and/or LSRP of record approval.

3.4 SOIL HANDLING AND CHARACTERIZATION

- A. Excavation, stockpiling and loading of the materials must be performed using methods that prevent the dispersion of soil into air, water, or adjacent land.
- B. Characterization and disposal of the non-hazardous materials (or hazardous materials or wastes, if applicable) shall be by the Contractor.
- C. During the Contractor's operations, including loading and transporting the excavated non-hazardous materials, take all precautions that are necessary to prevent the spread of any contamination to the surrounding areas. To the extent such contamination occurs as a result of the Contractor's operations, take all measures necessary to remediate the same.
- D. Remove materials, transport off-site, and perform operations in accordance with Appendix A of this Section.
- E. Backfill the soil excavation with clean fill per NJDEP protocol and compacted during emplacement to the proposed finished grade specified in the Contract Documents. All imported clean fill is subject to the approval of the Engineer and/or the LSRP of record for the site.

3.5 DISPOSAL OF EXCAVATED NON-HAZAROUS MATERIALS

- A. The excavated non-hazardous materials shall be disposed of at a facility holding current permits and licenses as stipulated in Appendix B to this Section - "Transportation and Disposal Requirements for Excavated Materials".
- B. Furnish and affix to all equipment at the time of transportation all the necessary labels and tags that are required by Federal and State agencies having jurisdiction over the transportation of non-hazardous materials and/or hazardous wastes, as applicable.
- C. Unless specifically approved in writing by the Engineer, the Contractor shall not stop *en route* either before or after picking up the materials from the site to pick up additional material from any other party.

3.5 DEWATERING

- A. Comply with the requirements for submitting plans for pollution prevention, storm water management, erosion and sedimentation control; compliance with Conservation District.
- B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding project site and surrounding area.
- C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 - 2. Install a dewatering system, specified in Division 31 Section "Dewatering," to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.
- D. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

END OF SECTION 02 60 00

SECTION 02 60 00

CONTAMINATED SITE MATERIAL REMOVAL

APPENDIX A

A.1 DESCRIPTION OF NON-HAZARDOUS MATERIALS

- A. The Engineer will determine the limits of the excavated materials, as defined in this Section, requiring handling and disposal as non-hazardous materials.
- B. Excavation shall continue vertically and horizontally to the specified limits and at the direction of the Engineer.
- C. Excavation beneath the water table may be required at the direction of the Engineer.

A.2 ADDITIONAL REQUIREMENTS

- A. The Contractor shall furnish all required disposal certificates.
- B. The Contractor's Safety Officer is required to be on-site at the on-set of field excavation and loading, and whenever new personnel are present, to present updates to required documentation, and as necessary to ensure implementation of the site-specific HASP by the Contractor.
- C. The Contractor shall adhere to any LSRP-approved plan for implementing continuous, full-time dust, odor, and vapor controls (as necessary), and shall provide appropriate mitigation measures in the event that elevated concentrations of dust, odor, or vapors are detected.

END OF APPENDIX A

SECTION 02 60 00

CONTAMINATED SITE MATERIAL REMOVAL

APPENDIX B

B.1 TRANSPORTATION AND DISPOSAL REQUIREMENTS FOR EXCAVATED MATERIALS

- A. Required Registration for Transporters of Non-hazardous Materials.
 - 1. All devices used by the Contractor for the transportation of non-hazardous materials shall have current registrations approved by NJDEP.
 - 2. If the Contractor proposes disposal that requires interstate transportation, then the Contractor shall comply with all applicable transportation regulations of the state(s) through or within which transportation will be made.
- B. Required Permits and Approvals for Solid Waste Facilities (SWFs).
 - 1. Where required, SWFs used by the Contractor for the Work herein shall have current registrations and permits for operating such facilities or shall be approved by the state (and by USEPA or other local agency, if applicable) in which it operates.
 - 2. Where required, SWFs used by the Contractor for the Work herein shall have current State Pollutant Discharge Elimination System permits.
 - 3. The SWF proposed by the Contractor shall meet the following requirements:
 - a. During the last twelve months, the SWF shall not have incurred more than TWO (2) Notice of Violations (NOVs) related to accepting unpermitted haulers or accepting waste containing contamination above the facility's permit limits.
 - b. During the last twelve months, the SWF shall not have incurred ANY Notice of Violation (NOV) related to poor housekeeping, such as spills of chemicals or petroleum products, which could contaminate soil and ground water.
 - c. The SWF shall not have incurred an Administrative Consent Order (ACO) related to groundwater remediation.
 - 4. The Engineer's approval of the proposed SWF will be contingent upon verification of the SWFs environmental compliance.

END OF APPENDIX B

SECTION 02 60 00

CONTAMINATED SITE MATERIAL REMOVAL

APPENDIX C

C.1 SOIL CHARACTERIZATION AND LOADING

A. Description of Non-Hazardous Materials

1. The Contractor shall assume the materials managed under this Section to be non-hazardous. The Contractor will conduct the waste characterization sampling and analysis and obtain disposal facility approval prior to excavation at no additional cost to the City.
2. The Contractor will determine, and the Engineer subsequently will verify the NJDEP-designated waste classification in accordance with the laboratory tests stipulated in Appendix D to this Section.

B. Additional Requirements

1. The Contractor shall provide trucks for accepting the non-hazardous materials as excavated (no staging will be permitted).
2. The Contractor shall load non-hazardous materials directly into the trucks and securely cover the soil once loaded and prior to leaving the site.
3. The Contractor shall furnish all required non-hazardous waste manifest forms.

END OF APPENDIX C

SECTION 02 60 00

CONTAMINATED SITE MATERIAL REMOVAL

APPENDIX D

D.1 LABORATORY ANALYSIS

- A. The Contractor will be responsible for the following
 - 1. Collecting samples in a manner sufficient to characterize the non-hazardous materials to be excavated from the site and subject those samples to laboratory analysis as required to confirm that the materials are “non-hazardous” and meet the acceptance criteria of the disposal facility.
 - 2. Employing the services of a New Jersey-certified environmental laboratory to analyze discrete and / or composite samples, as required to satisfy NJDEP and USEPA regulations and guidance for characterizing non-hazardous wastes, assessing the materials for hazardous waste characteristics, and for meeting disposal facility permit requirements.
- B. The Engineer will provide to the Contractor a copy of available laboratory soil data with the Addendum.

END OF APPENDIX D

SECTION 03 41 00
PRECAST STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Precast structural concrete.
2. Precast Classic Tide Pool Armor Unit

B. Related Requirements:

1. "Rip Rap Spec." for installation and placement of tide pool units.

1.2 DEFINITIONS

A. Design Reference Sample: Sample of approved precast structural concrete color, finish, and texture, preapproved by Engineer.

B. ECOLOGICAL CONCRETE - The term "ecological concrete" refers to concrete based on ASTM C150, "Standard Specification for Portland Cement," that offers ecological benefits in addition to its structural functionality. Ecological benefits include but are not limited to significant reduction in dominance of invasive species, improved biodiversity and species richness.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **Project site**.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each precast concrete mixture. Include compressive strength and, if required, water-absorption tests.

C. Shop Drawings:

1. Include member locations, plans, elevations, dimensions, shapes and sections, openings, support conditions, and types of reinforcement, including special

- reinforcement.
2. Detail fabrication and installation of precast structural concrete units, including connections at member ends and to adjoining construction.
 3. Indicate joints, reveals, drips, chamfers, and extent and location of each surface finish.
 4. Indicate separate face and backup mixture locations and thicknesses.
 5. Indicate type, size, and length of welded connections by AWS standard symbols.
 6. Detail loose and cast-in hardware, lifting and erection inserts, connections, and joints.
 7. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
 8. Include and locate openings larger than **10 inches**. Where additional structural support is required, include header design.
 9. Indicate location of each precast structural concrete unit by same identification mark placed on panel.
 10. Indicate relationship of precast structural concrete units to adjacent materials.
 11. Indicate locations, dimensions, and details of thin-brick units, including corner units and special shapes, and joint treatment.
 12. Indicate locations, dimensions, and details of stone facings, anchors, and joint widths.
 13. Indicate estimated camber for precast floor slabs with concrete toppings.
 14. Indicate shim sizes and grouting sequence.
 15. If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.
- D. ECOLOGICAL CONCRETE - Accepted products shall demonstrate enhanced ecological performance compared to other standard concrete based on ASTM C150, "Standard Specification for Portland Cement" products including significant reduction in dominance of invasive species, improved biodiversity and species richness. Accepted products shall have a track record of biological and structural performance under conditions similar to the region of interest, demonstrated across projects with recorded monitoring and analysis in peer-reviewed publications and reports.
- E. Samples:
1. For each type of finish indicated on exposed surfaces of precast structural concrete units with architectural finish, in sets of three, representative of finish, color, and texture variations expected; approximately **12 by 12 by 2 inches**.
 - a. Where other faces of precast concrete unit are exposed, include Samples illustrating workmanship, color, and texture of backup concrete as well as facing concrete.
- F. Delegated Design Submittals: For precast structural concrete indicated to comply with performance requirements and design criteria, including analysis data signed and

sealed by the qualified professional engineer responsible for their preparation.

1. Show precast structural concrete unit types, connections, types of reinforcement, including special reinforcement, and concrete cover on reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the structural seawall from precast structural concrete fascia.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator & Installer.
- B. Welding certificates.
- C. Material Certificates: For the following:
 1. Cementitious materials.
 2. Reinforcing materials and prestressing tendons.
 3. Admixtures.
 4. Bearing pads.
 5. Insulation.
 6. Structural-steel shapes and hollow structural sections.
 7. Precast Classic Tide Pool Armor Unit
 8. Precast Seawall Fascia Panels
- D. Material Test Reports: For aggregates, by a qualified testing agency.
- E. Preconstruction test reports.
- F. Source quality-control reports.
- G. Field quality-control **and special inspection** reports.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm that assumes responsibility for engineering precast structural concrete units to comply with performance requirements. Responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
 1. Designated as a PCI-certified plant as follows:
 - a. Group C, **Category C1 - Precast Concrete Products (no prestressed reinforcement).**
 - b. Group CA, **Category C1A - Precast Concrete Products (no prestressed reinforcement).**
- B. Required Certified Installer Qualifications: A precast concrete erector qualified and

designated by PCI's Certificate of Compliance, to erect **Category S2 – Complex** Structural Systems.

- C. Installer Qualifications: An experienced precast concrete erector who has retained a "PCI-Certified Field Auditor" to conduct a field audit of a project installed by erector in **Category S2 - Complex** Structural Systems and who can produce an Erectors' Post Audit Declaration, according to PCI MNL 127, "PCI Erector's Manual - Standards and Guidelines for the Erection of Precast Concrete Products."
- D. Testing Agency Qualifications: Qualified according to ASTM C1077 and ASTM E329 for testing indicated.
- E. Quality-Control Standard: For manufacturing procedures, testing requirements, and quality-control recommendations for types of units required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Structural Precast Concrete Products."
- F. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."
- G. Sample Panels: After sample approval and before fabricating precast structural concrete units provide sample panels approximately [16 sq. ft.] in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.
 - 1. Locate panels where indicated or, if not indicated, as directed by Architect.
 - 2. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
 - 3. After approval of repair technique, maintain one sample panel at fabricator's plant and one at Project site in an undisturbed condition as a standard for judging the completed Work.
 - 4. Demolish and remove sample panels when directed.

1.7 COORDINATION

- A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction before starting that Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Support units during shipment on nonstaining shock-absorbing material in same position as during storage.

- B. Store units with adequate bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.
 - 1. Store units with dunnage across full width of each bearing point unless otherwise indicated.
 - 2. Place adequate dunnage of even thickness between each unit.
 - 3. Place stored units so identification marks are clearly visible, and units can be inspected.
- C. Handle and transport units in a manner that avoids excessive stresses that cause cracking or damage.
- D. Lift and support units only at designated points indicated on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design precast structural concrete units, precast seawall fascia, and classic tide pool unit.
- B. Design Standards: Comply with **ACI 318** and with design recommendations in PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of precast structural concrete units indicated.
- C. Structural Performance:
 - 1. Precast structural concrete units and connections to the proposed steel seawall are to withstand all environmental loads, including wave loading and shall be calculated by the contractors engineer.
 - 2. Provide precast structural concrete units and connections capable of withstanding the anticipated demands in a waterfront location exposed to wave action.
 - a. Design precast structural concrete fascia panels and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements. Maintain precast structural concrete deflections within limits of **ACI 318**.
 - 1) Thermal Movements: Allow for in-plane thermal movements resulting from annual ambient temperature changes of **minus 18 to plus 120 deg F**.

