USCG YARD
SITKA WATERFRONT IMPROVEMENTS

COAST GUARD SITKA MOORINGS, SITKA, AK

Contract No.: 70Z04723DPCNI0006

Task Order No.: 70Z05025F43000003

BASIS OF DESIGN
and
DESIGN CRITERIA

Prepared For:

U.S. Coast Guard Facilities Design & Construction Center
952 2nd Avenue South
Seattle, Washington 98174

December 18, 2025

35% Submittal

Prepared By:

WHITING-TURNER

4600 River Road, Suite 200
College Park, MD 207374
(301) 656-7800

moffatt & nichol

645 G Street, Suite 100-1012
Anchorage, AK 99501
(907) 677-7500

Document Verification

Client	The Whiting and Turner Contracting Company
Project name	USCG Fast Response Cutter (FRC)
Document title	DRAFT Basis of Design and Design Criteria
Document sub-title	–
Status	35% Design
Date	December 18, 2025
Project number	250739
File reference	12-18-2025 USCG Sitka WF Improvements_Basis of Design

Revision	Description	Issued by	Date	Checked
0	35% Basis of Design Report	P. Wallis	12/18/25	12/18/25

Table of Contents

Document Verification i
1.0 PROJECT OVERVIEW 1
2.0 OPERATIONAL CRITERIA 2
2.1 RFP Requirements 2
2.2 Compliance with RFP Requirements 2
3.0 EXISTING CONDITIONS 4
4.0 GEOTECHNICAL FACTORS 5
4.1 Geologic Setting 5
4.2 Generalized Subsurface Conditions 5
4.3 Seismic Design Criteria 5
4.3.1 Liquefaction Potential 5
4.3.2 Seismic Site Class and Design Parameters 5
4.4 WLB Wharf Support Piles 6
4.5 FRP Dock Guide Piles 6
4.6 Trestle Abutment 6
4.7 Building Foundations 6
4.8 Pile Factors of Safety 6
5.0 CIVIL IMPROVEMENTS 7
5.1 System Description 7
5.2 Codes and Standards 7
5.3 Site Preparation 8
5.4 Grading and Storm Drainage 9
5.5 Stormwater Management 9
5.6 Fire Protection 10
5.7 Potable Water 10
5.8 Sanitary Sewer 10
5.9 Electrical and Telecommunications 10
5.10 Fencing and Gates 10

5.11 Pavement 11
6.0 MARINE STRUCTURAL IMPROVEMENTS 12
6.1 System Description 12
6.2 WLB Wharf 12
6.3 Approach Pier 12
6.4 Mooring Dolphin 13
6.5 References, Codes and Standards 13
6.6 Design Criteria 14
6.6.1 Geometric Constraints 14
6.6.2 Environmental Criteria 15
6.6.3 Material Properties 16
6.6.4 Design Loads 19
6.7 Static Earth Pressure 21
6.8 Environmental Loads 22
6.8.1 Seismic Loading 22
6.8.2 Wind Load on Structures 22
6.8.3 Snow and Ice Loads 22
6.8.4 Temperature 22
6.8.5 Mooring 22
6.8.6 Berthing 23
6.8.7 Wave and Current Loading 23
6.9 Application of Loadings 23
6.9.1 Concentrated Loads 23
6.9.2 Simultaneous Loads 23
6.9.3 Loading for Maximum Stress 24
6.9.4 Critical Loadings 24
6.9.5 Load Combinations 24
6.9.6 Load Factor Design 25
6.9.7 Service Load Design 25

6.9.8 Design Life 26
6.9.9 Corrosion Protection 26
7.0 ARCHITECTURAL 27
7.1 Preliminary Concept Building Plan 27
7.1.1 Applicable Codes & References List 27
7.1.2 Walls 27
7.1.3 Roof 27
7.1.4 Fasteners 28
7.1.5 Doors & Windows 28
7.2 Structural 29
7.2.1 Applicable Codes & References List 29
7.2.2 Design Criteria 30
7.2.3 Structural Material and Allowable Stress 31
7.2.4 Anti-Terrorism/Force Protection 31
7.3 Fire Protection 32
7.3.1 Applicable Codes and Standards 32
7.3.2 Building Description 33
7.4 Technology 35
7.4.1 Telecommunications 35
7.4.2 Grounding and Bonding 35
7.4.3 Outside Plant (OSP) and Campus Pathways and Cabling 36
7.4.4 Building Backbone/Riser Pathway and Cabling 36
7.4.5 Horizontal Pathway and Cabling 36
7.4.6 Telecommunications Work Area (WAO) Requirements 36
7.4.7 Public Address (PA) System 36
8.0 MECHANICAL 38
8.1 Plumbing 38
8.1.1 Codes and Standards 38
8.1.2 Design Overview 38

8.1.3 Domestic Water 38
8.1.4 Drain, Waste and Vent 39
8.2 HVAC for Boat Bay Building 40
8.2.1 Codes and Standards 40
8.2.2 Design Overview 40
8.2.3 Equipment and Controls 41
8.2.4 Testing and Balancing 41
8.2.5 Commissioning 41
8.2.6 Additional Requirements 41
8.3 Pier Utilities 42
8.3.1 Codes and Standards 42
8.3.2 Design Overview 42
8.3.3 Potable Water 42
8.3.4 Pier Fire Protection Water 43
8.3.5 Sewer Collection 44
8.3.6 Bilge and Oily Waste Collection 44
9.0 ELECTRICAL 46
9.1 Codes and Standards 46
9.2 Design Overview 46
9.2.1 Site Power Distribution 46
9.2.2 Lighting 47
9.2.3 Grounding 47
9.2.4 Conductor Sizing and Insulation 47
10.0 SUSTAINABILITY 48
10.1 Guiding Principles 48

List of Figures

Figure 2-1: Waterfront Improvements General Arrangement Plan 3
Figure 3-1: Aerial Photo of Existing Site 4
Figure 6-1: HS20 Loading 21

List of Tables

Table 4-1: Mapped Spectral Response Acceleration Values for Soil Factor 5
Table 4-2: Site Class, Site Coefficients, and Design Spectral Response Acceleration 5
Table 4-3: Pile Factors of Safety 6
Table 6-1: LRFD Load Combinations 25
Table 6-2: Service Load Design Load Combinations 25
Table 7-1: Construction Type (IBC Table 601) 33
Table 7-2: Occupancy Classification 33
Table 7-3: Allowable vs. Actual Building Area (IBC 506) 34
Table 7-4: Allowable vs. Actual Building Height and Stories 34
Table 7-5: Occupant Load Calculations 34
Table 7-6: Common Path, Dead-End, and Travel Distance Limits (NFPA 101 Table A.7.6) 34
Table 7-7: Minimum Interior Finish Ratings (NFPA 101 Table A.10.2.2) 34
Table 7-8: Fire Suppression Requirements (UFC 3-600-01 9-7.2, 9-10, 9-17 and RFP) 34
Table 7-9: Fire Alarm Requirements (UFC 3-600-01 9 9-18 and RFP) 34
Table 7-10: Emergency Lighting and Exiting 35
Table 7-11: Smoke Management Systems 35
Table 7-12: Fire Hydrant Distribution and Fire Department Access (UFC-3600-01 9-1.1, 9 -3.5) 35

Appendices

Appendix A Geotechnical Engineering Survey (PENDING)

Appendix B Pre-Engineered Metal Building Concept Drawings and Structural Design Data (PENDING)

Appendix C Pre-Engineered Metal Building Colors and Finishes (PENDING)

Appendix D Mooring & Berthing Analysis (PENDING)

1.0 PROJECT OVERVIEW

Sitka Moorings of the U.S. Coast Guard's (USCG) Seventeenth District, Pacific Area, is a facility located in Sitka, Alaska. Sitka Moorings is homeport for the USCGC Kukui (WLB-203), a Juniper-class seagoing buoy tender. The Kukui's mission is maintaining aids to navigation and other tasks executed in the region of Southeast Alaska. It is anticipated that USCG Sitka Moorings will eventually serve as fast response cutter (FRC) homeport, as well.

The existing WLB facility includes an existing pile-supported wharf, with an adjacent floating work boat dock. The waterfront improvements project includes the design of a replacement pile-supported WLB wharf with pile-supported approach trestle, and a new guide-pile-supported floating FRC dock, accessible via gangway from the new wharf. Upland improvements will include a new pre-engineered metal building (PEMB), boat maintenance building, new waterside utilities, and expanded parking facilities.

A sitewide demolition effort will include, but not be limited to selective removal of existing paving, walkways, trees, bushes and shrubbery, site utilities, fencing, gates, guardrails and bollards. Demolition of the existing WLB wharf and associated structures is beyond the scope of the present project.

