1. Temporary stockpile area is to be used for temporary storage of materials, to be used during construction of the proposed placement area and the bridge and R/S access roads.

2. During the construction of and during the use of temporary access roads, all permanent construction equipment and temporary vehicles must stay away from the existing wetland areas on the east and west sides of access road as shown. Please leave undisturbed the existing wetland areas on either side of the road.

3. The contractor shall prepare detailed written plan showing the proposed location, maintenance, and management of temporary stockpile area. The contractor shall also provide site-specific construction site management plan.

The contractor will be responsible for the maintenance and management of the temporary stockpile area and the construction site, including the management of temporary access road. The contractor will be responsible for ensuring that the temporary stockpile area is environmentally sound and that all necessary permits and approvals are obtained.

The temporary stockpile area and the construction site will be monitored regularly to ensure compliance with all relevant regulations and guidelines. The contractor will be responsible for addressing any issues that arise during the construction process.
30IN TO 24IN RCP CULVERT

JA C INT O POR T BLVD

30IN RCP CULVERT

DATE: 7-25-20 - 5:45pm

USER: JB BURD

DWG: C:\WORKING\CENTRAL01\D1796030\2010-HSC00_GCBS_SEG2-4.dwg

SHEET NO. 1 OF 4

CADD: DESIGNER: T. NEIL McLELLAN

DESIGN & SUPPORT MANAGING DIRECTOR - ENGINEERING

AS NOTED TO BE PERFORMED BY OTHERS

CONSULTANT: HDR ENGINEERING, INC.

Registration No. F-754 TBPELS FIRM

08/15/20. IT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

DATE: CHECKER:

PROJECT TITLE: HOUSTON SHIP CHANNEL (HSC) EXPANSION CHANNEL IMPROVEMENT PROJECT (ECIP) SITE PLAN

PROJECT NO.: PACKAGE B

REV: C-022

SEAL:

AUTHORITY

DESCRIPTION AS NOTED

08/15/20. IT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

K. D. BODDELL

PROJECT CONTRACT REPRESENTATIVE

C90-D13-P11-002

\[EQUATION\]

\[EQUATION\]
1. BORINGS ECP-2014 THROUGH ECP-2044 WERE DRILLED AT THE BELTWAY 8 DMPA
   TO SUBSURFACE CONDITIONS. A SUBSURFACE SURVEY WAS CONDUCTED IN THE
   SUBSURFACE TO LOCATE UNDERGROUND WELD, UTILITY, AND OTHER
   CONDITIONS.
2. THE GEOTECHNICAL STUDY WAS PERFORMED TO ESTABLISH A
   SUBSURFACE PROFILE. THE GEOTECHNICAL STUDY WAS PERFORMED TO
   LOCATE UNDERGROUND WELD, UTILITY, AND OTHER
   CONDITIONS.
3. THE GEOTECHNICAL STUDY WAS PERFORMED TO ESTABLISH A
   SUBSURFACE PROFILE. THE GEOTECHNICAL STUDY WAS PERFORMED TO
   LOCATE UNDERGROUND WELD, UTILITY, AND OTHER
   CONDITIONS.
4. THE INTERIOR EMBANKMENT SLOPE SHALL BE NO STEEPER THAN 6H:1V
   BETWEEN STATIONS 90+62.11 TO 92+09.73.
5. THE INTERIOR AND EXTERIOR EMBANKMENT SLOPES SHALL BE NO
   STEEPER THAN 6H:1V EXCEPT WHERE NOTED.
6. THE INTERIOR EMBANKMENT SLOPE SHALL BE NO STEEPER THAN 6H:1V
   BETWEEN STATIONS 90+62.11 TO 92+09.73.
7. THE INTERIOR AND EXTERIOR EMBANKMENT SLOPES SHALL BE NO
   STEEPER THAN 6H:1V EXCEPT WHERE NOTED.
8. THE INTERIOR EMBANKMENT SLOPE SHALL BE NO STEEPER THAN 6H:1V
   BETWEEN STATIONS 90+62.11 TO 92+09.73.
9. THE INTERIOR AND EXTERIOR EMBANKMENT SLOPES SHALL BE NO
   STEEPER THAN 6H:1V EXCEPT WHERE NOTED.
10. THE INTERIOR EMBANKMENT SLOPE SHALL BE NO STEEPER THAN 6H:1V
    BETWEEN STATIONS 90+62.11 TO 92+09.73.
11. THE INTERIOR AND EXTERIOR EMBANKMENT SLOPES SHALL BE NO
    STEEPER THAN 6H:1V EXCEPT WHERE NOTED.
12. THE INTERIOR EMBANKMENT SLOPE SHALL BE NO STEEPER THAN 6H:1V
    BETWEEN STATIONS 90+62.11 TO 92+09.73.
13. THE INTERIOR AND EXTERIOR EMBANKMENT SLOPES SHALL BE NO
    STEEPER THAN 6H:1V EXCEPT WHERE NOTED.
14. THE INTERIOR EMBANKMENT SLOPE SHALL BE NO STEEPER THAN 6H:1V
    BETWEEN STATIONS 90+62.11 TO 92+09.73.
15. THE INTERIOR AND EXTERIOR EMBANKMENT SLOPES SHALL BE NO
    STEEPER THAN 6H:1V EXCEPT WHERE NOTED.
16. THE INTERIOR EMBANKMENT SLOPE SHALL BE NO STEEPER THAN 6H:1V
    BETWEEN STATIONS 90+62.11 TO 92+09.73.
17. THE INTERIOR AND EXTERIOR EMBANKMENT SLOPES SHALL BE NO
    STEEPER THAN 6H:1V EXCEPT WHERE NOTED.
18. THE INTERIOR EMBANKMENT SLOPE SHALL BE NO STEEPER THAN 6H:1V
    BETWEEN STATIONS 90+62.11 TO 92+09.73.
19. THE INTERIOR AND EXTERIOR EMBANKMENT SLOPES SHALL BE NO
    STEEPER THAN 6H:1V EXCEPT WHERE NOTED.
20. THE INTERIOR EMBANKMENT SLOPE SHALL BE NO STEEPER THAN 6H:1V
    BETWEEN STATIONS 90+62.11 TO 92+09.73.
DRAINAGE CHANNEL PLAN

DRAINAGE CHANNEL PROFILE

SEGMENT 4: BOGGY BAYOU TO HUNTING BAYOU TURNING BASIN
EXISTING DRAINAGE CHANNEL PROFILE

MATCH EXISTING CHANNEL

DROP OUTLET

E 3192794.93
N 13836945.40
E 3192790.36
N 13836950.93
E 3192776.44
N 13836930.11
E 3192771.87
N 13836935.63
E 3192798.14
N 13836989.93
E 3192803.68
N 13837044.20

PULL-OUT MAINTENANCE ACCESS

65% DRAFT

DRAWN / CHECKED / APPROVED / DATE / REV. NO. / SHEET NO. / REV. DATE

SHEET TITLE: PROJECT TITLE: SHEET NO.

10'-0" 20'-0"

0'-0" 10'-0"

SCALE: AS SHOWN

ENGINEERING DRAWINGS

HDR Engineering, INC.

TBPELS Firm

Registration No. F-754

bidding, or permit purposes. To be used for construction, T. NEIL McLELLAN, P.E., 67263, 08/15/20. It is not under the authority of the purpose of interim review. This document is released for

C90-D13-P11-002

BELTWAY 8 (DMPA)

C-037  A

65% REVIEW
REALIGNED DRAINAGE CHANNEL PLAN

REALIGNED DRAINAGE CHANNEL PROFILE

SCALE: AS SHOWN
HORIZONTAL SCALE
VERTICAL SCALE

65% REVIEW

DRAFT
CHANNEL NOTES:
1. Channel to be lined with geotextile fabric overlayed with rock or broken concrete for erosion protection.

EXISTING GROUND

TYPICAL SECTION - OUTFALL CHANNEL
SCALE AS SHOWN

TYPICAL SECTION - REALIGNED CHANNEL
SCALE AS SHOWN

TYPICAL SECTION - PERIMETER DITCH
SCALE AS SHOWN

CHANNEL NOTES:
1. Channel to be lined with geotextile fabric overlayed with rock or broken concrete for erosion protection.
This document is released for the purpose of interim review under the authority of NAVIN K. GALANI, P.E., Registration No. F-754. It is not to be used for construction, bidding, or permit purposes.

65% REVIEW
1. Foundation design is based on the geotechnical data provided and certified by Fugro USA Land, Inc., Report No. 04.10190049-R2, Dated 2/18/2020, by Sara Navidi, P.E.

2. W8x40 columns/ piles were selected to provide adequate strength for the weir-box. The contractor may elect to provide heavier and stronger sections if required for driving installation of columns/piles. Columns shall not be spliced, U.N.O.

3. Columns/piles shall be installed by driving using a power hammer (diesel, air or hydraulic). Contractor shall provide alternative pile sections and/or reinforce pile sections to prevent damage during driving.

4. Contractor shall maintain and submit pile driving records for review by engineer. Records shall include the blows per foot for each foot of penetration, average ram stroke for each foot, hammer power/fuel setting, and all pile driving equipment data.

5. The structure has been designed to resist lateral force from a differential fill height not to exceed 4ft. Therefore, in any event, the height difference of soil on either side of the box should not be greater than 4ft.

6. Provide 1/2" full depth stiffener equal spaces typical at (3) locations shown for (4) corner columns.

7. All piles and columns shall conform to ASTM A572 Fy=50 ksi. All other steel shall conform to ASTM A36.

8. Concrete shall have a min. 28 days compressive strength of 4000 psi. Maximum water/cement ratio shall be 0.40.

9. All timber for lagging shall be No. 2 southern yellow pine, full size, and be CCA treated to a retention of 2.5 PCF.
CATCH BASIN APRON DETAIL
SCALE: 1" = 3'

NOTES:
1. FOR PROPOSED CATCH BASIN-1 AND EXISTING CONCRETE DRAINAGE FLUME REPAIR IN PLAN VIEW, SEE SHEET C-008.

DISCHARGE PIPE AND CATCH BASIN APRON DETAILS.

** APRON WIDTH VARIES PER PLANS AND SLOPE AS DETERMINED BY EXISTING GROUND
** WHEN REPLACING EXISTING CONCRETE FLUMES SHOWN IN PLAN SHEET C-105, USE THE SLIP-DOWEL INSTALL METHOD USING #3 BARS AT 12" O.C. AND GREENSTREAK SPEED DOWEL PLASTIC SLEEVES WHEN ATTACHING NEW CONCRETE APRON TO EXISTING CONCRETE PAVEMENT AND EXISTING CATCH BASIN.
1. GATE HINGE ASSEMBLY DETAIL

2. ROD PLATE DETAIL

3. SINGLE LOCK ASSEMBLY DETAIL FOR GATE TYPES A AND B

4. MULTI-LOCK ASSEMBLY DETAIL FOR GATE TYPES A AND B

5. BOLLARD AND CONCRETE FOOTING DETAIL

ACCESS CONTROL GATE DETAILS SHEET 2 OF 2

SOUTH BAYOU TO SOUTH BAYOU
PORT OF HOUSTON AUTHORITY

TECHNICAL SPECIFICATIONS FOR

HSC ECIP – SEGMENT 4 E2 CLINTON DMPA & BELTWAY 8 DMPA

Table of Contents

DIVISION 01 – GENERAL REQUIREMENTS
Section 01 00 50.00 Add Scope of Work 2
Section 01 16 60.00 Add Environmental Protection Measures 4
Section 01 35 53.00 Add Security Procedures 2

DIVISION 03 – CONCRETE
Section 03 31 00.00 45 Add Concrete for Minor Structures 9

DIVISION 05 – METALS
Section 05 05 23.16 Add Structural Welding 6

DIVISION 09 – FINISHES
Section 09 97 02 Add Hydraulic Structures 21

DIVISION 31 – EARTHWORK
Section 31 00 00 Add Earthwork 11
Section 31 05 19.13 Add Geotextile for Earthwork 4
Section 31 24 00 Add Embankment Construction 10

DIVISION 35 – WATERWAY AND MARINE CONSTRUCTION
Section 35 00 01 Add Construction Surveying 4
Section 35 20 30.00 45 Add Drop-Outlet Structure 8
Section 35 31 23 Add Stone for Erosion Control 6

65% PRELIMINARY

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW AND IS NOT INTENDED TO BE USED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

ENGINEER: THOMAS N. MCLELLAN, P.E.
REGISTRATION NO: 67263
DATE: 08/14/2020

HDR Engineering, Inc.
TBPELS Firm
Registration No. F-754
PORT OF HOUSTON AUTHORITY

TECHNICAL SPECIFICATIONS FOR

HSC ECIP – SEGMENT 4 E2 CLINTON DMPA & BELTWAY 8 DMPA

The Technical Specifications for the above-referenced Project are the Port of Houston Authority Standard Technical Specifications listed herein, inclusive of those that have been amended, supplemented, or otherwise modified herein, and inclusive of added sections as listed herein.

The Port of Houston Authority Standard Technical Specifications listed herein may be obtained from Port of Houston Authority Project & Construction Management Department.

Any Port of Houston Authority Standard Technical Specifications listed herein but not amended, supplemented, or otherwise modified herein shall apply as set forth in the Port of Houston Authority Standard Technical Specifications.

Amendments and other modifications to specific Sections of the Port of Houston Authority Standard Technical Specifications take precedence over such Specification Section language of the Port of Houston Authority Standard Technical Specifications.

Any newly added Technical Specification Sections are in addition to the Port of Houston Authority Standard Technical Specifications.

Subject to the foregoing, the Port of Houston Authority Technical Specifications for the above-referenced Project are as follows.
PORT OF HOUSTON AUTHORITY

TECHNICAL SPECIFICATIONS FOR

HSC ECIP – SEGMENT 4 E2 CLINTON DMPA & BELTWAY 8 DMPA

The following Sections of the Port of Houston Authority Standard Technical Specifications (December 2011) form a part of the Technical Specifications for the Project.

DIVISION 01 - GENERAL REQUIREMENTS
   Section 01 22 10.00 Std  Measurement of Quantities
   Section 01 35 29.00 Std  Health, Safety and Emergency Response Procedures

DIVISION 03 - CONCRETE
   Section 03 21 00.00 Std  Reinforcing Steel
   Section 03 31 00.00 Std  Structural Concrete

DIVISION 31 - EARTHWORK
   Section 31 23 33.00 Std  Trenching and Backfilling
   Section 31 41 33.00 Std  Trench Safety System

The attached modifications to the following Sections of the Port of Houston Authority Standard Technical Specifications (December 2011) form a part of the Technical Specifications for the Project.

NONE

The attached Technical Specification Sections are added to and form a part of the Technical Specifications for the Project.

DIVISION 01 – GENERAL REQUIREMENTS
   Section 01 00 50.00 Add  Scope of Work
   Section 01 16 60.00 Add  Environmental Protection Measures
   Section 01 35 53.00 Add  Security Procedures

DIVISION 03 – CONCRETE
   Section 03 31 00.00 45 Add  Concrete for Minor Structures

DIVISION 05 – METALS
   Section 05 05 23.16 Add  Structural Welding

DIVISION 09 – FINISHES
   Section 09 97 02 Add  Hydraulic Structures

DIVISION 31 – EARTHWORK
   Section 31 00 00 Add  Earthwork
   Section 31 05 19.13 Add  Geotextile for Earthwork
   Section 31 24 00 Add  Embankment Construction
<table>
<thead>
<tr>
<th>Section Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>35 00 01 Add</td>
<td>Construction Surveying</td>
</tr>
<tr>
<td>35 20 30.00 45 Add</td>
<td>Drop-Outlet Structure</td>
</tr>
<tr>
<td>35 31 23 Add</td>
<td>Stone for Erosion Control</td>
</tr>
</tbody>
</table>
PORT OF HOUSTON AUTHORITY

TECHNICAL SPECIFICATIONS FOR ECIP SEGMENT 4 E2 CLINTON/BELTWAY 8 DMPAS

SECTION 01 00 50.00 Add – SCOPE OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

The work consists of constructing two upland confined placement areas (PAs) to receive new work dredging from Project 11 – Segment 4 located within the Houston Ship Channel near the Washburn Tunnel Crossing in Houston, Texas. Placement of dredged material shall be at the Beltway 8 (BW8) dredged material PA located adjacent to the Houston Ship Channel near San Houston Parkway and San Jacinto Boulevard (reference the following coordinates: 13,846,061N 3,209,430E, ref. Texas State Plane Coordinate System, South Central Zone, NAD 83, in U.S. Survey Feet); and at the E2 Clinton (E2C) dredged material PA located 1.5 miles north of the Houston Ship Channel near Holland Avenue and 19th Street (reference the following coordinates: 13,846,061N 3,209,430E).

The work includes construction of perimeter embankments, drop outlet structures, outfall channels, drainage channels, perimeter ditching, access roads and other site features at the Beltway 8 (BW8) and E2-Clinton (E2C) PAs to receive approximately 4,890,000 CY of dredged material from the Houston Ship Channel from Boggy Bayou to Cotton Patch Bayou.

The scope of work includes clearing, grubbing and stripping; construction of outfall channels, drainage channels, perimeter ditching and other drainage features; perimeter embankment construction; drop outlet structure construction; erosion control measures; site security measures; geotechnical construction testing; topographic surveys before the start of construction, and during and after construction activities and placement of the dredged material; demobilization and site cleanup; and related ancillary work.

The location of the PA embankments, drop outlet structures, outfall channels and other site features shall occur as indicated on the Drawings and Specifications.

1.2 PERIOD OF PERFORMANCE

The period of performance shall be 450 days.

1.3 SAFETY

The Contractor shall complete the work in accordance with the safety requirements of Port Authority.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION
PORT OF HOUSTON AUTHORITY
TECHNICAL SPECIFICATIONS FOR ECIP SEGMENT 4 E2 CLINTON/BELTWAY 8 DMPAS

SECTION 01 16 60 Add – ENVIRONMENTAL PROTECTION MEASURES

PART 1 GENERAL

1.1 SUMMARY

This section covers prevention of environmental pollution and damage as the result of construction operations under this Contract and for those measures set forth in the other Specifications. For the purpose of this specification, environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare, unfavorably alter ecological balances of importance to human life, affect other species of importance to man, or degrade the utility of the environment for aesthetic, cultural, and/or historical purposes. The control of environmental pollution and damage requires consideration of air, water, and land and includes management of visual aesthetics, noise, solid waste, radiant energy and radioactive materials, as well as other pollutants. The environment shall be protected and all natural resources shall be preserved during construction. All Federal, State, and local laws and regulations shall be complied with during construction.

1.2 RELATED SECTIONS

1.3 SUBMITTALS

A. Prior to construction, Contractor shall provide Environmental Monitoring Plan describing training and credentials for personnel for pollution control and environmental protection/monitoring.

B. Refer to Paragraph 1.8, “Protection of Environmental Resources,” for reporting requirements for required environmental monitoring.

1.4 CONTRACTOR FACILITIES

Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas approved by Port Authority. Temporary movement or relocation of Contractor facilities shall be made only on approval by Port Authority. Disposal areas shall not be located in any wetlands, water body, or stream bed. Fuel and lubricate equipment in a manner that protects against spills and evaporation. Provide a berm with impervious liner around fuel and liquid chemical storage tanks to contain the tank contents in the event of a leak or spill. No refueling shall be done onsite unless approved by Port Authority in advance with acceptable spill protection measures.

1.5 QUALITY CONTROL

Contractor shall establish and maintain quality control for environmental protection of all items set forth herein. Contractor shall record on daily reports any problems in complying with laws, regulations, and ordinances and corrective action taken. Any damage caused by Contractor during construction shall be repaired, replaced, or restored to the satisfaction of Port Authority.

1.6 TRAINING OF CONTRACTOR PERSONNEL IN POLLUTION CONTROL

Contractor shall train his personnel in all phases of environmental protection. The training shall include methods of detecting and avoiding pollution, familiarization with pollution standards, both statutory and contractual, and installation and care of facilities (vegetative covers, and instruments
required for monitoring purposes) to ensure adequate and continuous environmental pollution control.

1.7 VOLATILE ORGANIC COMPOUNDS (VOC)

Contractors are required to comply with local, state, and federal VOC laws and regulations and shall have an acceptable VOC compliance plan. The plan shall demonstrate that the use of paints, solvents, adhesives, and cleaners comply with local VOC laws and regulations governing VOC materials and that all required permits have been obtained or will be obtained prior to starting work involving VOC’s, in the air quality district in which the start of work. An acceptable compliance plan shall contain, as a minimum, a listing of each materials subject to restrictions in the air quality management district in question, the rule governing its use, a description of the actions which Contractor will take, a description of the actions which Contractor will use to comply with the laws and regulations, and any changes in the status of compliance during the life of the Contract. Alternatively, if no materials are subject to the restrictions of the air quality management district where the work will be performed, or if there are no restrictions, the compliance plan shall be state.

1.8 PROTECTION OF ENVIRONMENTAL RESOURCES

A. General: The environmental resources within the Project boundaries and those affected outside the limits of permanent work under this Contract shall be protected during the entire period of this Contract. Contractor shall confine his activities to areas defined by the Drawings and Specifications. Environmental protection shall be as stated in the following subparagraphs.

B. Protection of Land Resources: Prior to the beginning of any construction, Contractor shall identify all land resources to be approved by Port Authority. Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without special permission from Port Authority. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized.

C. Protection of Water Resources: Contractor shall keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters. Special management techniques as set out below shall be implemented to control water pollution by the listed construction activities which are included in this Contract. Contractor is responsible for maintaining area drainage during construction. Water shall not be allowed to pond on any roadway surface, and runoff from adjacent properties shall not be impeded by Project Work.

D. Air Quality: The environmental coordination for this project included review by the Texas Commission on Environmental Quality (TCEQ). Based on TCEQ recommendations the following air quality measures are preferred for this project:

1. Contractor is encouraged to apply for Texas Emission Reduction Plan grants;
2. Contractor should exercise air quality best management practices;

E. Protection of Fish and Wildlife Resources: Contractor shall keep construction activities under surveillance, management, and control to minimize interference with, disturbance to and damage of fish and wildlife. Prior to beginning of construction operations, Contractor shall list species that require specific attention and describe measures for their protection. At a minimum, Contractor shall have personnel onsite who are trained to identify and continuously observe the work area for the endangered and/or protected species described under Paragraph 1.8.F. Performing site observations may require having dedicated biologists or environmental scientists at the upland dredged material placement area to serve as environmental monitors. All costs for environmental monitoring shall be borne by Contractor. Environmental monitoring and observations shall be documented in Contractor’s daily activities reports each day regardless of whether or not species were observed.

F. Other Protected Species: Implement the following measures to avoid and minimize impacts to
other federal- and state-protected species and habitats:

1. Instruct personnel associated with project of the need to identify eagles and colonial nesting birds and avoid impacting them during the breeding season.

2. Port Authority will coordinate with Texas Parks and Wildlife Department to determine the need for any environmental protection measures related to protection of Bald Eagle, Black Rail, Piping Plover, Rufa Red Knot, and other bird species. If directed by Port Authority, Contractor shall provide environmental observers as stated in Paragraph 1.8.E.