2.2 PRECAST STRUCTURAL CONCRETE

- A. Manufacturers: Subject to compliance with requirements, **provide products by the following:**

1. Econcrete.

2.3 MOLD MATERIALS

- A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that provides continuous precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.

1. Mold-Release Agent: Commercially produced form-release agent that does not bond with, stain, or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.

- B. Form Liners: Units of face design, texture, arrangement, and configuration **indicated**. Furnish with manufacturer's recommended form-release agent that does not bond with, stain, or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.

1. Form liner shall be used for the Precast Seawall Fascia Panels.

- a. Manufacturer shall be EConcrete®, panel for liner finish shall be **Azouri Bio Enhancing Design**

- C. Form Release Agent: Biodegradable vegetable-based mold release agent should be used on all ecological concrete elements. Release agent shall not deposit a residue that can affect biological growth on the concrete surface.

- D. Surface Retarder: Chemical set retarder, capable of temporarily delaying setting of newly placed concrete mixture to depth of reveal specified.

- E. ECOLOGICAL ENHANCING SURFACE MODIFIERS - Where indicated, the manufacturer shall produce concrete elements utilizing a textured surface proven to promote marine growth and habitat creation beyond what would be expected from a flat surface. The manufacturer's surface mold technologies (i.e., liners, texturizing agents, inserts, etc.) such as EConcrete or approved equal shall be intended to produce full-scale cast in place concrete elements that are in compliance with abrasion forces, freeze and

- F. thaw as specified by ACI 301 – Standard Specifications for Structural Concrete.

2.4 REINFORCING MATERIALS

- A. Galvanized Reinforcing Bars: **ASTM A615/A615M, Grade 60. Galvanize after**

fabrication and bending.

- B. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 116.

2.5 CONCRETE MATERIALS

- A. ECOLOGICAL ENHANCING CONCRETE MIX - Where indicated, the manufacturer shall produce concrete elements utilizing a concrete mix intended to support marine growth and habitat creation beyond what would be expected from standard marine-grade structural concrete. This concrete mix may use proprietary admixtures and pozzolanic materials. This concrete mix shall conform with ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete. The ecological admixtures such as "ECO-P1" as manufactured by EConcrete Inc. or approved equal must conform to Standard Specification for Chemical Admixtures for Concrete Specifications of Air-Entraining Admixtures for Concrete (ASTM C494, Type S). The use of plasticizers/superplasticizers should be limited to those that are hydroxycarboxylic or polycarboxylate based. Any curing compounds shall be water or water-based (non-resin based) meeting requirements of ASTM C309 and ASTM C1315. Other admixtures may be used in strict accordance with manufacturer's recommendations and ASTM Specifications upon approval of the Engineer.
- B. Portland Cement: ASTM C150/C150M, Type I or Type III, white, unless otherwise indicated.
 - 1. For surfaces exposed to view in finished structure, use gray or white cement, of same type, brand, and mill source.
- C. Supplementary Cementitious Materials:
 - 1. Pozzolans: ASTM C618, Class C, F, or N with maximum loss on ignition of 3 percent.
 - 2. Metakaolin: ASTM C618, Class N.
 - 3. Silica Fume: ASTM C1240, with optional chemical and physical requirement.
 - 4. Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 100 or 120.
- D. Normal-Weight Aggregates: Except as modified by PCI MNL 116, ASTM C33/C33M, with coarse aggregates complying with [**Class 4S**]. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.
 - 1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.
 - a. Gradation: **To match design reference sample**

2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand compatible with coarse aggregate to match approved finish sample.
- E. Lightweight Aggregates: Except as modified by PCI MNL 116, ASTM C330/C330M, with absorption less than 11 percent.
- F. ECOLOGICAL ENHANCING CONCRETE MIX - Where indicated, the manufacturer shall produce concrete elements utilizing a concrete mix intended to support marine growth and habitat creation beyond what would be expected from standard marine-grade structural concrete. This concrete mix may use proprietary admixtures and pozzolanic materials. This concrete mix shall conform with ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete. The ecological admixtures such as "ECO-P1" as manufactured by EConcrete Inc. or approved equal must conform to Standard Specification for Chemical Admixtures for Concrete Specifications of Air-Entraining Admixtures for Concrete (ASTM C494, Type S). The use of plasticizers/superplasticizers should be limited to those that are hydroxycarboxylic or polycarboxylate based. Any curing compounds shall be water or water-based (non-resin based) meeting requirements of ASTM C309 and ASTM C1315. Other admixtures may be used in strict accordance with manufacturer's recommendations and ASTM Specifications upon approval of the Engineer.
- G. Coloring Admixture: ASTM C979/C979M, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.
- H. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.
- I. Air-Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.
- J. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.
1. Water-Reducing Admixtures: ASTM C494/C494M, Type A.
 2. Retarding Admixture: ASTM C494/C494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
 4. Water-Reducing and Accelerating Admixture: ASTM C494/C494M, Type E.
 5. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 6. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
 7. Plasticizing Admixture: ASTM C494/C494M, Type S.
 8. Plasticizing and Retarding Admixture: ASTM C494/C494M, Type S.
 9. Corrosion-Inhibiting Admixture: ASTM C1582/C1582M.

2.6 STEEL CONNECTION MATERIALS

- A. Carbon-Steel Shapes and Plates: ASTM A36/A36M.
- B. Carbon-Steel-Headed Studs: ASTM A108, Grade 1010 through 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 116.
- C. Carbon-Steel Plate: ASTM A283/A283M, Grade C.
- D. Malleable-Iron Castings: ASTM A47/A47M, Grade 32510 or Grade 35028.
- E. Carbon-Steel Castings: ASTM A27/A27M, **Grade 60-30**.
- F. High-Strength, Low-Alloy Structural Steel: ASTM A572/A572M.
- G. Carbon-Steel Structural Tubing: ASTM A500/A500M, Grade B or Grade C.
- H. Wrought Carbon-Steel Bars: ASTM A675/A675M, **Grade 65**.
- I. Deformed-Steel Wire or Bar Anchors: ASTM A496/A496M or ASTM A706/A706M.
- J. Carbon-Steel Bolts and Studs: **ASTM A307, Grade A**; carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A563/A563M; and flat, unhardened steel washers, ASTM F844.
- K. High-Strength Bolts, Nuts, and Washers:
 - 1. ASTM F3125/F3125M, **Grade A325**, Type 1, heavy-hex steel structural bolts; ASTM A563/A563M heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
 - a. Finish: **Hot-dip zinc coating**.
 - 2. ASTM F3125/F3125M, **Grade A490**, Type 1, heavy-hex steel structural bolts; ASTM A563/A563M heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
- L. Zinc-Coated Finish: For exterior steel items and items indicated for galvanizing, apply zinc coating by **hot-dip process according to ASTM A123/A123M or ASTM A153/A153M**.
 - 1. For steel shapes, plates, and tubing to be galvanized, limit silicon content of steel to less than 0.03 percent or to between 0.15 and 0.25 percent or limit sum of silicon and 2.5 times phosphorous content to 0.09 percent.
 - 2. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035B or SSPC-Paint 20.

- M. Shop-Primed Finish: Prepare surfaces of nongalvanized-steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3, and shop apply **lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in MPI 79** according to SSPC-PA 1.
- N. Welding Electrodes: Comply with AWS standards.
- O. Precast Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install precast structural concrete units.

2.7 STAINLESS STEEL CONNECTION MATERIALS

- A. Stainless Steel Plate: ASTM A240/A240M or ASTM A666, Type 304, Type 316, or Type 201.
- B. Stainless Steel Bolts and Studs: **ASTM F593, Alloy Group 1 or 2**, hex-head bolts and studs; **ASTM F594, Alloy Group 1 or 2** stainless steel nuts; and flat, stainless steel washers.
 - 1. Lubricate threaded parts of stainless steel bolts with an antiseize thread lubricant during assembly.
- C. Stainless Steel-Headed Studs: ASTM A276/A276M, Alloy 304 or 316, with minimum mechanical properties of PCI MNL 116.

2.8 BEARING PADS

- A. Provide one of the following bearing pads for precast structural concrete units **as recommended by precast fabricator for application**:
 - 1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore, Type A durometer hardness, ASTM D2240; minimum tensile strength **2250 psi**, ASTM D412.
 - 2. Random-Oriented-Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. 70 to 90 Shore, Type A durometer hardness, ASTM D2240; capable of supporting a compressive stress of **3000 psi** with no cracking, splitting, or delaminating in the internal portions of pad. Test one specimen for every 200 pads used in Project.
 - 3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer; 80 to 100 Shore, Type A durometer hardness, ASTM D2240; complying with AASHTO's "AASHTO LRFD Bridge Design Specifications," Division II, Section 18.10.2; or with MIL-C-882E.
 - 4. Frictionless Pads: PTFE, glass-fiber reinforced, bonded to stainless or mild-steel plate, or random-oriented-fiber-reinforced elastomeric pads; of type required for in-service stress.

5. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

2.9 ACCESSORIES

- A. Reglets Specified Elsewhere: Specified in Section 076200 "Sheet Metal Flashing and Trim."
- B. Reglets: **[PVC extrusions,][Stainless steel, Type 302 or Type 304,][Copper,]** felt or fiber filled, or with face opening of slots covered.
- C. Precast Accessories: Provide clips, hangers, high-density plastic or steel shims, and other accessories required to install structural precast concrete units.

2.10 GROUT MATERIALS

- A. Sand-Cement Grout: Portland cement, ASTM C150/C150M, Type I, and clean, natural sand, ASTM C144 or ASTM C404. Mix at ratio of 1 part cement to 2-1/2 to 3 parts sand, by volume, with minimum water required for placement and hydration. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C1218/C1218M.
- B. Nonmetallic, Nonshrink Grout: Packaged, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107/C1107M, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C1218/C1218M.
- C. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C881/C881M, of type, grade, and class to suit requirements.

2.11 CONCRETE MIXTURES

- A. Prepare design mixtures for each type of precast concrete required.
- B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete fabricator's option.
- C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by **ACI 318** or PCI MNL 116 when tested according to ASTM C1218/C1218M.
- D. Normal-Weight Concrete Mixtures: by either laboratory trial batch or field test data methods according to ACI PRC-211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): **6000 psi**.
 2. Maximum Water-Cementitious Materials Ratio: 0.40.
- E. Water Absorption: For structural precast concrete with an architectural finish, limit water absorption to 6 percent by weight or 14 percent by volume, tested according to ASTM C642, except for boiling requirement.
- F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 116.
- G. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.
- H. Concrete Mix Adjustments: Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.12 MOLD FABRICATION

- A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.
1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form-release agent.
- B. Maintain molds to provide completed precast structural concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.
1. Form joints are not permitted on faces of structural precast concrete with an architectural finish that is exposed to view in the finished work.
 2. Edge and Corner Treatment: Uniformly **chamfered**.

2.13 FABRICATION

- A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."
- B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast structural concrete units to supporting and adjacent construction.
- C. Cast-in reglets, slots, holes, and other accessories in precast structural concrete units as indicated on the Contract Drawings.
- D. Cast-in openings larger than **10 inches** in any dimension. Do not drill or cut openings or prestressing strand without Architect's approval.
- E. Reinforcement: Comply with recommendations in PCI MNL 116 for fabricating, placing, and supporting reinforcement.
 1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcement exceeds limits specified in ASTM A775/A775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
 2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
 3. Place reinforcing steel and prestressing strand to maintain at least **3/4-inch** minimum concrete cover. Increase cover requirements for reinforcing steel to **1-1/2 inches** when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
 4. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.
- F. Reinforce precast structural concrete units to resist handling, transportation, and erection stresses and specified in-place loads.
- G. Prestress tendons for precast structural concrete units by either pretensioning or post-tensioning methods. Comply with PCI MNL 116.
 1. Delay detensioning or post-tensioning of precast, prestressed structural concrete units until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under same conditions as concrete unit.
 2. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
 3. If concrete has been heat cured, detension while concrete is still warm and moist

- to avoid dimensional changes that may cause cracking or undesirable stresses.
- 4. Protect strand ends and anchorages with bituminous, zinc-rich, or epoxy paint to avoid corrosion and possible rust spots.
- 5. Protect strand ends and anchorages with a minimum of **1-inch**- thick, nonmetallic, nonshrink, grout mortar and sack rub surface. Coat or spray the inside surfaces of pocket with bonding agent before installing grout.
- H. Comply with requirements in PCI MNL 116 and in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.
- I. Place face mixture to a minimum thickness after consolidation of the greater of **1 inch** or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.
- J. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete units.
 - 1. Place backup concrete mixture to ensure bond with face-mixture concrete.
- K. Thoroughly consolidate placed concrete by vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 116.
 - 1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants." Ensure adequate bond between face and backup concrete, if used.
- L. Comply with PCI MNL 116 procedures for hot- and cold-weather concrete placement.
- M. Identify pickup points of precast structural concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast structural concrete unit on a surface that does not show in finished structure.
- N. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.
- O. Discard and replace precast structural concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 116 and meet Architect's approval.