2.0 OPERATIONAL CRITERIA

2.1 RFP REQUIREMENTS

The following principal goals have been identified by USCG as requirements for this project:

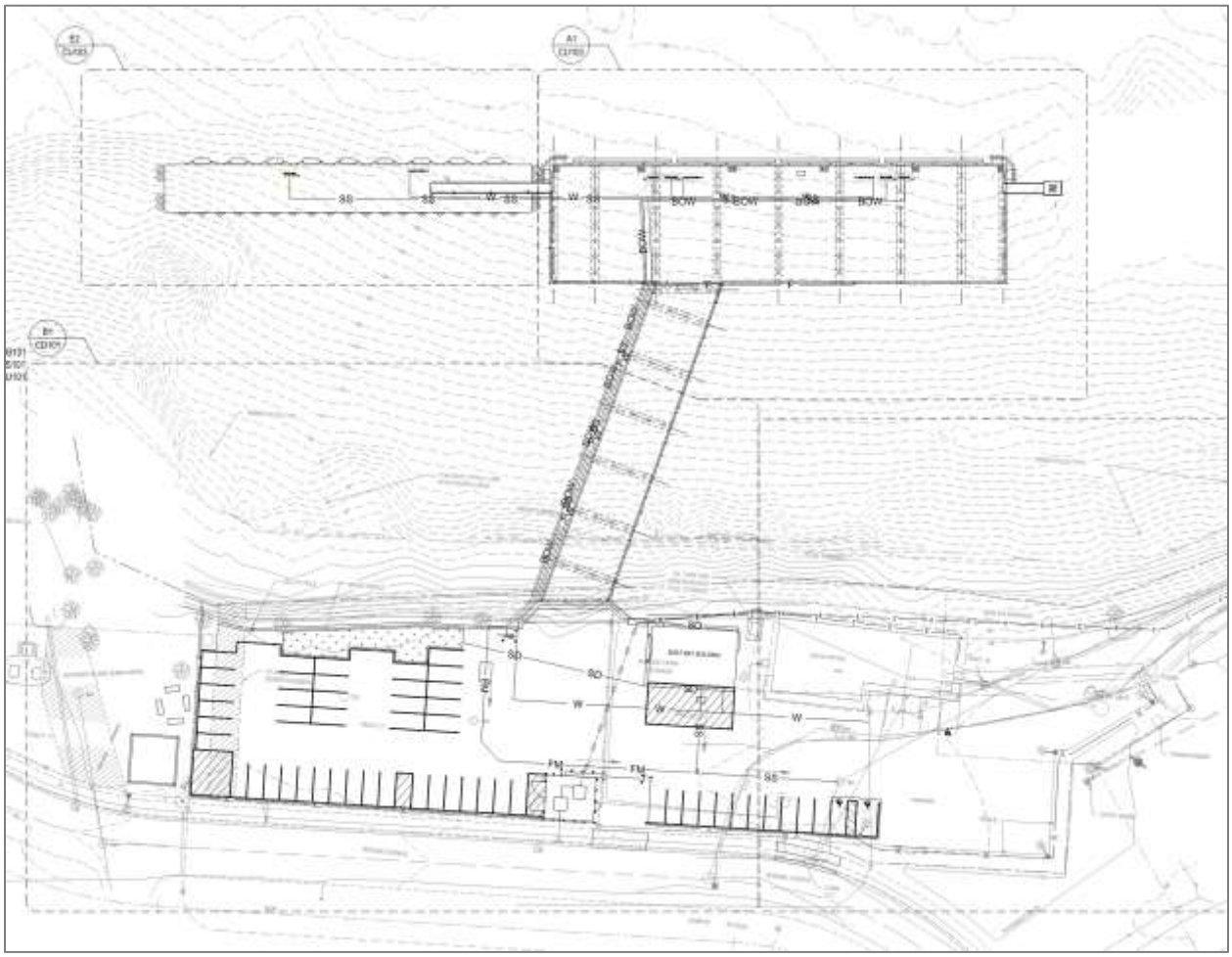
- Design and construction of a new 65 feet by 250 feet pile-supported WLB wharf, and 35 feet wide approach trestle. The wharf and trestle superstructures will be of precast concrete construction, with a cast-in-place concrete topping, supported on concrete-filled steel pipe piles.
- Design and construction of a new guide-pile-supported 25 feet by 200 feet FRC floating dock. The new dock will be of matched plant-precast concrete unit construction, and will be accessible from the new WLB wharf by a new aluminum access gangway.
- Design and construction of a new 31 foot by 47 foot pre-engineered metal building (PEMB) in support of boat maintenance. The new boat bay building will be constructed on a ground-supported cast-in-place concrete slab with thickened edges, and will include a light-duty electric bridge crane.
- Design and construction of miscellaneous site work, groundwork, pavement improvements, drive and parking striping and other traffic controls, and new fencing and security gate.

2.2 COMPLIANCE WITH RFP REQUIREMENTS

The general arrangement of the new WLB wharf and FRC dock, as well as all other associated site improvements, conforms to the RFP requirements. Design of structures and utility services comply with the operational requirements set forth in the RFP.

The General Arrangement Plan is shown in Figure 2-1.

Figure 2-1: Waterfront Improvements General Arrangement Plan



3.0 EXISTING CONDITIONS

The facility site is bounded by Seward Avenue on the north and west, and by Harbor Drive on the south and east.

The existing pile-supported WLB wharf is 60 feet by 220 feet, and accessed by a 31 foot wide approach trestle. A 12 foot by 150 foot floating dock is attached to the south edge of the WLB wharf. An existing auxiliary building is located along the east side of the approach trestle, and an existing warehouse building is supported at the deck level of the wharf along the south edge.

Figure 3-1: Aerial Photo of Existing Site

4.0 GEOTECHNICAL FACTORS

4.1 GEOLOGIC SETTING

PENDING

4.2 GENERALIZED SUBSURFACE CONDITIONS

PENDING

4.3 SEISMIC DESIGN CRITERIA

4.3.1 Liquefaction Potential

PENDING

4.3.2 Seismic Site Class and Design Parameters

PENDING

Table 4-1: Mapped Spectral Response Acceleration Values for Soil Factor

Description	Period (Sec)	Sa
Mapped Short Period Spectral Response Acceleration (S_s)	X.X	0.XXX g
Mapped 1-Second Period Spectral Response Acceleration (S_1)	X.X	0.XXX g

The Seismic Site Classification influences the determination of the Site Coefficients, the Design Spectral Response Acceleration values, and ultimately the Seismic Design Category. Note that the Seismic Site Classification is based on the characteristics of the upper 100-feet of soils and rock below the site. The IBC requires the use of Standard Penetration Test Resistance (test borings), Shear Wave Velocity (geophysical methods), and/or Undrained Shear Strength (soil laboratory testing) to categorize the Seismic Site Classification.

The project borings indicated the site as Site Class X. For Site Class X and mapped spectral acceleration values provided above, calculated Site Coefficient values and the Maximum and Design Spectral Response Acceleration values are given in Table 4-2. Complete results of Spectral Acceleration with varying period are given in Appendix B.

Table 4-2: Site Class, Site Coefficients, and Design Spectral Response Acceleration

Site Class	X
Site Profile	Stiff Soil
Site Coefficient (F_a)	X.X
Site Coefficient (F_v)	X.X
Short Period, Maximum Spectral Response Acceleration (S_{MS})	0.XXX g

1 Second Period, Maximum Spectral Response Acceleration (S_{M1})	0.XXX g
Short Period, Design Spectral Response Acceleration (S_{DS})	0.XXX g
1 Second Period, Maximum Design Spectral Response Acceleration (S_{D1})	0.XXX g

4.4 WLB Wharf Support Piles

PENDING

4.5 FRP Dock Guide Piles

PENDING

4.6 Trestle Abutment

PENDING

4.7 Building Foundations

PENDING

4.8 Pile Factors of Safety

Table 4-3: Pile Factors of Safety

Potential Failure Mode	Normal Operational and Environmental Loads		
	Normal Operational and Environmental Loads	Earthquake Load*	Test Loads
Axial compression	X.X	X.X	X.X
Axial tension	X.X	X.X	N/A
Lateral loads	X.X	X.X	N/A

** (alone or in combination with long-term service load, applied to factored demands rather than service demands)*

5.0 CIVIL IMPROVEMENTS

5.1 SYSTEM DESCRIPTION

The work covered by this section includes furnishing and installation of new stormwater collection and conveyance system; stormwater treatment facilities; design of Bilge Oily Water (BOW) treatment, and Oily Water (OW) systems, connection of sanitary and, potable water to the pier and new building from the existing network; pavement and incidental site improvements such as fencing and gates. The work also includes selective site demolition prior to construction.