3. Contractor shall not disturb bird nests between February 15 and October 1.

4. In the event that migratory birds are encountered onsite during construction, avoid adverse impacts on birds, active nests, eggs, and/or young.
   a. Do not disturb, destroy, or remove active nests, including ground nesting birds, during the nesting season (February 1 to October 1).
   b. Avoid the removal of unoccupied, inactive nests, as practicable.
   c. Do not collect, capture, relocate, or transport birds, eggs, young, or active nests without a permit.

1.9 CONTROL AND DISPOSAL OF WASTES

A. Hazardous Waste: Hazardous wastes are defined in 40 CFR 261. Hazardous wastes that are produced as a result of performing Work under this Contract shall be handled, stored, transported, and disposed of according to 40 CFR 262, where applicable. Prevent hazardous wastes from entering the ground, drainage areas, and surface waters. Immediately notify Port Authority of hazardous material spills. Also refer to Article 3.13 of the General Conditions for requirements if hazardous environmental conditions are encountered at the site.

B. Sanitary Waste: All sanitary waste shall be collected by a licensed sanitary waste management contractor from the portable units as necessary, or as required by local regulation.

C. Construction Debris: Contractor shall collect and properly dispose all trash and construction debris in accordance with all local and state solid waste management regulations and practices. No construction waste material shall be buried within the Project limits. Contractor shall store all waste materials in approved metal dumpsters or other containers approved by Port Authority. The dumpster shall be emptied as necessary or as required by local and state regulation and the contents hauled away for proper disposal.

1.10 POST CONSTRUCTION CLEAN UP

Contractor shall clean up areas used for construction to the satisfaction of Port Authority.

1.11 RESTORATION OF DAMAGE

Contractor shall restore all features damaged or destroyed during construction operations outside the limits of the approved Work areas. Such restoration shall be in accordance with the plan submitted for approval by Port Authority. This work will be accomplished at Contractor's expense without compensation.

PART 2 – PRODUCTS

(Not Used)

PART 3 – EXECUTION
PORT OF HOUSTON AUTHORITY
TECHNICAL SPECIFICATIONS FOR ECIP SEGMENT 4 E2 CLINTON/BELTWAY 8 DMPAS
SECTION 01 35 53.00 Add – SECURITY PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

Due to absence of physical access barriers around the project area, Contractor shall expect the potential for security risks to assets, equipment, and staff. Possible security concerns include but are not limited to theft, robbery, burglary, vandalism, and assault. It is the responsibility of the Contractor to protect his assets, equipment, and staff from security threats. Engineer or Port Authority shall not be deemed responsible for damages, losses, and harms incurred to Contractor’s assets, equipment, and staff from security threats.

1.2 RELATED SECTIONS

1.3 SUBMITTALS

Prior to commencement of work, Contractor shall submit a Security Procedures Plan to Port Authority for approval. It is the responsibility of the Contractor to ensure his proposed security methods and procedures are adequate and comply with all Federal, State, and Local laws, rules and ordinances. Approval of a Security Procedures Plan shall solely confer Port Authority’s consent to execution of such plan on Port Authority’s property and shall not make the Engineer or Port Authority responsible for losses, damages, injuries, or harms incurred despite or during execution of such plan nor shall it confirm lawfulness of Contractor’s Security Procedures Plan.

The Security Procedures Plan shall at minimum include:

1. Cover Letter briefly explaining intended Security Procedures;
2. Drawings of proposed physical barriers, surveillance cameras, and lamp posts (if any); and
3. Name and address of security services subcontractor (if any).

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 GENERAL

Contractor and his security services subcontractor (if any) shall obey all federal, state, and local laws and rules during conduct of security procedures. All security interventions shall be enacted in a professional, dignified, and humane manner. If necessary, it is the responsibility of the Contractor and his security services subcontractor (if any) to pay all related fees and appear in the court of law as plaintiff or defendant regarding all security-related matters.

3.2 PHYSICAL BARRIERS

If included in the Security Procedures Plan and upon approval by Port Authority, Contractor may install physical barriers at the project site. Physical barriers shall only be installed at locations shown on the Security Procedures Plan. Approval from Port Authority is required should the
Contractor wishes to modify locations of physical barriers. All physical barriers shall be removed from the site during demobilization.

3.3 LAMP POSTS

If included in the Security Procedures Plan and upon approval by Port Authority, Contractor may install lamp posts at the project site to maintain adequate lighting for security purposes. Lamp posts may only be installed at locations shown on the Security Procedures Plan. Approval from Port Authority is required should the Contractor wish to modify locations of lamp posts. Contractor is responsible for the energy supply required to operate lamp posts. All lamp posts shall be removed from the site during demobilization.

3.4 SURVEILLANCE CAMERAS

If included in the Security Procedures Plan and upon approval by Port Authority, Contractor may install surveillance cameras at the project site. Surveillance cameras may only be installed at locations shown on the Security Procedures Plan. Approval from Port Authority is required should the Contractor wish to modify locations of surveillance cameras. Contractor is responsible for the energy supply required to operate the cameras. All surveillance cameras shall be removed from the site during demobilization.

3.5 SECURITY PERSONNEL

If included in the Security Procedures Plan and upon approval by Port Authority, Contractor may employ security personnel to patrol the project site. All security personnel employed by the Contractor or his security services subcontractor shall be well-groomed and wear clean and pressed uniforms. Contractor shall ensure that security personnel receive orientation training regarding construction sites and known or potential hazards and methods for recognizing and avoiding known or potential hazards. All security personnel shall have adequate security training and be properly licensed and certified to bear and use service weapons.

END OF SECTION
PORT OF HOUSTON AUTHORITY

TECHNICAL SPECIFICATION FOR ECIP SEGMENT 4 E2 CLINTON/BELTWAY 8 DMPAS

SECTION 03 31 00.00 45 Add – CONCRETE FOR MINOR STRUCTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

Subject to the requirements of the General and Special Conditions, the work covered in this Section consists of materials, labor, testing, and techniques required to place quality Portland cement concrete for the drop-outlet structure (outfall structures) footing/slabs in the placement areas as specified herein and shown on the Drawings.

1.2 RELATED SECTIONS

SECTION 01 22 10.00 Std - Measurement of Quantities
SECTION 03 21 00.00 Std - Reinforcing Steel
SECTION 03 31 00.00 Std - Structural Concrete
SECTION 31 23 33.00 Std - Trenching and Backfilling
SECTION 31 41 33.00 Std - Trench Safety System

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 117 (2010; Errata 2011) Specifications for Tolerances for Concrete Construction and Materials and Commentary
ACI 214R (2011) Evaluation of Strength Test Results of Concrete
ACI 301 (2016) Specifications for Structural Concrete
ACI 308.1 (2011) Specification for Curing Concrete
ACI 347R (2014; Errata 1 2017) Guide to Formwork for Concrete
ACI MCP SET (2017) Manual of Concrete Practice
ASTM INTERNATIONAL (ASTM)


ASTM C231/C231M (2017a) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method


1.4 SUBMITTALS

PHA approval is required for submittals with a "G" designation submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Conveying and Placing Concrete

The methods and equipment for transporting, handling, depositing, and consolidating the concrete shall be submitted prior to the first concrete placement. Concrete Mixture Proportions; G

Ten days prior to placement of concrete, submit the mixture proportions that will produce concrete of the quality required.

Applicable test reports shall be submitted to verify that the concrete mixture proportions selected will produce concrete of the quality specified.

SD-03 Product Data

Air Entraining Admixture Water-Reducing or Retarding Admixture

Curing Materials

Portland Cement; G

Reinforcing Steel; G

Manufacturer's literature is available from suppliers demonstrating compliance with applicable specifications.

Batching and mixing equipment will be accepted on the basis of manufacturer's data that demonstrates compliance with the applicable specifications.

SD-05 Design Data

Formwork: Submit Formwork design prior to the first concrete placement.

SD-06 Test Reports

Aggregates and Slump: Aggregates and slump will be accepted on the basis of certificates of compliance and test reports that show the material(s) meets the quality and grading requirements of the specifications under which it is furnished.

PART 2 PRODUCTS

2.1 CERTIFICATE OF COMPLIANCE

Certificates required for demonstrating proof of compliance of materials with specification requirements shall be executed in three copies. Each certificate will be signed by an official authorized to certify in behalf of the manufacturing company and contain the name and address of the Contractor, the project...
name and location, and the quantity and date or dates of shipment or delivery to which the certificates apply. Copies of laboratory test reports submitted with certificates are to contain the name and address of the testing laboratory and the date or dates of the tests to which the report applies. Certification are not to be construed as relieving the Contractor from furnishing satisfactory material, if after tests are performed on selected samples, the material is found not to meet the specific requirements.

2.2 MATERIALS

A. Cementitious Materials:

Cementitious materials shall be Portland cement, and shall conform to appropriate specifications listed below. Use of cementitious materials in concrete which will have surfaces exposed in the completed structure shall be restricted so there is no change in color, source, or type of cementitious material. Cementitious material will be accepted on the basis of a manufacturer's certificate of compliance, accompanied by mill test reports that the materials meet the requirements of the specification under which it is furnished.

B. Portland Cement:

Cement shall be Portland cement conforming to ASTM C150, Type II or V, low alkali.

2.3 AGGREGATES

Aggregate shall conform to ASTM C33/C33M, Table 2 Grading Requirements for Coarse Aggregates for any of the following Size Number 2, 3, 4, 5, 56, 57, 357, and 467 or TXDOT Item 421.2. Aggregate shall be composed of clean, uncoated grains of material.

2.4 POZZOLAN (FLY ASH)

Pozzolan (fly ash) shall conform to ASTM C618, Class F or C. The loss of ignition shall not exceed 6.0 percent.

2.5 CHEMICAL ADMIXTURES

Chemical admixtures, to be used, when required or approved, are to comply with the appropriate specification listed. Chemical admixtures that have been in storage at the project site for longer than 6 months or have been subjected to freezing are to be retested at the expense of the Contractor when directed by the Contracting Officer and will be rejected if test results are not satisfactory.

A. Air-Entraining Admixture

Air-entraining admixtures must conform to ASTM C260/C260M

B. Water-Reducing or Retarding Admixture

ASTM C494/C494M, Type A, B, or D.

2.6 CURING MATERIALS

A. Imperous-Sheet

Impervious-sheet materials are to conform to ASTM C171, type optional, except polyethylene film, if used, are to be white opaque.

B. Membrane-Forming Compound

Membrane-Forming curing compound is to conform to ASTM C309, Type 1-D or 2, Class B.

2.7 WATER

Water for mixing and curing is to be drinkable and fresh, clean, potable, and free of injurious amounts of oil, acid, salt, or alkali.

2.8 FORMWORK
The design and engineering of the formwork, as well as its construction, is to be the responsibility of the Contractor.

A. Form Coatings

Forms for exposed surfaces are to be coated with a non-staining form oil, which is to be applied shortly before concrete is placed.

2.9 EMBEDDED ITEMS

Embedded items are to be of the size and type indicated or as needed for the application.

A. Reinforcing Steel

Reinforcing Steel Bar is to conform to the requirements of ASTM A615/A615M, Grade 60. Details of reinforcement not shown are to be in accordance with ACI 318, Chapters 7 "Details of Reinforcement" and 12 "Development and Slices of Reinforcement."

B. Tie Wires

Tie wires are to conform to the requirements of ASTM A1064/A1064M.

2.10 SAMPLING AND TESTING

The PHA will maintain the discretion to sample and test aggregates and concrete to determine compliance with the specifications. Provide facilities and labor when necessary to assist the PHA in procurement of representative test samples. Samples of aggregates are to be obtained at the point of batching in accordance with ASTM D75/D75M. Concrete is to be sampled in accordance with ASTM C172/C172M. Slump and air content are to be determined in accordance with ASTM C143/C143M and ASTM C231/C231M, respectively, when cylinders are molded. Compression test specimens are to be tested in accordance with ASTM C31/C31M. Compression test specimens are to be tested in accordance with ASTM C39/C39M. Samples for strength tests are to be taken not less than once each shift in which concrete is produced from each class of concrete required. A minimum of four specimens will be made from each sample. Three specimens are to be tested for acceptance at 28 days, or 90 days if pozzolan is used, and one specimen is to be tested at 7 days for information.

A. Strength

Acceptance test results will be the average strengths of three specimens tested at 28 days. The strength of the concrete will be considered satisfactory as long as the average of three consecutive acceptance test results equal or exceed the following specified compressive strength fc:

<table>
<thead>
<tr>
<th>Compressive Strength @ 28 days, psi</th>
<th>Maximum Water Cement Ratio</th>
<th>Structure or Portion of Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>4,000</td>
<td>0.40</td>
<td>Site Cast Structural Concrete</td>
</tr>
</tbody>
</table>

B. Construction Surface and Tolerances

A Class "C" finish according to ACI 117 is to apply to surfaces except those specified to receive a Class "D" finish. Tolerances are to conform to class surface "C" on table 3.1 ACI 347R. A Class "D" finish is to apply to surfaces that will be permanently concealed after construction. Surface requirements for the classes of finish required are as specified in Part 4 of ACI MCP SET.
C. Concrete Mixture Proportions

Concrete Mixture Proportions are to be the responsibility of the Contractor. Ten days prior to placement of concrete, submit the mixture proportions that will produce concrete of the quality required. Applicable test reports to verify that the concrete mixture proportions selected will produce concrete of the quality specified. Mixture proportions are to include the dry weights of Cementous material(s); the nominal maximum size of the coarse aggregate; the specific gravities, absorptions, and saturated surface-dry weights of fine and coarse aggregates; the quantities, types, and names of admixtures; and quantity of water per cubic yard of concrete. Materials included in the mixture proportions are to be of the same type and from the same source as will be used on this project. The maximum nominal size coarse aggregate is to be 1 inches.

D. Ready-Mix Concrete

If Ready-Mix Concrete to be used, it is to meet the requirements of ASTM C94/C94M.

Ready-mixed concrete manufacturer must provide duplicate delivery tickets with each load of concrete delivered. Provide delivery tickets with the following information in addition to that required by ASTM C94/C94M: Type and brand cement content in 95-pound bags per cubic yard of concrete

Maximum size of aggregate

Amount and brand name of admixtures

Total water content expressed by water/cement ratio

PART 3 EXECUTION

3.1 PREPARATION FOR PLACING

Check specified elevation and dimensions before beginning installation.

If foundation elevation or dimensions vary more than 1/2 inch from design for proper installation, notify the contracting officer and wait for instructions before beginning installation. Determine quantity of concrete needed and minimize the production of excess concrete. Designate locations or uses for potential excess concrete before the concrete is placed.

Surfaces against which concrete is to be placed must be free of debris, loose material, standing water, snow, ice, and other deleterious substances before start of concrete placing. Any latex bonding agent, if used, it is to conform to ASTM C1059/C1059M. Standing or flowing water, loose particles, debris, and foreign material are to have been removed. Earth foundations are to be satisfactorily compacted. Spare vibrators are to be available. Preparation is to be approved prior to placing.

A. Embedded Items

Reinforcement is to be secured in place; joints, anchors, and other embedded items are to have been positioned prior to placement of concrete. Internal ties are to be arranged so that when the forms are removed the metal will be not less than 2 inches from concrete surfaces permanently exposed to view or exposed to water on the finished structures. Embedded items are to be free of oil and other foreign materials including, but not limited to, loose coatings or rust, paint, and scale. Embedding wood in concrete will be permitted only when specifically authorized or directed. Equipment used to place, consolidate, protect, and cure the concrete is to be at the placement site and in good operating condition.

B. Formwork Installation
Forms are to be properly aligned, adequately supported, and mortar-tight. The form surfaces are to be smooth and free from irregularities, dents, sags or holes when used for permanently exposed faces. Exposed joints and edges are to be chamfered, unless otherwise indicated.

C. Production of Concrete
   1. Volumetric Batching and Continuous Mixing
      Concrete made by volumetric batching and continuous mixing is to conform to the requirements of ASTM C685/C685M, and "Option A" for ordering Information Section, except as otherwise specified or approved.
   2. Ready-Mixed Concrete
      Ready-mixed concrete is to conform to the requirements of ASTM C94/C94M and "Option A" in the Ordering Information Section, except as otherwise specified or approved.

3.2 CONVEYING AND PLACING CONCRETE

Convey and place concrete in accordance with ACI 301, Section 5. Submit the methods and equipment for transporting, handling, depositing, and consolidating the concrete prior to the first concrete placement.

A. Cold-Weather Requirements
   Place concrete in cold weather in accordance with ACI 306R.

B. Hot-Weather Requirements
   Place concrete in hot weather in accordance with ACI 305R.

C. Consolidation
   Each layer of concrete shall be consolidated by internal vibrating equipment. Internal vibration shall be systematically accomplished by inserting the vibrator through the fresh concrete in the layer below at a uniform spacing over the entire area of placement. The distance between insertions shall be approximately 1.5 times the radius of action of the vibrator and overlay the adjacent, just vibrated area by a few inches. The vibrator shall penetrate rapidly to the bottom of the layer and at least by 6 inches into the layer below when a lower layer exists. It shall be held stationary until the concrete is consolidated and then withdrawn slowly at the rate of about 3 inches per second.

3.3 FORM REMOVAL

Forms are not to be removed before the expiration of 24 hours after concrete placement except where otherwise specifically authorized. Supporting forms and shoring are not to be removed until the concrete has cured for at least 5 days. When conditions on the work do not justify this requirement, forms will be required to remain in place for longer periods.

3.4 FINISHING

No finishing or repair will be done when either the concrete or ambient temperature is below 50 degrees F.

A. Broom Finish
   A broom finish is to be applied to the concrete slab. The concrete is to be secreted and floated to the required finish plane with no coarse aggregate visible. After surface moisture disappears, the surface are to be broomed or brushed with a broom or fiber brush in a direction transverse to that of the water flow or as directed.

3.5 CURING AND PROTECTION

STANDARD TECHNICAL SPECIFICATIONS
Revision Date: September 2017
Page 7
A. Curing

Beginning immediately after placement and continuing for at least 7 days conforming to ACI 308.1, the concrete is to be cured and protected from premature drying, extremes in temperature, rapid temperature change, freezing, mechanical damage, and exposure to rain or flowing water. Materials and equipment used for adequate curing and protection are to be available and at the placement site prior to start of concrete placement. Preservation of moisture for concrete surfaces not in contact with forms is to be accomplished by one of the following methods:

1. Continuous sprinkling or ponding.
2. Application of absorptive mats or fabrics kept continuously wet.
3. Application of sand kept continuously wet.
5. Application of membrane forming curing compound conforming to ASTM C309, Type 1-D, on surfaces permanently exposed to view and Type 2 on other surfaces is to be accomplished in accordance with manufacturer’s instructions.

B. Preservation of Moisture

The preservation of moisture for concrete surfaces placed against wooden forms is to be accomplished by keeping the forms continuously wet for 7 days. If forms are removed prior to end of the required curing period, other curing methods are to be used for the balance of the curing period. During the period of protection removal, the temperature of the air in contact with the concrete is not to be allowed to drop more than 25 degrees F within a 24-hour period.

3.6 TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL

Individuals required to sample and test the concrete specified herein are to have demonstrated a knowledge and ability to perform the necessary test procedures equivalent to the ACI 214R guidelines for certification of Concrete Field Testing Technicians.

A. Inspection Details and Frequency of Testing

1. Preparations for Placing

Inspect foundation or construction joints, forms, and embedded items in sufficient time prior to each concrete placement to certify to the Contracting Officer that these items are ready to receive concrete.

2. Slump

Slump is to be 3 to 5 inches and be checked twice during each shift that concrete is produced for each class of concrete required. Samples are to be obtained in accordance with ASTM C172/C172M and tested in accordance with ASTM C231/C231M.

3. Consolidation and Protection

Ensure that the concrete is properly consolidated, finished, protected, and cured.

B. Action Required

1. Placing

The placing foreman is not to permit placing to begin until verification is received stating that an adequate number of acceptable vibrators in working order with competent operators are available. Placing is not to be continued if concrete is inadequately consolidated.

2. Slump
When a test result is outside the specification limits the concrete is not to be delivered to the forms and an adjustment is to be made to the batch weights of water and fine aggregate. The adjustments are to be made so that the water-cement ratio does not exceed that specified in the submitted concrete mixture proportion.

C. Reports
The results of tests or inspections conducted are to be reported informally as they are completed and in writing daily and be submitted at the end of each daily reporting period as specified in the SECTION 01 45 01.00 45 QUALITY CONTROL

D. Field Testing
1. Provide samples and test concrete for quality control during placement. Sampling of fresh concrete for testing are to be in accordance with ASTM C172/C172M.

2. Test concrete for compressive strength at 7 and 28 days for each design mix. Concrete test specimens are to conform to ASTM C31/C31M. Perform compressive strength testing conforming to ASTM C39/C39M.

3. Test Slump at the site of discharge for each design mix in accordance with ASTM C143/C143M.

4. Determine temperature of concrete at time of placement in accordance with ASTM C1064/C1064M.

END OF SECTION
PORT OF HOUSTON AUTHORITY

TECHNICAL SPECIFICATION FOR ECIP SEGMENT 4 E2 CLINTON/BELTWAY 8 DMPAS

SECTION 05 05 23.16 Add – STRUCTURAL WELDING

PART 1  GENERAL

1.1  SECTION INCLUDES

Subject to the requirements of the General and Special Conditions, the work covered in this Section consists of furnishing plant, labor, materials, and equipment and performing the welding operations in connection with constructing new Drop-Outlet Structures in designated Placement Areas (PAs).

1.2  RELATED SECTIONS

SECTION 01 22 10.00 Std - Measurement of Quantities
SECTION 03 21 00.00 Std - Reinforcing Steel
SECTION 03 31 00.00 Std - Structural Concrete
SECTION 31 23 33.00 Std - Trenching and Backfilling
SECTION 31 41 33.00 Std - Trench Safety System

1.3  REFERENCES

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
AISC 360 (2016) Specification for Structural Steel Buildings

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

AMERICAN WELDING SOCIETY (AWS)
AWS D1.1/D1.1M (2015; Errata 1 2015; Errata 2 2016) Structural Welding Code - Steel
AWS D1.4/D1.4M (2011) Structural Welding Code - Reinforcing Steel
AWS D1.8/D1.8M (2016) Structural Welding Code—Seismic Supplement

AWS QC1 (2016) Specification for AWS Certification of Welding Inspectors


ASTM INTERNATIONAL (ASTM)


1.4 SUBMITTALS

PHA approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals
  Welding Quality Assurance Plan; G

SD-03 Product Data
  Welding Procedure Qualifications; G Welder, Welding Operator, and Tacker Qualification
  Previous Qualifications
  Pre-Qualified Procedures; G
  Welding Electrodes and Rods

SD-06 Test Reports
  Nondestructive Testing
  Weld Inspection Log

SD-07 Certificates
  Certified Welding Procedure Specifications (WPS)
  Certified Brazing Procedure Specifications (BPS)
  Certified Procedure Qualification Records (PQR)
  Certified Welder Performance Qualifications (WPQ)
  Certified Brazer Performance Qualifications (BPQ)
  Certified Welding Inspector
  Nondestructive Testing Personnel
1.5 QUALITY ASSURANCE

Except for pre-qualified (in accordance with AWS D1.1/D1.1M) and previously qualified procedures, each Contractor performing welding must record in detail and qualify the welding procedure specification for any welding procedure followed in the fabrication of weldments. Conform welding procedure qualifications to AWS D1.1/D1.1M and to the specifications in this section. Submit for approval copies of the welding procedure specification and the procedure qualification records for each type of welding being performed. Submission of the welder, welding operator, or tacker qualification test records is also required. Approval of any procedure, however, does not relieve the Contractor of the sole responsibility for producing a finished structure meeting all the specified requirements. Submit this information on the forms in Annex M of AWS D1.1/D1.1M. Individually identify and clearly reference on the detail drawings and erection drawings all welding procedure specifications, or suitably key them to the contract drawings. In case of conflict between this specification and AWS D1.1/D1.1M, this specification governs.