2.14 FABRICATION TOLERANCES

- A. Fabricate precast structural concrete units to shapes, lines, and dimensions indicated so each finished unit complies with PCI MNL 116 product dimension tolerances as well as position tolerances for cast-in items.

2.15 COMMERCIAL FINISHES

- A. Commercial Grade: Remove fins and protrusions larger than **1/8 inch** and fill holes larger than **1/2 inch**. Rub or grind ragged edges. Faces must have true, well-defined surfaces. Air holes, water marks, and color variations are permitted. Limit form joint offsets to **3/16 inch**.
- B. Standard Grade: Normal plant-run finish produced in molds that impart a smooth finish to concrete. Surface holes smaller than **1/2 inch** caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls are permitted. Fill air holes greater than **1/4 inch** in width that occur more than once per **2 sq. in.** Major or unsightly imperfections, honeycombs, or structural defects are not permitted. Limit joint offsets to **1/8 inch**.
- C. Grade B Finish: Fill air pockets and holes larger than **1/4 inch** in diameter with sand-cement paste matching color of adjacent surfaces. Fill air holes greater than **1/8 inch** in width that occur more than once per **2 sq. in.** Grind smooth form offsets or fins larger than **1/8 inch**. Repair surface blemishes due to holes or dents in molds. Discoloration at form joints is permitted.
- D. Grade A Finish: Repair surface blemishes and fill air holes with the exception of air holes **1/16 inch** in width or smaller, and form marks where the surface deviation is less than **1/16 inch**. Float apply a neat cement-paste coating to exposed surfaces. Rub dried paste coat with burlap to remove loose particles. Discoloration at form joints is permitted. Grind smooth all form joints.
- E. Screed or float finish unformed surfaces. Strike off and consolidate concrete with vibrating screeds to a uniform finish. Hand screed at projections. Normal color variations, minor indentations, minor chips, and spalls are permitted. Major imperfections, honeycombing, or defects are not permitted.
- F. Smooth, steel trowel finish unformed surfaces. Consolidate concrete, bring to proper level with straightedge, float, and trowel to a smooth, uniform finish.
- G. Apply roughened surface finish according to **ACI 318** to precast concrete units that receive concrete topping after installation.

2.16 COMMERCIAL ARCHITECTURAL FINISHES

- A. Manufacture member faces free of joint marks, grain, and other obvious defects with corners, including false joints, uniform and straight. Finish exposed-face surfaces of

precast concrete units to match approved **design reference sample** and as follows:

1. PCI's "Architectural Precast Concrete - Color and Texture Selection Guide," of plate numbers indicated.
2. As-Cast-Surface Finish: Provide surfaces to match approved sample or mockup for acceptable surface, air voids, sand streaks, and honeycomb.
3. Textured-Surface Finish: Impart by form liners or inserts.
4. Bushhammer Finish: Use power or hand tools to remove matrix and fracture coarse aggregates.
5. Exposed-Aggregate Finish: Use chemical-retarding agents applied to concrete molds and washing and brushing procedures to expose aggregate and surrounding matrix surfaces after form removal.
6. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.
7. Acid-Etched Finish: Use acid and hot-water solution, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces. Protect hardware, connections, and insulation from acid attack.
8. Honed Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.
9. Polished Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.
10. Sand-Embedment Finish: Use selected stones placed in a sand bed in bottom of mold, with sand removed after curing.
11. Thin-Brick Facing: See "Thin-Brick Facings" Article.
12. Stone Facing: See "Stone Facings" Article.

2.17 SOURCE QUALITY CONTROL

- A. Testing Agency: **Contractor will engage** a qualified testing agency to evaluate precast structural concrete fabricator's quality-control and testing methods.
 1. Allow testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with testing agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.
- B. Testing: Test and inspect precast structural concrete according to PCI MNL 116 requirements and ASTM C1610/C1610M, ASTM C1611/C1611M, ASTM C1621/C1621M, and ASTM C1712.
 1. Test and inspect self-consolidating concrete according to PCI TR-6.
- C. Strength of precast structural concrete units is considered deficient if units fail to comply with **ACI 318** requirements for concrete strength.
- D. If there is evidence that strength of precast concrete units may be deficient or may not

comply with **ACI 318** requirements, employ a qualified testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C42/C42M.

1. A minimum of three representative cores to be taken from units of suspect strength, from locations directed by Architect.
 2. Test cores in an air-dry condition or, if units are wet under service conditions, test cores after immersion in water in a wet condition.
 3. Strength of concrete for each series of three cores is considered satisfactory if average compressive strength is equal to at least 85 percent of 28-day design compressive strength and no single core is less than 75 percent of 28-day design compressive strength.
 4. Report test results in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports include the following:
 - a. Project identification name and number.
 - b. Date when tests were performed.
 - c. Name of precast concrete fabricator.
 - d. Name of concrete testing agency.
 - e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.
- E. Patching: If core test results are satisfactory and precast structural concrete units comply with requirements, clean and dampen core holes and solidly fill with same precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.
- F. Defective Units: Discard and replace precast structural concrete units that do not comply with requirements, including strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Architect's approval. Architect reserves the right to reject precast units that do not match approved samples, sample panels, and mockups. Replace unacceptable units with precast concrete units that comply with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, bearing surface tolerances, and other conditions affecting performance of the Work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Do not install precast concrete units until supporting, cast-in-place concrete has attained minimum allowable design compressive strength and until supporting steel or other structure is structurally ready to receive loads from precast concrete units.

3.2 INSTALLATION

- A. Install clips, hangers, bearing pads, and other accessories required for connecting precast structural concrete units to supporting members and backup materials.
- B. Erect precast structural concrete level, plumb, and square within specified allowable tolerances. Provide temporary structural framing, shoring, and bracing as required to maintain position, stability, and alignment of units until permanent connections are complete.
 - 1. Install temporary steel or plastic spacing shims or bearing pads as precast structural concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
 - 2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
 - 3. Remove projecting lifting devices and use plastic patch caps or sand-cement grout to fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
 - 4. For hollow-core slab voids used as electrical raceways or mechanical ducts, align voids between units and tape butt joint at end of slabs.
- C. Connect precast structural concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.
 - 1. Do not permit connections to disrupt continuity of roof flashing.
- D. Field cutting of precast units is not permitted without approval of Architect.
- E. Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed concrete units.
- F. Welding: Comply with applicable requirements in AWS D1.1/D1.1M and AWS D1.4/D1.4M for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.
 - 1. Protect precast structural concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.
 - 2. Clean weld-affected steel surfaces with chipping hammer followed by brushing, and apply a minimum **4.0-mil-** thick coat of galvanized repair paint to galvanized surfaces according to ASTM A780/A780M.

3. Clean weld-affected steel surfaces with chipping hammer followed by brushing, and reprime damaged painted surfaces.
 4. Visually inspect welds and remove, reweld, or repair incomplete and defective welds.
- G. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.
1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot.
 2. For slip-critical connections, use one of the following methods to assure proper bolt pretension:
 - a. Turn-of-Nut: According to RCSC's "Specification for Structural Joints Using ASTM A325 or A 490 Bolts."
 - b. Calibrated Wrench: According to RCSC's "Specification for Structural Joints Using ASTM A325 or A 490 Bolts."
 - c. Twist-off Tension Control Bolt: ASTM F3125/F3125M, Grade 1852.
 - d. Direct-Tension Control Bolt: ASTM F3125/F3125M, Grade 1852.
 3. For slip-critical connections, use method and inspection procedure approved by Architect and coordinated with inspection agency.
- H. Grouting or Dry-Packing Connections and Joints: Grout connections and joints and open spaces at keyways, connections, and joints where required or indicated on Shop Drawings. Retain flowable grout in place until hard enough to support itself. Alternatively, pack spaces with stiff dry-pack grout material, tamping until voids are completely filled.
1. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces.
 2. Fill joints completely without seepage to other surfaces.
 3. Trowel top of grout joints on roofs smooth and uniform. Finish transitions between different surface levels not steeper than 1 to 12.
 4. Place grout end cap or dam in voids at ends of hollow-core slabs.
 5. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.
 6. Keep grouted joints damp for not less than 24 hours after initial set.

3.3 ERECTION TOLERANCES

- A. Erect precast structural concrete units level, plumb, square, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 135.
- B. Minimize variations between adjacent slab members by jacking, loading, or other method recommended by fabricator and approved by Architect.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: **Contractor will engage** a qualified special inspector to perform the following special inspections:
 - 1. Erection of precast structural concrete members.
- B. Testing Agency: **Contractor will engage** a qualified testing agency to perform tests and inspections.
- C. Visually inspect field welds and test according to ASTM E165 or to ASTM E709 and ASTM E1444. High-strength bolted connections are subject to inspections.
- D. Testing agency will report test results promptly and in writing to Contractor and Architect.
- E. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.
- F. Additional testing and inspecting, at Contractor's expense, to be performed to determine compliance of replaced or additional work with specified requirements.
- G. Prepare test and inspection reports.

3.5 REPAIRS

- A. Repair precast structural concrete units if permitted by Architect.
 - 1. Repairs may be permitted if structural adequacy, serviceability, durability, and appearance of units have not been impaired.
- B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of **20 ft.**.
- C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A780/A780M.
- D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.
- E. Remove and replace damaged precast structural concrete units that cannot be repaired or when repairs do not comply with requirements as determined by Architect.

3.6 CLEANING

- A. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.
- B. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
 - 1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.
 - 2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 034100

SECTION 05 73 00

Decorative Metal Railings

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. The work in this section includes all labor, materials, equipment, and services necessary to complete the Decorative Metal Railing elements as shown on the drawings and/or specified herein, including but not necessarily limited to the following:
 - a. Maritime Park Guardrail with Wood Lean Rail
 - b. Hudson River Waterfront Walk Guardrail
 - c. Hudson Get Down Rail
 - d. ADA Kickrail

B. Related Sections include the following:

1. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - a. DIVISION 1 – GENERAL REQUIREMENTS
 - b. Section 03 3 000 - Cast-In-Place Concrete
 - c. Section 32 13 16 – Decorative Concrete Paving
 - d. Section 32 14 10 - Unit Paving
 - e. Section 32 15 42 – Aggregate Surfacing
 - f. Section 32 16 13 – Concrete Vertical Curb
 - g. Section 32 16 23 – Sidewalks
 - h. Section 32 32 19 - Stone Masonry
 - i. Section 32 32 23 – Concrete Segmental Retaining Wall

C. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section

1.2 SUBMITTALS

- A. All submittals, samples, and shop drawings shall comply with the Division 01 requirements.
- B. Any proposed substitution shall comply with the Division 1 requirements. Substitutions shall only be considered when the Contractor demonstrates the acceptability of the proposed substitution and when the substitution causes no delay to the project schedule. The contractor is responsible to anticipate all lead times for all proposed substitutions.
- C. Product Data: For each type of product

- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for Cor-Ten and Galvanized Steel features, including finish, and support structure indicating compliance with referenced standard.
- E. Shop Drawings: Shop Drawings shall include materials, profiles, plans, elevations, sections, details, method of assembly, connections, and installation. Shop Drawings shall show true profiles, methods of anchoring, hardware, if any, and all other necessary information. Take accurate field measurements before preparation of shop drawings.
- F. Samples for Initial Selection: For products involving selection of color, texture, or design.
- G. Samples for Verification: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters, 12" sample
 - 2. Fittings, end caps, and brackets.
 - 3. Welded connections.
 - 4. Brazed connections.
 - 5. Cable and cable hardware and connections.
 - 6. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and guard infill. Sample need not be full height, 3' x 3" Sample.
 - a. Show method of connecting and finishing members at intersections.
- H. Delegated Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 PERFORMANCE REQUIREMENTS

- A. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- C. Structural Movement: Provision shall be made in the Work of this Section to accommodate differential structural movements, deflections, and thermal movement of the structure due to gravity loads, wind loads, seismic, loads, and temperature.
- D. Analysis: Requirements of this Section shall be analytically and mathematically proven, except for those requirements to be proven exclusively by physical testing methods. Calculations, related data and their application in engineering, fabrications, assembly, and installation shall be the responsibility of the Contractor's Professional Engineer registered in the State of New York.
- E. Structural Performance: Metal Fabrications shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
- F. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

- G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation. Refer to DIVISION 1 – GENERAL REQUIREMENTS for mockup requirements.