5.2 CODES AND STANDARDS

The following references, standards, and codes shall be used where appropriate for the design:

a) American Association of State Highway Transportation Officials (AASHTO), *Guide for Design of Pavement Structures*, 4th Edition, Supplement, 1998

b) American Water Works Association (AWWA)

c) DoD Unified Facilities Criteria, UFC 3-201-01 *Civil Engineering, with Change 5, 2021*

d) DoD Unified Facilities Criteria, UFC 3-230-01 Water Storage, Transmission, and Distribution, with Change 3, 2021

e) DoD Unified Facilities Criteria, UFC 3-240-01 *Wastewater Collection, with Change 2, 2020*

f) DoD Unified Facilities Criteria, UFC 3-600-01 *Fire Protection Engineering for Facilities*, with Change 6, 2021

g) National Fire Protection Association (NFPA), *Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves*, (NFPA 307), 2021

h) National Fire Protection Association (NFPA), NFPA 1 Fire Code.

i) Alaska Department of Transportation and Public Facilities (ADOT &PF), *Standard Specifications for Highway Construction*, 2020

j) Alaska Department of Transportation and Public Facilities (ADOT &PF), *Erosion and Sediment Control Manual*, 2004

k) Alaska Department of Environmental Conservation (AKDEC), *Alaska Stormwater Guide, 2025*

l) City and Borough of Sitka, Stormwater Design Standards, 2015

m) USDA Soil Conservation Service, Urban Hydrology for Small Watersheds, 2nd Edition (TR-55), 1986

n) International Code Council (ICC), 2018 International Building Code (IBC)

o) International Code Council (ICC), 2018 International Plumbing Code (IPC)

p) City of Sitka Plumbing Code

q) U.S. Department of Defense, UFC Regulation 26 05 41 Underground Electrical Construction, 2017

r) U.S. Department of Defense, UFC Regulation 3 430 09 Exterior Mechanical Utility Distribution, 2004

s) U.S. Department of Defense, UFC Regulation 3 430 05 Natural Gas and Liquefied Petroleum Gas Distribution Pipelines, 2021

t) U.S. Department of Defense, UFC Regulation 33 11 00 Water Utility Distribution Piping, 2022

u) U.S. Department of Defense, UFC Regulation 3-201-01 Civil Engineering Change 5, 2021

5.3 SITE PREPARATION

Items to be demolished and removed from the site include:

- Various light poles
- Wind turbine
- Walkways
- Memorial Garden and plantings
- Swing set
- Portions of the wharf and bulkhead to allow for new bulkhead construction
- Miscellaneous
- Fencing, bollards, guard rail, gates and pavements

Except for the Memorial Garden and swing set which will be reused and relocated, all demolition material shall become the property of the Contractor. It is assumed that there are no PCB's, underground tanks, contaminated soils, or hazardous materials within the site preparation limits.

The construction of the bulkhead abutment will require removal of asphalt pavement, excavation of at approach pier abutment, in order to install new bulkhead wall.

Removal and installation of utilities is addressed in later sections.

5.4 GRADING AND STORM DRAINAGE

Site planning, design, construction, and maintenance strategies for the new site development will be implemented to maintain, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the rate and volume of flow. The site will be graded to maintain positive drainage, as evidenced by the absence of any ponded water within the drive aisles and drainage swales/ditches after a significant (i.e., 90 Percentile) rainfall event.

Existing inlets will capture rainfall runoff from all disturbed and redeveloped areas outside of the entrance way to the buildings. Further, all rainfall runoff originating from the roof of the two new buildings will be captured via roof drains and then directed directly into the proposed grass swale.

New inlets and manholes outside of the footprint of the concrete slab or the concrete platform will be precast concrete. All storm drain piping will be Class IV reinforced concrete pipe or respective HDPE piping with the same or larger cross-sectional area depending on the SDR needed to match a Class IV pipe. Manhole covers and/or grates will be provided to all underground and below grade storm drain structures. Manhole openings shall be 30 inch minimum to comply with OSHA confined space requirements.

To comply with the UFC Regulations 3 201 01, the minimum offset between storm drain lines to other utilities is 5 feet. New inlets and storm drainpipes will be designed using flow rates calculated from the 10-year storm event using the Rational Method and storm drain system sizing based on Manning's Equations. Rainfall data for use in stormwater design computations will be as published by NOAA Atlas 14 for the 24 hour duration, 10-year storm.

5.5 STORMWATER MANAGEMENT

Existing and new areas that contribute to the land transfer area's stormwater runoff will meet applicable water discharge permit regulations, state and local water resource protection and erosion reduction measures, and other water quality regulations for the stormwater system. The following stormwater management (SWM) Best Management Practices (BMP) will be provided:

1. A diversion structure will divert the first inch of rainfall (the Water Quality Volume) to the stormwater treatment system.
2. A grassed swale will address the treatment of the water quality volume for approximately 40% of the project area. The grassed swale will treat the full build out impervious area of the site.

Stormwater runoff will reach the grassed swale where the first inch of rainfall is treated. All stormwater runoff above the first inch of runoff will bypass the swale and discharge directly to the harbor.

5.6 FIRE PROTECTION

Adequate fire hydrant coverage for the site will be provided while considering a 150 linear foot fire hose length equating to maximum hydrant spacing of 300 feet. This spacing conforms to the requirements of UFC 3-600-01.

The fire hydrant will be added at the access pier with applicable valves which conforms to UFC 3-600-01. Fire hydrants will be dry-barrel type, AWWA C502 or UL 246 and/or as per USCG Yard specifications as will the adjacent Fire Department Connection (FDC) Dry Standpipe.

5.7 POTABLE WATER

Potable water is provided from a main distribution system on Seward Street.

All domestic water piping will be NSF 61 certified. All domestic water piping installed shallower than a bury depth of 4 feet and on or under the platform will be insulated. See below in Section 7 for more information on insulation requirements.

To comply with the UFC Regulations 33 11 00 and 33 30 00, the minimum offset between the potable water and the sanitary sewer line is 6 feet and the preferred distance is 10 feet. The offset to other utilities is 5 feet.

5.8 SANITARY SEWER

The sanitary sewer system will comprise of a force main into a gravity main in accordance with Sitka Plumbing Code and the 2018 International Plumbing Code. Ductile iron pipe shall conform to ASTM A746 with AWWA C110 or AWWA C153 fittings. Sanitary from the pier will be treated in a Bilge Oily Water (BOW) Treatment System before entering the sanitary system. Sanitary from the building will be treated in an Oily Water System (OWS) prior to joining the treated sanitary from the pier and entering the public system.

The sanitary sewer force main will connect to an existing manhole in Seward Street.

To comply with the UFC Regulations 33 11 00 and 33 30 00, the minimum offset between the sanitary sewer and the water line is 6 feet and the preferred distance is 10 feet. The offset to other utilities is 5 feet.

5.9 ELECTRICAL AND TELECOMMUNICATIONS

To comply with the UFC Regulations 26 05 41, the minimum offset between electrical and telecommunication lines to other utilities is 12 inches.

5.10 FENCING AND GATES

Fencing shall be 6 feet perimeter security fence. The manufacturer shall provide a total fence system of Montague Plus Standard Picket space, welded and rackable. The system shall include all components. All structural fence components shall be warranted within specified limitations by the manufacturer for a date of 20 years from date of purchase.

Warranty shall cover any defects in material finish. All fence posts shall be mounted in concrete footers.

Gate shall be cantilever with a nominal 30 feet length with a nominal 22 feet – 24 feet opening and be powered by an electric controller. The electric gate controller shall be a commercial gate operator capable of moving a gate up to 2000 lbs. The gate shall include a robust lockable mechanism.

5.11 PAVEMENT

For this project, bituminous asphalt paving will be required for reconstruction of pavement due to paving improvements and utility improvements as shown on the construction drawings within the limits of demolition. The areas surfaced with asphalt pavement include work within the parking lot and into Seward Street. It is assumed that industrial traffic within these areas will consist of trucks supporting the yard operation, occasional truck deliveries, and Personal Vehicles. These sections will be constructed to match the existing section using AKDOT materials. The pavement will be based on the following assumptions:

- Design life of 25 years
- HS20 and CAT 200 F152 equivalent loadings
- Channelized repetitions
    - Truck (1 trip per day)
- Subgrade CBR of 4 (as per Geotechnical Report in RFP)
- Minimum cut and fill between existing ground and the finished grade

Where concrete pavement and concrete landings are called for, they shall be normal-weight concrete and have a compressive strength (f'c) of 5,000 psi.