A. Previous Qualifications

Welding procedures previously qualified by test in accordance with AWS D1.1/D1.1M, may be accepted for this contract without re-qualification, upon receipt of the test results, if the following conditions are met:

1. Testing was performed by an approved testing laboratory, technical consultant, or the Contractor’s approved quality control organization.
2. The qualified welding procedure conforms to the requirements of this specification and is applicable to welding conditions encountered under this contract.
3. The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.

B. Pre-qualified Procedures

Welding procedures which are considered pre-qualified as specified in AWS D1.1/D1.1M will be accepted without further qualification. Submit for approval a listing or an annotated drawing to indicate the joints not pre-qualified. Procedure qualification is mandatory for these joints.

C. Welder, Welding Operator, and Tacker Qualification

Each welder, welding operator, and tacker assigned to work on this contract must be qualified in accordance with the applicable requirements of AWS D1.1/D1.1M and as specified in this section. Welders, welding operators, and tackers who make acceptable procedure qualification test welds will be considered qualified for the welding procedure used within the applicable essential variables for welder qualification.

1. Previous Personnel Qualifications

At the discretion of the Contracting Officer, welders, welding operators, and tackers qualified by test within the previous 6 months may be accepted for this contract without re-qualification if all the following conditions are met:

a. Copies of the welding procedure specifications, the procedure qualification test records, and the welder, welding operator, and tacker qualification test records are submitted and approved in accordance with the specified requirements for detail drawings.

b. Testing was performed by an approved testing laboratory, technical consultant, or the Contractor’s approved quality control organization.

c. The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.
2. Certificates

Before assigning any welder, welding operator, or tacker to work under this contract, submit the names and certification that each individual is qualified as specified. State in the certification the type of welding and positions for which the welder, welding operator, or tacker is qualified, the code and procedure under which the individual is qualified, the date qualified, and the name of the firm and person certifying the qualification tests. Keep the certification current, on file, and furnish 3 copies.

3. Renewal of Qualification

Re-qualification of a welder or welding operator is required under any of the following conditions:

a. It has been more than 6 months since the welder or welding operator has used the specific welding process for which he is qualified.

b. There is specific reason to question the welder or welding operator’s ability to make welds that meet the requirements of these specifications.

c. The welder or welding operator was qualified by an employer other than those firms performing work under this contract, and a qualification test has not been taken within the past 12 months. Submit as evidence of conformance all records showing periods of employment, name of employer where welder, or welding operator, was last employed, and the process for which qualified.

d. A tacker who passes the qualification test is considered eligible to perform tack welding indefinitely in the positions and with the processes for which he/she is qualified, unless there is some specific reason to question the tacker’s ability or there has been a gap greater than 6 months since he/she last used the process. In such a case, the tacker is required to pass the prescribed tack welding test.

D. Inspector Qualification

Submit certificates indicating that certified welding inspectors meet the requirements of AWS QC1. Submit qualifications for nondestructive testing personnel in accordance with the requirements of ANSI/ASNT CP-189 for Levels I or II in the applicable nondestructive testing method. Level I inspectors must have direct supervision of a Level II inspector.

E. Symbols and Safety

Use symbols in accordance with AWS A2.4, unless otherwise indicated. Follow safe welding practices and safety precautions during welding in conformance with AWS Z49.1.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Conform the design of welded connections to AISC 360, unless otherwise indicated or specified. Material with welds will not be accepted unless the welding is specified or indicated on the drawings or otherwise approved. Perform welding as specified in this section, except where additional requirements are shown on the drawings or are specified in other sections. Do not commence welding until welding procedures, inspectors, nondestructive testing personnel, welders, welding operators, and tackers have been qualified and the submittals approved by the Contracting Officer. Perform all testing at or near the work site. Maintain records of the test results obtained in welding procedure, welder, welding operator, and tacker performance qualifications.

A. Pre-erection Conference

Hold a pre-erection conference prior to the start of the field welding, to bring all affected parties together and to gain a naturally clear understanding of the project and the Welding
Procedure Specifications (WPS) (submitted for all welding, including welding done using pre-qualified procedures). Mandatory attendance is required by all Contractor’s welding production and inspection personnel and appropriate PHA personnel. Include as items for discussion: responsibilities of various parties; welding procedures and processes to be followed; welding sequence (both within a joint and joint sequence within the building); inspection requirements and procedures, both visual and nondestructive testing; welding schedule; and other items deemed necessary by the attendees.

2.2 MATERIALS

Provide all welding equipment, welding electrodes and rods, welding wire, and fluxes capable of producing satisfactory welds when used by a qualified welder or welding operator. Use E70XX welding electrodes. Provide welding equipment and materials that comply with the applicable requirements of AWS D1.1/D1.1M. Submit product data on welding electrodes and rods.

PART 3 EXECUTION

3.1 WELDING OPERATIONS

A. Requirements

Conform workmanship and techniques for welded construction to the requirements of AWS D1.1/D1.1M and AISC 360. When AWS D1.1/D1.1M and the AISC 360 specification conflict, the requirements of AWS D1.1/D1.1M govern.

B. Identification

Identify all welds in one of the following ways:

1. Submit written records to indicate the location of welds made by each welder, welding operator, or tacker.

2. Identify all work performed by each welder, welding operator, or tacker with an assigned number, letter, or symbol to identify welds made by that individual. The Contracting Officer may require welders, welding operators, and tackers to apply their symbol next to the weld by means of rubber stamp, felt-tipped marker with waterproof ink, or other methods that do not cause an indentation in the metal. Place the identification mark for seam welds adjacent to the weld at 3 foot intervals. Identification with die stamps or electric etchers is not allowed.

3.2 QUALITY CONTROL

Perform testing using an approved inspection or testing laboratory or technical consultant; or if approved, the Contractor’s inspection and testing personnel may be used instead of the commercial inspection or testing laboratory or technical consultant. A Certified Welding Inspector must perform visual inspection on 100 percent of all welds. Document this inspection in the Visual Weld Inspection Log. Test 100% of CJP and PJP welds using ultrasonic testing per Table 6.2 of AWS D1.1/D1.1M. Randomly test 50% of all fillet welds or as indicated by magnetic particle or dye penetrant testing. Verify the welds conform to paragraph STANDARDS OF ACCEPTANCE. Conform procedures and techniques for inspection to applicable requirements of AWS D1.1/D1.1M, ASTM E165/E165M, and ASTM E709. Submit a Welding Quality Assurance Plan and records of tests and inspections.

3.3 STANDARDS OF ACCEPTANCE

Conform dimensional tolerances for welded construction, details of welds, and quality of welds to the applicable requirements of AWS D1.1/D1.1M and the contract drawings. Submit all records of nondestructive testing.
A. Nondestructive Testing

The welding is subject to inspection and tests in the mill, shop, and field. Inspection and tests in the mill or shop do not relieve the Contractor of the responsibility to furnish weldments of satisfactory quality. When materials or workmanship do not conform to the specification requirements, the PHA reserves the right to reject material or workmanship or both at any time before final acceptance of the structure containing the weldment. Any indication of a defect is regarded as a defect, unless re-evaluation by nondestructive methods or by surface conditioning shows that no unacceptable defect is present. Submit all records of nondestructive testing in accordance with paragraph STANDARDS OF ACCEPTANCE.

B. Destructive Tests

Make all repairs when metallographic specimens are removed from any part of a structure. Employ only qualified welders or welding operators, and use the proper joints and welding procedures, including peening or heat treatment if required, to develop the full strength of the members and joints cut and to relieve residual stress.

3.4 PHA INSPECTION AND TESTING

In addition to the inspection and tests performed by the Contractor for quality control, the PHA will perform inspection and testing for acceptance to the extent determined by the Contracting Officer. The work may be performed by the PHA's own forces or under a separate contract for inspection and testing. The PHA reserves the right to perform supplemental nondestructive and destructive tests to determine compliance with paragraph STANDARDS OF ACCEPTANCE.

3.5 CORRECTIONS AND REPAIRS

If inspection or testing indicates defects in the weld joints, repair defective welds using a qualified welder or welding operator as applicable. Conduct corrections in accordance with the requirements of AWS D1.1/D1.1M and the specifications. Repair all defects in accordance with the approved procedures. Repair defects discovered between passes before additional weld material is deposited. Wherever a defect is removed and repair by welding is not required, blend the affected area into the surrounding surface to eliminate sharp notches, crevices, or corners. After a defect is thought to have been removed, and before re-welding, examine the area by suitable methods to ensure that the defect has been eliminated. Repaired welds must meet the inspection requirements for the original welds.

END OF SECTION
PORT OF HOUSTON AUTHORITY

TECHNICAL SPECIFICATION FOR ECIP SEGMENT 4 E2 CLINTON/BELTWAY 8 DMPAS
SECTION 09 97 02 Add – HYDRAULIC STRUCTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

Subject to the requirements of the General and Special Conditions, the work covered in this Section consists of furnishing labor and equipment necessary to perform the operations in connection with painting of drop-outlet structures. Painting will be considered as a subsidiary work to which it pertains.

1.2 RELATED SECTIONS

SECTION 01 22 10.00 Std - Measurement of Quantities
SECTION 03 21 00.00 Std - Reinforcing Steel
SECTION 03 31 00.00 Std - Structural Concrete
SECTION 31 23 33.00 Std - Trenching and Backfilling
SECTION 31 41 33.00 Std - Trench Safety System

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D4417 (2014) Field Measurement of Surface Profile of Blast Cleaned Steel

INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ISEA)

ANSI/ISEA Z87.1 (2015) Occupational and Educational Personal Eye and Face Protection Devices
<table>
<thead>
<tr>
<th>Organization</th>
<th>Document</th>
</tr>
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<tr>
<td><strong>NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)</strong></td>
<td></td>
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<tr>
<td>NFPA 70</td>
<td>(2017; ERTA 1-2 2017; TIA 17-1; TIA 17-2; TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6; TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10; TIA 17-11; TIA 17-12; TIA 17-13; TIA 17-14; TIA 17-15; TIA 17-16; TIA 17-17) National Electrical Code</td>
</tr>
<tr>
<td><strong>NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)</strong></td>
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<tr>
<td><strong>SOCIETY FOR PROTECTIVE COATINGS (SSPC)</strong></td>
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<tr>
<td>SSPC Paint 16</td>
<td>(2006; R 2015; E 2015) Coal Tar Epoxy-Polyamide Black (or Dark Red) Paint</td>
</tr>
<tr>
<td>SSPC SP 1</td>
<td>(2015) Solvent Cleaning</td>
</tr>
<tr>
<td>SSPC SP 5/NACE No. 1</td>
<td>(2007) White Metal Blast Cleaning</td>
</tr>
</tbody>
</table>
U.S. ARMY CORPS OF ENGINEERS (USACE)

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
29 CFR 1910   Occupational Safety and Health Standards
29 CFR 1910.20 Access to Employee Exposure and Medical Records
29 CFR 1910.94 Ventilation
29 CFR 1910.134 Respiratory Protection
29 CFR 1910.146 Permit-required Confined Spaces
29 CFR 1926.62 Lead

40 CFR 50   National Primary and Secondary Ambient Air Quality Standards
40 CFR 50.6 National Primary and Secondary Ambient Air Quality Standards for PM10
40 CFR 50.12 National Primary and Secondary Ambient Air Quality Standards for Lead
40 CFR 58   Ambient Air Quality Surveillance
40 CFR 60   Standards of Performance for New Stationary Sources
40 CFR 117 Determination of Reportable Quantities for Hazardous Substances
40 CFR 122 EPA Administered Permit Programs: The National Pollutant Discharge Elimination System
40 CFR 261 Identification and Listing of Hazardous Waste
40 CFR 262 Standards Applicable to Generators of Hazardous Waste
40 CFR 262.22 Number of Copies
40 CFR 263 Standards Applicable to Transporters of Hazardous Waste
40 CFR 302 Designation, Reportable Quantities, and Notification
40 CFR 355 Emergency Planning and Notification
40 CFR 171 General Information, Regulations, and Definitions
1.4 SAFETY, HEALTH, AND ENVIRONMENTAL REQUIREMENTS

Perform work in accordance with all applicable health, safety, and environmental requirements as well as EM 385-1-1. Submit matters of interpretation of these requirements to the Contracting Officer for resolution before starting work. If no clarifications are sought, then the submittal is not necessary. Where the regulations conflict, the most stringent requirements shall apply. This paragraph supplements the health, safety, and environmental requirements of EM 385-1-1.

A. Safety

Submit a Safety Plan in accordance with the requirements of Section 01 of EM 385-1-1, including, but not limited to, each of the topic areas listed in Appendix A therein and the specified requirements. Develop each topic in a concise manner to include management and operational aspects. Submit a Ventilation Assessment Plan complying with all applicable safety standards.

1. Abrasive Blasting

For abrasive blasting comply with the requirements in Section 06.H of EM 385-1-1. In addition to the requirements in Section 20 of EM 385-1-1, use hoses and hose connections of a type to prevent shock from static electricity. Hose lengths shall be joined together by approved couplings of a material and type designed to prevent erosion and weakening of the couplings. The couplings and nozzle attachments shall fit on the outside of the hose and designed to prevent accidental disengagement.

2. Workers Other Than Blasters

Protect workers, other than blasting operators working in close proximity to abrasive blasting operations, by utilizing MSHA/NIOSH-approved half-face or full-face air purifying respirators equipped with high-efficiency particulate air (HEPA) filters, eye protection meeting or exceeding ANSI/ISEA Z87.1 and hearing protectors (ear plugs and/or ear muffs) providing a noise reduction rating of at least 20 dBA or as needed to provide adequate protection. Personal protective equipment shall be provided where required by 29 CFR 1910.146 and in accordance with 29 CFR 1910, Subpart I.

3. Cleaning Before and After Abrasive Blasting

Cleaning with compressed air shall be in accordance with Section 20.B.5 of EM 385-1-1 and personnel shall be protected as specified in 29 CFR 1910.134.

When cleaning with solvents, provide ventilation where required by 29 CFR 1910.146 or where the concentration of solvent vapors exceeds 10 percent of the Lower Explosive Limit (LEL). Ventilation shall be in accordance with 29 CFR 1910.94, paragraph (c)(5).

4. Pretreatment of Metals and Concrete with Acids

Personnel shall be protected in accordance with 29 CFR 1910, Subpart I. In addition to the requirements of Section 05 of EM 385-1-1, provide an eyewash in accordance with ANSI/ISEA Z358.1, paragraph (6).

5. Paint Mixing

Local exhaust ventilation shall be provided in the area where coatings are mixed. This ventilation system shall be capable of providing at least 100 linear fpm of capture velocity in the mixing zone. Exposure of skin and eyes shall be avoided by wearing appropriate chemically resistant gloves, apron, safety goggles, and face shields meeting or exceeding the requirements of ANSI/ISEA Z87.1. A combination unit, comprised of an eyewash and deluge shower, within close proximity to the mixing operation shall be provided in accordance with ANSI/ISEA Z358.1, paragraph (9). Individuals who have a history of, or develop a sensitivity to epoxy or polyurethane...
resin systems, shall not conduct work tasks or otherwise be exposed to such chemicals.

6. Confined Spaces

When using solvent-based paint in confined spaces, prepare a Confined Spaces Plan. Provide ventilation to exchange air in the space at a minimum rate of 5,000 cubic feet per minute per spray gun in operation. It may be necessary to install both a mechanical supply and exhaust ventilation system to effect adequate air changes within the confined space. Locate and affix all air-moving devices to an opening of the confined space in a manner assuring that the airflow is not restricted or short circuited and is supplied in the proper direction. Means of egress shall not be blocked. Continue ventilation after completion of painting and through the drying phase of the operation. If the ventilation system fails or the concentration of volatiles exceeds 10 percent of the LEL (except in the zone immediately adjacent to the spray nozzle), stop painting and evacuate spaces until adequate ventilation is provided. Provide an audible alarm that signals system failure as an integral part of the ventilation system. The effectiveness of the ventilation shall be checked by using ventilation smoke tubes and making frequent oxygen and combustible gas readings during painting operations. Exhaust ducts shall discharge clear of the working areas and away from possible sources of ignition. Submit detailed written standard operating procedures for confined spaces in accordance with 29 CFR 1910.146 and EM 385-1-1, Section 6I. The procedures shall include:

a. Certificates of calibration for all testing and monitoring equipment. The certificates of calibration shall include: type of equipment, model number, date of calibration, firm conducting calibration, and signature of individual certifying calibration.

b. Methods of inspection of personal protective equipment prior to use.

c. Work practices and other engineering controls designed to reduce airborne hazardous chemical exposures to a minimum.

d. Specification of the design and installation of ventilation systems which shall provide adequate oxygen content and provide for the dilution of paint solvent vapor, lead, and other toxic particulates within the confined space. In addition, include plans to evaluate the adequacy of air flow patterns.

7. Paint Spraying

Submit a comprehensive written Respiratory Protection Plan in accordance with 29 CFR 1910.134, 29 CFR 1926.62, and Section 05.G of EM 385-1-1. During all spray painting operations, spray painters shall use approved SCBA or SAR (airline) respirators, unless valid air sampling has demonstrated contaminant levels to be consistently within concentrations that are compatible with air-purifying respirator Assigned Protection Factor (APF). Persons with facial hair that interferes with the sealing surface of the face piece to face seal or interferes with respirator valve function shall not be allowed to perform work requiring respiratory protection. Air-purifying chemical cartridge/canister half- or full-face piece respirators that have a particulate pre-filter and are suitable for the specific type(s) of gas/vapor and particulate contaminant(s) may be used for non-confined space painting, mixing, and cleaning (using solvents). These respirators may be used provided the measured or anticipated concentration of the contaminant(s) in the breathing zone of the exposed worker does not exceed the APF for the respirator and the gas/vapor has good warning properties or the respirator assembly is equipped with a NIOSH-approved end of service life indicator for the gas(es)/vapor anticipated or encountered. Where paint contains toxic elements that may become airborne during painting in non-confined spaces, air-purifying half- and full-face piece respirators or powered air-purifying respirators equipped with appropriate gas vapor cartridges, in combination...
with a high-efficiency filter, or an appropriate canister incorporating a high-efficiency filter, shall be used.

8. Explosion Proof Equipment

Electrical wiring, lights, and other equipment located in the paint spraying area shall be of the explosion proof type designed for operation in Class I, Division 1, Group D, hazardous locations as required by the NFPA 70. Electrical wiring, motors, and other equipment, outside of but within 20 feet of any spraying area, shall not spark and shall conform to the provisions for Class I, Division 2, Group D, hazardous locations. Electric motors used to drive exhaust fans shall not be placed inside spraying areas or ducts. Fan blades and portable air ducts shall be constructed of nonferrous materials. Motors and associated control equipment shall be properly maintained and grounded. The metallic parts of air-moving devices, spray guns, connecting tubing, and duct work shall be electrically bonded and the bonded assembly shall be grounded.

9. Further Precautions

a. Workers must wear non-sparking safety shoes.

b. Place and ground solvent drums, taken into the spraying area, on nonferrous surfaces. Maintain metallic bonding between containers and drums when materials are being transferred.

c. Inspect insulation on all power and lighting cables to ensure that the insulation is in excellent working condition and is free of all cracks and worn spots. Cables shall be further inspected to ensure that no connections are within 50 feet of the operation, that lines are not overloaded, and that they are suspended with sufficient slack to prevent undue stress or chafing.

10. Ignition Sources

Ignition sources, to include lighted cigarettes, cigars, pipes, matches, or cigarette lighters shall be prohibited in area of solvent cleaning, paint storage, paint mixing, or paint application.

B. Health

Prepare and submit a Medical Surveillance Plan and a statement from the examining physician indicating the name of each employee evaluated and any limitations which will preclude the employee from performing the work required. The statement shall include the date of the medical evaluation, the physician’s name, signature, and telephone number.

1. Air Monitoring

Prepare and submit an Air Monitoring Test Plan. Perform air sampling and testing as needed to assure that workers are not exposed to contaminants above the permissible exposure limit. In addition, provide the Contracting Officer with a copy of the Air Monitoring Test Report from the laboratory within five working days of the sampling date, including records of air monitoring plans and tests performed. Submit reports as soon as information is available. Also provide results from direct-reading instrumentation on the same day the samples are collected. Prepare and submit an Airborne Sampling Plan detailing the NIOSH 2003-154, Factory Mutual, or Underwriters Laboratories approved equipment, equipment calibration procedures, sampling methods, sampling to be performed, and analytical procedures to be used based on the type of work to be performed and anticipated toxic contaminants to be generated. Include the name of the accredited laboratory, listed by the American Industrial Hygiene Association (AIHA), to be used to conduct the analysis of any collected air samples.
2. Medical Status

Prior to the start of work, and annually thereafter, submit a Medical Status Report including records of medical tests. Medically evaluate all Contractor employees working with or around paint systems, thinners, blast media, those required to wear respiratory protective equipment, and those who will be exposed to high noise levels for the particular type of exposure they may encounter. Maintain medical records as required by 29 CFR 1910.20. The evaluation shall include:

   a. Audiometric testing and evaluation of employees who will work in a noise environment with a time weighted average greater than or equal to 90 dBA.
   b. Vision screening (employees who use full-face piece respirators shall not wear contact lenses).
   c. Medical evaluation shall include, but shall not be limited to, the following:
      i. Medical history including, but not limited to, alcohol use, with emphasis on liver, kidney, and pulmonary systems, and sensitivity to chemicals to be used on the job.
      ii. General physical examination with emphasis on liver, kidney, and pulmonary system.
      iii. Determination of the employee’s physical and psychological ability to wear respiratory protective equipment and to perform job-related tasks.
      iv. Determination of baseline values of biological indices for later comparison to changes associated with exposure to paint systems and thinners or blast media, which include: liver function tests to include SGOT, SGPT, GGPT, alkaline phosphates, bilirubin, complete urinalysis, EKG (employees over age 40), blood urea nitrogen (bun), serum creatinine, pulmonary function test, FVC, and FEV, chest x-ray (if medically indicated), blood lead and ZPP (for individuals where it is known there will be an exposure to materials containing lead), other criteria that may be deemed necessary by the Contractor's physician, and Physician's statements for individual employees that medical status would permit specific task performance.
   v. For lead-based paint removal, the medical requirements of 29 CFR 1926.62 shall also be included. Prepare and submit a Worker Protection Plan in accordance with the requirements of 29 CFR 1926.62, addressing all necessary aspects of worker protection and including activities emitting lead, means to achieve compliance, alternative technologies considered, air monitoring program, implementation schedule, work practice program, administrative controls, multi-Contractor site arrangements, and jobsite inspections.

3. Change in Medical Status

Any employee whose medical status has changed negatively due to work related chemical and/or physical agent exposure while working with or around paint systems and thinners, blast media, or other chemicals shall be evaluated by a physician, and obtain a physician’s statement as described in paragraph MEDICAL STATUS prior to allowing the employee to return to those work tasks. Submit a Change in Medical Status Report detailing any negative changes in employee medical status and the results of the physician’s reevaluation statement.