1. Build mockups as shown on Drawings for the following elements:
 - a. Maritime Park Guardrail with Wood Lean Rail
 - b. Hudson River Waterfront Walk Guardrail
 - c. Hudson Get Down Rail
 - d. ADA Kickrail
2. Build mockups for each form and finish of railing, consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 36 inches in length.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on laboratory mockups. Payment for these services will be made by Owner. Retesting of products that fail to meet specified requirements is to be done at Contractor's expense.

1. Build laboratory mockups at testing agency facility; use personnel, materials, and methods of construction that will be used at Project site.
2. Test railings in accordance with ASTM E894 and ASTM E935.
3. Notify Architect seven days in advance of the dates and times when laboratory mockups will be tested.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.
- B. Structural Performance: Railings, including attachment to building construction, are to withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
 - b. Infill load and other loads need not be assumed to act concurrently.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.
- C. Stainless Steel Cable and Cable Fittings:
 - 1. Cable: 1-by-5 wire cable made from wire complying with ASTM A492, Type 316.
 - 2. Cable Diameter: 5/16"
 - 3. Cable Fittings: Connectors of types indicated, fabricated from stainless steel, and with capability to sustain, without failure, a load equal to minimum breaking strength of cable with which they are used.
 - 4. Intermediate Cable Supports: Stainless steel flat bar, 1/4 by 1 inch, predrilled.
- D. Castings: ASTM B26/B26M, Alloy A356.0-T6.

2.3 STAINLESS STEEL DECORATIVE RAILINGS

- A. Castings: ASTM A743/A743M, Grade CF 8 Tnemec Tnemec Endura – Shield Coating, color to match DK Bronze RAL8019

- B. Plate, Sheet, and Strip: ASTM A240/A240M or ASTM A666, Type 316L. Tnemec Endura – Shield Coating, color to match DK Bronze RAL8019
- C. Flat Bar: ASTM A666, Type 316L. Tnemec Coating
- D. Stainless Steel Cable and Cable Fittings:
 - 1. Supplied by Jakob Rope Systems: 119 S. H St – Lake Worth Beach, FL 33460. P: (516)330-6502, www.jakob-usa.com
 - 2. Cable: 1-by-19wire cable made from wire complying with ASTM A492, Type 316 Stainless Steel
 - 3. Cable Diameter: 5/16 inch
 - 4. Cable Fittings: Connectors of types indicated, fabricated from stainless steel, and with capability to sustain, without failure, a load equal to minimum breaking strength of cable with which they are used.
 - 5. Intermediate Cable Supports: Stainless steel flat bar, 1/4-by-1-inch predrilled.
 - 6. Color to match RAL8019
- E. Wood Topper:
 - 1. Supplied by Trilox: 228 India Street Brooklyn, NY 11222. P: (347) 987-4553, www.trilox.com
 - 2. Thermally modified ash 2inch x 8inch lean rail topper.
 - 3. See contract drawings for details

2.4 FASTENERS

- A. Fastener Materials:
 - 1. Stainless Steel Railing Components: Type 316 stainless steel fasteners.
- B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction [and capable of withstanding design loads].
- C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless otherwise indicated
 - 1. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, in accordance with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy \Group 2 (A4) stainless steel bolts, ASTM F593 and nuts, ASTM F594.

2.5 FABRICATION

- A. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage

- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.
 - 1. Clearly mark units for reassembly and coordinated installation.
 - 2. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately.
 - 1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
 - 2. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water.
 - 1. Provide weep holes where water may accumulate.
 - 2. Locate weep holes in inconspicuous locations.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint.
- I. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings.
 - 1. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - 2. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- J. Form changes in direction as follows:
 - 1. As detailed.
- K. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.
- M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, handrail brackets, miscellaneous fittings, and anchors to interconnect railing members to other Work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.
- N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry Work.
1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
 2. Coordinate anchorage devices with supporting structure.
- O. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.
- P. For removable railing posts, fabricate slip-fit sockets from stainless steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height.
1. Provide socket covers designed and fabricated to resist being dislodged.
 2. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.
- Q. Stainless Steel Cable Guard Infill: Fabricate cable guard infill assemblies in the shop to field-measured dimensions with fittings machine swaged.
1. Minimize amount of turnbuckle take-up used for dimensional adjustment, so maximum amount is available for tensioning cable.
 2. Tag cable assemblies and fittings to identify installation locations and orientations for coordinated installation.
- R. Toe Boards: Where indicated on Drawings, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.7 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces.
 - 3. Remove embedded foreign matter and leave surfaces chemically clean.
- C. Stainless Steel Sheet and Plate Finishes:
 - 1. Directional Satin Finish: ASTM A480/A480M, No. 4.
 - 2. Tenmec Endura – Shield Coating, color to match DK Bronze RAL8019

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Perform cutting, drilling, and fitting required for installing railings.
 - 1. Fit exposed connections together to form tight, hairline joints.
 - 2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
 - 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
 - 4. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 - 1. Coat concealed surfaces of [aluminum] [and] [copper alloys] that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings.

Seal recessed holes of exposed locking screws, using plastic cement filler colored to match finish of railings.

- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve, extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

- A. Use stainless steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Cover anchorage joint with flange of same metal as post, [welded to post after placing anchoring material.
- D. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post].
- E. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For aluminum railings, attach posts as indicated, using fittings designed and engineered for this purpose.
 - 2. For copper-alloy railings, attach posts as indicated, using fittings designed and engineered for this purpose.
 - 3. For stainless steel railings, weld flanges to posts and bolt to metal-supporting surfaces.
 - 4. For steel railings, weld flanges to posts and bolt to metal-supporting surfaces.
- F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ATTACHING RAILINGS

- A. Anchor railing ends to concrete and masonry with brackets on underside of rails connected to railing ends and anchored to wall construction with anchors and bolts.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends.

3.6 REPAIR

- A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099600 "High-Performance Coatings."

3.7 FIELD QUALITY CONTROL

- A. **Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections and to prepare test reports. Payment for these services will be made by Contractor.**
- B. Extent and Testing Methodology: Testing agency will randomly select completed railing assemblies for testing that are representative of different railing designs and conditions in the completed Work. Test railings in accordance with ASTM E894 and ASTM E935 for compliance with performance requirements.
- C. Remove and replace railings where test results indicate that they do not comply with specified requirements unless they can be repaired in a manner satisfactory to Architect and comply with specified requirements.
- D. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

3.8 CLEANING

- A. Clean stainless steel by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.
- B. Clean copper alloys in accordance with metal finisher's written instructions in a manner that leaves an undamaged and uniform finish matching approved Sample.
- C. Clean wood lean rails by wiping with a damp cloth and then wiping dry.
- D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

3.9 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 057300

SECTION 09 97 13.26**COATINGS FOR STEEL WATERFRONT STRUCTURES (COAL-TAR EPOXY)****PART 1 – GENERAL****1.1 SUMMARY**

- A. Work includes surface preparation and application of protective coating systems to new steel sheet piling and pipe piles in a saltwater, tidal NYC waterfront environment.
- B. Coating system basis: **Coal-tar epoxy (CTE) meeting AMPP/SSPC Paint 16**; heavy-build immersion-grade application in submerged and splash/tidal zones, with epoxy/urethane topcoat for atmospheric/UV-exposed steel.

1.2 REFERENCES

- A. AMPP/SSPC-PAINT 16 – Coal Tar Epoxy-Polyamide Coating.
- B. AMPP/SSPC-SP 10/NACE No. 2 – Near-White Blast Cleaning of Steel.
- C. AMPP/SSPC-PA 2 – Measurement of Dry Coating Thickness.
- D. NACE/AMPP SP0188 – Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
- E. AWWA C210 (non-potable service) – Liquid-Epoxy and Coal-Tar Epoxy Coatings for Steel Pipe.
- F. USACE EM guidance for protective coatings (informational).

1.3 SUBMITTALS

- A. Product Data: Manufacturer's technical data sheets (TDS), safety data sheets (SDS), application/curing requirements, recoat windows, immersion ratings, and VOC/PAH content.
- B. Coating Schedule: DFT, number of coats, colors, and stripe coat locations.
- C. Quality Control Plan: Surface prep, environmental controls, DFT measurements (per PA 2), holiday testing procedures, hold points.
- D. Certificates: Applicator qualifications (minimum 5 marine projects of similar scope in last 5 years), abrasive media certifications, compressor air quality reports.
- E. Samples: Two 6 in x 12 in steel panels showing full system for Splash/Tidal and Atmospheric zones.
- F. Record Documents: Daily logs, DFT readings, holiday test maps, cure verification, deviations and repairs.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: NACE/AMPP-certified Coating Inspector Level 2 or higher to oversee QC; crew trained by coating manufacturer.
- B. Pre-construction Meeting: Review substrate condition, welding/edge rounding, access/containment, tidal work windows, cure times before immersion, inspection plan.
- C. Mock-Up: Coat a minimum 100 sq ft representative area including welds and edges for acceptance of surface prep, stripe coats, film build, and appearance.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in unopened containers bearing product name, batch number, and shelf-life.
- B. Store per manufacturer: temperature, stacking, and moisture requirements. Protect from freezing and direct sunlight.

1.6 FIELD CONDITIONS

- A. Environmental: Apply only when steel temperature is ≥ 5 °F above dew point; ambient and substrate temperatures within manufacturer limits. Maximum relative humidity per TDS.
- B. Tidal Coordination: Schedule to prevent tidal wetting, spray, or condensation during application and until coating achieves **immersion-service cure** per TDS.
- C. Containment: Provide SSPC-Guide 6/7 compliant containment and waste management for abrasive blasting and PAH-bearing residues.

1.7 WARRANTY

- A. Warranty: 5-year labor and materials warranty covering adhesion, film integrity, and holiday-free condition in immersion zones at Substantial Completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS (ACCEPTABLE)

Subject to compliance with this Section, products listed set a **performance standard**:

- A. **Carboline** – Bitumastic® 300 M or Bitumastic® 300 M COE (coal-tar epoxy).
- B. **Sherwin-Williams Protective & Marine** – **Targuard® Coal Tar Epoxy** (standard or Low VOC as required).
- C. **PPG Protective & Marine** – **AMERCOAT® 78 HB** Coal-Tar Epoxy.

2.2 MATERIALS

- A. Coal-Tar Epoxy (CTE): Two-component, high-build, immersion-grade CTE meeting **AMPP/SSPC Paint 16** compositional specification; self-priming to steel; suitable for brackish/saltwater immersion and splash/tidal exposure; capable of **16–24 mils DFT per coat** by airless spray.
- B. Colors: Manufacturer's standard black (or dark red for contrasting intermediate/stripe coats). Provide contrasting first and second coats where practical to aid inspection.
- C. Thinner/Cleaner: As recommended by coating manufacturer; comply with VOC limits.
- D. Stripe Coat Material: Same CTE as line coats unless manufacturer recommends compatible alternative.
- E. Topcoat (Atmospheric/UV Zone Only): Two-component aliphatic polyurethane, color per Owner, compatible with selected CTE via manufacturer-approved tie-coat or cure interval.

2.3 COATING SYSTEM SCHEDULE (NEW STEEL)

Note: DFT values are **minimums**; do not exceed manufacturer maximum per coat. Provide additional passes as needed to achieve DFT without runs/sags.