6.0 MARINE STRUCTURAL IMPROVEMENTS

6.1 SYSTEM DESCRIPTION

The marine structural scope for the Sitka Waterfront Improvements project includes the design and construction of new waterfront infrastructure to support mooring, berthing, and maintenance operations for USCG vessels, specifically the Fast Response Cutter (FRC) and WLB buoy tender. The primary structural elements include the WLB Wharf, Approach Pier, FRC Floating Dock (to be designed by others and not included in this document), gangway connecting the WLB wharf and the FRC dock, and a new Mooring Dolphin. These components are designed to accommodate vessel mooring, crane operations, pedestrian access, and integration with landside utilities.

The WLB Wharf and Approach Pier will be fixed, pile-supported concrete structures designed for heavy-duty vehicular and crane loading. The Mooring Dolphin will extend the effective mooring length of the wharf. Ancillary elements such as fender systems, ladders, shore ties, and gangways are included to support safe and functional operations. Sufficient clearances will be provided between adjacent structural elements of construction to prevent damaging impact forces due to seismic deformations, as required by the project specifications. A detailed description of the primary marine structural improvements are presented below.

6.2 WLB WHARF

The WLB Wharf is a fixed, pile-supported concrete structure designed for mooring and berthing of WLB vessels and their associated operations at the berth. It supports crane loading, mooring forces, and vehicular access. The deck is supported by concrete-filled steel pipe piles embedded into competent bearing strata. The wharf includes bollards, fendering, gangway access to the FRC floating dock and utility connections both to the landside and to the FRC floating dock. Safety features including railings, ladders, life rings, and lighting are included as secondary systems where necessary on the structure.

6.3 APPROACH PIER

The Approach Pier serves as the transition between the landside infrastructure and the waterfront infrastructure. It is designed for pedestrian access, vehicle traffic, transitory mobile crane loads (but not crane operations), and utility routing. The pier consists of a reinforced concrete deck supported by steel pipe piles and pile caps, similar in configuration to the WLB Wharf but without mooring hardware.

The pier provides access to the WLB Wharf and therefore the FRC Floating Dock (via a gangway from the WLB Wharf) and includes safety features such as railings, ladders, and lighting. It is designed to accommodate tidal fluctuations and vessel movement while maintaining structural integrity. The pier also supports utility conduits and electrical systems required for dock operations. Structural detailing ensures durability and resilience under environmental and seismic loads.

The approach pier will include a concrete abutment and apron that will act as a transition from the landside to the pier.

6.4 MOORING DOLPHIN

The Mooring Dolphin is a standalone pile-supported structure located at the southern end of the WLB Wharf. Its primary function is to extend the effective mooring length of the wharf and absorb berthing energy from vessels. The dolphin consists of a steel platform supported by large-diameter steel pipe piles, with a concrete cap and integrated bollards and fendering.

The dolphin is designed to resist lateral loads from vessel impact and mooring forces, including wind and current effects. It must be operational prior to demolition of the existing dolphin to maintain uninterrupted mooring capability. Fendering systems include foam-filled or polymeric elements to reduce impact forces and protect both the vessel and structure. The dolphin is tied into the overall mooring layout and designed for long-term durability in the marine environment.

6.5 REFERENCES, CODES AND STANDARDS

The following references, standards, and codes shall be used where appropriate for the design:

a) American Associations of State and Highway Transportation Officials (AASHTO), *LRFD Bridge Design Specification*, 10th Edition, 2020

b) American Concrete Institute (ACI), Building Code Requirements for Structural Concrete and Commentary, ACI 318-19, 2019

c) American Concrete Institute (ACI), *Specifications for Structural Concrete*, ACI 301-16, 2020

d) American Institute of Steel Construction (AISC), ANSI/AISC 303-16, *Code of Standard Practice for Structural Steel Buildings and Bridges*, 2016

e) American Railway Engineering and Maintenance-of-Way Association (AREMA), *Manual for Railway Engineering*, 2016.

f) ASCE/SEI 7-16 Standard, Minimum Design Loads for Buildings and Other Structures, 2016

g) ASCE 24-14 Standard, Flood Resistant Design and Construction, 2014

h) ASCE 61-14 Standard, Seismic Design for Piers and Wharves, 2014

i) ANSI/AWS D1.1, Structural Welding Code – Steel, 2015

j) ANSI/AWS D1.4, Structural Welding Code – Reinforcing Steel, 2011

k) ANSI/AWS D3.6, Structural Welding Code – Underwater Welding, 2017

l) American Institute of Steel Construction (AISC), ANSI/AISC 360-16, Specification for Structural Steel Buildings, 2016.

m) International Code Council, *International Building Code* (IBC), 2021

n) Precast/Prestressed Concrete Institute (PCI), *PCI Design Handbook*, 8th Edition, 2017

o) American Wood Council, National Design Specification (NDS) for Wood Construction, 2018

p) The Aluminum Association, *Aluminum Design Manual*, 2020

q) Unified Facilities Criteria (UFC) 1-200-01 *General Building Requirements*, 2020

r) Unified Facilities Criteria (UFC) 3-190-06 *Protective Coatings and Paints*, 2004

s) Unified Facilities Criteria (UFC) 3-220-01 *Geotechnical Engineering Procedures for Foundation Design of Buildings and Structures*, 2012

t) Unified Facilities Criteria (UFC) 3-220-01A *Deep Foundations*, 2004

u) Unified Facilities Criteria (UFC) 3-220-02 *Pile Driving Equipment*, 2004

v) Unified Facilities Criteria (UFC) 3-220-03FA *Soils and Geology Procedures for Foundation Design of Buildings and Other Structures*, 2004

w) Unified Facilities Criteria (UFC) 3-301-01 *Structural Engineering*, Change 2, September 2024

x) Unified Facilities Criteria (UFC) 3-310-04 *Seismic Design of Buildings*, With Change 1, 2013

y) Unified Facilities Criteria (UFC) 3-570-06 *O&M: Cathodic Protection Systems*, 2019

z) Unified Facilities Criteria (UFC) 4-151-10 *General Criteria for Waterfront Construction*, 2012

aa) Unified Facilities Criteria (UFC) 4-152-01, *Design: Piers and Wharves*, 2017

bb) Unified Facilities Criteria (UFC) 4-159-03, *Design: Moorings*, 2020

6.6 DESIGN CRITERIA

6.6.1 Geometric Constraints

The new WLB wharf will be a minimum of 250 feet in length and 65 feet wide, with its face offset from the face of the existing wharf at an angle to avoid the underwater obstruction of the sea plane ramp to the North of the site. The new FRC floating dock will be aligned with the new WLB wharf to the Northwest, creating an approximately 450 foot long wharf and dock system, connected by a gangway structure between the two elements.

- WLB Wharf: 250 feet by 65 feet
- Approach Pier: ~185 feet by 35 feet
- Gangway: 65 feet minimum length, 5 feet minimum width
- Dolphin: Positioned to extend mooring length of WLB Wharf to 275 feet

6.6.2 Environmental Criteria

The following environmental criteria shall govern the design of the new structures:

6.6.2.1 Wind

Wind force will be applied to both moored vessels and marine structures and their appurtenances (e.g. wharf, trestle, gangway, etc.) as required by applicable codes and standards. The design wind loads shall be considered for two discrete mooring cases as follows:

- Mooring Forces Case A: The occupied dock shall be designed to resist the wind load on a single moored vessel to any of the dock segments during a 75 mph Wind Speed from any angle + broadside wave forces + longitudinal current for a tidal range of Mean High Water Datum plus one foot (MHW +1.0 foot surge height).
- Mooring Forces Case B: The vacant dock (no ship present) system shall be designed to resist a Wind Speed of 100 mph from any angle in combination with broadside wave forces (but need not consider passing vessel wave forces), for a tidal range of Mean High Water Datum plus one foot (MHW +1.0 foot surge height).

Wind forces shall consider wind direction from the full arc of 0-degrees to 180-degrees at 15-degree increments.

6.6.2.2 Tides and Current

The following tidal datums, referenced to Mean Lower Low Water (MLLW), are provided based on data obtained from the National Oceanic and Atmospheric Administration (NOAA) tide gauge at Sitka Alaska (Station 9451600).

a) Extreme High Water Observed = 14.88ft
b) Highest Astronomical Tide (HAT) = 12.81ft
c) Mean Higher High Water (MHHW) = 9.94ft
d) Mean High Water (MHW) = 9.16ft
e) Mean Tide Level (MTL) = 5.31ft
f) Mean Sea Level (MSL) = 5.29ft
g) Mean Diurnal Tide Level (DTL) = 4.97ft
h) Mean Low Water (MLW) = 1.46ft

i) Mean Lower Low Water (MLLW) = 0.00ft

j) Lowest Astronomical Tide (LAT) = -3.29ft

k) Extreme Low Water Observed = -4.10ft

Currents in the vicinity of the proposed wharf structure vary depending on the time of year and specific location. For the purposes of design, currents shall be assumed to 2 knots.