C. Environmental Protection

Prepare an Environmental Protection Plan incorporating the submittals for Water Quality Plan, Containment Plan, Waste Disposal Plan, Soil Quality Plan, TSP Monitoring Plan,
PM-10 Monitoring Plan, and Visible Emissions Monitoring Plan. The submitted plan shall also address all aspects of establishing and demarcating regulated areas, ventilation/containment system performance verification, and reporting of accidental releases. Comply with the following environmental protection criteria.

1. Waste Classification, Handling, and Disposal

Prepare and submit a Waste Disposal Plan in accordance with the requirements of 40 CFR 261 and 40 CFR 262 including classification and handling. The Contractor is responsible for assuring the proper disposal of all hazardous and nonhazardous waste generated during the project. Waste generated from abrasive blasting, lead-containing paints with recyclable steel or iron abrasives shall be disposed of as a hazardous waste or shall be stabilized with proprietary pre-blast additives regardless of the results of 40 CFR 261 App II, Mtd 1311. Where stabilization is preferred, employ a proprietary blast additive that has been blended with the blast media prior to use. Place hazardous waste in properly labeled, closed containers shielded adequately to prevent dispersion of the waste by wind or water. Any evidence of improper storage shall be cause for immediate shutdown of the project until corrective action is taken. Store nonhazardous waste in closed containers separate from hazardous waste storage areas. All hazardous waste shall be transported by a licensed transporter in accordance with 40 CFR 263 and 49 CFR 171, Subchapter C. Transport all nonhazardous waste in accordance with local regulations regarding waste transportation. In addition to the number of copies required by 40 CFR 262.22, supply one copy of each Waste Manifest to the Contracting Officer prior to transportation.

2. Containment

Prepare a Containment Plan for containing debris generated during paint removal operations, including drawings, load-bearing capacity calculations, and wind load calculations. When the design is such that the spent abrasive is allowed to accumulate in quantities greater than 1,000 pounds, and/or impart a significant wind load on the structure, have the drawings approved by a registered structural engineer. The drawings and calculations shall be stamped with the engineer's seal. Also identify the type and placement of water booms, methods for anchoring the booms, and the procedures for removing debris. Contain debris generated during paint removal operations in accordance with the requirements of SSPC Guide 6, Class 2A. Where required, verify the containment air pressure by instrument.

3. Visible Emissions Monitoring

Prepare a Visible Emissions Monitoring Plan including the provisions for halting work and correcting the containment in the event unacceptable emissions are observed. General statements shall not be used; specific methods, procedures, and details are required. Measure the time of emissions in accordance with 40 CFR 60, App A, Mtd 22. Monitor visible emissions for not less than 15 minutes of every hour. Calculate visible emissions for each hour by extrapolation. In no case shall visible emissions extend greater than 150 feet in any direction horizontal from the containment. In no case shall visible emissions be observed in the area of any sensitive receptor. If such emissions occur the job shall be shut down immediately and corrective action taken. Notify the foreman whenever visible emissions exceed 40 seconds in a 1 hour period. The foreman shall be notified and the job shall be shut down and corrective action taken whenever visible emissions exceed 75 seconds in a 2 hour period. Total observed visible emissions from the containment shall not exceed 1 percent of the work day. Shutdown and corrective action shall be taken to prevent such an occurrence. Document each time that the work is halted due to a violation of the visible emissions criteria.
Documentation shall include the cause for shutdown and the corrective action taken to resolve the problem.

4. PM-10 Monitoring

Prepare and submit a PM-10 Monitoring Plan for monitoring emissions of particulate matter 10 microns or less in size (PM-10). The plan shall comply with the requirements of EPA regulation 40 CFR 50.6 and this paragraph. The plan shall also include provisions for halting work and correcting the containment in the event unacceptable emissions occur. The positioning of air monitoring equipment shall be in accordance with 40 CFR 58, App E, and Subpart (8). In addition, a minimum of two PM-10 monitors shall be used at the project site, one downwind from the project and one in the area of greatest public access (e.g., playground, school yard, or homeowner's yard). When the project is in an area where there are critical receptors nearby, monitoring shall be conducted throughout the entire period that abrasive blasting and cleanup operations are performed. Otherwise, monitoring shall be performed 4 of the first 8 days and on a regular basis thereafter for a sum total of 25 percent of the time surface preparation and debris cleanup are performed. Failure to meet air quality regulatory limits shall require air monitoring to be repeated immediately after corrective actions have been taken. Also conduct pre-project PM-10 monitoring. The pre-project PM-10 monitoring shall be conducted a minimum of 2 weeks prior to the beginning of the project. The monitoring shall continue for a minimum of 3 days to establish background levels. Submit a PM-10 Test Report to the Contracting Officer within 48 hours, which includes:

a. Name and location of jobsite.
b. Date of monitoring.
c. Time of monitoring (i.e., time monitoring begins and ends each day).
d. Identification and serial number of monitoring units.
e. Drawing showing specific location of monitoring units.
f. Drawing showing specific location of paint removal operation and the method of removal or work activity being performed.
g. Wind direction and velocity.
h. A flow chart verifying the rate of air flow across the filter throughout the sampling period.
i. Name and address of laboratory.
j. Laboratory test procedure.
k. Laboratory test results.
l. Signatures of field and laboratory technicians conducting the work.

5. TSP Monitoring

Prepare a TSP Monitoring Plan for monitoring emissions of Total Suspended Particulates (TSP). The plan shall comply with the requirements of EPA regulation 40 CFR 50.12 and this paragraph. The plan shall also include provisions for halting work and correcting the containment in the event unacceptable emissions occur. The positioning of air monitoring equipment shall be in accordance with 40 CFR 58, App E, and Subpart (8). In addition, use a minimum of two TSP monitors at the project site, one downwind from the project and one in the area of greatest public access (e.g., playground, school yard, or homeowner's yard). Conduct TSP-lead monitoring in accordance with 40 CFR 50, App B. When the project is in an area where there are critical receptors nearby, monitoring shall be conducted throughout the entire period.
that abrasive blasting and cleanup operations are performed. Otherwise, monitoring shall be performed 4 of the first 8 days and on a regular basis thereafter for a sum total of 25 percent of the time surface preparation and debris cleanup are performed. Failure to meet air quality regulatory limits shall require air monitoring to be repeated immediately after corrective actions have been taken. Also conduct pre-project TSP monitoring. The pre-project TSP monitoring shall be conducted a minimum of 2 weeks prior to the beginning of the project. Continue the monitoring for a minimum of 3 days to establish background levels. Submit a TSP Test Report to the Contracting Officer within 48 hours including:

a. Name and location of jobsite.
b. Date of monitoring.
c. Time of monitoring (i.e., time monitoring begins and ends each day).
d. Identification and serial number of monitoring units.
e. Drawing showing specific location of monitoring units.
f. Drawing showing specific location of paint removal operation and the method of removal or work activity being performed.
g. Wind direction and velocity.
h. A flow chart verifying the rate of air flow across the filter throughout the sampling period.
i. Name and address of laboratory.
j. Laboratory test procedure.
k. Laboratory test results.
l. Signatures of field and laboratory technicians conducting the work.

6. Water Quality

Prepare a Water Quality Plan for all job sites where lead-containing or other hazardous paint will be removed, including provisions for halting work if spills or emissions are observed entering into bodies of water or found in areas where storm water runoff could carry the debris into bodies of water or storm sewers. The plan shall also address cleanup and reporting procedures.. Conduct operations in such a manner that lead-containing and other hazardous paint debris do not contaminate the water and so that NPDES permits in accordance with EPA regulation 40 CFR 122 are not required for the project. In the event that there are any releases of lead paint debris into the waterways, with reportable quantities of hazardous substances designated pursuant to Section 311 of the Clean Water Act, they shall be reported to the EPA in accordance with 40 CFR 117 and 40 CFR 355. Releases or spills that carry into waterways or storm sewers shall be thoroughly documented. The documentation shall include the time and location of the release, amount of material released, actions taken to clean up the debris, amount of debris recovered, and corrective action taken to avoid a reoccurrence. Releases shall also be reported to the Coast Guard and other state and local authorities as appropriate. If the release is equivalent to 10 pounds or more of lead-containing material in a 24-hour period, it is considered to be a reportable quantity under CERCLA. Comply with 40 CFR 302.

7. Soil Quality

Prepare a Soil Quality Plan for all job sites where lead-containing or other hazardous paint will be removed. The plan shall include provisions for halting the work should soil contamination occur, correcting the deficiencies responsible for the contamination, and provide procedures for removing and replacing contaminated soil.
Establish and implement practices and procedures for preventing contamination of the soil from the removal of lead-containing or other hazardous paints. Unless otherwise directed by the Contracting Officer, soil shall be considered to have been contaminated by the Contractor's operation if an increase in the total lead content of 100 PPM or greater over background levels occurs. For purposes of computing the increase compute the mean background levels and the mean post-removal levels. The 100 PPM criteria is met if the difference between the means is less than 100 PPM plus the 95 percent confidence limit. Soil sampling and testing shall be conducted prior to the beginning of the project and after the project is completed. Interim testing may also be performed in the event the Contractor or Contracting Officer wants to confirm that the containment system and work practices continue to provide satisfactory protection of the soil. Unless otherwise directed by the Contracting Officer, the following minimum test locations shall be selected for soil analysis. Two locations shall be selected beneath or immediately adjacent to the structure being prepared, and additional samples shall be taken within 100 feet in each direction of the project (i.e., N, S, E, W) in which soil is present. The number of soil sample locations shall be sufficient to adequately characterize the soil contaminant levels within and around the project area. Five composite samples shall be collected at each location. Each of the five samples shall be comprised of five individual plugs of soil combined in a single bag. The composite samples at each location shall be collected using the following procedure:

a. Place a 1-square foot template at each location.
b. Remove a sample of soil 3/4 inch in diameter and 1/2 inch in depth at the center of the template and at each of the four corners. Place the five soil plugs into a single bag. This represents one of the three samples to be removed at a given location.
c. Move the template 1 inch in any direction and repeat the process to collect the second sample. Place all plugs in a separate bag. Move the template 1 inch farther to collect the third sample.
d. Identify each sample bag with the date, specific location of the sample, name and signature of the sampling technician, and complete chain of custody records.
e. It is critical that the specific location of each sample be thoroughly measured and documented as the final project testing (and any interim testing) shall be sampled in the precise locations.

Three samples collected at each location shall be analyzed. One of the remaining two samples shall be maintained by the Contractor for the duration of the project and the other by the Contracting Officer in the event reanalysis is required. Lead-containing samples shall be analyzed in accordance with EPA testing guidance as published in 40 CFR 261, App III, by a laboratory listed by the American Industrial Hygiene Association (AIHA) as being proficient in conducting the test. Note that if it is determined that contamination of the soil has occurred as a result of the paint removal operations, TCLP testing will be employed to determine if the soil shall be handled and disposed of as a hazardous waste. The initial sampling of the soil for total lead content does not establish whether the soil would be considered hazardous by TCLP testing. As a result, at the Contractor's option, additional pre-work soil samples may be removed (minimum of 105 grams is required for a single test at each site) to conduct TCLP testing to establish whether the soil would be classified as hazardous prior to project startup. In the event that there is a release of lead paint debris onto the soil and if the release is 10 pounds or more of lead-containing material in a 24-hour period, it is considered to be a reportable quantity under CERCLA. Comply with 40 CFR 302. Thoroughly document the occurrence of any spills of lead debris into the soil. The documentation shall include the time and location of the release, amount of...
material released, actions taken to clean up the debris, amount of debris reclaimed, and corrective action taken to avoid a reoccurrence. Provide the documentation to the Contracting Officer and include the Soil Quality Test Report with results of the pre-work and post work soil quality tests.

1.5 SUBMITTALS

PHA approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals
- Safety, Health, and Environmental Requirements; G
- Safety Plan; G
- Confined Spaces Plan; G
- Respiratory Protection Plan; G
- Airborne Sampling Plan; G
- Ventilation Assessment Plan; G
- Medical Surveillance Plan; G
- Worker Protection Plan; G
- Environmental Protection Plan; G
- Waste Manifest
- Waste Disposal Plan; G
- Containment Plan; G
- Visible Emissions Monitoring Plan; G
- PM-10 Monitoring Plan; G
- TSP Monitoring Plan; G
- Water Quality Plan; G
- Soil Quality Plan; G

SD-03 Product Data
- Manufacturer’s Product Data Sheet; G

SD-04 Samples
- Product Samples; G
- Special Paint Formulas; G
- Solvent and Thinners; G

SD-06 Test Reports
- PM-10 Test Report
- TSP Test Report
- Soil Quality Test Report
- Inspection Reports
- Medical Status Report

Soil Quality Test Report with results of the pre-work and post work soil quality tests.
Change in Medical Status Report
Air Monitoring Test Plan; G
Air Monitoring Test Report
SD-07 Certificates
Certified EHS Professional
Certified Lead Laboratory
SSPC QP 1 Certificate
SSPC QP 2 Certificate
Qualified Hazardous Paint Removal Contractor; G
Coating Thickness Gage Qualification
Qualified Paint Applicator; G

1.6 HANDLING AND STORAGE

Qualifications and experience shall comply with the following:

A. Certified Environmental, Health, and Safety (EHS) Professionals

Provide a certificate for each Certified EHS Professional; submit qualifications and experience of qualified and competent persons employed to provide preconstruction and onsite environmental, safety, and health services. Obtain acceptance of this submission prior to the submission of other required environmental, safety, and health submittal items. Utilize a qualified and competent person as defined in Section 01 of EM 385-1-1 to develop the required safety and health submittal and to provide onsite safety and health services during the contract period. The person shall be a Certified Industrial Hygienist (CIH), an Industrial Hygienist (IH), or a Certified Safety Professional (CSP) with a minimum of 3 years of demonstrated experience in similar related work. The CIH, IH, or CSP may utilize other qualified and competent persons, as defined in EM 385-1-1, to conduct on-site safety and health activities as long as these persons have a minimum of 2 years of demonstrated experience in similar related work and are under the direct supervision of the CIH, IH, or CSP. For lead containing jobsites, the competent and qualified person shall have successfully completed an EPA or state accredited lead-based paint abatement Supervisor course specific to the work to be performed and shall possess current and valid state and/or local government certification, as required.

B. Certified Lead Laboratory

Provide documentation which includes the name, address, and telephone number of the laboratories to be providing services. In addition, the documentation shall indicate that each laboratory is an EPA National Lead Laboratory Accreditation Program (NLLAP) accredited laboratory and that each is rated proficient in the NIOSH/EPA Environmental Lead Proficiency Analytical Testing Program (ELPAT) and will document the date of current accreditation. Certification shall include accreditation for heavy metal analysis, list of experience relevant to analysis of lead in air, and a Quality Assurance and Quality Control Program. Submit a certificate for the Certified Lead Laboratory.

C. Qualified Painting Contractor

Provide a certified SSPC QP 1 Painting Contractor. Submit a copy of the SSPC QP 1 Certificate.

D. Qualified Hazardous Paint Removal Contractor

Provide a certified SSPC QP 2 Painting Contractor. Provide a copy of the SSPC QP 2 Certificate.
E. Qualified Paint Applicator

Submit records of qualification tests and third party certification for each Qualified Paint Applicator. Prior to the initiation of any work all paint applicators shall be tested and certified as meeting the requirements of the qualified paint applicator. Certification shall be administered by the PHA approved independent third party Test Agency. Applicators failing the certification test will not be permitted to apply any paint on the project.

1. Test Plate

   The test plate shall consist of a 6 by 6 feet steel plate with a 3/8 inch minimum thickness. The test plate shall have at least six bolts, three with bolt heads exposed and three with threads exposed, a 12-inch wide flange and a 6-inch diameter pipe each 18 inches long welded perpendicular to the test panel and a 6-inch deep T-beam with sealed ends welded horizontal across the test panel one foot up from the bottom all within the area to be painted on one side. Bolts shall be 1 inch minimum diameter.

2. Certification Test Procedure

   Conduct certification testing of paint applicators at the job site in coordination with the Contracting Officer. Supply the fabricated test plates to be used for the tests and provide crane service, rigging, and any other work necessary to provide accessibility for the certification testing and inspection. In preparation, clean and prepare the test plates in accordance with the requirements of the contracted work. Perform abrasive blasting with the blast media to be used in the contract. The paints to be applied shall be the Contractor supplied materials and shall be those previously tested and approved for use on the contract. Paints shall be applied as specified in the contract. The painter being tested shall mix and thin the paints to be used in the test and shall set up and adjust the application equipment for use. Each painter shall apply each of the types of paint comprising the specified system. The test plate shall be painted in a near vertical position.

3. Certification Criteria

   Evaluate the paint applicator based on the conformance of the applied paint system to the requirements of the specifications. Deficiencies in the coatings, improper mixing or improper application methods are basis for failure. The Test Agency shall be the sole judge as to the acceptability of each paint applicator's performance.

F. Coating Thickness Gage Qualification

Submit Coating Thickness Gage Qualification documentation of manufacturer's certification for all coating thickness gages. Magnetic flux thickness gages as described in ASTM D7091 shall be used to make all coating thickness measurements on ferrous metal substrates. Eddy current thickness gages as described in ASTM D7091 shall be used to measure coating thickness on all nonferrous metal substrates. Gages shall have an accuracy of +/-3 percent or better. Gages to be used on the job shall be certified by the manufacturer as meeting these requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

Process and package paints to ensure that within a period of one year from date of manufacture, they will not gel, liver, or thicken deleteriously, or form gas in the closed container. Paints, unless otherwise specified or permitted, shall be packaged in standard containers not larger than 5 gal, with removable friction or lug-type covers. Containers for vinyl-type paints shall be lined with a coating resistant to solvents in the formulations and capable of effectively isolating the paint from contact with the metal container. Each container of paint or separately packaged component thereof shall be labeled to indicate the purchaser's order number, date of manufacture, manufacturer's batch number, quantity, color, component identification and designated name, and formula or specification number of the paint together with special labeling instructions, when specified. Paint shall be delivered to the job in unbroken containers. Paints that can be harmed by exposure to cold weather shall be stored in
ventilated, heated shelters. All paints shall be stored under cover from the elements and in locations free from sparks and flames.

1.8 AMBIENT CONDITIONS

Paint shall be applied only to surfaces that are above the dew point temperature and that are completely free of moisture as determined by sight and touch. Paint shall not be applied to surfaces upon which there is detectable frost or ice. Except as otherwise specified, the temperature of the surfaces to be painted and of air in contact therewith shall be not less than 45 degrees F during paint application nor shall paint be applied if the surfaces can be expected to drop to 32 degrees F or lower before the film has dried to a reasonably firm condition. During periods of inclement weather, painting may be continued by enclosing the surfaces and applying artificial heat, provided the minimum temperatures and surface dryness requirements prescribed previously are maintained. Paint shall not be applied to surfaces heated by direct sunlight or other sources to temperatures that will cause detrimental blistering, pinholing, or porosity of the film.

PART 2 PRODUCTS

Product Samples of each batch of thinner, solvent, and paint shall be submitted to the PHA for testing. Submit Manufacturer's Product Data Sheet for each type of paint used; for products that are specified to be applied in accordance with the manufacturer's recommendations, submit the paint manufacturer's product data sheet or other written instructions for those products. Submit samples of all special paint formula, Military, Master Painter Institute, and SSPC paints and samples of solvents or thinners used to reduce the viscosity of the paint. Allow at least 30 days for sampling and testing of samples of paints and thinners. Sampling may be at the jobsite or source of supply. Notify the Contracting Officer when the paint and thinner are available for sampling. Sampling of each batch will be witnessed by the Contracting Officer unless otherwise specified or directed. Submit a 1-quart sample of paint and thinner for each batch proposed for use. The sample shall be labeled to indicate formula or specification number and nomenclature, batch number, batch quantity, color, date made, and applicable project contract number. Testing will be performed by the PHA. Costs for retesting rejected material will be deducted from payments to the Contractor.

2.1 SPECIAL PAINT FORMULAS

Special paints shall have the composition as indicated in the formulas listed herein. Where so specified, certain components of a paint formulation shall be packaged in separate containers for mixing on the job. If not specified or otherwise prescribed, the color shall be that naturally obtained from the required pigmentation.

2.2 PAINT FORMULATIONS

Special paint formulas shall comply with the following:

A. Formula C-200a. Coal Tar-Epoxy (Black) Paint

The paint shall conform to SSPC Paint 16 manufactured with Type 1 pitch.

In addition to standard labeling, container labels shall include the term, Corps of Engineers Formula C-200a.

PART 3 EXECUTION

3.1 CLEANING AND PREPARATION OF SURFACES TO BE PAINTED

A. General Requirements

Clean surfaces to be painted before applying paint or surface treatments. Remove deposits of grease or oil in accordance with SSPC SP 1, prior to mechanical cleaning. Solvent cleaning shall be accomplished with mineral spirits or other low toxicity solvents
having a flash point above 100 degrees F. Use clean cloths and clean fluids to avoid leaving a thin film of greasy residue on the surfaces being cleaned. Protect items not to be prepared or coated from damage by the surface preparation methods. Machinery shall be protected against entry of blast abrasive and dust into working parts. Cleaning and painting shall be so programmed that dust or other contaminants from the cleaning process do not fall on wet, newly painted surfaces, and surfaces not intended to be painted shall be suitably protected from the effects of cleaning and painting operations. Welding of, or in the vicinity of, previously painted surfaces shall be conducted in a manner to prevent weld spatter from striking the paint and to otherwise reduce coating damage to a minimum; paint damaged by welding operations shall be restored to original condition. Surfaces to be painted that will be inaccessible after construction, erection, or installation operations are completed shall be painted before they become inaccessible.

B. Ferrous Surfaces Subject to Severe Exposure

Ferrous surfaces subject to extended periods of immersion or as otherwise required shall be dry blast-cleaned to SSPC SP 5/NACE No. 1. The blast profile, unless otherwise specified, shall be 1.5 to 2.5 mils as measured by ASTM D4417, Method C. Appropriate abrasive blast media shall be used to produce the desired surface profile and to give an angular anchor tooth pattern. If recycled blast media is used, an appropriate particle size distribution shall be maintained so that the specified profile is consistently obtained. Steel shot or other abrasives that do not produce an angular profile shall not be used. Weld spatter not dislodged by blasting shall be removed with impact or grinding tools and the areas re-blasted prior to painting. Surfaces shall be dry at the time of blasting. Blast cleaning to SSPC SP 5/NACE No. 1 shall be done in the field and, unless otherwise specifically authorized, after final erection. Within 8 hours after blast cleaning, and in any case prior to the deposition of any detectable moisture, contaminants, or corrosion, all ferrous surfaces shall be cleaned of dust and abrasive particles by brush, vacuum cleaner, and/or blown down with clean, dry, compressed air, and given the first coat of paint. The surfaces, if shop blasted, shall be shop coated with the first and second coats of the specified paint system. The shop coating shall be maintained in good condition by cleaning and touching up of areas damaged during the construction period. If pinpoint or general rusting appears, surfaces shall be re-blasted and repainted at no added cost to the Government. Prior to the field application of subsequent coats, soiled areas of the shop coating shall be thoroughly cleaned and all welds or other unpainted or damaged areas shall be cleaned and coated in a manner to make them equivalent to adjacent, undamaged paint surfaces.