1. Surface Prep: **SSPC-SP 10**; profile 2.0–3.0 mil; edge-round $\geq 1/16$ in.
2. Stripe Coat: One stripe to all edges, welds, and discontinuities **before** first line coat and **after** any abrasive touch-ups.
3. Line Coats: **Coal-Tar Epoxy in 2 coats to achieve 24–30 mils total DFT.**

4. Holiday Test: 100% of area after full cure; repair and re-test.

2.4 ACCESSORIES

- A. Abrasives: Mineral or steel grit suitable to achieve specified profile; free of chlorides per manufacturer.
- B. Sealants/Fillers: Manufacturer-approved for pits and weld undercuts prior to coating.
- C. Identification: Stencils/labels compatible with coating.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify steel is fabricated, welded, and corrected prior to coating; remove weld spatter and sharp edges; bevel/round edges to minimum 1/16 in radius.
- B. Verify ambient and substrate conditions.

3.2 SURFACE PREPARATION

- A. Perform **SSPC-SP 10** blast to specified profile; remove dust and contaminants; measure profile with replica tape or profile gauge.
- B. Solvent clean per **SSPC-SP 1** before and after blasting as required.
- C. Chloride Remediation: If salt contamination exceeds manufacturer's limit, perform fresh-water wash or approved soluble salt remover; verify with field test kits.

3.3 APPLICATION

- A. Mix and induct per manufacturer; maintain pot life; strain if required; use plural-component equipment where recommended for high builds.
- B. Apply by airless spray; back-roll/back-brush as needed to wet edges and welds.
- C. Stripe Coats: Apply first; allow to tack per TDS; ensure visibility at inspection.
- D. Recoat Windows: Adhere strictly to minimum/maximum intervals; if exceeded, abrade per manufacturer instructions before recoating.
- E. Film Thickness: Measure wet and dry film thickness per **SSPC-PA 2**; record each lift by location.
- F. Curing: Maintain temperature and time to achieve **immersion-service cure** before tidal exposure; extend cure in cool/damp conditions per TDS.
- G. Repairs: Power-tool clean SSPC-SP 11 (minimum) and feather; spot-prime and rebuild to specified DFT; re-test.

3.4 FIELD QUALITY CONTROL

- A. Holiday Testing: test voltage and probe type per NACE SP0188; map and log all indications; re-test after repair.
- B. Adhesion: Conduct pull-off adhesion testing (ASTM D4541) at Engineer's direction in splash zone; minimum acceptable per manufacturer or 400 psi, whichever is greater.
- C. DFT Verification: Independent QA to audit PA 2 measurements; provide final DFT map by station/elevation.

3.5 PROTECTION

- A. Protect finished coatings from damage by fenders, tie-backs, and construction operations. Touch up damaged areas prior to acceptance.

3.6 CLEANING AND WASTE MANAGEMENT

A. Collect and properly dispose of abrasive media, dust, and PAH-bearing wastes per applicable regulations.

3.7 CLOSEOUT SUBMITTALS

A. Provide final QC package, manufacturer warranties, and Owner's maintenance recommendations.

APPENDIX A – BASIS-OF-DESIGN PRODUCT SCHEDULE

(Use one of the following, or approved equal meeting Part 2.)

Option 1 – Carboline Bitumastic® 300 M (or 300 M COE):

- 2 coats to 24–30 mils DFT total; stripe coats between coats.

Option 2 – Sherwin-Williams Targuard® Coal-Tar Epoxy (standard or Low-VOC):

- 2 coats to 24–30 mils DFT total; stripe coats between coats.

Option 3 – PPG AMERCOAT® 78 HB Coal-Tar Epoxy:

- 2 coats to 24–30 mils DFT total; stripe coats between coats.

END OF SECTION

SECTION 26 09 23
LIGHTING CONTROL DEVICES

Part 1 – General

1.01 Summary

This section specifies requirements for furnishing and installing the Musco Control-Link System, or approved equal, for automated lighting control, including all necessary equipment, wiring, programming, and integration.

1.02 References

- National Electrical Code (NEC)
- NFPA 70
- UL Standards as applicable
- Musco Control-Link Manufacturer's Installation Instructions

1.03 Submittals

- Product Data: Submit manufacturer's literature for Musco Control-Link System, including specifications, features, and installation instructions.
- Shop Drawings: Provide wiring diagrams and system layout.
- Operation and Maintenance Manuals: Submit complete manuals for installed system.
- Warranty Documentation: Submit manufacturer's warranty terms.

1.04 Quality Assurance

- Installer shall be qualified and experienced in installation of automated lighting control systems.

- System shall be installed in accordance with manufacturer's recommendations and applicable codes.

1.05 Warranty

- Provide manufacturer's standard warranty for Control-Link System, minimum one year from date of substantial completion.

Part 2 – Products

2.01 Manufacturer

Musco Lighting or approved equal. No substitutions unless pre-approved by Architect.

2.02 System Description

- Musco Control-Link System for automated control of site lighting.
- System shall provide remote scheduling, monitoring, and manual override capabilities.
- System shall be compatible with site's lighting fixtures and electrical infrastructure.

2.03 Components

- Control-Link central controller
- Remote communication interface (cellular, Ethernet, or as specified)
- Input/output modules as required
- Enclosures rated for installation location
- All necessary wiring, connectors, and mounting hardware

2.04 Accessories

- Surge protection devices

- Backup battery (if specified)
- Manual override switches

Part 3 – Execution

3.01 Examination

- Verify site conditions are suitable for installation.
- Confirm compatibility of electrical infrastructure with system requirements.

3.02 Installation

- Install Musco Control-Link System in accordance with manufacturer's instructions and approved shop drawings.
- Mount controller and interface devices securely in designated locations.
- Connect all wiring per NEC and local codes.
- Integrate system with site lighting fixtures as indicated.
- Label all components and wiring clearly.

3.03 Programming and Commissioning

- Configure system for specified schedules, zones, and overrides.
- Test system operation and communication functions.
- Demonstrate system operation to Owner's representative.

3.04 Cleaning and Protection

- Remove debris and packaging from site.

- Protect installed equipment from damage until acceptance.

3.05 Training

- Provide training for Owner's personnel on operation and basic troubleshooting of Control-Link System.

3.06 Closeout

- Submit final documentation, including as-built drawings and operation manuals.
- Obtain Owner's acceptance of installed system.

Part 4 – Measurement and Payment

4.01 Measurement and Payment

All coordination, materials, labor needed to purchase and install the Control Lighting System, inclusive of all materials in order to make a functioning lighting control system reflected in this specification and manufacturer's product details shall be incorporated into the lump sum price for Lighting Control Devices.

END OF SECTION 26 09 23

SECTION 31 20 00

EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 1 Specification Sections, apply to this Section.
- B. Earthwork shall be performed in accordance with Division 200 of the New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition as well as special provisions herein.
- C. Subbase shall be performed in accordance with Section 301 of the New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition as well as special provisions herein.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Preparing subgrades for slabs-on-grade, walks and pavements.
 - 2. Excavating and backfilling structures.
 - 3. Drainage course for slabs-on-grade.
 - 4. Subbase course for concrete pavements.
 - 5. Excavating and backfilling for utility trenches.
 - 6. Excavation for proposed pavement and slabs.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for concrete slabs, pads, and foundations.
 - 2. Division 26 Section "Raceways and Boxes" for electrical conduits.
 - 3. Division 31 Section "Site Clearing" for temporary erosion and sedimentation control measures, site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements.
 - 4. Division 31 Section "Dewatering" for lowering and disposing of ground water during construction.
 - 5. Division 31 Section "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
 - 6. Division 31 Section "Erosion and Sedimentation Controls" for soil erosion and sediment control procedures.
 - 7. Division 32 Section "Turf and Grasses" for finish grading, including preparing and placing topsoil and planting soil for lawns.
 - 8. Division 33 Section "Stormwater Conveyance" for storm drains and structures.

1.3 DEFINITIONS

- A. Backfill: Soil material used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Backfill Excavation: Material meeting the requirements for Dense-Graded Aggregate Base Course, as defined in Section 32 11 23, which is installed if & where directed by the Engineer, to fill voids created by the Excavation & Offsite Removal of Unclassified Material or Excavation & Offsite Removal of Unsuitable Material directed by the Engineer.
- C. Base Course: Course placed between the subbase course and paving.
- D. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

- E. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill. The soil shall be certified as clean fill in accordance with N.J.A.C. 7:26 1.4 and 7:26E-1.8.
- F. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- G. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated. Bidder to note that in addition to soils, part of the excavated material will be comprised of non-decomposable inert solids such as broken concrete and metallic products generated from the demolition of the existing playground and backstop. Material Characterization reports related to the soils.
 - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer. This may also be used if, during earthwork operations, the Engineer determines that there are unsuitable materials on site and they must be removed above and beyond the initial contract. This excavation and replacement material required will be paid for according to Contract provisions for unit prices.
 - 2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
 - 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.
 - 4. **The work for disposal of excess soils at off-site locations at a facility chosen by the contractor subject to approval by the Owner shall be paid for in the following items listed in the proposal:**
 - **EXCAVATION, HANDLING, AND DISPOSAL OF NON-HAZARDOUS MATERIALS**
 - **EXCAVATION, HANDLING, AND DISPOSAL OF HAZARDOUS MATERIALS**
- H. Fill: Soil materials used to raise existing grades.
- I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- J. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- K. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- L. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.
- M. Unsuitable Material: All material that cannot be compacted as directed by the Engineer.
- N. Unclassified Material: All materials above the subgrade elevations that includes brick and concrete debris, boulders (rocks over 3' in diameter), other obstructions including metals, piping, trash, etc.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Structural Fill
- B. Material Test Reports: From a qualified testing agency, paid for by the Contractor, indicating and interpreting test results for compliance of the following with requirements indicated:
 - 1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
 - 2. Laboratory compaction curve according to ASTM D 1557 for each on-site and borrow soil material proposed for fill and backfill.
 - 3. Clean-fill certification from the material supplier or certification that the material originates from an authorized quarry/mine. Soils shall be certified as clean fill in accordance with N.J.A.C. 7:26 1.4 and 7:26E-1.8.
- C. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

1.5 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: An independent testing agency, paid for by the Contractor, qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

1.6 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing and then only after arranging to provide temporary utility services according to requirements indicated.
 - 1. Notify Engineer not less than three days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Engineer's written permission.
 - 3. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Structural Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter, or fill as described in attached soils report.
- C. Unsatisfactory Soils for Import: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction. No payment will be made for the removal and disposal of unsatisfactory soil imported by the contractor.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- H. Drainage Course: Narrowly graded mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.
- I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.
- J. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.
- K. Backfill Excavation: Material meeting the requirements for Dense-Graded Aggregate Base Course, as defined in Section 32 11 23.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 31 Section "Site Clearing."
- C. Protect and maintain erosion and sedimentation controls, which are specified in Division 31 Section "Erosion and Sedimentation Controls" during earthwork operations.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 - 2. Install a dewatering system, specified in Division 31 Section "Dewatering," to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

- A. Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Project Lump Sum includes excavation to all subgrade elevations including the removal of excess fill if required. Bidder to note that in addition to soils, part of the excavated material will be comprised of non-decomposable inert solids such as broken concrete and metallic products generated from the demolition of the existing playground and backstop. Material Characterization reports related to the soils.

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.6 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
 - 1. Clearance: As indicated.
- C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.

3.7 EXCAVATION & OFFSITE REMOVAL OF UNCLASSIFIED MATERIAL (IF & WHERE DIRECTED)

- A. Excavation: Excavate material regardless of the character of surface and subsurface conditions encountered, if and where directed by the Engineer.

- B. Disposal: Dispose of Unclassified Material in accordance with Subsection 3.22.

3.8 EXCAVATION & OFFSITE REMOVAL OF UNSUITABLE MATERIAL (IF & WHERE DIRECTED)

- A. Excavation: Excavate unsuitable material regardless of the character of surface and subsurface conditions encountered, if and where directed by the Engineer.
- B. Disposal: Dispose of Unsuitable Material in accordance with Subsection 3.22.