6.6.2.3 Seismic Design Criteria

The design of the pile supported structures will be performed with Displacement Based design methodology. The design will be consistent with the methodology presented in ASCE 61-14 Seismic Design of Piers and Wharves.

The following seismic design criteria are provided for the site, pending confirmatory recommendations from the project geotechnical engineer:

a) Seismic Site Class C

b) Mapped Spectral Response Acceleration Values:

- Ss 0.941g
- S1 0.600g

c) Importance Factor (per UFC 3-301-01): 1.5

d) Risk Category: IV

e) Design Classification: Moderate, per ASCE 61-14

f) Minimum Seismic Hazard (Return Period) and Performance Requirements, per ASCE 61-14:

- Operating Level Earthquake: N/A
- Contingency Level Earthquake: 224-yr RP, Controlled and Repairable Damage
- Design Earthquake: Per ASCE 7, Life Safety Protection

6.6.3 Material Properties

The following material and design specifications are recommended as minimum parameters for the proposed project. All materials shall be new and of the best quality of their respective kinds as described or if not stated, to be at least in accordance with the relevant ASTM International (ASTM) standards.

6.6.3.1 Concrete

a) All concrete work shall be performed in accordance with ACI 301 *Specifications for Structural Concrete* and all reinforced concrete materials shall be proportioned,

fabricated, delivered, and placed in accordance with ACI 318 *Building Code Requirements for Structural Concrete and Commentary*.

b) All cast-in-place, precast, and prestressed concrete shall be normal weight concrete.

c) Cement shall conform to the requirements of ASTM C150, Type II, unless otherwise specified

d) Concrete aggregates shall conform to the requirements of ASTM C33

e) Admixtures for concrete shall be in accordance with manufacturer's recommendations and shall conform to the requirements of ASTM C494

f) Mix water for concrete shall be clean, fresh, and potable

g) Precast and cast-in-place concrete shall be afforded corrosion protection measures, as required, through the use of concrete admixtures, such as air-entraining compounds, calcium nitrite, or other approved methods as specified. Concrete subject to immersion and splash shall be provided with a calcium nitrite corrosion inhibitor sufficient to provide for a nitrite content of not less than 5.1 pounds per cubic yard in the hardened concrete.

h) Cast-in-place concrete shall have a minimum compressive strength (f'c) of 5,000 psi (pounds per square inch) at 28 days

i) Precast, non-prestressed concrete shall have a minimum compressive strength (f'c) of 6,000 psi at 28 days

j) Cementitious grout (other than for auger cast piles) shall be non-metallic and non-shrink with a minimum compressive strength of 8,000 psi at 28 days, unless otherwise specified

k) The minimum concrete cover over reinforcing steel shall be 3 inches, unless otherwise indicated

l) Chamfer all exposed external corners of concrete with 45 degree, 3/4 inch chamfers, unless otherwise indicated

m) All joints between cast-in-place concrete and hardened concrete shall be cleaned with a roughened surface of 1/4 inch amplitude and coated with an epoxy bonding compound in accordance with manufacturer's recommendations, unless otherwise indicated

6.6.3.2 Reinforcing Steel

a) All detailing, fabrication, and erection of reinforcing steel shall conform to the latest edition of the *ACI Manual of Concrete Practice*, including but not limited to: ACI 301 and ACI-SP-66, *ACI Detailing Manual.*

b) Reinforcing steel for concrete shall conform to the requirements of ASTM A615, Grade 60, unless otherwise specified.

c) Reinforcing steel to be welded shall conform to the requirements of ASTM A706, Grade 60

d) All welding of reinforcing steel shall conform to the requirements of ANSI/AWS D1.4

e) Welded wire fabric reinforcement for concrete shall conform to the requirements of ASTM A1064

f) Mild steel spiral reinforcement for concrete shall conform to the requirements of ASTM A1064

g) All reinforcing bar splices shall be Class “B” tension lap splices in accordance with ACI 318-19, unless otherwise indicated

h) Lifting inserts shall be provided in all applicable precast members to facilitate lifting and supporting members during erection. Additional reinforcing steel shall be provided as necessary to prevent cracking during handling, delivery, and erection

6.6.3.3 Steel Pipe Piles

a) Steel pipe piles shall conform to the requirements of ASTM A252 and ASTM A572, Grade 50

b) Pipe piles shall have a minimum diameter of 18 inches and a maximum diameter of 30 inches.

c) All steel pipe piles shall be hot-dipped galvanized for a minimum of 8 feet below the mudline to the pile top.

d) All steel pipe piles shall be concrete filled; the concrete shall be a minimum 4,000 psi concrete.

e) Pipe piles shall be checked for the presence of water in the pipe, a maximum of 24 hours prior to placing fill. If water is found, it shall be removed before placing fill. Concrete fill shall be placed by tremie method and may be placed either before or after the piles are installed.

6.6.3.4 Structural and Miscellaneous Steel

a) All steel work shall be performed in accordance with the AISC Code of Standard Practice for Steel Buildings and Bridges

b) All above-water welding of structural steel shall conform to the requirements of ANSI/AWS D1.1

c) All underwater welding of structural steel shall conform to the requirements of AWS D3.6

d) Structural steel shapes, plates, and bars shall conform to the requirements of ASTM A36, ASTM A572, and/or ASTM A992 as applicable

e) Structural carbon steel fasteners shall conform to the requirements of ASME/ANSI B18.2.2 and ASTM F3125, unless otherwise specified

f) Washers shall be circular flat smooth and shall conform to ANSI B18.22.1, unless otherwise specified

g) Concrete anchor bolts shall conform to the requirements of ASTM F1554 Grade 36, unless otherwise specified

h) Welded studs shall conform to ANSI B18.2.2 and ASTM F3125

i) All structural steel shapes, plates, bars, miscellaneous fabrications, bolts, and all hardware except stainless steel shall be zinc-coated or galvanized by the hot-dip process in accordance with the requirements of ASTM A123 and/or ASTM A153 as applicable, after fabrication, in the shop, unless otherwise noted

6.6.3.5 Miscellaneous Materials

Aluminum materials and fabrication shall conform to the *Aluminum Design Manual* of The Aluminum Association.

6.6.4 Design Loads

6.6.4.1 General

The structures shall be designed for the loading requirements provided herein. Where loading conditions exist that are not specifically identified herein, the Designer shall rely on accepted industry standards. However, in no case shall other standards supersede the requirements specified.

6.6.4.2 Dead Loads

A. General

Dead loads consist of the weight of the entire structure, including all the permanent attachments such as rails, crossover castings and associated hardware. A realistic assessment of all present and future attachments shall be made and included for consideration.

B. Unit Weights

Actual and available construction material weights shall be used for the design of the structure. When specific item weights are not readily available, the following typical unit weights shall be used (where pcf denotes pounds per cubic foot; plf denotes pounds per linear foot; psf denotes pounds per square foot):

a) Steel or Cast Steel 490 pcf
a) Cast Iron 450 pcf
b) Aluminum Alloys 175 pcf
c) Timber (treated and untreated) 50 pcf
d) Reinforced Concrete (normal weight) 150 pcf
e) Compacted Sand, Earth, Gravel, or Ballast 120 pcf moist, 125 pcf Saturated
f) Asphalt Paving and Graded Aggregate Base (GAB) 145 pcf

6.6.4.3 Vertical Live Loads

The approach pier and WLB wharf are subjected to the following vertical live loads:

a) Uniform Live Load
b) Concentrated Live Loads:
    - 75-ton mobile crane outrigger (distributed across 4 foot by 4 foot cribbing pad)
c) Vehicular Live Loads
    - AASHTO HS20-44
    - 20-ton Dual Axle Magni Telehandler (in transit with load)
    - 75-ton mobile crane
    - 9-ton Buoy Storage on Deck (distributed over a 1 foot by 2 foot block)
d) Gangway Live Loads
    - 100 psf uniformly distributed or 300 lb concentrated over 6 inch by 6 inch area at any location along gangway
    - Minimum 50 plf electrical utilities along one side
    - Minimum 50 plf mechanical utilities along one side

The approach pier and WLB Wharf are subjected to uniform live loads, concentrated loads, and vehicular live loads. The gangway structure is subjected to uniform live loads, point loads, and mechanical/electrical loads on one side. These live loads are outlined by type and affected structure below.

A. Uniform Live Loading, point loading, and linear Loading

All pile-supported waterfront structures shall be designed for a 600 psf (pounds per square foot) uniformly distributed live load, using alternate and adjacent span load combinations to produce the envelope of governing design forces. Uniform live load shall be applied to produce maximum stresses, unless otherwise noted.

The gangway structure shall be design for a 100 psf uniform live load or a 300 lb point load acting on a 6 inch by 6 inch area at any location. Additionally, the gangway shall be designed for minimum 50 lb per linear foot mechanical utilities load on one side and a minimum 50 lb per linear foot electrical utilities load on one side.