3.2 PAINT APPLICATION

A. General

The finished coating shall be free from holidays, pinholes, bubbles, runs, drops, ridges, waves, laps, excessive or unsightly brush marks, and variations in color, texture, and gloss. Application of initial or subsequent coatings shall not commence until the Contracting Officer has verified that atmospheric conditions and the surfaces to be coated are satisfactory. Each paint coat shall be applied in a manner that will produce an even, continuous film of uniform thickness. Edges, corners, crevices, seams, joints, welds, rivets, corrosion pits, and other surface irregularities shall receive special attention to ensure that they receive an adequate thickness of paint. Spray equipment shall be equipped with traps and separators and where appropriate, mechanical agitators, pressure gauges, pressure regulators, and screens or filters. Air caps, nozzles, and needles shall be as recommended by the spray equipment manufacturer for the material being applied. Airless-type spray equipment may be used only on broad, flat, or otherwise simply configured surfaces, except that it may be employed for general painting if the spray gun is equipped with dual or adjustable tips of proper types and orifice sizes. Airless-type equipment shall not be used for the application of vinyl paints.
B. Mixing and Thinning

Paints shall be thoroughly mixed, strained where necessary, and kept at a uniform composition and consistency during application. Dry-powder pigments specified to be added at the time of use shall, with the aid of powered stirrers, be incorporated into the vehicle or base paint in a manner that will produce a smooth, homogeneous mixture free of lumps and dry particles. Where necessary to suit conditions of the surface temperature, weather, and method of application, the paint may be thinned immediately prior to use. Thinning shall generally be limited to the addition of not more than 1 pint per gal of the proper thinner; this general limitation shall not apply when more specific thinning instructions are provided. Paint that has been stored at low temperature, shall be brought up to at least 70 degrees F before being mixed and thinned, and its temperature in the spray tank or other working container shall not fall below 60 degrees F during the application. Paint that has deteriorated in any manner to a degree that it cannot be restored to essentially its original condition by customary field-mixing methods shall not be used and shall be removed from the project site. Paint and thinner that is more than 1 year old shall be resampled and resubmitted for testing to determine its suitability for application. Moisture cure urethane paint shall be resampled and resubmitted for testing to determine its suitability for application whenever the paint is more than six months old as indicated by the date of manufacture on the container.

C. Time between Surface Preparation and Painting

Surfaces that have been cleaned and/or otherwise prepared for painting shall be primed as soon as practicable after such preparation has been completed but, in any event, prior to any deterioration of the prepared surface.

D. Method of Paint Application

Unless otherwise specified, paint shall be applied by brush, roller, or spray to ferrous and nonferrous metal surfaces. Special attention shall be directed toward ensuring adequate coverage of edges, corners, crevices, pits, rivets, bolts, welds, and similar surface irregularities. Other methods of application to metal surfaces shall be subject to the specific approval of the Contracting Officer. Paint on plaster, concrete, or other nonmetallic surfaces shall be applied by brush, roller, and/or spray.

E. Coverage and Film Thickness

Film thickness or spreading rates shall be as specified hereinafter. Where no spreading rate is specified, the paint shall be applied at a rate consistent with the manufacturer’s written instructions. In any event, the combined coats of a specified paint system shall completely hide base surface and the finish coats shall completely hide undercoats of dissimilar color.

1. Measurement on Ferrous Metal

Where dry film thickness requirements are specified for coatings on ferrous surfaces, measurements shall be made with a gage qualified in accordance with paragraph Coating Thickness Gage Qualification. They shall be calibrated and used in accordance with ASTM D7091. Prior to each use the Base Metal Reading (BMR) shall be established for the gage as specified in the test method. Accuracy of the gage shall be verified using plastic shims as specified by the test method both prior to and following each set of measurements. Frequency of measurements shall be as recommended for field measurements by ASTM D7091, except that measurements shall be performed on all areas of the structure being coated. Thickness measurements shall be reported as the mean for each spot determination.

F. Progress of Painting Work

Where field painting on any type of surface has commenced, the complete painting operation, including priming and finishing coats, on that portion of the work shall be
completed as soon as practicable, without prolonged delays. Sufficient time shall elapse between successive coats to permit them to dry properly for recoating, and this period shall be modified as necessary to suit adverse weather conditions. Paint shall be considered dry for recoating when it feels firm, does not deform or feel sticky under moderate pressure of the finger, and the application of another coat of paint does not cause film irregularities, such as lifting or loss of adhesion of the undercoat. All coats of all painted surfaces shall be unscarred and completely integral at the time of application of succeeding coats. At the time of application of each successive coat, undercoats shall be cleaned of dust, grease, overspray, or foreign matter by means of airblast, solvent cleaning, or other suitable means. Cement and mortar deposits on painted steel surfaces, not satisfactorily removed by ordinary cleaning methods, shall be brush-off blast cleaned and completely repainted as required. Undercoats of high gloss shall, if necessary for establishment of good adhesion, be scuff sanded, solvent wiped, or otherwise treated prior to application of a succeeding coat. Field coats on metal shall be applied after erection except as otherwise specified and except for surfaces to be painted that will become inaccessible after erection.

G. Contacting Surfaces

When riveted or ordinary bolted contact is to exist between surfaces of ferrous or other metal parts of substantially similar chemical composition, such surfaces will not be required to be painted, but any resulting crevices shall subsequently be filled or sealed with paint. Contacting metal surfaces formed by high-strength bolts in friction-type connections shall not be painted. Where a nonmetal surface is to be in riveted or bolted contact with a metal surface, the contacting surfaces of the metal shall be cleaned and given three coats of the specified primer. Unless otherwise specified, corrosion-resisting metal surfaces, including cladding therewith, shall not be painted.

H. Drying Time Prior to Immersion

Minimum drying periods after final coat prior to immersion shall be: epoxy and moisture cure urethane systems at least 5 days, vinyl-type paint systems at least 3 days, and cold-applied coal tar systems at least 7 days. Minimum drying periods shall be increased twofold if the drying temperature is below 65 degrees F and/or if the immersion exposure involves considerable abrasion.

I. Protection of Painted Surfaces

Where shelter and/or heat are provided for painted surfaces during inclement weather, such protective measures shall be maintained until the paint film has dried and discontinuance of the measures is authorized. Items that have been painted shall not be handled, worked on, or otherwise disturbed until the paint coat is fully dry and hard. All metalwork coated in the shop or field prior to final erection shall be stored out of contact with the ground in a manner and location that will minimize the formation of water-holding pockets; soiling; contamination, and deterioration of the paint film, and damaged areas of paint on such metalwork shall be cleaned and touched up without delay. The first field coat of paint shall be applied within a reasonable period of time after the shop coat and in any event before weathering of the shop coat becomes extensive.

J. Coal Tar-Epoxy (Black) Paint (Formula C-200a)

1. Mixing

Component B shall be added to previously stirred Component A and thoroughly mixed together with a heavy-duty mechanical stirrer just prior to use. The use of not more than 1 pint of xylene thinner per 1 gal of paint will be permitted to improve application properties and extend pot life. The pot life of the mixed paint, extended by permissible thinning, may vary from 2 hours in very warm weather to 5 or more hours in cool weather. Pot life in warm weather may be extended by precooling the components prior to mixing; cooling the mixed material; and/or by slow, continuous stirring during the application
period. The mixed material shall be applied before unreasonable increases in viscosity take place.

2. Application

Spray guns shall be of the conventional type equipped with a fluid tip of approximately 0.09 inch in diameter and external atomization, seven-hole air cap. Material shall be supplied to the spray gun from a bottom withdrawal pot or by means of a fluid pump; hose shall be 1/2 inch in diameter. Atomization air pressure shall not be less than 80 psi. High-pressure airless spray equipment may be used only on broad, simply configured surfaces. Brush application shall be with a stiff-bristled tool heavily laden with material and wielded in a manner to spread the coating smoothly and quickly without excessive brushing. The coverage rate of the material is approximately 110 square feet/gal per coat to obtain 20 mils (dry thickness) in a two-coat system. The paint shall flow together and provide a coherent, pinhole-free film. The direction of the spray passes (or finish strokes if brushed) of the second coat shall be at right angles to those of the first where practicable.

3. Subsequent Coats

Except at the high temperatures discussed later in this paragraph, the drying time between coal tar-epoxy coats shall not be more than 72 hours, and application of a subsequent coat as soon as the undercoat is reasonably firm is strongly encouraged. Where the temperature for substrate or coating surfaces during application or curing exceeds or can be expected to exceed 125 degrees F as the result of direct exposure to sunlight, the surfaces shall be shaded by overhead cover or the interval between coats shall be reduced as may be found necessary to avoid poor intercoat adhesion. Here, poor intercoat adhesion is defined as the inability of two or more dried coats of coal tar-epoxy paint to resist delamination when tested aggressively with a sharp knife. Under the most extreme conditions involving high ambient temperatures and sun-exposed surfaces, the drying time between coats shall not exceed 10 hours, and the reduction of this interval to a few hours or less is strongly encouraged. Where the curing time of a coal tar-epoxy undercoat exceeds 72 hours of curing at normal temperatures, 10 hours at extreme conditions, or where the undercoat develops a heavy blush, it shall be given one of the following treatments before the subsequent coat is applied:

a. Etch the coating surface lightly by brush-off blasting, using fine sand, low air pressure, and a nozzle-to-surface distance of approximately 3 feet.

b. Remove the blush and/or soften the surface of the coating by wiping it with cloths dampened with 1-methyl-2-pyrrolidone. The solvents may be applied to the surface by fog spraying followed by wiping, but any puddles of solvent shall be mopped up immediately after they form. Apply the subsequent coat in not less than 15 minutes or more than 3 hours after the solvent treatment.

4. Ambient Temperature

Coal tar-epoxy paint shall not be applied when the receiving surface or the ambient air is below 50 degrees F nor unless it can be reasonably anticipated that the average ambient temperature will be 50 degrees F or higher for the 5-day period subsequent to the application of any coat.

5. Safety

In addition to the safety provisions in paragraph SAFETY, HEALTH, AND ENVIRONMENT, other workmen as well as painters shall avoid inhaling atomized particles of coal tar-epoxy paint and contact of the paint with the skin.
3.3 PAINT SYSTEMS APPLICATION

The required paint systems and the surfaces to which they shall be applied are shown in this paragraph, and/or in the drawings. Supplementary information follows.

A. Fabricated and Assembled Items

Items that have been fabricated and/or assembled into essentially their final form and that are customarily cleaned and painted in accordance with the manufacturer's standard practice will be exempted from equivalent surface preparation and painting requirements described herein, provided that:

1. Surfaces primed (only) in accordance with such standard practices are compatible with specified field-applied finish coats.

2. Surfaces that have been primed and finish painted in accordance with the manufacturer’s standard practice are of acceptable color and are capable of being satisfactorily touched up in the field.

3. Items expressly designated herein to be cleaned and painted in a specified manner are not coated in accordance with the manufacturer's standard practice if different from that specified herein.

B. Surface Preparation

The method of surface preparation and pretreatment shown in the tabulation of paint systems is for identification purposes only. Cleaning and pretreatment of surfaces prior to painting shall be accomplished in accordance with detailed requirements previously described.

C. System No. 6

Paint shall be spray or brush applied with a minimum of two coats to provide a minimum total thickness at any point of 16 mils. The specified film thickness shall be attained in any event, and any additional (beyond two) coats needed to attain specified thickness shall be applied at no additional cost to the PHA.

D. Protection of Non-painted Items and Cleanup

Walls, equipment, fixtures and all other items in the vicinity of the surfaces being painted shall be maintained free from damage by paint or painting activities. Paint spillage and painting activity damage shall be promptly repaired.

3.4 INSPECTION

Inspect and document all work phases and operations on a daily basis. Submit daily Inspection Reports. As a minimum the daily report shall contain the following:

A. Inspections performed, including the area of the structure involved and the results of the inspection.

B. Surface preparation operations performed, including the area of the structure involved, the mode of preparation, the kinds of solvent, abrasive, or power tools employed, and whether contract requirements were met.

C. Thinning operations performed, including thinners used, batch numbers, and thinner/paint volume ratios.

D. Application operations performed, including the area of the structure involved, mode of application employed, ambient temperature, substrate temperature, dew point, relative humidity, type of paint with batch numbers, elapsed time between surface preparation and application, elapsed time for recoat, condition of underlying coat, number of coats applied, and if specified, measured dry film thickness or spreading rate of each new coating.
### 3.5 PAINTING SCHEDULES

**SYSTEM NO. 6**

<table>
<thead>
<tr>
<th>Items or surfaces to be coated:</th>
<th>Metal Surfaces of Drop outlet Structure Except the Grating and Walkway Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SURFACE PREPARATION</strong></td>
<td><strong>1st COAT</strong></td>
</tr>
<tr>
<td>White metal blast cleaning</td>
<td>Coal tar epoxy C-200a (black)</td>
</tr>
</tbody>
</table>

**END OF SECTION**
PORT OF HOUSTON AUTHORITY
TECHNICAL SPECIFICATION FOR ECIP SEGMENT 4 E2 CLINTON/BELTWAY 8 DMPAS
SECTION 31 00 00Add – EARTHWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

Subject to the requirements of the General and Special Conditions, this specification applies to the earthwork requirements for access roads, roadway side slopes, driveways, driveway side slopes, trenches for drainage structures, drainage channels, and drainage ditches and swales at the E2 Clinton and Beltway 8 placement areas (PAs) unless otherwise noted in the plans.

1.2 RELATED SECTIONS

SECTION 01 22 10.00 Std - Measurement of Quantities
SECTION 31 23 33.00 Std - Trenching and Backfilling
SECTION 31 24 00 Add – Embankment Construction
SECTION 31 41 33.00 Std - Trench Safety System

1.3 MEASUREMENT REQUIREMENTS

A. Excavation

The unit of measurement for excavation and borrow will be the cubic yard, computed by the average end area method from design cross sections, including the excavation for ditches, gutters, and channel changes, when the material is acceptably utilized or disposed of as herein specified. The measurements will include authorized excavation of rock (except for piping trenches that is covered below), and authorized excavation of unsatisfactory subgrade soil; allowance will be made on the same basis for selected backfill ordered as replacement. The measurement will not include the volume of subgrade material or other material that is scarified or plowed and reused in-place, and will not include the volume excavated without authorization or the volume of any material used for purposes other than directed. The volume of excavation for temporary ditches or swales to drain the site will not be measured for payment. Adjustments to excavation quantity can be made based on field measurements within 10% of the adjusted bid quantity. Field measurement adjustments require surveyed elevations and measurements prior to beginning excavation and fill operations and survey elevations and measurements after excavation has been completed and approved. The measurement will not include the volume of any excavation performed prior to the taking of elevations and measurements of the undisturbed grade.

B. Topsoil Requirements

Separate excavation, hauling, and spreading or piling of topsoil and related miscellaneous operations will be considered subsidiary obligations of the Contractor, covered under the contract unit price for excavation.

C. Select Granular Material

Measure select granular material in place as the actual cubic yards replacing wet or unstable material in trench bottoms in authorized over depth areas. Provide unit prices which include furnishing and placing the granular material, excavation and disposal of unsatisfactory...
material, and additional requirements for sheeting and bracing, pumping, bailing, cleaning, and other incidentals necessary to complete the work.

1.4 PAYMENT PROCEDURES

Payment will constitute full compensation for all labor, equipment, tools, supplies, and incidentals necessary to complete the work.

1.5 CRITERIA FOR BIDDING

Base bids on the following criteria:

A. Surface elevations are as indicated.
B. Pipes or other artificial obstructions, except those indicated, will not be encountered.
C. Ground water elevations indicated by the boring logs were those existing at the time subsurface investigations were made and do not necessarily represent ground water elevation at the time of construction.

1.6 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)


ASTM D2434 (1968; R 2006) Permeability of Granular Soils (Constant Head)


1.7 DEFINITIONS

A. Satisfactory Materials


B. Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory which contains root and other organic matter or frozen material. Notify the PHA when encountering any contaminated materials.

C. Cohesion less and Cohesive Materials

Cohesion less materials include materials classified in ASTM D2487 as GW,
GP, SW, and SP. Cohesive materials include materials classified as GC, SC, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesion less only when the fines are non-plastic. Perform testing, required for classifying materials, in accordance with ASTM D4318, ASTM C136/C136M and ASTM D1140.

D. Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D698 abbreviated as a percent of laboratory maximum density.

E. Topsoil

Material suitable for topsoil obtained from on-site excavations or offsite areas is defined as: Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than one inch diameter, brush, weeds, toxic substances, and other material detrimental to plant growth. Amend topsoil pH range to obtain a pH of 5.5 to 7.

F. Hard/Unyielding Materials

Hard/Unyielding materials comprise weathered rock, dense consolidated deposits, or conglomerate materials which are not included in the definition of "rock" with stones greater than 36 inch in any dimension or as defined by the pipe manufacturer, whichever is smaller. These materials usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.

G. Rock

Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried masonry, or concrete other than pavement exceeding 1/2 cubic yard in volume. Removal of hard material will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.

H. Unstable Material

Unstable materials are too wet to properly support the utility pipe, conduit, or appurtenant structure.

I. Select Granular Material

Select granular material consist of materials classified as GW, GP, SW, or SP, by ASTM D2487 where indicated. The liquid limit of such material must not exceed 35 percent when tested in accordance with ASTM D4318. The plasticity index must not be greater than 12 percent when tested in accordance with ASTM D4318, and not more than 35 percent by weight may be finer than No. 200 sieve when tested in accordance with ASTM D1140. Provide a minimum coefficient of permeability of 0.002 feet per minute when tested in accordance with ASTM D2434.

J. Initial Backfill Material

Initial backfill consists of select granular material or satisfactory materials free from rocks 3 inches or larger in any dimension or free from rocks of such size as recommended by the pipe manufacturer, whichever is smaller. When the pipe is coated or wrapped for corrosion protection, free the initial backfill material of stones larger than 1 inch in any dimension or as recommended by the pipe manufacturer, whichever is smaller.
K. Expansive Soils

Expansive soils are defined as soils that have a plasticity index equal to or greater than 15 when tested in accordance with ASTM D4318.

L. Non-frost Susceptible (NFS) Material

Non-frost susceptible material are a uniformly graded washed sand with less than 5 percent passing the No. 200 size sieve, and with not more than 3 percent by weight finer than 0.02 mm grain size.

M. Pile Supported Structure

As used herein, a structure where both the foundation and floor slab are pile supported.

1.8 SYSTEM DESCRIPTION

Subsurface soil boring logs are shown on the drawings. The subsoil investigation report and samples of materials taken from subsurface investigations are available from PHA and can be examined upon request. These data represent the best subsurface information available; however, variations may exist in the subsurface between boring locations.

A. Classification of Excavation

No consideration will be given to the nature of the materials, and all excavation will be designated as unclassified excavation.

B. Dewatering Work plan

Submit procedures for accomplishing dewatering work.

1.9 SUBMITTALS

PHA approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Shoring; G
Dewatering Work Plan; G

SD-03 Product Data

Utilization of Excavated Materials; G
Opening of Any Excavation or Borrow Pit

SD-06 Test Reports

Test Reports; G

Within 24 hours of conclusion of physical tests, submit 4 copies of test results, including calibration curves and results of calibration tests.

SD-07 Certificates

Qualifications of Testing Agency
PART 2  PRODUCTS

2.1 DETECTION WIRE FOR NON-METALLIC PIPING

Insulate a single strand, solid copper detection wire with a minimum of 12 AWG.

2.2 MATERIAL FOR RIP-RAP

A. Provide geotextile fabric and rock conforming to TxDOT Item 432/DMS-6200 for construction indicated.

B. Bedding Material: Provide bedding material consisting of sand, gravel, or crushed rock, well graded, with a maximum particle size of 2 inches. Compose material of tough, durable particles. Allow fines passing the No. 200 standard sieve with a plasticity index less than six.

PART 3  EXECUTION

3.1 STRIPPING OF TOPSOIL

Where indicated or directed, strip topsoil to a depth of 18 inches. Spread topsoil on areas already graded and prepared for topsoil, or transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations indicated or specified. Keep topsoil separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 2 inches in diameter, and other materials that would interfere with planting and maintenance operations. Remove from the site any surplus of topsoil from excavations and gradings.

3.2 GENERAL EXCAVATION

A. General

Perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Perform the grading in accordance with the typical sections shown and the tolerances specified in paragraph FINISHING. Transport satisfactory excavated materials and place in fill or embankment within the limits of the work. Excavate unsatisfactory materials encountered within the limits of the work below grade and replace with satisfactory materials as directed. Include such excavated material and the satisfactory material ordered as replacement in excavation. Dispose surplus satisfactory excavated material not required for fill or embankment in areas approved for surplus material storage or designated waste areas. Dispose unsatisfactory excavated material in designated waste or spoil areas. During construction, perform excavation and fill in a manner and sequence that will provide proper drainage at all times. Excavate material required for fill or embankment in excess of that produced by excavation within the grading limits from the borrow areas indicated or from other approved areas selected by the Contractor as specified.

B. Ditches, Gutters, and Channel Changes

Finish excavation of ditches, gutters, and channel changes by cutting accurately to the cross sections, grades, and elevations shown on Drawings. Do not excavate ditches and gutters below grades shown. Backfill the excessive open ditch or gutter excavation with satisfactory, thoroughly compacted, material or with suitable stone or cobble to grades shown. Dispose excavated material as shown or as directed, except in no case allow material be deposited a maximum 4 feet from edge of a ditch. Maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

C. Drainage Structures

Make excavations to the lines, grades, and elevations shown, or as directed. Provide trenches and foundation pits of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Clean rock or other hard
foundation material of loose debris and cut to a firm, level, stepped, or serrated surface. Remove loose disintegrated rock and thin strata. Do not disturb the bottom of the excavation when concrete or masonry is to be placed in an excavated area. Do not excavate to the final grade level until just before the concrete or masonry is to be placed.

D. Drainage

Provide for the collection and disposal of surface and subsurface water encountered during construction. Completely drain construction site during periods of construction to keep soil materials sufficiently dry. Construct storm drainage features (ponds/basins) at the earliest stages of site development, and throughout construction grade the construction area to provide positive surface water runoff away from the construction activity and provide temporary ditches, swales, and other drainage features and equipment as required to maintain dry soils. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein. It is the responsibility of the Contractor to assess the soil and ground water conditions presented by the plans and specifications and to employ necessary measures to permit construction to proceed.

E. Dewatering

Control groundwater flowing toward or into excavations to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. Do not permit French drains, sumps, ditches or trenches within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Take control measures by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open; maintain the water level continuously, at least 2 feet below the working level. Operate dewatering system continuously until construction work below existing water levels is complete.

F. Trench Excavation Requirements

Excavate the trench as recommended by the manufacturer of the pipe to be installed. Slope trench walls below the top of the pipe, or make vertical, and of such width as recommended in the manufacturer's printed installation manual. Provide vertical trench walls where no manufacturer's printed installation manual is available. Shore trench walls more than 5 feet high, cut back to a stable slope, or provide with equivalent means of protection for employees who may be exposed to moving ground or cave in. Excavate trench walls which are cut back to at least the angle of repose of the soil. Give special attention to slopes which may be adversely affected by weather or moisture content. Do not exceed the trench width below the pipe top of 24 inches plus pipe outside diameter (O.D.) for pipes of less than 24 inches inside diameter, and do not exceed 36 inches plus pipe outside diameter for sizes larger than 24 inches inside diameter. Where recommended trench widths are exceeded, provide redesign, stronger pipe, or special installation procedures by the Contractor. The Contractor is responsible for the cost of redesign, stronger pipe, or special installation procedures without any additional cost to the PHA.