3.9 SUBGRADE INSPECTION

- A. Notify Third Party Special Inspector when excavations have reached required subgrade.
- B. If Third Party Testing Agency determines that unsatisfactory soil is present, continue excavation and replace with certified clean fill material.
- C. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
 - 2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
 - 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Third Party Special Inspector and replace with compacted backfill or fill as directed.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Third Party Special Inspector, without additional compensation.

3.10 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation by extending bottom elevation of concrete to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Engineer.
 - 1. Fill unauthorized excavations under other construction or utility pipe as directed by Engineer.

3.11 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.12 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Surveying locations of underground utilities for Record Documents.
 - 2. Testing and inspecting underground utilities.
 - 3. Removing concrete formwork.
 - 4. Removing trash and debris.
 - 5. Removing temporary shoring and bracing, and sheeting.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.13 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

- C. Backfill trenches excavated under footings and within 18 inches of bottom of footings with dense-graded aggregate; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 3 Section "Cast-in-Place Concrete."
- D. Place and compact initial backfill of, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit.
 - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- E. Backfill voids with a ready-mixed flowable fill with a twenty-eight-day compressive strength of 1,200 psi to within six inches of the surface of the pavement for a hot mixed asphalt base course (four inches) and a hot mix asphalt surface course.

3.14 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use satisfactory soil material.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.15 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.16 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
 - 1. Under pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
 - 2. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 90 percent.
 - 3. For utility trenches, compact each layer of initial and final backfill dense-graded aggregate material at 90 percent.

3.17 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from pavement and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Lawn or Unpaved Areas: Plus or minus 1 inch.
 - 2. Walks: Plus or minus 1/4 inch.

3. Pavements: Plus or minus 1/2 inch.

3.18 SUBBASE AND BASE COURSES

- A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase and base course under pavements as follows:
 1. Place base course material over subbase course under pavement.
 2. Shape subbase and base course to required elevations and grades.
 3. Place subbase and base course 6 inches or less in compacted thickness in a single layer.
 4. Place subbase and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 5. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.19 DRAINAGE COURSE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
 1. Place drainage course 6 inches or less in compacted thickness in a single layer.
 2. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 3. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.20 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified 3rd party geotechnical engineering testing agency, paid for by the Contractor, to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
 1. Paved Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than 3 tests.
 2. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet or less of trench length, but no fewer than 2 tests.
- D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify, and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.21 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property. Bidder to note that in addition to soils, part of the excavated material will comprise of non-decomposable inert solids such as broken concrete and metallic products generated from the demolition of the existing playground and backstop. Material Characterization Reports (MCR) related to the soils are appended to the bid specifications to assist with the identification of the disposal facilities prior to bid submission. The bidder is to specifically note that disposal costs are to be computed based on these reports and no changes will be allowed on account of disposal of surplus and waste materials. In addition, no additional material/waste characterization analysis is to be performed by the bidder as part of their scope of work.

PART 4 – SPECIAL PROVISIONS

Measurement and Payment

The various pay items will be considering to handle the various tasks listed in this section:

- Clearing Site
- Earth Moving
- Excavation, Handling, And Disposal Of Non-Hazardous Materials
- Excavation, Handling, And Disposal Of Hazardous Materials

Contractor should use Clearing Site for the removal of all items in order to allow for Earth Moving activities to take place. Excavation, Handling, and Disposal of material will be split into two categories based on the material found at the site, which is either Non-Hazardous or Hazardous. Earth Moving will consist of all the necessary construction activities to develop the site to the proposed grading and the need for borrow excavation and certified fill to establish the proposed improvements.

This work shall also include the removal of all excess materials and shall include soils unsuitable for re-use. Material that is observed to weave or pump during construction operations shall be deemed unsuitable for re-use and disposed off-site as per the direction of the Engineer. This work shall also include the material and labor for importing of the fill material (borrow excavation) and spreading of the borrowing excavation, as needed to complete the project improvements.

This work shall also include the cost for all borrow excavation, certified clean fill, and site grading required for the installation and construction of all proposed improvements described on the project plans, regardless of the material encountered, in conformance with the final grades provided on the project plans. The work shall also include import of clean fill as needed to develop the proposed improvements.

The work for disposal of excess soils at off-site locations at a facility chosen by the contractor subject to approval by the Owner shall be paid for in the following items listed in the proposal:

- EXCAVATION, HANDLING, AND DISPOSAL OF NON-HAZARDOUS MATERIALS
- EXCAVATION, HANDLING, AND DISPOSAL OF HAZARDOUS MATERIALS

In addition, this work shall also include the removal of rock due the need to install proposed underground improvements as indicated and as directed by the Engineer. The manner of rock excavation shall be examined on a case by case basis but shall include removal by hand or machine, the use of blasting is not permitted on this project.

All excavation and disposal including cutting, rock removal, etc., as required shall be included in the excavation items listed in the proposal. Materials to be excavated are unclassified. Contractor shall be responsible for removal of any and all excessive and unsuitable materials encountered, without additional cost to the Owner.

Following the site clearing and stripping, excavation within the grading limits of the project shall be performed to establish the sub-grade for the site, as needed and determined in the field by the Engineer. Cost for disposal of all material shall be the responsibility of the contractor.

Any excess subsoil shall be kept separate from topsoil and/or other excavated materials and properly stored in stockpiles, so that it shall not be subject to abnormal erosion and loss and does not interfere with subsequent construction, material storage and/or contamination from construction activities. Material removed below grade shall be replaced with approved material, thoroughly compacted to a density equal to adjacent areas using suitable equipment, as approved by the Engineer.

Contractor shall carry excavation to lines and grades required, to dimensions and depths shown, with sufficient working space to permit placing, protection, inspection, and completion of all contract work. Materials of every nature encountered shall be loosened and removed manually or with power equipment. Excavated material shall be stockpiled on the construction site, if needed for the work; otherwise, it shall be disposed of properly off site.

The sides of all excavations shall be free of undercuts and properly sloped or braced to prevent slides and caving. Provide barriers, snow fence, markings, and guarding lighting as required at all open excavations for working and public safety. Remove protective materials when no longer required. All excavations shall be maintained free of water and protected at all times from frost.

1. Critical Areas of Existing Utilities: Hand excavation of such areas shall be required to ensure that utilities are not damaged.
2. Inspection: Contractor shall not begin work until bearing surfaces have been cleared, and Engineer's authorization given to proceed. Contractor is required to give ample advance notice to permit the Engineer to arrange for proper field inspection of conditions. The Engineer shall approve the sub-grade before permission is granted to proceed.
3. Contractors shall schedule excavation, construction, protection, inspection, and completion so as to minimize the time that any excavation remains open.

Site grading shall include grading, preparation, and compacting all material required to bring the site to grade, as shown on the plans or as directed by the Engineer, and all incidental work to the satisfaction of the Engineer.

The importing of the fill material (borrow excavation) and spreading of the borrowing excavation, shall be paid for on a percentage complete basis. All material shall be certified clean by the contractor and/or contractor's representative or be virgin material as certified by a commercial quarry. The contractor shall install the material in lifts and compact the material to 95% compaction so that settling of the site does not occur. The contractor shall utilize the services of a geotechnical engineer in areas of fill that are greater than four feet.

Compaction shall be performed in accordance with Section 203 of the NJDOT Standard Specification.

END OF SECTION 31 20 00

SECTION 31 32 37**GROUND IMPROVEMENT BY RAPID IMPACT COMPACTION (RIC)****PART 1 – GENERAL****1.1 SUMMARY**

This Section covers all labor, materials, and equipment necessary to perform ground improvement using Rapid Impact Compaction (RIC) beneath the proposed skatepark facilities, to increase soil density in the upper 10 to 12 feet, reduce settlement, and improve subgrade uniformity.

Work includes:

1. Preparation of a detailed construction work plan which will indicate baseline testing, test sections, equipment and coverage considerations.
2. Vibration monitoring program.
3. Mobilization, layout, and execution of RIC.
4. Verification testing and quality control.
5. Preparation of a final Ground Improvement Summary Report documenting all testing and achieved improvement.

1.2 REFERENCES

- A. ASTM D1556 – Density and Unit Weight of Soil by Sand-Cone Method.
- B. ASTM D6938 – In-Place Density and Water Content by Nuclear Methods.
- C. ASTM D1196 – Static Plate Load Test.
- D. ASTM D6951 – Dynamic Cone Penetrometer (DCP).

1.3 SUBMITTALS**A. Pre-Construction Submittals:**

1. Contractor qualifications: at least three (3) similar RIC projects in granular or fill soils.
2. Equipment data sheets: hammer weight, drop height, foot diameter, and onboard monitoring specifications.
3. Proposed grid spacing, pass sequence, and energy level plan.
4. Proposed regrading between RIC progress.
5. Test-section proposal with target acceptance values and testing plan.
6. Vibration monitoring plan.

B. Construction Records:

1. Daily impact logs including energy, blows, and final set per point.

2. Real-time monitoring printouts or data files.
3. As-built grid showing coordinates and limits of treatment.

C. Post-Construction Submittals:

1. Verification test results.
2. Final Ground Improvement Summary Report, certified by the Geotechnical Engineer for approval by the Engineer.

1.4 QUALITY ASSURANCE

- A. Work shall be observed and reviewed by a Geotechnical Engineer licensed in the state.
- B. Equipment shall include a calibrated automated system recording impact count, set per blow, and energy output.
- C. Conduct a test section to verify procedures and parameters prior to production work.

1.5 FIELD CONDITIONS

- A. Verify site conditions and existing soil data prior to mobilization.
- B. Do not operate RIC within 10 feet of existing utilities, retaining structures, or formwork unless approved by the Engineer.
- C. Suspend operations during saturated, frozen, or ponded water conditions.

PART 2 – EXECUTION

2.1 PREPARATION

- A. Strip and remove vegetation, debris, and soft surficial materials from the treatment area.
- B. Establish RIC grid and control benchmarks per approved layout.
- C. Conduct the test section(s) as specified in the approved Work Plan. Coordinate with the Engineer for any changes needed prior to the start of production RIC application.

2.2 RIC OPERATIONS

- A. Conduct RIC at locations and depths shown on the Work Plan or as modified after test sections.
- B. Use multi-pass compaction with progressively reduced spacing to achieve uniform improvement.
- C. Continue impact at each point until the acceptance criteria is achieved.
- D. Vibrations are not to exceed a peak particle velocity of 2.0 inches per second (ips) unless approved by the Engineer. A threshold reporting peak particle velocity of 1.0 ips is to be used until such time that actual site response during RIC operations can be evaluated. If vibrations exceed 2.0 ips the RIC equipment, frequency, or field modifications will need to be achieved. This may include the use of trenches to isolate vibration transmission at no additional cost.

2.3 FIELD QUALITY CONTROL AND ACCEPTANCE CRITERIA

Verification testing shall be performed under supervision of the Geotechnical Engineer.

Acceptance Criteria –Slab-on-Grade Applications:

1. Total Settlement: Maximum predicted post-construction settlement ≤ 1.0 inch under uniform 200 psf slab load.
2. Differential Settlement: ≤ 0.50 inch within any 50-foot span.
3. Subgrade Modulus (k-value): Post-RIC $k \geq 200$ pci
4. DCP Improvement: Post-RIC DCP index shall show $\geq 50\%$ reduction in in/blow compared to baseline.
5. Surface Uniformity: Final graded surface shall be smooth to within ± 0.5 inch and free of abrupt depressions > 1 inch.
6. Noncompliant areas shall be re-treated or re-compacted until acceptance criteria are met at no additional cost to Owner.

2.4 VERIFICATION TESTING MATRIX

Test Type	Frequency	Purpose	Acceptance Threshold
Dynamic Cone Penetrometer (DCP)	1 per 2,500 ft²	Assess relative density increase	$\geq 50\%$ reduction in DCP penetration rate
Plate Load Test (ASTM D1196)	1 per 7,500 ft² (minimum 2 total)	Determine subgrade modulus (k)	$k \geq 200$ pci
In-situ Density Test (ASTM D1556/D6938)	1 per 2,500 ft²	Confirm surface compaction	$\geq 95\%$ of maximum dry density
Surface Level Survey	100% of treated area	Verify final grade uniformity	± 0.5 in. tolerance
Visual Observation by Geotech	Continuous	Confirm densification behavior and set per blow	Consistent set < 0.375 in/blow

Notes:

- Additional verification tests may be required at the discretion of the Engineer if results indicate variable improvement.
- Re-testing is required in any area re-compacted after failing acceptance criteria.