B. Concentrated Live loading

The WLB shall consider a concentrated live load for a 75-ton mobile crane outrigger. The load shall be assumed to be distributed over a 4 foot by 4 foot cribbing pad area.

C. Vehicular Live Loading

The approach pier and the WLB wharf will be subjected to the following vehicular live loads:

a) AASHTO HS20-44 (see Figure 6-1)

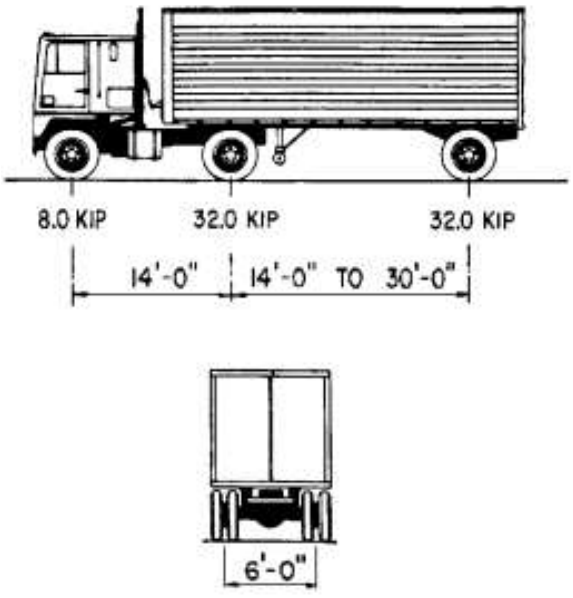
b) 20-ton Dual Axle Magni Telehandler (in transit with load)

c) 75-ton mobile crane

d) 9-ton Buoy Storage on Deck (distributed over a 1 foot by 2 foot block)

Truck loading shall be in accordance with the AASHTO *Standard Specifications for Highway Bridges*; Impact factor shall be 1.15.

Figure 6-1: HS20 Loading



6.7 STATIC EARTH PRESSURE

Static earth pressure acting on retaining structures shall be determined in consideration of subsurface characteristics including unit weights of soils, angle of internal friction, and

cohesion, and hydrostatic pressures in accordance with recommendations provided in the project geotechnical report and with accepted engineering practice. Soil friction angle shall be 30 degrees for the man-placed compacted granular fill behind the new wharf retaining walls, around utility structures, and around the building foundations. The sliding friction coefficient between building foundations and compacted existing granular subgrade shall be 0.4.

6.8 ENVIRONMENTAL LOADS

6.8.1 Seismic Loading

Seismic mass includes the self-weight of the structure, supported soil, and 10% of the uniform live load. Earthquake loads are applied in combination with other service loads using load factors per UFC 4-152-01. Structural components such as piles, pile caps, and retaining walls are evaluated for lateral and vertical seismic effects. Liquefaction is not anticipated based on subsurface conditions and factor of safety analyses.

Seismic load combinations are included in Section 6.6 and follow UFC and ASCE guidelines for both LRFD and service load design. All marine structures are designed to remain operational following a seismic event, with ductile detailing and redundancy incorporated where applicable.

6.8.2 Wind Load on Structures

Wind load on structures shall be based on the wind load requirements specified in Section 6.6.2.1 above.

6.8.3 Snow and Ice Loads

Based on historical climate data for the region and the protected nature of the project site, snow and ice accumulation is not anticipated to be significant and need not be considered in the design.

6.8.4 Temperature

Thermal stresses and strains are to be applied to the concrete transfer platform structure using a mean temperature of 70°F (Fahrenheit) with a temperature rise of 35°F and a temperature fall of 45°F.

6.8.5 Mooring

Mooring Service Type IIB, Table 3-4, per UFC 4-159-03 shall be used to substantiate the new mooring hardware system capacity for the respective vessels (FRC and WLB). A mooring analysis shall be conducted for design vessels considering a 75-mph wind speed, resulting waves from governing direction, and a 2-knot longitudinal current at tide levels from MLLW to MHHW plus one foot. The layout of mooring devices shall support port and starboard mooring configurations. The WLB mooring lines are assumed to be

adjusted at the first mean tide after berthing of the ship. Thereafter, lines are only tended when tides exceed MHHW or MLLW.

The design shall include a minimum of six, 100-ton mooring bollards, approximately equally spaced (unless mooring calculations dictate a higher capacity) along the outboard face of the new WLB wharf and the new mooring dolphin.

6.8.6 Berthing

A berthing analysis shall be performed for the WLB design vessel at the proposed wharf following UFC 4-152-01 methodology. The berthing analysis performed for the project shall assume that the vessel approach velocity is 0.74 fps (per UFC 4-159-03 for moderate exposure), an accidental berthing impact factor of 1.5 per UFC 4-152-01, and a ship approach angle of 15-degrees from the longitudinal axis of the berth. The berthing energy is assumed to be distributed into the fender pile system through provided mooring camels.

6.8.7 Wave and Current Loading

Analysis of wind-wave growth and propagation will be conducted for mooring analysis wind speeds to determine site-specific design wave conditions. The analysis will consider wind directions in 15-degree increments spanning a 330° to 180° arc. Horizontal wave loads on wharf piles and wave uplift forces on the wharf deck will be provided for consideration under a 100-yr still water level. Passing vessel waves will not be considered. For the purposes of design, currents shall be assumed to be 2 knots.

6.9 APPLICATION OF LOADINGS

6.9.1 Concentrated Loads

Wheel loads from designated pneumatic-tired equipment such as trucks and mobile truck cranes, as well as outrigger float loads (lifting loads) associated with vehicles and equipment described herein, may be applied at any point on the applicable structures. Equipment may be oriented in any direction and the position causing maximum stress on the structural members shall be used in the design. Loads shall be applied to the wharf deck in a logical manner, and the dimensional limits of the loading shall reflect equipment dimensions provided herein.

6.9.2 Simultaneous Loads

Uniform and concentrated live loads should be applied in a logical manner. Designated uniform live loadings and concentrated live loadings should not be applied simultaneously in the same area.

6.9.3 Loading for Maximum Stress

For determining shear forces and bending moments in continuous structural members, the designated uniform and concentrated loadings shall be applied on only those spans which produce the maximum effect.

6.9.4 Critical Loadings

Concentrated loads from trucks and other specialty vehicles and equipment, including outrigger float loads associated with the truck cranes, are generally critical for punching shear and the design of short spans such as deck slabs, trench covers, and utility vault covers. Uniform loading and truck crane outrigger float loads are generally critical for the design of beams, pile caps, and support piles.

6.9.5 Load Combinations

6.9.5.1 General

The structures shall be proportioned to safely resist the load combinations represented in the following Table 6-1 and Table 6-2 taken from UFC 4-152-01. These tables list load factors (β) to be used for each combination and the percentage of unit stress applicable for service load combinations. Each component of the structure and the foundation elements should be analyzed for all applicable load combinations. The algebraic signs (+ or -) should be those that produce the most unfavorable (yet realistic) loading.

6.9.5.2 Load Combination Equation

$$S_i \text{ or } U_i = \beta_D D + \beta_L (L_c + \text{I or } L_u) + \beta_{Be} B_e + \beta_B B + \beta_C C + \beta_E E + \beta_{Eq} Eq + \beta_W W + \beta_{Ws} W_s + \beta_{RST} (R + S + T) + \beta_{Ice} Ice$$

Where:

S_i = service load combination

U_i = ultimate load combination

β_x = load factor listed below

6.9.5.3 Load Symbols

The following load symbols are applicable for the previous Load Combination Equation:

D =	Dead Load	L_u =	Live Load (Uniform)
L_c =	Live Load (Concentrated)	I =	Impact Load (for L_c Only)
B =	Buoyancy Load	W =	Wind Load on Structure/Vessel
C =	Current Load on Structure	C_s =	Current Load on Ship
E =	Earth Pressure Load	Eq =	Earthquake Load

R = Creep/Rib Shortening *S* = Shrinkage

T = Temperature Load *Ice* = Ice Pressure

Earthquake load is dependent on the seismic mass of the structures under consideration. Seismic mass shall be considered as the self-weight of the structures and any supported soils and 10% of supported uniform live load, according to ASCE 61-14 Chapter 3.7.3. The weight of the vessels shall not be considered as seismic mass.

6.9.6 Load Factor Design

Concrete structures for piers and wharves may be proportioned using the Load and Resistance Factor Design (LRFD) or ultimate strength method; however, they should be checked for serviceability and construction loads. Load combinations are presented in Table 6-1.

6.9.7 Service Load Design

Concrete and steel structures may also be proportioned using service load combinations and allowable stresses. The service load approach should be used for designing all foundations and for checking foundation stability. Load combinations are presented in Table 6-2.