1. Bottom Preparation

Grade the bottoms of trenches accurately to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Excavate bell holes to the necessary size at each joint or coupling to eliminate point bearing. Remove stones of 3 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, to avoid point bearing.

2. Removal of Unyielding Material

Where unyielding material is encountered in the bottom of the trench, remove such material 12 inches below the required grade and replaced with suitable materials as provided in paragraph BACKFILLING AND COMPACTION.
3. Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, remove such material to the depth directed and replace it to the proper grade with select granular material as provided in paragraph BACKFILLING AND COMPACTION. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the Contractor is responsible for excavating the resulting material and replacing it without additional cost to the PHA.

4. Excavation for Appurtenances

Provide excavation for manholes, catch-basins, inlets, or similar structures of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Clean rock or loose debris and cut to a firm surface either level, stepped, or serrated, as shown or as directed. Remove loose disintegrated rock and thin strata. Specify removal of unstable material. When concrete or masonry is to be placed in an excavated area, take special care not to disturb the bottom of the excavation. Do not excavate to the final grade level until just before the concrete or masonry is to be placed.

5. Jacking, Boring, and Tunneling

Unless otherwise indicated, provide excavation by open cut except that sections of a trench may be jacked, bored, or tunneled if, in the opinion of the Contracting Officer, the pipe, cable, or duct can be safely and properly installed and backfill can be properly compacted in such sections.

G. Underground Utilities

The Contractor is responsible for movement of construction machinery and equipment over pipes and utilities during construction. Perform work adjacent to non-PHA utilities as indicated in accordance with procedures outlined by utility company. Excavation made with power-driven equipment is not permitted within 25 feet of known utility or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by the PHA. Report damage to utility lines or subsurface construction immediately to the PHA.

3.3 OPENING AND DRAINAGE OF EXCAVATION AND BORROW PITS

Notify the PHA sufficiently in advance of the opening of any excavation or borrow pit or borrow areas to permit elevations and measurements of the undisturbed ground surface to be taken. Except as otherwise permitted, excavate borrow pits and other excavation areas providing adequate drainage. Transport overburden and other spoil material to designated spoil areas or otherwise dispose of as directed. Provide neatly trimmed and drained borrow pits after the excavation is completed. Ensure that excavation of any area, operation of borrow pits, or dumping of spoil material results in minimum detrimental effects on natural environmental conditions.

3.4 SHORING

General Requirements: Submit a Shoring and Sheeting plan for approval 15 days prior to starting work. Submit drawings and calculations, certified by a registered professional engineer, describing the methods for shoring and sheeting of excavations. Finish shoring, including sheet piling, and install as necessary to protect workmen, banks, adjacent paving, structures, and utilities. Remove shoring, bracing, and sheeting as excavations are backfilled, in a manner to prevent caving.
3.5 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

Do not excavate to final grade until just before concrete is to be placed. Roughen the level surfaces, and cut the sloped surfaces, as indicated, into rough steps or benches to provide a satisfactory bond. Protect shales from slaking and all surfaces from erosion resulting from ponding or water flow.

3.6 GROUND SURFACE PREPARATION

General Requirements: Remove and replace unsatisfactory material with satisfactory materials, as directed by the PHA, in surfaces to receive fill or in excavated areas. Scuff the surface to a depth of 6 inches before the fill is started. Plow, step, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that the fill material will bond with the existing material. When subgrades are less than the specified density, break up the ground surface to a minimum depth of 6 inches, pulverizing, and compacting to the specified density. When the subgrade is part fill and part excavation or natural ground, scuff the excavated or natural ground portion to a depth of 12 inches and compact it as specified for the adjacent fill.

3.7 UTILIZATION OF EXCAVATED MATERIALS

A. General

Dispose unsatisfactory materials removing from excavations into designated waste disposal or spoil areas. Use satisfactory material removed from excavations, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes. Submit procedure and location for disposal of unused satisfactory material. Submit proposed source of borrow material. Do not waste any satisfactory excavated material without specific written authorization. Dispose of satisfactory material, authorized to be wasted, in designated areas approved for surplus material storage or designated waste areas as directed. Clear and grub newly designated waste areas on PHA-controlled land before disposal of waste material thereon. Stockpile and use coarse rock from excavations for constructing slopes or embankments adjacent to streams, or sides and bottoms of channels and for protecting against erosion. Do not dispose excavated material to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

1. Backfill for Appurtenances

After the manhole, catch basin, inlet, or similar structure has been constructed and the concrete has been allowed to cure for 7 days, place backfill in such a manner that the structure is not be damaged by the shock of falling earth. Deposit the backfill material, compact it as specified for final backfill, and bring up the backfill evenly on all sides of the structure to prevent eccentric loading and excessive stress.

B. Rip-Rap Construction

Construct rip-rap on geotextile fabric in accordance with TxDOT Item 432 in the areas indicated. Trim and dress indicated areas to conform to cross sections, lines and grades shown within a tolerance of 0.1 foot.

3.8 SUBGRADE PREPARATION

A. Proof Rolling

Finish proof rolling on an exposed subgrade free of surface water (wet conditions resulting from rainfall) which would promote degradation of an otherwise acceptable subgrade. After stripping, proof roll the existing subgrade of the maintenance road and entrances with six passes of a 15 ton, pneumatic-tired roller. Operate the roller in a systematic manner to ensure the number of passes over all areas, and at speeds between 2-1/2 to 3-1/2 mph. Notify the PHA a minimum of 3 days prior to proof rolling. Perform proof rolling in the presence of the PHA. Variances between depression depths of roller passes which measure greater than 3 inches is classified as rutting or pumping. Undercut rutting or pumping of material to a depth of 12 inches and replace
with select material. Prepare bids based on replacing approximately 3,700 square yards, with an average depth of 12 inches at various locations.

3.8.1 Construction

Shape subgrade to line, grade, and cross section, and compact as specified. Include plowing, diskng, and any moistening or aerating required to obtain specified compaction for this operation. Remove soft or otherwise unsatisfactory material and replace with satisfactory excavated material or other approved material as directed. Excavate rock encountered in the cut section to a depth of 6 inches below finished grade for the subgrade. Bring up low areas resulting from removal of unsatisfactory material or excavation of rock to required grade with satisfactory materials, and shape the entire subgrade to line, grade, and cross section and compact as specified. After rolling, the surface of the subgrade for roadways shall not show deviations greater than 1/2 inch when tested with a 12-foot straightedge applied both parallel and at right angles to the centerline of the area. Do not vary the elevation of the finish subgrade more than 0.05 foot from the established grade and cross section.

B. Compaction

Finish compaction by sheep foot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Except for paved areas (roadway / driveways), compact each layer of the embankment to at least 90 percent of laboratory maximum density.

3.9 FINISHING

A. General

Finish the surface of excavations, and subgrades to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. Provide the degree of finish for graded areas within 0.1 foot of the grades and elevations indicated except that the degree of finish for subgrades specified in paragraph SUBGRADE PREPARATION. Finish gutters and ditches in a manner that will result in effective drainage. Finish the surface of areas to be turfed from settlement or washing to a smoothness suitable for the application of turfing materials. Repair graded, topsoiled, or backfilled areas prior to acceptance of the work, and re-established grades to the required elevations and slopes.

B. Subgrade

During construction, keep excavations shaped and drained. Maintain ditches and drains along subgrade to drain effectively at all times. Do not disturb the finished subgrade by traffic or other operation. Protect and maintain the finished subgrade in a satisfactory condition until subbase, base, or pavement is placed. Do not permit the storage or stockpiling of materials on the finished subgrade. Do not place subbase, base course, or pavement until the subgrade has been checked and approved, and in no case place subbase, base, surfacing, or pavement on a muddy, spongy, or frozen subgrade.

3.10 PLACING TOPSOIL

On areas to receive topsoil, prepare the compacted subgrade soil to a 2 inches depth for bonding of topsoil with subsoil. Spread topsoil evenly to a thickness of 6 inches and grade to the elevations and slopes shown. Do not spread topsoil when frozen or excessively wet or dry. Obtain material required for topsoil in excess of that produced by excavation within the grading limits from offsite areas.

3.11 TESTING

A. General

Perform testing by the Contractor's validated testing facility. Submit qualifications of the PHA validated commercial testing laboratory or the Contractor's validated testing facilities. If the Contractor elects to establish testing facilities, do not permit work requiring testing until the Contractor's facilities have been inspected, and approved by the PHA.
1. Determine field in-place density in accordance with ASTM D6938. When ASTM D6938 is used, check the calibration curves and adjust using only the sand cone method as described in ASTM D1556/D1556M. ASTM D6938 results in a wet unit weight of soil in determining the moisture content of the soil when using this method.

2. Check the calibration curves furnished with the moisture gauges along with density calibration checks as described in ASTM D6938; check the calibration of both the density and moisture gauges at the beginning of a job on each different type of material encountered and at intervals as directed by the PHA. ASTM D2937, use the Drive Cylinder Method only for soft, fine-grained, cohesive soils. When test results indicate, as determined by the PHA, that compaction is not as specified, remove the material, replace and re-compact to meet specification requirements.

3. Perform tests on re-compacted areas to determine conformance with specification requirements. Appoint a registered professional civil engineer to certify inspections and test results. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

B. Fill and Backfill Material Gradation

One test per 1,000 cubic yards stockpiled or in-place source material. Determine gradation of fill and backfill material in accordance with ASTM D6913.

C. In-Place Densities

1. One test per 1,000 lineal feet, or fraction thereof, of each lift of fill or backfill for ditch and roadway areas compacted by other than hand-operated machines.

2. One test per 500 lineal feet, or fraction thereof, of each lift of fill or backfill for ditch and roadway areas compacted by hand-operated machines.

3. One test per 500 linear feet, or fraction thereof, of each lift of trench backfill.

D. Check Tests on In-Place Densities

If ASTM D6938 is used, check in-place densities by ASTM D1556/D1556M as follows:

1. One check test per lift for each 3,000 lineal feet, or fraction thereof, of each lift of fill or backfill for ditch and roadway areas compacted by other than hand-operated machines.

2. One check test per lift for each 1,500 square feet, of fill or backfill for ditch and roadway areas compacted by hand-operated machines.

3. One check test per lift for each 1,500 linear feet, or fraction thereof, of trench backfill.

E. Moisture Contents

In the stockpile, excavation, or borrow areas, perform a minimum of two tests per day per type of material or source of material being placed during stable weather conditions. During unstable weather, perform tests as dictated by local conditions and approved by the PHA.

F. Optimum Moisture and Laboratory Minimum Density (proctor)

Perform tests for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 10,000 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density. Include a sieve analyses, -200 sieve and Atterberg limit with each proctor test.
G. Tolerance Tests for Subgrades

Perform continuous checks on the degree of finish specified in paragraph SUBGRADE PREPARATION during construction of the subgrades.

3.12 DISPOSITION OF SURPLUS MATERIAL

Remove surplus material or other soil material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber to an offsite location of the Contractor's choosing which does not violate local or State laws or requirements.

END OF SECTION


PORT OF HOUSTON AUTHORITY

TECHNICAL SPECIFICATION FOR ECIP SEGMENT 4 E2 CLINTON/BELTWAY 8 DMPAS

SECTION 31 05 19.13Add – GEOTEXTILE FOR EARTHWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

Subject to the requirements of the General and Special Conditions, this Section includes furnishing materials, labor, and equipment for the installation of geotextile fabric beneath stone for erosion control at upland confined Placement Areas (PAs), including a realigned drainage channel at Beltway 8 PA.

1.2 RELATED SECTIONS

SECTION 01 22 10.00 Std - Measurement of Quantities

SECTION 31 00 00 Add - Earthwork

SECTION 31 24 00 Add - Embankment Construction

SECTION 35 31 23 Add - Stone for Erosion Control

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D4354 (2012) Sampling of Geosynthetics for testing

ASTM D4355/D4355M (2014) Deterioration of Geotextiles from Exposure to Light, Moisture, and Heat in a Xenon-Arc Type Apparatus

ASTM D4533 (2011) Trapezoid Tearing Strength of Geotextiles

ASTM D4632/D4632M (2015a) Grab Breaking Load and Elongation of Geotextiles


ASTM D4884/D4884M (2014a) Strength of Sewn or Thermally Bonded Seams of Geotextiles

STANDARD TECHNICAL SPECIFICATIONS
Revision Date: September 2017

31 05 19.13Add Page 1

GEOTEXTILE FOR EARTHWORK
1.3 SUBMITTALS

PHA approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. The following shall be submitted in accordance with SECTION 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals
- Initial Survey; G

SD-03 Product Data
- Manufacturer's Product Data

SD-06 Test Reports
- Certified Test Reports; G
- Sewn Seam Details and Laboratory Test Reports; G

SD-08 Manufacturer's Instructions
- Manufacturer's Installation Instructions

1.4 DELIVERY, STORAGE AND HANDLING OF MATERIALS

Materials delivered to the site shall be inspected for damage, unloaded, and stored with the minimum of handling. Materials shall not be stored directly on the ground without a fabric or plastic liner beneath, and shall be kept free of dirt and debris.

PART 2 PRODUCTS

2.1 GEOTEXTILE FILTER FABRIC

A. Filter Fabric

Filter Fabric shall be pervious nonwoven sheet, consisting of long-chain synthetic polymers composed of at least 85 percent by weight polyolefin, polyesters, or polyamides. Sheets shall be formed into a stable network such that filaments or yarns retain their relative position to each other. Sheets shall be inert to chemicals commonly encountered in natural water, the soil conditions encountered at the site, and UV stabilized. The edges of sheets shall be salvaged or otherwise finished to prevent outer filaments or yarns from pulling away from the sheet.

B. Physical Properties

Conformance of filter fabric shall be in accordance with ASTM D4759. Filter fabric shall be sampled in accordance with ASTM D4354 and tested to verify the following minimum physical properties and requirements.
C. Acceptable Products

The following products or Contracting Officer-approved alternate may be used for geotextile filter fabric:

1. U.S. Fabrics 250NW
2. Mirafi 100N
3. Propex Geotex 1001

Listing of specific manufacturer’s products shall not be construed as product approval without certified tests. Actual physical properties of the products furnished must conform to the minimum physical properties specified under the table in paragraph 2.1. In addition to the minimum physical properties listed, other properties (such as fabric weight and weave type) shall be considered by the manufacturer in providing a product that is appropriate for the native material, method of installation, and method of rock placement for the proper functioning of the filter.

D. Certified Test Reports

Submit manufacturer’s certified test results to the Contracting Officer showing actual test values of the filter fabric physical properties.

E. Sewn Seams

Submit details for sewn seams. If fabric pieces are overlapped in lieu of sewn seams, disregard sewn seam requirements. Details shall address, but not be limited to, thread type, thread tension (sewing device), stitch density and type, overlap, and number of rows and type of chain stitch. Also submit laboratory test reports evaluating the load-transfer capability of the proposed seams in accordance with ASTM D4884/D4884M.

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<th>Test Method</th>
<th>Measure</th>
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<td>ASTM D4751</td>
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*Note: #100 AOS is the largest opening size allowed.
PART 3 EXECUTION

3.1 SUBGRADE PREPARATION

Unless otherwise noted in the drawings, the surface to receive the geotextile filter fabric shall be prepared by locating and removing obstructions or debris.

3.2 INITIAL SURVEY

Lines and grade of erosion control subgrade shall be surveyed by Contractor and submitted to Contracting Officer prior to placement of geotextile materials. Refer to SECTION 35 20 00 CONSTRUCTION SURVEYING.

3.3 GEOTEXTILE MATERIALS

A. General

Geotextile fabric shall be placed over the prepared subgrade as indicated on the drawings.

B. Protection

Work shall be sequenced so that geotextile materials are not exposed more than 7 days from the time rolls are removed from their protective covering and are fully covered by stone and/or opaque temporary coverings. During periods of shipment and storage, geotextile materials shall be protected from direct sunlight, ultra-violet rays, and high temperatures and in accordance with any other instructions of the manufacturer. Unpackaged rolls and/or sheets shall be protected with temporary opaque coverings.

C. Placement

Geotextile fabric shall be placed in accordance with the manufacturer's instructions, but placement method shall meet, as a minimum the following criteria:

1. Geotextile fabric sheets shall be loosely laid and conform to surface irregularities so as to minimize tension in the sheets when subsequent stone is placed.

2. Geotextile fabric sheets shall be oriented parallel to the subgrade slope gradient and laps between geotextile fabrics sheets shall be no less than 3 feet except where specified otherwise on the drawings. When used, sewn seams shall be pre-approved by Contracting Officer and installed in accordance with manufacturer's recommendations.

3. Geotextile fabric sheets shall not be staked down such that they are taut and subject to significant puncture or tearing during stone placement.

4. Method of stone placement shall be such that geotextile fabric sheets are not pulled apart at the laps or significantly punctured or torn.

5. Construction equipment and/or vehicles shall not operate directly on geotextile materials, unless otherwise permitted by Contracting Officer.

END OF SECTION
PORT OF HOUSTON AUTHORITY

TECHNICAL SPECIFICATION FOR ECIP SEGMENT 4 E2 CLINTON/BELTWAY 8 DMPAS

SECTION 31 24 00 Add – EMBANKMENT CONSTRUCTION

PART 1 GENERAL

1.1 SECTION INCLUDES

Subject to the requirements of the General and Special Conditions, the work covered in this Section consists of furnishing labor, equipment, and other incidentals necessary to perform construction of perimeter dikes with excavated materials at the E2 Clinton and Beltway 8 upland confined Placement Areas (PAs). The work shall be performed in accordance with this specification and shall conform to the lines, grades, notes and typical sections shown in the plans.

1.2 RELATED SECTIONS

SECTION 01 22 10.00 Std - Measurement of Quantities

SECTION 31 00 00 Add – Earthwork

SECTION 35 00 01 Add – Construction Surveying

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)


1.4 SUBMITTALS

PHA approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Planned sequence of construction for dikes, outlet structures and channels, access roads, and drainage channels, as applicable for each PA. Include excavation of borrow areas and dike foundation areas. Include plan and cross sectional schematic drawings showing starting and final work locations and clearing, grubbing and stripping limits. Include location of planned ingress/egress routes and temporary facilities

Methods and types of equipment to be utilized for excavation, handling, placing, and compaction
Plan for locating/identifying and testing borrow areas within the PAs

Planned erosion control measures and other environmental controls, including work exclusion areas

Methods for protecting existing utilities

Material distribution and stockpiling plan

Trenching and shoring plan, as applicable

Planned methods for dewatering including control of surface and ground water in the borrow areas and any other excavations. Describe equipment types and planned durations.

Planned methods for demobilization and site control, including measures to address flooding, if an extreme coastal storm impacts the work area. Refer to Site storm protection requirements in Section 01 14 00 Work Restrictions. If necessary, modify the Plan as required to meet field conditions; any modifications to the plan will require an additional submittal to PHA for review.

SD-06 Test Reports

Daily activities reports

Borrow material testing

1.5 QUALITY ASSURANCE

A. Daily Reports

On a daily basis, record the following:

1. Weather
2. Equipment onsite
3. Material testing results
4. Quantities, quality, and locations of material excavated for borrow areas
5. Locations of dike foundation preparation
6. Quantity and locations of fill placed
7. Surveys performed
8. Records of any corrective action taken
9. Items described under Paragraph 1.4 related to Excavation and Dikes

Submit daily reports to PHA on a weekly basis.

B. Excavation

Establish and maintain quality control for excavation operations to assure compliance with Contract requirements, and maintain records of the quality control for construction operations including the following:
1. Lines, grades, and tolerances
2. Disposition or stockpiling of materials, including any unsatisfactory materials
3. Clay and sandy clay materials shall be segregated from sands and silts
4. Conditions that may induce seepage or weaken the foundation of dikes
5. Stability of excavations
6. Drainage condition of the burrow areas and any associated dewatering performed

C. Dikes
Establish and maintain field quality control for foundation preparation and idle construction operations to assure compliance with Contract requirements.

D. Construction Surveys
Perform surveys to verify that the dimensions, slopes, lines, and grades conform to specified requirements. Refer to SECTION 35 00 01 CONSTRUCTION SURVEYING for survey requirements.

E. Testing by Government
During the life of this Contract, PHA may perform independent quality assurance tests. Contractor shall make the equipment needed to perform these tests available to PHA.

F. Testing Agencies
Laboratories performing Contractor's tests shall be accredited in accordance with ASTM D3740 and ASTM E329. Personnel engaged in the testing shall be certified in accordance with ASTM D5255. PHA or PHA's designated representative shall be provided advance notification of field sampling and testing so that he/she may observe sampling/testing.

G. Records
A copy of the records of inspections and corrective actions taken shall be included in the daily quality control reports.

H. Utilities
Movement of construction machinery and equipment over existing pipelines and utilities during construction shall be at Contractor's risk. Perform work adjacent to pipelines and utilities in accordance with procedures outlined by pipeline/utility Companies. Excavation made with power-driven equipment is not permitted within twenty-five feet of known pipelines, or five feet of known utility or other subsurface construction. Excavation shall proceed only after Texas One-Call has been contacted and the utility marked in the field. For work immediately adjacent to (or for excavations exposing) a utility or other buried obstruction, excavate by hand. Prior to execution, inform the utility company of these operations to avoid any unsafe practice. Report damage to utility lines or subsurface construction immediately to PHA.

1.6 HANDLING AND STORAGE
Dike and Embankment: The terms "Embankment" and "Dike" are interchangeable in these specifications and drawings. "Embankment" and "Dike" are defined as the earth fill portions of the dike system, or other fills related to a dike construction, including interior dikes and perimeter dikes.

1.7 SITE CONDITIONS
A. Surface Drainage
Contractor shall be aware that the project sites are subject to ponding during and after rain. Surface water shall be directed away from excavations and construction sites to prevent erosion and undermining of foundations. Diversion ditches and grading shall be provided and maintained as
necessary during construction. Ponding water and undrained water in the excavation areas in the PAs shall be drained through pumps or other approved available methods. Newly constructed slopes and backfill surfaces shall be protected to prevent slope surface erosion and sloughing. Excavation shall be performed so that the excavated areas and surrounding areas are drained continuously and effectively.

B. Changes in Dike Alignment
The right is reserved by PHA to make changes in the dike alignments as may be found necessary before completion of the work. If it becomes necessary, through no fault of Contractor, to abandon a line or location on which work has been done, payment for materials placed will be made as specified in the associated payment item.

C. Subsurface Soil Information
Geotechnical investigation data are provided in Appendix A. Lab reports of soil analyses are available from PHA and can be examined upon request. These data represent the most recent information available. Variations may exist in the soil conditions between sample locations. In addition, groundwater levels indicated on the soil boring logs were levels found at the time of exploration. The groundwater level in the PAs can vary significantly depending on time of year and the amount of precipitation. Contractor shall also be aware that debris is likely to be encountered during excavation. Contractor shall draw his own conclusions as to the character of the in-situ soil materials, groundwater levels, and amount and type of debris that may be encountered.