2.5 SITE RESTORATION

- A. Regrade the treated area to design elevation, compact to $\geq 95\%$ of maximum dry density, and prepare for skatepark slab construction.
- B. Remove debris and restore the area to clean condition suitable for slab construction.

2.6 GROUND IMPROVEMENT SUMMARY REPORT

- A. Submit within 2 weeks of completion and include:
 1. Equipment details and parameters used.
 2. As-built RIC grid and cumulative energy data.
 3. All verification test results.
 4. Certification by Geotechnical Engineer confirming compliance with acceptance criteria.

PART 3 – MEASUREMENT AND PAYMENT

A. Measurement

1. Unit of Measure: Square Foot (SF) of ground improvement performed by Rapid Impact Compaction (RIC).
2. Measured Limits: Plan area of the skatepark limits plus a 7ft buffer, projected vertically to the ground surface. Contractor shall submit a Work Plan for approval to verify limits.
3. What's Included in SF: All depths of treatment required to meet acceptance criteria (upper 10–12 feet or as modified by approved test sections). No additional measurement for multiple passes, re-treatment, or increased energy necessary to achieve acceptance.
4. What's Not Measured Separately: Overbuild beyond the indicated limits; rework due to Contractor means and methods; test sections; layout; surveys; vibration monitoring; instrumentation; temporary controls; regrading between passes; debris handling; incidentals. These are incidental to the SF pay item.

B. Payment

1. Basis of Payment: Payment will be made at the Contract Unit Price per SF for **GROUND IMPROVEMENT BY RAPID IMPACT COMPACTION (RIC)**, upon acceptance of the treated area by the Engineer following successful completion of all verification testing and submittals required in this Section, including the Final Ground Improvement Summary Report.
2. Acceptance for Payment: An area is eligible for payment only after:
 - Verification testing for that area meets the Acceptance Criteria in Article 2.3 and the Verification Testing Matrix in Article 2.4, and
 - Required records (daily impact logs, monitoring data, as-built grid) for that area are submitted and accepted, and
 - The Engineer concurs that the improvement is complete and compliant.
3. No Separate Payment: No separate payment will be made for mobilization/demobilization, development and execution of test sections, vibration monitoring, QC/QA testing and reporting, re-treatment of noncompliant areas, re-testing, temporary environmental controls, or site restoration described in this Section; costs shall be included in the SF unit price.
4. Noncompliant Areas: Areas failing to meet acceptance criteria shall be re-treated and re-tested at no additional cost to the Owner until acceptance is achieved.
5. Partial Payments: No partial payments will be made for areas not yet accepted. Progress payments for accepted areas may be made in discrete blocks as approved by the Engineer (e.g., by grid, phase, or milestone), provided each block meets Articles 2.3 and 2.4 and all required records are submitted for that block.

END OF SECTION

SECTION 31 62 19 –**DRILLED CONCRETE-FILLED STEEL PIPE PILES****PART 1 – GENERAL****1.1 SUMMARY****A. Section includes:**

1. Furnishing and installing drilled concrete-filled steel pipe king piles for combi-wall bulkheads using a down-the-hole (DTH) hammer system with integral cuttings control (e.g., Mincon Spiral Flush) to advance casing through soil, fill, and obstructions into bearing stratum or rock.
2. Shop-fabricated, weld-on sheet-pile interlocks/clutches on pipe king piles compatible with the specified infill sheet-pile system, including fit-up verification and protection during installation.
3. Construction in tidal/near-water environments, including containment of air/water returns and cuttings.

B. Related Sections:

03 30 00 Cast-in-Place Concrete;
03 20 00 Concrete Reinforcing;
03 35 00 Concrete Finishing;
05 05 23 Metal Fastenings;
05 50 00 Metal Fabrications (connection plates/wale interfaces);
09 97 13.26 Marine Coatings (above-water coating, if any);
31 23 16 Excavation;
31 23 33 Trenching;
31 23 19 Dewatering;
31 62 16 Sheet Piles (Infill Piles);
31 62 00 Deep Foundations (General);
31 09 13 Geotechnical Instrumentation (if used).

C. System intent: King piles provide primary axial/lateral capacity and stiffness; infill sheet piles provide closure, shear transfer through interlocks, and global wall continuity. Coordinate tolerances and sequencing to ensure proper infill sheet engagement.

1.2 REFERENCES

- A. ACI 318 – Building Code Requirements for Structural Concrete.
- B. ACI 301 – Specifications for Structural Concrete.
- C. ASTM A252 – Welded and Seamless Steel Pipe Piles.
- D. ASTM A106/A53 (as applicable for pipe material if specified by Designer).
- E. ASTM A615/A706 – Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- F. AWS D1.1 – Structural Welding Code – Steel.
- G. ASTM C94 – Ready-Mixed Concrete.

- H. ASTM C150/C595 – Hydraulic Cement.
- I. ASTM C494 – Chemical Admixtures for Concrete.
- J. ASTM D1143/D1143M – Static Axial Compression Pile Load Tests.
- K. ASTM D3689 – Static Axial Tension Pile Load Tests.
- L. ASTM D3966 – Lateral Load Tests of Piles.
- M. ASTM D6760 – Integrity Testing of Concrete Deep Foundations by Ultrasonic Crosshole Testing (if access tubes are provided).
- N. ASTM D5882 – Low-Strain Integrity Testing of Piles.
- O. ACI 336.1 – Reference Specification for the Construction of Drilled Piers (for practices not otherwise covered).

1.3 DEFINITIONS

A. **DTH system with cuttings control:** A down-the-hole hammer with a shrouded bit/collar that directs returns upward inside/adjacent to casing to minimize ground loss and uncontrolled ejecta (e.g., **Mincon Spiral Flush** or approved equal).

1.4 SUBMITTALS

A. Product Data:

1. DTH system: Hammer, bit types/sizes, cuttings-control collar/shroud, air compressors/boosters, air-water injection equipment, return capture/containment plan.
2. Casing/pipe: Manufacturer, grade (ASTM A252 Grade 2 or 3 unless noted), wall thickness, mill certifications.
3. Interlocks/Clutches: Manufacturer and profile designation; steel grade; weld details; dimensional tolerances; compatibility letter for the specified sheet-pile section (from interlock supplier).
4. Centralizers, shoes, drive rings, and rock teeth/shoes. B. Working Drawings and Procedures (sealed by a Professional Engineer experienced in DTH piling and combi-walls):
5. Drilling plan: equipment train, expected pressures/flows, sequencing, obstructions protocol, tidal window plan, spoils containment, noise/dust suppression.
6. Templates and Alignment: Fabrication drawings for top and mudline templates; method of restraining rotation; procedures to maintain interlock plumbness and orientation.
7. Casing advancement and seating method; anticipated torque/energy; criteria for bearing confirmation (e.g., penetration rate, hammer energy, or rock socket length).
8. Interlock Protection: Measures to protect shop-welded interlocks during handling, drilling, and seating (e.g., guide shoes, sacrificial runners, caps).

9. Concrete placement plan (tremie/pump), mix, target slump/flow, placement rate, methods to prevent segregation and contamination, and head control below water table.
 10. Reinforcement cage details, splices, centralization, and temporary support during concrete placement.
- C. Quality Control Plan: Inspection hold points; verticality and position survey; interlock orientation checks; recording forms for drilling parameters (air pressure, return rate/character, penetration rate, depth, strata changes); concrete delivery/placement logs; integrity testing procedures.
- D. Load Test Program (if indicated): Setup, instrumentation, and sequence for ASTM D1143/D3689/D3966.
- E. Welding: WPS/PQR and welder qualifications per AWS D1.1 including procedures for interlock welds.
- F. Preconstruction Test Piles / Fit-Up: If required, fabricate a mock-up king pile segment with interlocks and verify fit-up with a sample infill sheet pile; submit report.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum 5 completed projects within last 5 years using DTH with cuttings-control advancing steel pipe piles to rock in similar ground conditions; submit references.
- B. Manufacturer's Technical Assistance: Provide DTH manufacturer's representative for first 5 production piles and for all test piles.
- C. Pre-Installation Conference: Review geotechnical report, obstructions, tidal logistics, cuttings containment, noise/dust control, acceptance criteria for bearing, concreting plan, and QC/testing.

1.6 PROJECT CONDITIONS

- A. Environmental and Safety: Comply with applicable air/noise permits; contain all returns and cuttings; no discharge of cementitious water to surface waters; provide spill kits and sumps as needed.
- B. Utilities/Obstructions: Verify clearances; pothole and protect existing structures; define obstruction removal protocol.
- C. Coordination: Coordinate pile installation with infill sheet pile delivery, and driving equipment to avoid schedule and tolerance conflicts.

1.7 MEASUREMENT AND PAYMENT

- A. Unit price by installed horizontal length along the alignment of the combi-wall.

PART 2 – PRODUCTS

2.1 STEEL PIPE PILES (CASING)

A. Pipe: ASTM A252 Grade 3 (unless noted otherwise), **outside diameter** and **wall thickness** as shown; straightness per ASTM.

B. Fabrication:

1. Splices: Full-penetration groove welds per AWS D1.1; back-gouge/back-weld; align to maintain tolerances.
2. Shoes: Welded rock shoe with carbide teeth or hardfacing where shown.
3. Internal Centralizers: Provide on reinforcement cages to maintain **2 in.** minimum cover (or as shown).
4. Weld-On Interlocks/Clutches: Provide continuous, straight, shop-welded interlocks on one or both sides of the pipe as indicated to accept the specified infill sheet piles. Interlocks shall be of compatible profile and steel grade to achieve required shear transfer and watertightness. Provide mill-rolled interlock bars (e.g., ball-and-socket or Omega-type) from a recognized supplier. Grind welds flush where required for sheet entry.

C. Coatings (if required by drawings): Factory applied per Section 09 97 13.26 full length; none inside pile.

2.2 DTH DRILLING SYSTEM

A. Basis-of-Design: **Mincon Spiral Flush** DTH with shrouded/ported collar for controlled returns; provide compatible hammer(s), bits (casing-advancement ring bits where required), and air/water injection equipment.

B. Compressors/Boosters: Sized for required hammer performance at depth; provide pressure/flow gauges at rig and hammer.

C. Return Containment: Swivels, hoses, cyclones, settling tanks, and filtration as needed to prevent uncontrolled venting or ground loss.

2.3 CONCRETE AND REINFORCEMENT

A. Concrete for Piles:

1. **Exposure:** Marine/groundwater; design for durability. Minimum **f'c = 5,000 psi** at 28 days (unless noted), **w/cm ≤ 0.40**, **air 4–6%** if above water table/freezing; sulfate resistance per ACI.
2. Workability: Slump **8–10 in.** with HRWR for tremie/pumped placement; cohesion adequate to resist washout; optional anti-washout admixture for submerged placement subject to trial mix approval.
3. Aggregates: Nominal max size suitable for clearances (typically **3/4 in or 3/8.** for dense cages and tremie).
4. Chloride limits per ACI 318 for reinforced concrete in contact with soil/water.

B. Reinforcement: ASTM **A615 Grade 60** (or A706 where welding is indicated); Hot-dipped galvanized.

C. Tremie/Pump Line: Steel tremie with watertight joints and **bottom seal (plug)** capability; internal diameter ≥ 4 in.

PART 3 – EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify layout by survey; provide control for pile locations and cutoff elevations.

B. Establish working platform; provide access/containment suitable for tidal cycles.

C. Verify utility clearances and protection.

3.2 INSTALLATION – GENERAL

A. Tolerances (Combi-Wall Critical):

1. Plan location of king pile centerline: ± 1 in. or $0.05D$ (whichever greater).
2. Spacing between king piles: $\pm 1/2$ in. relative to design module to ensure infill sheet fit-up.
3. Verticality (king piles): $\leq 1:200$ (0.5%) deviation.
4. Interlock plumbness and orientation: Deviation of interlock entrance relative to design plane $\leq 1/4$ in. in 10 ft; rotation of pile about its axis $\leq 1^\circ$.
5. Cutoff elevation: $+0 / - 1$ in. after trim.

B. Templates and Guides: Provide rigid top and mudline templates (and intermediate, if required) to maintain spacing, plumbness, and interlock alignment during drilling and seating. Provide rotational keys or stops to prevent pile twist.