Table 6-1: LRFD Load Combinations

	1	2	3	4	5	6	7	8
D	1.4	1.2	1.2	-	1.2	1.2	0.9	0.9
L	-	1.6**	1.0	-	1.0	0.16*	-	-
C	1.4	1.2	1.2	-	1.2	1.2	0.9	0.9
E	1.6	1.6	1.6	-	1.6	1.6	1.6	1.6
Eq	-	-	-	-	-	1.0	-	1.0
W	-	-	-	-	1.0	-	1.0	-
RST	-	1.2	-	-	-	-	-	-
Ice	-	0.5	-	-	1.0	-	1.0	-

** Applied as a gravity load in combination with earthquake loads. When included in seismic mass, factor is 0.1.*

***Load factor is 1.6 for uniform live load, 1.3 for outrigger loads*

Table 6-2: Service Load Design Load Combinations

	1	2	3	4	5	6	7	8	9	10
D	1.0	1.0	1.0	1.0	1.0	1.0	-	-	0.6	0.6
L	-	1.0	-	0.75	0.75	0.1	-	-	-	-

C	1.0	1.0	1.0	1.0	1.0	1.0	-	-	0.6	0.6
E	1.0	1.0	1.0	1.0	1.0	1.0	-	-	1.0	1.0
Eq	-	-	-	-	-	0.7	-	-	-	0.7
W	-	-	-	-	0.6	-	-	-	0.6	-
RST	-	1.0	-	0.75	-	-	-	-	-	-
Ice	-	0.7	0.7	-	-	-	-	-	0.7	-

6.9.8 Design Life

The design life of all waterfront structural concrete and steel components of the new approach pier, wharf, floating dock, mooring dolphin, and gangway, shall be a minimum of 75 years.

The design life of all metal railing, stairs, stair landings, access lids, trench covers, etc. shall be a minimum of 50 years.

6.9.9 Corrosion Protection

All fasteners, anchors, and miscellaneous connections shall be made of corrosion compatible materials. The design shall incorporate, but is not limited to, additional “sacrificial” material thickness, passive anodes, stainless steel, epoxy coated rebar, hot-dip galvanization and/or high-performance coatings to ensure structures meet design service life requirements.

6.9.9.1 Steel Pipe Piles

Steel pipe piles shall be hot-dipped galvanized to a minimum of 8 feet below existing mudline, assumed to provide 10 years of protection of the base steel according to UFC 4-151-10 Table 5-1, with a further 65 years of corrosion of sacrificial steel thickness.

6.9.9.2 Steel Hardware

Steel hardware such as railing, stairs, access lids, etc. shall be hot-dipped galvanized on all surfaces.

6.9.9.3 Concrete Reinforcement

Reinforcing may be either epoxy coated, black steel, composite, or stainless steel if protective cover, corrosion inhibitor admixtures and concrete density are considered, and a 75-year service live objective is met. The design shall isolate coated reinforcing from direct contact with non-coated steel fabrications, anchor bolts, pile dowels and rails.

7.0 ARCHITECTURAL

7.1 PRELIMINARY CONCEPT BUILDING PLAN

The new Boat Bay Building is a heated building not routinely occupied by 11 or more people. Gross floor area to be a minimum of 1,467 as measured from face of cladding to face of cladding. Design of the Boat Bay Building to meet the requirements of the Memorandum of Agreement between USCG and the State Historic Preservation Office, which includes:

7.1.1 Applicable Codes & References List

- 2021 IBC 2021 International Building Code
- NFPA 101 National Fire Protection Association Life Safety Code
- ADAAG 2010 ADA Accessibility Guidelines
- NRCA Manual National Roofing Contractors Association Roofing and Waterproofing Manual

7.1.2 Walls

The exterior walls of the facility consist of a pre-engineered metal building with exterior metal wall panels; wall systems shall be a prefinished single skin metal panel siding on an insulated metal panel backup wall system. The prefinished single skin metal panel siding shall resemble horizontal clapboard siding and meet SHPO requirements. Panels shall be made from minimum 22 gauge galvanized steel G90 galvanized, per ASTM A653, and painted on exterior with a full strength 70% fluoropolymer (Kynar 500 or Hylar 5000) finish with a dry film thickness of 0.9 mil minimum (color as recommended by Architect from manufacturer's standard color range and approved by the Government). The exterior and interior panel wall insulation shall be a minimum of R-19, designed to target 30% energy consumption reduction from the baseline set by ASHRAE 90.1, unless deemed unfeasible based on site and building constraints, energy source availability, and a 40-year life cycle cost analysis. Design and construct the building envelope with a continuous air barrier to control air leakage into, or out of, the conditioned space that shall meet the requirements of ASHRAE Standard 189.1, Section 7.4.2.9, Continuous Air Barrier.

7.1.3 Roof

Roofing shall be metal standing seam panels, galvanized per ASTM A653 with a fluoropolymer coating from the manufacturers standard colors to match existing adjacent USCG buildings on site. Roofing to include a 20-year manufacturer’s warranty against blistering, peeling, cracking, chipping, or rust. Roof insulation shall be a minimum of R-30, designed to target 30% energy consumption reduction from the baseline set by ASHRAE

90.1, unless deemed unfeasible based on site and building constraints, energy source availability, and a 40-year life cycle cost analysis.

The roof will be sloped at 1:3 to pre-finished metal gutter and downspouts that will connect to a below grade storm water system.

7.1.4 Fasteners

- Concealed fasteners for anchor clips shall be #10-13- 1 inch or #10-16- 1 inch long pancake head #2 Phillips drive screw as required.
- Concealed fasteners for flashing attachment shall be #10-13- 1 inch or #10-16-1 inch long truss head #2 Phillips drive screw as required.
- There shall be no exposed fasteners except to fasten flashing at fixing points, or for panel attachment as dictated by warranty requirements for longitudinal thermal expansion and contraction, or as indicated on the shop drawings.

7.1.5 Doors & Windows

The exterior personnel doors and frames will be fiberglass reinforced plastic (FRP) with a seamless, minimum 15 mil thick gel coat color finish that is applied at the time of manufacturing. Doors shall be 1-3/4 inches thick with reinforced frame perimeters, hinge pockets, lockset and closer locations and polyurethane core construction between the FRP face panels. Vision lights shall be installed by the door manufacturer at the time of manufacture; glazing shall meet the requirements of the Large Missile Test of ASTM E1996. All doors shall be fully weather stripped and include a heavy-duty fiberglass or metal threshold that prevents drafts, dirt, water, and insect entry.

A single overhead insulated rolling or coiling service door shall be 12 feet by 12 feet, with R-8 minimum, galvanized steel slats with the exterior slat face being minimum 20 gauge and inside slat face being minimum 24 gauge. Insulation shall be foamed-in-place, closed cell urethane.

Eight total fixed, thermally broken, extruded aluminum windows are arranged on the long facades to provided daylight to the interior workspace, which includes three work bench stations with tool storage. Finish of windows shall either be heavy anodized Architectural Class I (0.7mil or thicker AA-M10-C22-A41) or a 20 year “Kynar” color finish. The window shall have successfully passed the impact and cycle requirements of South Florida protocols, TAS-201, TAS-202 and TAS-203, and have NOA's and Florida Product Approval for large missile impact. Window and other exterior glass shall be low “E” meet the requirements of the Large Missile Test of ASTM E1996. Laminated glass used to make up the insulating glass units shall consist of not less than two 1/8 inch thick panes of glass bonded together with a minimum 0.09 inch thick polyvinyl-butyral (PVB) interlayer. Insulating glass units shall be installed in frames using structural silicone sealant.

All exterior doors and windows must have a Miami-Dade Notice of Acceptance (NOA) per the New Building Design and Construction CSTO.

Door / Window Type	Door / Window Frame Material	Hardware Type
Exterior Personnel Doors	FRP Insulated Door, FRP Frame	Classroom lockset, exterior weather stripping/drips, touch bar exit device
Boat Bay Door	12' w x 12' h Insulated Overhead Rolling/Coiling	Controls by manufacturer
Fixed Exterior Windows	Architectural Severe Duty Aluminum, with durable material at sills (such as 3/4" thick synthetic solid surface material, 3/4" marble, or anodized aluminum to match the window frames)	N/A

7.1.5.1 Floors

The concrete slab of the boat bay building shall be covered with slip resistant, thin-section, trowel applied, decorative epoxy flooring system, designed to produce a seamless floor and cove base.

Room / Space	Floor	Wall	Ceiling
Boat Bay	Seamless Epoxy	Interior surfaces, except factory pre-finished materials, shall be painted a minimum of one prime coat and two finish coats of latex eggshell enamel.	Vinyl backed insulation and exposed structure

7.2 STRUCTURAL

The Boat Bay building will be anchored to, and supported by, reinforced concrete foundation walls and footings.