1.8 PROTECTION OF EXISTING SERVICE LINES AND UTILITY STRUCTURES
Existing pipelines and utility lines that are shown or the locations of which are made known to Contractor prior to excavation and that are to be retained shall be protected from damage during excavation and backfilling and, if damaged, shall be repaired by and at the expense of Contractor. If Contractor damages existing pipelines or utility lines that are not shown or the locations of which are not known to Contractor, report of this damage shall be made immediately to PHA.

PART 2 PRODUCTS

2.1 GENERAL
Materials for embankment fills shall be secured from required excavations and from the borrow areas indicated on the Drawings. Should supplemental material be required, Contractor shall identify suitable supplemental borrow areas onsite at no cost to PHA. The intention is to use the most suitable materials obtainable from these sources. Material to be wasted will be specifically designated by Contractor at the time the material is excavated. Materials containing brush, roots, sod or other perishable or organic materials shall not be considered suitable for dike construction. Available soil boring and CPT logs are provided in the geotechnical reports for borrow excavation references; however, the soil materials may vary from the sampled locations. Actual suitability of the materials shall be subject to testing by Contractor, and to field review by PHA.

2.2 FILL MATERIALS
A. Location
Fill materials may be obtained from on-site excavation.
Fill materials located/identified by Contractor and approved by PHA may also be used. All fill material shall be subject to testing by Contractor prior to placement for perimeter dike construction.

B. Fill Materials for Perimeter Dike Construction (Dike Fill)
Perimeter Dikes shall be constructed with compacted fill materials obtained from designated borrow areas, required excavation, and any supplemental borrow areas located/identified by Contractor
and approved by PHA. Fill shall be free from organics, roots, brush, debris, or other objectionable materials.

1. Maximum particle size: 3 inches when tested in accordance with ASTM D6913.
2. Minimum percent passing No. 200 Sieve: 60% when tested in accordance with ASTM D1140.
3. Plasticity Index shall be greater than 15 when tested in accordance with ASTM D4318.

PART 3 EXECUTION

3.1 GENERAL
A. Lines and Grades
The dikes shall be constructed to the lines, grades, and cross sections indicated on the Drawings. PHA reserves the right to increase or decrease the foundation widths and dike slopes, or to make other changes in the dike or berm sections, as may be considered necessary to produce a safe and functional earthen structure.

B. Conduct of the Work
Contractor shall maintain and protect the newly-constructed and/or improved dikes in a satisfactory condition during construction until final completion and acceptance of the work under this Contract. If, in the opinion of PHA, Contractor's hauling activities cause horizontal shear planes or slickensides, rutting, quaking, heaving, cracking, or excessive deformation of the dikes or backfill areas, Contractor shall subsequently limit the type, load, or travel speed of the hauling equipment. Contractor may be required to remove, at no additional payment, dike material placed outside of prescribed slope lines. Approved dike or backfill material which is lost in transit or rendered unsuitable after being placed in the dike or backfill and before final acceptance of the work shall be replaced using a satisfactory method at no additional cost to PHA. Any unsatisfactory material shall be excavated and removed from the dike or backfill and disposed, and the excavated area shall be refilled, at no additional cost to PHA.

C. Volume
The "neat-line volumes" have been used by PHA to prepare the estimates shown on the Bid Proposal Form. The volumes are estimates only and Contractor is responsible for interpreting the volume numbers in preparing his estimate for bidding. "Neat-line volumes" is defined as the unadjusted, raw quantities computed from the dike templates. The percentage for items including overbuilding, compaction, settlement, foundation displacement, or construction waste, is the responsibility and decision of Contractor.

D. Tolerances
The dikes shall be constructed to the grades, lines, and cross-sections shown on the Drawings. At every point along the side slopes, a tolerance of 6 inch above or 2 inches below the prescribed grade will be permitted in the final dressing, provided that excess material is distributed to ensure that the crown of the dikes drain to the PA interiors and that there are no abrupt humps or depressions in the surfaces. At every point along the crest, a tolerance of 6 inch above or 0 inches below the prescribed grade will be permitted in the final dressing.

E. Utilities
Contractor is responsible for movement of construction machinery and equipment over pipelines and utilities during construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the Contract.
excavation until approval for backfill is received. Report damage to pipelines and utility lines immediately to PHA.

3.2 SITE DRAINAGE AND DEWATERING

A. Drainage
Dike foundation areas, borrow areas, temporary stockpiles, and partially-completed fill shall be kept continuously drained. Contractor shall establish/construct and maintain temporary drainage features (ditches, swales, ponds, basins, etc.) throughout the duration of construction, and grade the construction area to provide positive surface water runoff away from the construction activity. Prior to placement of fill, the areas shall be completely drained of standing water and allowed to dry so that the surface areas are firm enough for the operation of equipment thereon. Once drainage of the work area and sufficient drying of the foundation surfaces have been accomplished, excavation and the dike construction can proceed. It is the responsibility of Contractor to assess the soil and groundwater conditions and to employ necessary methods that will permit construction to proceed.

B. Dewatering
Surface and groundwater control shall be accomplished in coordination with the required excavation and dike construction to prevent sloughing of excavation slopes, boils, uplift and heave in the excavation and to eliminate interferences with orderly progress of construction. In the event of heavy rain fall, the surface and groundwater control may necessitate the use of temporary berms, diversion ditches, and pumps. Methods for care of surface water and for controlling the surface and groundwater levels shall be subject to approval.

3.3 EXCAVATION

A. General
Excavation shall consist of removal of material in preparing the foundations to the lines and grades shown on the drawings, removal of material from ditches to the lines and grades shown on the drawings, removal of objectionable materials and obtaining required fill materials from the borrow areas.

B. Borrow Areas
1. Borrow areas shall be located/identified and tested by Contractor as required to complete the work. Borrow areas shall be located within the PA interiors subject to the restrictions stated on the drawings or at offsite borrow areas identified by the Contactor to provide Fill Material.

2. The soil information presented in Appendix A only represent general selective samples taken during initial subsurface soil investigation. If the designated borrow area materials do not meet the requirements for the Fill Material, Contractor shall locate/identify supplemental borrow areas within the vicinity of the project. Supplemental borrow areas shall be tested by Contractor for conformance with the Fill Material requirements stated in this specification. Contractor's Work Plan shall be revised, resubmitted, and approved by PHA prior to use of any supplemental borrow areas.

3. Prior to performing any material excavation at borrow areas to obtain fill for dike construction, the following surface preparation shall be performed:
   a. Clearing and Grubbing: Unless indicated otherwise on the drawings, remove trees, stumps, logs, shrubs, brush and vegetation and other deleterious items that would interfere with construction operations. Remove stumps entirely. Grub out root matter and roots over 2 inches in diameter to at least 18 inches below existing surface. Clearing and grubbing at the Beltway 8 PA is addressed under a separate contract.
b. Stripping: Strip unsuitable topsoil from the site where excavation or grading is indicated and stockpile separately from other excavated material. Topsoil is to be reused to cover constructed dikes after completion.

4. Borrow areas shall be excavated to the extent necessary to obtain satisfactory materials but within the maximum limits stated on the drawings. Borrow areas shall be drained continuously and kept relatively dry during excavation. Interior stockpiles of satisfactory materials located within PAs shall be utilized as borrow materials if the material complies with the Fill Material requirements of this specification.

5. The bottom of borrow areas shall be graded relatively smooth, and interior borrow areas shall be graded to drain towards the nearest drop-outlet structure, during and after the borrow excavation is completed.

C. Disposition and Stockpiling of Excavated Materials

Satisfactory excavated material shall be incorporated in the appropriate zones of the dike templates. When direct placement is not practicable, satisfactory material from the excavation shall be stockpiled in approved areas for subsequent use in other parts of the work for which it is specified herein or as indicated. Satisfactory material in excess of the quantity necessary to construct backfills and dike shall be stockpiled for future construction work. No payment will be made for such stockpiling, nor for the reloading and hauling of this material to its final position in the dikes.

3.4 EMBANKMENT CONSTRUCTION

A. General

Prior to beginning placement of fill materials on the dike foundation, notify PHA that the foundation is ready to receive fill. No fill shall be placed on the dike foundation until these areas have been observed by PHA or PHA's designated representative, and surveyed by Contractor.

B. Clearing, Grubbing and Stripping

Prior to placing any fill for dike construction, the following surface preparation shall be performed. Unless indicated otherwise on the drawings, remove trees, stumps, logs, shrubs, brush and vegetation and other deleterious items that would interfere with construction operations. Remove stumps entirely. Grub out root matter and roots over 2 inches in diameter to at least 18 inches below existing surface. Strip unsuitable topsoil from the site where excavation or grading is indicated and stockpile separately from other excavated material. The top 2 feet of soil within the dike footprint shall be excavated, spread, reworked, and replaced to facilitate bond between foundation and newly placed fill material.

C. Foundation Preparation

Foundation areas for the new dikes shall be proof-rolled and observed by PHA's representative before placing new fill materials for dike construction. Proof roll subgrade with one to two passes of a rubber tired tandem dump truck with a gross weight of 50,000 pounds or equivalent equipment in a systematic manner to ensure testing over all areas at speeds between 2-1/2 to 3-1/2 mph. Repair unstable areas identified during the proof rolling as specified. Sloping ground surfaces steeper than 1:Vertical to 6:Horizontal shall be stepped or benched to form a proper bond with the existing surface. Remove and replace unsatisfactory or very soft materials with satisfactory materials by methods of displacing or excavation.

D. Gradation and Distribution

The materials throughout each zone of the dikes shall be graded and distributed so that the overall dikes are free from lenses, pockets, streaks, and layers of material differing substantially in texture or gradation from surrounding material of the same class. If lenses, pockets, or layers of materials differing substantially in texture or gradation from surrounding material occur in the spread material, the layer shall be mixed by harrowing or another approved method to blend the materials. During
the placing and spreading process, continuously maintain a force of workers adequate to remove roots, debris, and oversize stones from the dike materials.

E. Equipment Traffic

Equipment traffic on a dike zone shall be routed to distribute the compactive effort as much as practicable. Ruts formed in the surface of a layer of spread material shall be filled before that material is compacted.

F. Moisture Control

1. Compacted Fill

The moisture content after compaction shall be as uniform as practicable throughout any one layer of materials. Material that is too wet shall be spread on the embankment and permitted to dry, assisted by discing or harrowing, if necessary, until the moisture content is reduced to an amount within the specified limits. When the material is too dry, Contractor will be required to sprinkle each layer of the fill. Harrowing or other approved methods will be required to work the moisture into the material until a uniform distribution of moisture is obtained. The moisture content of Fill shall be controlled so that hauling, spreading, and compacting equipment can operate with normal procedure without excessive rutting of the fill.

2. Insufficient Moisture for Suitable Bond

If, in the opinion of PHA, the top or contact surfaces of a partial fill section become too dry to permit a suitable bond between these surfaces and the additional fill to be placed thereon, loosen the dried materials by scarifying or discing, dampen the loosened material to an acceptable moisture content, and compact this layer to densities comparable to the underlying embankment and in accordance with the applicable requirements of Section 3.4.G, Compaction.

3. Excessive Moisture for Suitable Bond

If the top or contact surfaces of a partially filled section become too wet to permit suitable bond between these surfaces and the additional fill to be placed thereon, the wet material shall be scarified and permitted to dry, assisted by discing or harrowing, if necessary. The material shall then be compacted in accordance with the applicable requirements of Section 3.4.G, Compaction.

4. Drying Wet Material

Material that is too wet shall be spread on the dike and permitted to dry, dried in the borrow area prior to bringing it to the dike, or disked or harrowed to promote drying, until the moisture content is reduced to workable condition.

5. Increase Moisture in Dry Materials

Contractor shall take measures to increase the moisture content of material that is too dry. The moisture content of material that is too dry can be adjusted on the dike or in the borrow area prior to bringing it to the dike. Add water to the fill material and by harrowing or other approved methods, then work the moisture into the material until a uniform distribution of moisture within the specified limits is obtained. Water applied on a layer of fill on the dike shall be accurately controlled in amount so that free water will not appear on the surface during or subsequent to rolling. If too much water is added to a part of the dike, the rolling on that section of the dike shall be delayed until the moisture content of the materials is reduced to an amount within the specified limits.
6. Treating Source Material

If it is impracticable to obtain the specified moisture content by wetting or drying the material on the fill, Contractor shall pre-wet or dry the material at the source of excavation or in the borrow area.

7. Test Data

The optimum moisture contents verses maximum density relationship have been tested in accordance with ASTM D698 during the design phase; results are presented in the geotechnical report in Appendix A for reference purposes only. Additional testing should be performed for fill material as presented in Section 3.5, Field Quality Control.

G. Compaction - Moisture and Density Requirements

1. Compaction Equipment

Contractor shall apply appropriate means and methods for compacting fill material to achieve the compaction requirements stated herein.

a. Compacted Fill material shall be placed or spread in horizontal layers.

b. After a layer of material has been dumped and spread it shall be harrowed as required to break up and blend the fill materials and to obtain uniform moisture distribution. Harrowing shall be performed with a heavy disk plow, or other approved harrow, to the full depth of the layer. If one pass of the harrow does not accomplish the breaking up and blending of the materials, additional passes of the harrow shall be required, but in no case will more than three passes of the harrow on any one layer be required for this purpose.

c. When the moisture content and the condition of the layer are satisfactory, the lift shall be compacted to the specified percent compaction and moisture content.

d. Fill loose lift thickness shall be 12 inches or less.

e. After preparation of the previous compacted layer to receive the new layer of fill, the new layer shall be compacted by the controlled movement of the hauling equipment over the area of the fill.

f. Dumping, spreading, sprinkling, and compacting may be performed at the same time at different points along a section when there is sufficient area to permit these operations to proceed simultaneously.

g. Compacted Fill shall be compacted to at least 95 percent of the maximum dry density at a moisture content between 1 percent "dry" and 3 percent "wet" of the optimum moisture content as determined by ASTM D698. Fill shall be compacted by equipment that provides a "kneading" compaction with an approved tamping, pad foot, or sheep foot roller. When wet weather or extended dry periods deteriorate the exposed surface whereby a good bond cannot be formed between successive lifts, the Contractor shall prepare the surface. This preparation shall include removing, scarifying, and/or moisture conditioning the top couple of inches of the underlying material before placing the next lift.

3.5 FIELD QUALITY CONTROL

Perform testing by the Contractor's validated testing facility. If the Contractor elects to establish testing facilities, do not permit work requiring testing until the Contractor's facilities have been inspected, and approved by the PHA. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

A. In-place densities: One test per 250 lineal feet, or fraction thereof, on subgrade and each 12-inch compacted lift of Random Fill and Impervious Fill.
B. Perform the following tests for each type material or source of material including borrow material (Random Fill and Impervious Fill).

1. Atterberg Limits (ASTM D4318): One test per 10,000 cubic yards or per change in material.

2. Gradation Tests (ASTM D6913 and D1140): One test per 10,000 cubic yards or per change in material.

3. Moisture-Density Relationship Tests (ASTM D698): One test per 10,000 cubic yards or per change in material.

3.6 EROSION AND SLIDES

If erosion or sliding of any part of the dikes occur during or after construction, but prior to acceptance, Contractor shall rebuild that portion of the dike without cost to PHA. Where settlement of the dike, due to weak foundation conditions, develops to an extent that will make it inadvisable, in the opinion of PHA, to continue placement of additional materials, PHA may omit further work on these portions of the embankment and to accept it as completed.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES

Subject to the requirements of the General and Special Conditions, the work covered in this section consists of furnishing all materials, labor and equipment necessary to perform Initial, Progress, and As-built topographic surveys of the placement areas (PAs), drop-outlet structures, outfall channels, realigned drainage channels, and subsidiary items thereto, as shown on the drawings and as described in these Specifications. Provide the details for the survey layouts and stakeouts in the Work Plan.

1.2 RELATED SECTIONS

SECTION 01 22 10.00 Std - Measurement of Quantities

1.3 MEASUREMENT AND PAYMENT

All costs for performing the Work under this section shall be considered subsidiary to costs for PA construction. Refer to SECTION 01 22 00.10 MEASUREMENT AND PAYMENT.

1.4 REFERENCES

Publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)


1.5 SUBMITTALS

PHA approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with the SECTION 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Name and Affiliation of Professional Land Surveyor (For Information Only)

Survey Plan; G

Survey Notification (For Information Only)

SD-02 Shop Drawings

Initial Survey; G

Progress Surveys; G

SD-11 Closeout Submittals

As-Built Survey; G

1.6 QUALITY ASSURANCE
A. Professional Licensure

All surveys shall be performed by personnel who are under the direct supervision of a professional land surveyor licensed in the State of Texas. Prior to commencing surveying activities, provide name and affiliation of professional surveyor to be used on project. All survey drawings and reports shall be signed and sealed by a professional land surveyor licensed in the State of Texas whose license is active and is in good standing with the Texas Board of Professional Land Surveying at the time of the survey.

B. Horizontal and Vertical Datum


C. Survey Notification

Notify Contracting Officer, no later than 3-calendar days prior to performing any surveying, so that Contracting Officer or Contracting Officer's designee can accompany the survey crew and witness the surveying activity.

D. Survey Plan

Provide a Survey Plan that includes a description of methods, equipment, and schedule to be applied for required surveys as well as quality control and quality assurance (QA/QC) procedures to be applied. In particular, plan shall document an approach that is appropriate for accurate topographic surveying in very soft soils. Refer to EM 1110-2-1003 for QA/QC guidelines.

E. Survey Accuracy

Minimum horizontal accuracy for all surveying equipment shall be within ±1.0" RMS. Minimum vertical accuracy for all surveying equipment shall be within ±1.5" RMS.

F. Shot Spacing

The spacing between two consecutive survey shots shall be the smaller of the following:

1. Five (5) feet; or
2. The distance on which a 0.5 foot change in elevation is observed.

G. Transducer Frequency

Maintain consistent transducer frequency between Initial, Progress, and as-built surveys.

H. Surveys Deliverables

1. Survey drawings shall be provided on 11" X 17" format. Digital copies shall be provided in AutoCAD DWG (version 2018 or earlier) and Adobe PDF formats. All survey drawings shall contain the following information:
   a. Cover Sheet
   b. Project Name
   c. Government Information and Project Number
   d. Professional Land Surveyor's Seal, Signature and Affiliation
   e. Date(s) Surveys were Performed
   f. Location and Description of Survey Control Points
   g. Vertical and Horizontal Datum(s)
   h. Sheet Name and Number
i. Name of Contractor  

j. Graphic Scale Bar(s)  

k. Transducer Frequency  

l. Description of Submittal  

m. Revision(s) Block  

2. All survey plots shall comprise a well-organized, stand-alone set of drawings that do not include any outdated or superseded information that may have been previously submitted. Plots shall include the following:  

   a. Plan sheets clearly documenting locations, limits, and dimensions of completed work and locations where cross sections were taken.  
   
b. Cross-section sheets providing an overlay of initial, progress, and as-built survey transects superimposed with specified templates.  
   
c. As work progresses, plots documenting completed work shall be submitted with requests for progress payments. In addition, upon completion of all work, a final, complete set of survey plots shall be submitted to document as-built surveys at all transects required. This final submittal shall be a comprehensive, stand-alone set of drawings, not an assembly of individual drawings that were previously submitted with progress pay requests.  

3. Point files of the initial, progress, and as-built surveys shall be included in digital submittals in ASCII text format and shall contain the following information:  

   a. Transect Number  
   b. Point Number  
   c. Northing  
   d. Easting  
   e. Elevation  
   f. Description  

PART 2 PRODUCTS  

Not used.  

PART 3 EXECUTION  

3.1 INITIAL SURVEY  

Prior to constructing the PAs or other site features, collect Initial Survey transects at 50 foot spacing, creating a grid across each PA site extents. Transects shall be predominantly perpendicular to the PA embankments, and extend across the PA, including both embankments to the exterior slope toes. The initial survey shall be submitted to Contracting Officer at least seven (7) days before commencement of any PA construction activities. The initial survey shall be conducted within a five-day (max) period. Drawings for Initial Survey shall include cross sections and contours. The design template (i.e. embankments) shall also be shown on the Initial Survey cross sections. In addition, all potential hazards or obstructions, including pipelines, within the PA shall be plotted on the Initial Survey drawing submittals.
3.2 PROGRESS SURVEYS

Progress Surveys shall be performed to document the progression of work and as substantiation for payment. Collect Progress Survey transects at the same locations as the initial survey. Perform Progress Surveys at the following stages of Work:

A. After completion of embankment construction and prior to placement of dredged material.
B. Monthly while dredging is actively proceeding to monitor the deposition patterns of dredged material during settlement.
C. After major weather events to verify berm integrity at the direction of the Contracting Officer.

3.3 AS-BUILT SURVEY

Perform an As-Built Survey upon completion of placing dredged material in each PA to document conditions of the completed work. The As-Built Survey shall be conducted within a single 7-day period. All locations and limits covered during the initial survey shall be re-surveyed during the As-Built Survey. Data obtained during Progress Surveys shall not be considered part of the As-Built Survey unless otherwise authorized by Contracting Officer.

END OF SECTION
PORT OF HOUSTON AUTHORITY

TECHNICAL SPECIFICATION FOR ECIP SEGMENT 4 E2 CLINTON/BELTWAY 8 DMPAS

SECTION 35 20 30.00 45 Add – DROP-OUTLET STRUCTURE

PART 1  GENERAL

1.1  SECTION INCLUDES

The work covered in this Section consists of furnishing plant, labor, materials, equipment and performing the work in connection with constructing a new Drop-outlet Structures. All structure member materials used for the new drop-outlet structure fabrication shall be new unless specifically noted on the drawings. The term "Drop-outlet Structure" includes, but is not limited to, support stanchions, support bracing, columns, beams, concrete footings, walkways, grating, catwalks, handrails, discharge pipes, piles, and other miscellaneous items as shown on the Drawings for both E2 Clinton and Beltway 8 PAs.

1.2  RELATED SECTIONS

SECTION 01 22 10.00 Std - Measurement of Quantities
SECTION 03 21 00.00 Std - Reinforcing Steel
SECTION 03 31 00.00 Std - Structural Concrete
SECTION 05 05 23.16 Add – Structural Welding
SECTION 09 97 02 Add – Hydraulic Structures
SECTION 31 23 33.00 Std - Trenching and Backfilling
SECTION 31 41 33.00 Std - Trench Safety System
SECTION 33 40 01.10 45 – Effluent Pipe
SECTION 35 31 23 Add – Stone for Erosion Control

1.3  REFERENCES

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AMERICAN WELDING SOCIETY (AWS)
AWS D1.1/D1.1M (2015; Errata 1 2015; Errata 2 2016) Structural Welding Code - Steel
AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA C2 (2003) Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes
AWPA M4 (2015) Standard for the Care of Preservative-Treated Wood Products

ASTM INTERNATIONAL (ASTM)

ASTM A500/A500M (2018) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)


SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC AB 1 (2015; E 2017) Mineral and Slag Abrasives
SSPC Paint 16 (2006; R 2015; E 2015) Coal Tar Epoxy-Polyamide Black (or Dark Red) Paint
SSPC PS 11.01 (1982; E 2004) Black (or Dark Red) Coal Tar Epoxy Polyamide Painting System

U.S. ARMY CORPS OF ENGINEERS (USACE)


U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40CFR 261 Identification and Listing of Hazardous Waste
40CFR 262.22 Number of Copies
40CFR 263 Standards Applicable to Transporters of Hazardous Waste
49CFR 171 General Information, Regulations, and Definitions

1.4 SUBMITTALS
A. Shop Drawings for: Structure, Steel Railings and Handrails, Grating, Protective Coatings, and Coating.
B. Product Data for: Structural Steel, Steel Railings and Handrails, Galvanizing, Grating, Coal Tar Epoxy-Polyamide, Aliphatic Polyurethane Abrasive, Blasting Material Inorganic Zinc.
   1. Submit certificates of compliance for Aliphatic Polyurethane from suppliers which demonstrate compliance with the applicable specifications for lumber treatment and galvanizing.
   2. The producer of the treated wood products is to provide certification at WWPL 08, Best Management Practices (BMP) for the use of Treated Wood in Aquatic Environments were utilized, including a written description and appropriate documentation of the BMP used.