C. Records: Maintain daily logs of pile ID, start/finish times, depths, strata, penetration rates, compressor pressures/flows, return characteristics, obstructions, casing/pipe heat numbers, interlock alignment checks, welds, and inspections.

3.3 DTH DRILLING AND CASING ADVANCEMENT

A. Advance casing using **DTH hammer with cuttings-control collar** to prevent uncontrolled air/returns and to minimize ground loosening. Adjust air/water injection to maintain visible, contained returns.

B. Through Fill/Obstructions: Core through cobbles, boulders, debris, and man-made obstructions. Where advancement stalls, remove/replace bit or use ring-bit system to cut annulus and advance casing.

C. Rock Seating / Socketing:

1. Seat casing on competent rock or advance **rock socket** to elevations shown on Drawings.
2. Acceptance Indicators (when socket required): Minimum rock socket tip elevation.

D. Groundwater/Tidal: Maintain positive control of returns; no uncontrolled venting at surface or over-water; divert to cyclones/settling tanks; skim and dispose legally.

E. Cleaning: After reaching tip elevation/required socket, flush loose cuttings from casing/socket using air-lift or water circulation until returns are clean and free of visible debris.

F. Interlock Protection and Cleanliness: Cap or cover interlock grooves during drilling as needed; after seating, clean interlock entries of burrs and debris; verify gauge and straightness before infill sheet driving.

3.4 REINFORCEMENT PLACEMENT

A. Install cage to required embedment and splices; provide centralizers to maintain cover; secure to prevent flotation during concrete placement. Cage shall be provide for full length of pipe pile.

3.5 CONCRETE PLACEMENT

A. Submerged Conditions (typical): Place concrete by **tremie** beginning at tip; maintain tremie outlet continuously embedded ≥ 10 ft in fresh concrete; do not permit free fall in water.

B. Above Water Table: Pump or tremie with measures to prevent segregation; minimize free fall.

C. Head Control: Maintain positive concrete head in casing/socket at all times; monitor volume vs. theoretical; investigate losses.

D. Casing/Pipe: **Left-in-place**; do not extract unless specifically shown. If temporary casing is used locally, extract only after concrete achieves sufficient head and stability.

E. Top Finish: Overfill; after initial set, trim to cutoff elevation.

3.6 FIELD QUALITY CONTROL

A. Inspection: Continuous inspection during drilling and placement by Contractor QC and Owner's testing agency.

B. Integrity Testing: Perform low-strain integrity testing (ASTM D5882) on all production king piles unless otherwise indicated; investigate anomalies and remediate per Engineer.

C. Load Testing (if specified): Conduct static axial compression/tension and/or lateral tests per approved plan (ASTM D1143/D3689/D3966).

D. Concrete Testing: Per ACI 301/ASTM C94; cylinders for strength; slump/temperature/air; unit weight; record admixtures and delivery times.

E. Weld Inspection: Visual and NDE per AWS D1.1 for full-penetration splices, rock shoes, and interlock welds; repair defects and re-inspect.

F. Survey/As-Built: Provide surveyed coordinates of king pile centerlines at top and mudline templates, interlock orientation (rotation), and cutoff elevations. Provide a module check confirming spacing for infill sheet installation.

3.7 ACCEPTANCE CRITERIA

A. Pile is acceptable when:

1. Installed at specified location, verticality, and cutoff;
2. Casing/socket achieved design tip/length and bearing criteria;
3. Concrete placed without interruption and with satisfactory integrity test results; and
4. Infill Sheet Fit-Up: Demonstrated by successful trial insertion of a representative sheet (if directed) or by template/module survey showing compliance with tolerances; and
5. As-built records submitted and accepted.

3.8 REMEDIATION

A. Provide remedial actions (e.g., coring, pressure grouting, supplemental piles) where integrity testing or records indicate defects, at no cost to Owner if due to Contractor means/methods.

3.9 PROTECTION AND CLEANUP

A. Protect piles from damage by subsequent work; cap/cover openings until superstructure connection.

B. Remove and dispose of cuttings, slurry water, and waste in accordance with regulations; keep waterway free of debris.

END OF SECTION

SECTION 32 31 19

DECORATIVE METAL FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section Includes:
 - 1. Fence – Typical Module
 - 2. Gate
 - 3. Path Fence
 - 4. Nursery Fence
- C. Related Sections include the following:
 - 1. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - a. DIVISION 1 – GENERAL REQUIREMENTS
 - b. Section 03 30 00 – Cast-In-Place Concrete
 - c. Section 05 50 00 – Site Metal Fabrications
 - d. Section 05 73 00 – Decorative Metal Railings
 - e. Section 32 13 16 – Decorative Concrete Paving
 - f. Section 32 14 00 – Unit Paving
 - g. Section 32 16 13 – Concrete Vertical Curb
 - h. Section 32 16 23 – Sidewalks
 - i. Section 32 32 23 – Concrete Segmental Retaining Wall

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For fencing and gates.
 - 1. Include plans, elevations, sections, gate locations, post spacing, and mounting attachment details, and grounding details.
 - 2. Gate Operator: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
 - 3. Wiring Diagrams: Include diagrams for power, signal, and control wiring.

- C. Samples: For each fence material and for each color specified.
 - 1. Provide Samples 12 inches in length for linear materials.
 - 2. Provide Samples 12 inches square for steel mesh.
 - 3. Assembled Sample of system, made from full-size components, including top rail, post, and infill. Sample need not be full height, 3' x 3' Sample.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Product Test Reports: For decorative metallic-coated-steel tubular picket fences, including finish, indicating compliance with referenced standard.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For gate operators to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Include 10-foot length of fence complying with requirements.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Lightning-Protection System: Maximum grounding-resistance value of 25 ohms under normal dry conditions.

2.2 DECORATIVE STEEL FENCES

- A. Decorative Steel Fences: Fences made from steel tubing bars and shapes, hot-dip galvanized with Tnemec Coating Endura Shield to match RAL 8019
- B. Posts: Square steel tubing.
 - 1. Line Posts: 2 by 3 inches with 3/16-inch wall thickness.
 - 2. End and Corner Posts: Custom dimensions per condition with 3/16-inch wall thickness.
 - 3. Swing Gate Posts: 2 by 3 inches with 3/16-inch wall thickness.
- C. Post Caps: Formed from steel sheet

D. Square Welded Wire Mesh

1. McNICHOLS Wire Mesh Square, Stainless Steel Mesh P: (877) 941 – 2609, www.mcnichols.com
2. See drawings
3. Color to match: RAL 8019

E. Rails:

1. Steel Tube Rails: Square steel tubing 1.5" diameter with 1/8-inch wall thickness.

F. Fasteners: Stainless-steel carriage bolts and tamperproof nuts.

G. Fabrication: Assemble fences into sections by welding pickets to rails.

1. Fabricate sections with clips welded to rails for field fastening to posts.
2. Drill posts and clips for fasteners before finishing to maximum extent possible.

H. Fabrication: Fabricate bar grating infill into sections of size indicated.

1. Fabricate rails with clips welded to rails for field fastening to posts.
2. Drill posts, clips, and bar grating for fasteners before finishing to maximum extent possible.

I. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay

J. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A123/A123M. For hardware items, hot-dip galvanize to comply with ASTM A153/A153M.

1. Hot-dip galvanize posts and rails.
2. Hot-dip galvanize rail and picket assemblies after fabrication.
3. Hot-dip galvanize bar grating infill after fabrication.
4. Hot-dip galvanize custom-design rail and infill assemblies after fabrication.

K. Finish for Bar Grating Infill: Powder coating.

L. Finish for Steel Items - Other Than Bar Grating Infill: Primed Shop painted Tnemec coating].

M. Fasteners: Manufacturer's standard concealed fastening system.

N. Fasteners: Manufacturer's standard tamperproof, corrosion-resistant, color-coated fasteners matching fence components with resilient polymer washers.

O. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay.

2.3 SWING GATE

A. Gate Configuration: Double leaf

B. Gate Frame Height: 10'-4".

- C. Gate Opening Width: 6' single swing gate with ½" gap at center.
- D. Galvanized-Steel Frames and Bracing: Fabricate members from square tubes 2 by 3 inches formed from 0.18-inch nominal-thickness, metallic-coated steel sheet or formed from 0.18-inch nominal-thickness steel sheet and hot-dip galvanized after fabrication.
- E. Frame Corner Construction: Welded and 5/16" diameter, adjustable truss rods for panels 5 feet wide or wider.
- F. Additional Rails: Provide as indicated, complying with requirements for fence rails.
- G. Infill: Comply with requirements for adjacent fence.
- H. Hardware: Latches permitting operation from both sides of gate, hinges, and keepers for each gate leaf more than 5 feet wide. Provide center gate stops and cane bolts for pairs of gates. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.
- I. Hinges: BHMA A156.1, Grade 1, suitable for exterior use.
 - 1. Function: 39 - Full surface, triple weight, antifriction bearing.
 - 2. Material: cast steel; galvanized.
- J. Rim Locks: BHMA A156.5, Grade 1, suitable for exterior use.
 - 1. Function: 626 - Interlocking deadbolt operated by key from either side
 - 2. Material: Cast, forged, or extruded brass or bronze.
 - 3. Mounting Plate: Configuration necessary for mounting locks. Fabricate from 1/8-inch thick, steel plate; galvanized
- K. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay
- L. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A123/A123M. For hardware items, hot-dip galvanize to comply with ASTM A153/A153M.
- M. Tnemec coating Endura Shield to match RAL 8019

2.4 STEEL FINISHES

- A. Surface Preparation: Clean surfaces according to SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning." After cleaning, apply a conversion coating compatible with the organic coating to be applied over it.
- B. Coating: Immediately after cleaning, apply manufacturer's standard two-coat finish consisting of epoxy primer and TGIC polyester topcoat to a minimum total dry film thickness of not less than 8 mils. Comply with coating manufacturer's written instructions.
 - 1. Color and Gloss: Match Architect's sample
- C. Primer Application: Apply zinc-rich epoxy primer immediately after cleaning, to provide a minimum dry film thickness of 2 mils per applied coat, to surfaces that are exposed after assembly and installation, and to concealed surfaces.

- D. High-Performance Coating: Apply intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.
 - 1. Match approved Samples for color, texture, and coverage. Remove and refinish, or recoat work that does not comply with specified requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.
- B. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet (152.5 m) or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.
 - 1. Construction layout and field engineering are specified in Section 017300 "Execution."

3.3 DECORATIVE FENCE INSTALLATION

- A. Install fences according to manufacturer's written instructions.
- B. Install fences by setting posts as indicated and fastening rails and infill panels to posts. Peen threads of bolts after assembly to prevent removal.
- C. Post Excavation: Drill or hand-excavate holes for posts in firm, undisturbed soil. Excavate holes to a diameter of not less than 4 times post size and a depth of not less than 24 inches plus 3 inches for each foot or fraction of a foot that fence height exceeds 4 feet.
- D. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 2. Posts Set into Concrete in Sleeves: Use galvanized-steel pipe sleeves with inside diameter at least 3/4 inch (20 mm) larger than outside diagonal dimension of post, preset and anchored into concrete for installing posts.
 - a. Extend posts at least 5 inches (125 mm) into sleeve.
 - b. After posts have been inserted in sleeves, fill annular space between post and sleeve with nonshrink grout, mixed and placed to comply with grout manufacturer's

written instructions; shape and smooth to shed water. Finish and slope top surface of grout to drain water away from post.

3.4 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.5 FIELD QUALITY CONTROL

- A. **Testing Agency: Contractor will engage qualified testing agency to perform tests and inspections.**
 - 1. Grounding-Resistance Tests: Subject completed grounding system to a megger test at each grounding location. Measure grounding resistance not less than two full days after last trace of precipitation, without soil having been moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural grounding resistance. Perform tests by two-point method according to IEEE 81.
 - 2. Excessive Grounding Resistance: If resistance to grounding exceeds specified value, notify Architect promptly. Include recommendations for reducing grounding resistance and a proposal to accomplish recommended work.
 - 3. Report: Prepare test reports of grounding resistance at each test location certified by a testing agency. Include observations of weather and other phenomena that may affect test results.

3.6 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.

3.7 DEMONSTRATION

- A. Train Owner's personnel to adjust, operate, and maintain gates.

END OF SECTION 323119