D. Manufacturer’s Instructions, Submit manufacturer’s instructions for Protective Coatings including details of thinning, mixing, handling, and application.

E. Closeout Submittals for: Inspection Reports Pile, Driving Records Inspection, and Forms.

1.5 PROTECTION

A. Safety:
The Contractor is to be responsible for instructing its employees in appropriate safety practices. The Contractor and its personnel is to adhere to the applicable safety requirements as outlined in the U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1.

B. Working on the Drop-Outlet Structure:
   Provide the following items when workers are working on the drop-outlet structure:
   1. Life jackets when water is present.
   2. A method of communication other than cellular phones.
   3. At least two individuals are required to be present when working on the structure.

1.6 ENVIRONMENTAL PROTECTION

In addition to the requirements of the SECTION 01 57 19.00 45 TEMPORARY ENVIRONMENTAL CONTROLS, comply with the following environmental protection criteria:

A. Waste Classification, Handling, and Disposal:
   Contractor shall be responsible for the proper disposal of hazardous and non-hazardous waste generated during this project. Waste generated from abrasive blasting lead-containing paints with recyclable steel or iron abrasives are to be disposed as a hazardous waste or be stabilized with propriety pre-blast additives regardless of the results of 40 CFR 261, App 11, MTD 1311. Where stabilization is preferred, employ a propriety blast additive that has been blended with the blast media prior to use. Hazardous waste is to be placed in properly labeled closed containers and be shielded adequately to prevent dispersion of the waste by wind or water. Evidence of improper storage will be cause for immediate shutdown of the project until corrective action is taken. Non-hazardous waste is to be stored in closed containers separate from hazardous waste storage areas. Hazardous waste is to be transported by a licensed transporter in accordance with 40 CFR 263 and 49 CFR 171, Subchapter C. Non-hazardous waste shall be transported in accordance with local regulations regarding waste transportation. In addition to the number of manifest copies required by 40 CFR 262.22, one copy of each manifest is to be supplied to the Contracting Officer prior to transportation.

B. Containment:
   Contain debris generated during paint removal operations in accordance with the requirements of SSPC Guide 6, Class 3A. Where required, the containment air pressure is to be verified.
visually. Where required the minimum air movement velocity is to be 100 fpm for cross draft ventilation or 60 fpm for downdraft ventilation.

1.7 DELIVERY, HANDLING, AND STORAGE

Materials are to be delivered in their original, unopened containers bearing the manufacturer’s name, shelf-life, product identification, and batch number.

Coatings, thinners, and cleaners are to be stored in tightly closed containers in a covered, well-ventilated area where they will be protected from exposure to extreme cold or heat, sparks, flame, direct sunlight, or rainfall. Manufacturer’s instructions for storage limitations are to be followed.

PART 2 PRODUCTS

2.1 MATERIALS

A. Concrete:

Concrete shall conform to the requirements in SECTION 03 31 00.00 Mod STRUCTURAL CONCRETE, except for the headwall is ½-inch thick steel plate conforming to ASTM A36/A36M.

B. Structural Steel:

Structural Steel shall conform to the requirement of ASTM A572/A572M grade 50 for piles and ASTM A36/A36M for other structural steel members.

C. Grating:

Grating shall be galvanized welded steel grating and consist 1 1/4-inch by 3/16-inch rectangular bearing bars spaced at 1 3/16-inch centers and cross bars welded at 4-inch centers. End banding bars of 1 1/4-inch by 3/16-inch to be welded to the ends of every bearing bar. The top surface of the bearing bars shall be serrated for slip resistance. The grating shall be secured to the supporting members with two galvanized saddle clips at every support. The grating material is to meet the requirements of ASTM A1011/A1011M and ASTM A510 and be galvanized in accordance with ASTM A123/A123M.

D. Drainage Pipe:

Drainage Pipe is to meet the requirements of the SECTION 33 40 01.10 45 EFFLUENT PIPE.

E. Steel Railings and Handrails:

Design handrails to resist a concentrated load of 250 pounds in any direction at any point of the top of the rail or 20 pounds per foot applied horizontally to top of the rail, whichever is more severe. NAAMM AMP 521, provide the same size rail and post. Provide pipe collars of the same material and finish as the handrail and posts.

Provide steel handrails, including inserts in concrete, steel pipe conforming to ASTM A53/A53M or structural tubing conforming to ASTM A500/A500M, Grade A or B of equivalent strength. Provide steel railings of 2 inches nominal size. Railings to be hot-dip galvanized.

Fabrication: Joint posts, rail, and corners by one of the following methods:

1. Flush-type rail fittings of commercial standard, welded and ground smooth with railing splice locks secured with 3/8-inch hexagonal-recessed-head setscrews.

2. Mitered and welded joints made by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Butt railing splices and reinforce them by a tight fitting interior sleeve not less than 6 inches long.
3. Railings may be bent at corners in lieu of jointing, provided bends are made in suitable jigs and the pipe is not crushed.

F. Lumber

Lumber shall be southern yellow pine rough No. 1, dense, minimum allowable bending stress of 1,350 psi. Cuts in lumber or abraded surfaces of new work are to receive a field treatment in accordance with AWPA M4.

1. Treated Lumber:

Treated lumber shall be furnished and installed by the Contractor on the sides of the structures from the top of the concrete slab or headwall to 2 feet below the lower deck of the structure. Lumber thickness and length shall be as shown. Lumber is to be 4-inch nominal width. Lumber to be furnished shall be straight, even sawed, sound, and entirely free from defects which can impair its durability or its usefulness for the purpose intended. Lumber shall bear the official Grade mark of the association under whose rules it is purchased or, in lieu thereof, each shipment shall be accompanied by a certificate of inspection issued by the inspection association. Lumber shall have a Chromated Copper Arsenate (CCA) preservative treatment and be accompanied by a certificate with Best Management Practices from a recognized treatment company certifying the amount of treatment.

2. Preservative Treatment:

Preservative Treatment by pressure processes shall be in accordance with AWPA C2. Lumber shall receive a treatment of 2.5 pcf of CCA solution.

G. Scour Protection at Pipe Outfall:

Stone for scour protection at pipe outfall shall meet the requirements of SECTION 35 31 23 STONE FOR EROSION CONTROL.

2.2 FABRICATION

A. Structural Steel:

Structural Steel is to be fabricated in accordance with the latest specification of AISC 325. All members other than galvanized shall be painted in accordance with SECTION 09 97 02 PAINTING: HYDRAULIC STRUCTURES.

B. Structural Welding:

Structural Welding is to meet the requirements of SECTION 05 05 23.16 STRUCTURAL WELDING and as shown.

2.3 PROTECTIVE COATINGS

A. Galvanizing:

Galvanizing of steel handrails, grating, pipe sleeve, and headwall steel plate are to conform to the requirements of ASTM A123/A123M. Galvanizing coating thickness grade is to be "G85" or 2 ounces of hot-dip zinc coating per square foot of surface area in accordance with ASTM A123/A123M. Galvanized areas damaged, abraded, or where galvanized material has been broken by field welding, cutting, drilling, handling, storage, or by other methods are to be coated with two coats of Galvaweld or other field coating materials as approved.

B. Coating:

Provide catalyst components for coatings specific for resin components. Use thinners which are compatible with the Coal Tar Epoxy-Polyamide coating:
1. System: SSPC PS 11.01
2. Paints: SSPC Paint 16 Black
3. Top Coat Paints: Aliphatic Polyurethane
4. Primer: Inorganic Zinc

Structural steel, except steel handrails, is to be painted with a minimum of 3 mils DFT of Devoe Catha-Coat 302H inorganic zinc primer and a minimum of 6 mils DFT of Devoe Devran 224HS epoxy topcoat or a minimum of 2 mils DFT of Ameron Dimetcote 302H inorganic zinc primer and a minimum of 5 mils DFT of Ameron Amercoat 370 epoxy topcoat or equivalent products as approved. Surface preparation and paint application is to follow manufacturer's recommendations. Structural steel is to be entirely painted from concrete foundation to the top of each spillway. After paint is fully cured, a minimum of 2 feet of material is to be backfilled over and around drop-outlet pipe. Safety precautions included with the application instructions are to be observed during storage, handling, and use. Read each component's material safety data sheet before use. Steel handrails are to be galvanized after fabrication as specified above.

2.4 ABRASIVE BLASTING MATERIAL

Abrasive blasting materials are to be per SSPC Painting Manual, Chapter 2.4, and SSPC AB 1.

PART 3 EXECUTION

3.1 INLET HEADWALLS

Inlet headwalls are to be constructed of 1/2-inch thick steel plate as shown on drawings.

3.2 ERECTION OF STRUCTURAL STEEL

Erection of structural steel is to be in accordance with the latest specifications of the AISC 325.

3.3 PILES

Sizes and locations of the steel piles shall be as shown.

A. Placement Of Piles

Piles shall be driven as accurately as practicable in the correct locations true to line laterally, longitudinally and vertically. The final locations of piles shall be placed so that the framing members may be erected without excessive straining, crimping or bending of the member or piles. Piles may be one piece or they may be cut and spliced with full penetration welds.

B. Driving

Piles shall be driven with a hammer of the size and type suitable for the work. The hammers shall be operated at the speed and conditions recommended by the manufacturer. Power capacity shall be sufficient to operate the hammer continuously at full rated speed. A cast or structural steel driving head or mandrel shall be used to prevent upsetting the pile head. Pile drivers shall have firmly supported leads extending to the lowest point the hammer is to reach. Each pile shall be driven continuously and without voluntary interruption until the required depth of penetration has been attained. Deviation from this procedure will be permitted only if the driving is stopped by causes which reasonably cannot have been anticipated. When handling and driving long piles of a high slenderness ratio, special precautions shall be taken to ensure against overstress or leading away from a plumb or true position when driving.
3.4 PILE LENGTH PENETRATION

Pile tips shall be driven to the minimum tip elevation shown on drawings. Pile Driving Records such as blow count and length information shall be submitted using Pile Driving Record Form.

A. Pile Obstruction

A pile which cannot be driven to the required depth because of an obstruction shall remain in place at the maximum depth attainable. Contracting Officer shall determine by consideration of the penetration obtained for the initial pile, if one or more additional piles will be required. An additional pile may be driven vertically or on a batter as directed. It shall terminate near the mid-depth of the slab and be field cut and welded to the original pile as directed. The concrete slab shall be extended parallel and perpendicular to the main slab, sufficiently to encase the pile with a minimum of 1-foot of concrete at any point through the slab. Unless otherwise directed, the tip elevation shall be the same as that specified for the piles. The location, spacing, and alignment of the portion of piles above the concrete slab shall be maintained as shown on Drawings.

1. Unsatisfactory Piles

Piles which are damaged, mis-located, or driven out of alignment shall be withdrawn and replaced by new piles, or shall be cut off and abandoned and additional piles driven, as specified in Subparagraph: Pile Obstruction above, or as directed, without additional cost to PHA. Relocated piles shall be located to permit framing as shown.

B. Jetting

Water jets shall not be used for driving.

C. Inspected Piles

Contracting Officer may require that a pile be withdrawn for inspection. Piles found to be in suitable condition shall be re-driven. The cost for pulling and re-driving suitable piles will be determined by Contracting Officer and will be borne by PHA. Piles found not suitable shall be replaced by new piles, at no additional cost to PHA.

3.5 COATING

Protective coating shall be applied in accordance with SECTION 09 97 02 PAINTING: HYDRAULIC STRUCTURES

3.6 FIELD WELDING

Procedures of manual shielded metal arc welding, appearance and quality of welds made, and methods used in correcting welding work are to comply with AWS D1.1/D1.1M.

3.7 COATING INSPECTION

On-site work as described herein is to be inspected for compliance with this specification by Contracting Officer.

For all protective coatings applied on-site and off-site locations, the Contractor is to be responsible coating inspection. Inspector is to be present at the pre-work conference to address necessary clarification of inspection and specification requirements. Apparent deviation from the specified requirements or any out of tolerance condition is to be immediately reported to the Contracting Officer for determination of corrective action. Submit Inspection Reports performed by the Coating Inspector. Dry film thickness measurements of each coat is to be included in the Inspection reports.

Inspection Forms are to be submitted at the pre-work conference which are to be used by the Coating Inspector and forwarded to the Contracting Officer prior to delivery of the coated work to the job site.
3.8 CONTRACTOR QUALITY CONTROL

A. Compliance Inspection

Inspect for compliance with Contract requirements and record the inspection of the operations including but not limited to the following:

1. Materials. Certificates are to be submitted to show conformance with applicable specification requirements.

2. Lumber Installation. Boards are to meet minimum height. Length and width are to meet the specification requirements.

3. Galvanized Welds of Reinstalled Walkway and Treatment are to conform to specification requirements.

B. Records

A copy of the records of inspections and corrective actions taken are to be included in the daily quality control reports.

END OF SECTION
PORT OF HOUSTON AUTHORITY
TECHNICAL SPECIFICATION FOR ECIP SEGMENT 4 E2 CLINTON/BELTWAY 8 DMPAS
SECTION 35 31 23 Add – STONE FOR EROSION CONTROL

PART 1  GENERAL

1.1  SECTION INCLUDES

The work includes furnishing materials, labor, and equipment for placement of stone for
construction of scour pads at drop-outlet structures (outfall structures), and any other specified
erosion control structures or channels requiring stone or riprap, such as the realigned drainage
channel at the Beltway 8 PA.

1.2  RELATED SECTIONS

SECTION 01 22 10.00 Std - Measurement of Quantities
SECTION 31 00 00 Add - Earthwork
SECTION 31 05 19 Add – Geotextile for Earthwork
SECTION 31 24 00 Add - Embankment Construction

1.3  REFERENCES

ASTM INTERNATIONAL (ASTM)

Degradation of Large-Size Coarse Aggregate by
Abrasion and Impact in the Los Angeles Machine

Aggregates

ASTM D5519  (2015) Particle Size Analysis of Natural and Man-
Made Riprap Materials

Absorption of Rock for Erosion Control

1.4  SUBMITTALS

A. Preconstruction Submittals for: Stone Quality, Test Report Schedule, and Delivery Schedule
   Name and Location, and Historical Quality Reports From Quarry Initial Survey.

B. Test Reports for: Stone Quality Test Reports, Gradation Test Reports, Stone Gradation Test
   methodology Description, and Daily Activities Reports.

C. Certificates for: Qualifications/Certifications For Sampling/Testing Agency

D. Closeout Submittals for: Acceptance Survey
1.5 STORAGE OF CONSTRUCTION MATERIALS

Construction materials unloaded from the barges, trucks, and/or railroad cars that cannot be immediately used for construction shall be stored in areas prepared by Contractor to be relatively smooth in order that all of the stored material may later be recovered free from dirt or other foreign materials.

1.6 QUALITY CONTROL/QUALITY ASSURANCE

A. Environmental Protection Requirements

Refer to SECTION 01 57 19.00 45 TEMPORARY ENVIRONMENTAL CONTROLS.

B. Materials Testing

1. Contractor/Quarry shall provide all equipment and facilities for testing construction materials.

2. Acceptable Stone shall meet the quality acceptance criteria in paragraph 2.01, A, when tested in accordance with the procedures listed below:
   a) Sampling of the stone shall be performed in accordance with ASTM D75/D75M.
   b) The absorption of stone shall be determined in accordance with ASTM D6473.
   c) The unit weight of stone shall be provided based on the apparent specific gravity determined in accordance with ASTM D6473.
   d) The loss by abrasion of stone shall be determined in accordance with ASTM C535, processed and tested for No. 1 grading. The gradation of stone shall be determined in accordance with ASTM D5519, Test Method C. in accordance with the following requirements and Table 1.
   e) Gradation: Sample sizes of stone shall consist of at least 50 stones per test. Refer to Paragraph 2.1 for gradation requirements.
   f) Quality: Refer to Paragraph 2.1 for quality requirements.
   g) Placement: Continuous inspection of placement to ensure proper thickness and that material is not segregated. Refer to Paragraph 3.2 for placement requirements.

3. Prior to performing quality or gradation testing of stone, Contractor shall provide at least 3 days advance notice, in writing, so that Contracting Officer/Engineer may have the opportunity to attend and observe the testing. Contractor shall conduct gradation tests at the quarry, not at the project site.

4. Table 1 provides required submittals associated with stone quality. Detailed descriptions of submittals are below.

<table>
<thead>
<tr>
<th>Stone Submittal Number</th>
<th>Submittal Description</th>
<th>Required Submission Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Name, Location, and Historical Quality Reports from Quarry</td>
<td>Prior to transport of delivery of any Stone from quarry.</td>
</tr>
</tbody>
</table>
2. Testing Laboratory Qualifications

Prior to transport or delivery of any Stone from quarry.

3. Stone Delivery, Staging, and Testing Schedule

Prior to transport or delivery of any Stone from quarry.

4. Stone Quality and Gradation Test Report 1

With or after Stone delivery, staging, and testing schedule but prior to transport or delivery of any Stone from quarry.

5. Stone Quality and Gradation Test Report 2

After approximately 1/3rd of total Stone quantity has been shipped from quarry, but prior to any subsequent shipment.

6. Stone Quality and Gradation Test Report 3

After approximately 2/3rd of total Stone quantity has been shipped from quarry, but prior to any subsequent shipment.

6. Stone Submittal 1: Contractor shall provide the name and location of the quarry that will be the source of the stone for the project. Contractor shall also provide historical quality reports from the selected quarry to determine the acceptability of the stone from the proposed source. Historical quality reports are not considered suitable alternatives to the quality and gradation reports required during construction. Quality and gradation reports during construction shall be from new tests performed on actual stone to be used on the project.

7. Stone Submittal 2: Submit testing laboratory qualifications.

8. Stone Submittal 3: Prior to commencing stone delivery to project site, submit a stone delivery, staging, and testing schedule, and a description of the planned gradation test procedure. The schedule shall describe when stone quality and gradation testing will be performed to ensure that test results are available for Contracting Officer’s review prior to stone being shipped from the quarry. For each stone type, a minimum of 3 quality and 3 gradation tests are required and shall be provided at specified intervals to ensure compliance with quality and gradation requirements. For each stone type, the first quality and gradation test reports shall be performed, submitted, and reviewed by Contracting Officer prior to delivery of any stone. The remaining quality and gradation tests shall be performed, submitted, and reviewed by Contracting Officer at approximately 1/3rd and 2/3rd of total stone quantity shipment (of each stone type) from quarry.

9. Stone Submittals 4-6: Contractor shall obtain Contracting Officer’s review and confirmation of compliance of gradation and quality tests prior to shipment of stone in the increments stated in Table 1. If a single shipment of stone is planned to encompass multiple
 increments, Contractor shall submit the required number of test submittals and receive review and confirmation of compliance prior to shipment of stone from quarry. Contractor may request variations to timeframes in Table 1 in stone delivery, staging, and testing schedule.

**PART 2 PRODUCTS**

### 2.1 STONE MATERIAL

**A. Stone:**

All stone shall be a durable natural stone or broken concrete. It shall be free from visible fractures, shale partings, cracks, overburden soil, clay pockets, cavities (vugs or “honeycombs”), laminations, and other defects that would tend to increase unduly its deterioration from natural causes. Stone shall not include objectionable quantities of dirt, sand, clay, and/or rock fines. Stone shall comply with quality parameters in Table 2.

**Table 2. Stone Quality Parameters**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Value</th>
<th>Max/Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Weight</td>
<td>155 PCF</td>
<td>Min</td>
</tr>
<tr>
<td>Absorption</td>
<td>3%</td>
<td>Max</td>
</tr>
</tbody>
</table>

**B.** The stone shall be reasonably well graded and shall include essentially all stone sizes between the two extremes specified which will result in a dense, fairly well-graded material not having noticeable voids or a lack of the larger sizes. Bi-modal or gap graded stone gradation test results may result in rejection of the stone material. Stone size range (gradation) shall conform to the requirements specified below (Table 3). Gradation test results that begin on the coarse side of the curve and end up on the fine side of the curve shall be considered “skip-graded” and will not be accepted.
### Table 3. Gradation Limits for Erosion Control Stone

<table>
<thead>
<tr>
<th>Particle Mass, lb</th>
<th>Percent Lighter than the Mass Specified</th>
</tr>
</thead>
<tbody>
<tr>
<td>265</td>
<td>100</td>
</tr>
<tr>
<td>180</td>
<td>50-100</td>
</tr>
<tr>
<td>100</td>
<td>15-50</td>
</tr>
<tr>
<td>50</td>
<td>0-15</td>
</tr>
</tbody>
</table>

C. Stone Shape: The greatest dimension of each stone shall not be more than three times its least dimension. The faces of individual stones shall be roughly angular, not rounded, in shape.

D. Where broken concrete is used, cut exposed metal flush with the surface prior to placing the material.

### PART 3 EXECUTION

#### 3.1 COORDINATION WITH QUARRY

Contractor shall be knowledgeable of the methods used at the quarry to produce the stone gradations specified, especially the effects of repeated handling. Contractor shall coordinate with the quarry and use loading and unloading methods that ensure that required gradations are provided for placement.

#### 3.2 STONE PLACEMENT

**A. General**

Stone shall be placed over the prepared subgrade and geotextile fabric within the limits indicated on the drawings.

**B. Placement**

The stone layer shall be constructed as indicated on the drawings, and include the following characteristics:

1. A placement technique and drop height less than 1 foot shall be used that will not damage the geotextile materials.

2. Contact between individual stones shall be maximized on all sides. Each stone shall have at least three (minimum) points of contact with other stones.

3. Stone shall be placed and spread in such a manner that the various stone sizes produce a relatively uniform surface and a completed layer that is a reasonably well-graded, compact mass of rock with minimal percentage of voids. Smaller stones shall be placed as required to produce a relatively uniform finished outer surface.

4. Actual stone limits shall be such that the finished surface of stone is within the specified tolerance limits. Requirements with respect to the finished crest elevation, crest width, and side slopes are provided on the drawings.
3.3 MISPLACED MATERIALS

If any stone is deposited elsewhere than in places designated or approved, the Contractor may be required to remove such misplaced material and redeposit it where directed at no additional cost to the PHA.

3.4 SURVEYING AND ACCEPTANCE

A. General

Contractor shall provide initial and final surveys, as described in SECTION 35 20 00, CONSTRUCTION SURVEYING, for measurement and acceptance of stone placement.

B. Acceptance Criteria

Acceptance of the stone shall be based upon field observations and review of the final surveys to verify that the stone meets the limits and tolerances specified in the drawings and the requirements of paragraph 3.2.

3.5 CLEANUP

Upon completion of the work, all plant, including stakes, piles, excess stone, and other markers or obstructions placed by or for Contractor shall be promptly removed.

END OF SECTION