7.2.1 Applicable Codes & References List

- UFC 3-301-01 Structural Engineering, 10 October 2024
- UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings with Change 1 (19 August 2020)
- 2021 IBC 2021 International Building Code
- ACI 318-19 Building Code Requirements for Structural Concrete
- AISC 360-16 Specification for Structural Steel Buildings
- ASCE 7-16 Minimum Design Loads and Associated Criteria for Buildings and Other Structures

7.2.2 Design Criteria

- Building Risk Category: II
- Dead Loads
- Superimposed Dead Loads
  - Mechanical Plumbing and Electrical 15 psf
  - Roofing – Insulated Metal Roof 5 psf
  - Sprinkler Systems 5 psf
  - Five Unit Heaters hung from roof structure (500 pounds each)
- Live Loads
  - Habitable Areas 40 psf
  - Stairs and exit ways 40 psf or 300 lbs concentrated
  - Balconies and decks 60 psf or 300 lbs concentrated
  - Parking and Driveways 500 psf
  - Storage above ceilings 20 psf
  - Maintenance bay 250 psf
  - Crane 3-ton
  - Garage floor area 40 psf
  - Snow Loads
  - Ground Snow Load 50 psf
  - Importance Factor 1.0
  - Exposure Category Ce 1.0
  - Minimum Roof Snow Load 50 psf
- Special Live Loads
  - Equipment loads shall include curbs and any other appurtenances.
  - Roof areas used to access roof mounted equipment for maintenance shall be designed for Uniform Live Load of 40 psf or a concentrated live load of 300 pounds, whichever governs.
- Wind Parameters
  - Wind Exposure Category: D

- Basic Wind Speed: 150 mph
- Risk Category II
- Surface Roughness Category C

- Seismic Parameters
  - Site Class D
  - Soil Site Class C
  - Short Period (Ss) 0.941 g
  - 1 Sec Period (S1) 0.60 g
  - Spectral Response Coefficient (SDS) 0.753 g
  - Spectral Response Coefficient (SD1) 0.530 g

Importance Factors conform to UFC 3-301-01, Table 2-2.

7.2.3 Structural Material and Allowable Stress

a) Structural Steel

- Wide Flange Members ASTM A992 (Fy = 50 ksi)
- Hollow Steel Sections ASTM A500, Grade C (Fy = 50 ksi)
- All other Steel Members ASTM A36 (Fy = 36 ksi)
- High Strength Bolts ASTM A325
- Welding Electrode E70XX

All miscellaneous metal fabrications, such as stairs, grating, handrails, guardrails, angles, anchor bolts, and bollards shall be hot-dipped galvanized with A316 stainless steel hardware.

a) Concrete Compressive Strength

- Foundations 4000 psi
- Cast-in-place concrete 5000 psi

7.2.4 Anti-Terrorism/Force Protection

The building shall incorporate the antiterrorism (AT) based mitigating measures within UFC 4-010-01 DoD Minimum Antiterrorism Standard for Buildings, as specified below:

- Standoff Distance – Government has determined that this building is exempt.
- Unobstructed Space – Government has determined that this building is exempt.

- Parking beneath Buildings or on Rooftops – Parking beneath the building is not authorized and rooftop is not possible with design of the building.
- Progressive Collapse – Government has determined that this building is exempt.
- Building Overhangs and Breezeways – None incorporated in design.
- Exterior Masonry Walls – None incorporated in design.
- Glazing – None incorporated in design.
- Building Entrance Layout – Government has determined that this building is exempt.
- Exterior Doors – Doors shall comply with the UFC.
- Mail Rooms and Loading Docks – None incorporated in design
- Roof Access – Interior access only for the mechanical room, and access to the boat bay is required and shall be secured with locked cages or similar.
- Overhead Mounted Architectural Features – None incorporated in design.
- Air Intakes – Government has determined that this building is exempt.
- Mail Rooms and Loading Dock Ventilation – None incorporated in design.
- Emergency Air Distribution and Shutoff – Shall comply with the UFC.
- Equipment Bracing – Shall comply with the UFC.
- Under building Access – Shall comply with the UFC.
- Mass Notification – Shall Comply with the UFC.

7.3 FIRE PROTECTION

7.3.1 Applicable Codes and Standards

The building will be fully sprinklered, single story, and of Type IIB construction. The building will include an industrial ship maintenance and a mechanical/boiler room.

- UFC 1-200-01, General Building Requirements, October 2020
- UFC 3-600-01, Design: Fire Protection Engineering for Facilities, May 2021
- UFC 4-021-01, Design and O&M: Mass Notification Systems, January 2010
- International Building Code (IBC), 2021 edition, as referenced by UFC 1-200-01 and UFC 3-600-01
- NFPA 1, Fire Code, 2021 Edition
- NFPA 10, Standard for Portable Fire Extinguishers, 2021 Edition

- NFPA 13, Standard for the Installation of Sprinkler Systems, 2019 edition, as referenced by UFC 1-200-01 and UFC 3-600-01
- NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection, 2019 edition, as referenced by UFC 1-200-01 and UFC 3-600-01
- NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances, 2019 edition, as referenced by UFC 1-200-01 and UFC 3-600-01
- NFPA 30A, Code for Motor Fuel Dispensing Facilities and Repair Garages, 2021 Edition
- NFPA 70, National Electrical Code, 2020 edition, as referenced by UFC 1-200-01 and UFC 3-600-01
- NFPA 72, National Fire Alarm and Signaling Code, 2019 Edition, as referenced by UFC 1-200-01 and UFC 3-600-01
- NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems, 2018 Edition
- NFPA 101, Life Safety Code, 2018 Edition, as referenced by UFC 1-200-01 and UFC 3-600-01

7.3.2 Building Description

The new FRC Maintenance Building will be a single-story building of Type II-B Construction. The building structure will be a pre-engineered metal building.

See Architecture Section for further descriptions.

Table 7-1: Construction Type (IBC Table 601)

Building Element	Type of Construction	Fire Resistance Rating
Primary Structural Frame	II-B	0 hours
Non-Bearing Exterior Wall	II-B	0 hours
Slab on Grade	II-B	0 hours

Table 7-2: Occupancy Classification

Areas*	Occupancy	IBC	NFPA 101
Boat Bays	Industrial	F-1	Special Purpose Industrial

** UFC defined occupancy, per UFC 3-600-01 Table 10-1.*

Table 7-3: Allowable vs. Actual Building Area (IBC 506)

Occupancy	Allowed Area	Frontage Area Factor Increase	Adjusted Allowed Area (sprinklered)	Actual Area
F-1	46,500 ft^2	Not Needed	46,500 ft^2	1,467 ft^2

Table 7-4: Allowable vs. Actual Building Height and Stories

Allowable Building Height (ft)	Actual Building Height (ft)
75 (IBC Table 504.3)	1 (IBC Table 504.4)

Table 7-5: Occupant Load Calculations

Occupancy Use	Code Reference	Occupant Load Factor (SF/Person)	Area Type
Special Purpose Industrial	NFPA 101 Table 7.3.1.2	100	Gross

Table 7-6: Common Path, Dead-End, and Travel Distance Limits (NFPA 101 Table A.7.6)

Occupancy	Common Path Limit (ft.)	Dead End Limit (ft.)	Travel Distance Limit (ft.)
Special Purpose Industrial	100	50	400

Table 7-7: Minimum Interior Finish Ratings (NFPA 101 Table A.10.2.2)

Occupancy	Exits	Exit Access Corridors	Other Spaces
Special Purpose Industrial	Class A or B, Class I or II	Class A or B, Class I or II	Class A, B or C

Table 7-8: Fire Suppression Requirements (UFC 3-600-01 9-7.2, 9-10, 9-17 and RFP)

Sprinklers	Standpipe	Fire Extinguishers
Not required	Not required	Required per the RFP
		NFPA 10 Table 6.2.1.1

Table 7-9: Fire Alarm Requirements (UFC 3-600-01 9 9-18 and RFP)

Manual Initiation	Automatic Initiation	Occupant Notification
Manual fire alarm pull stations at all exits	Spot smoke detectors, linear heat detection	Voice messaging

Table 7-10: Emergency Lighting and Exiting

Occupancy	Emergency Lighting*	Exit Signage
Special Purpose Industrial	Required (NFPA 101 40.2.9)	Required (NFPA 101 40.2.10)

Table 7-11: Smoke Management Systems

Smoke Control System	Smoke and Heat Vents	Passive Smoke Management
Not required	Not required	Not required

Table 7-12: Fire Hydrant Distribution and Fire Department Access (UFC-3600-01 9-1.1, 9 -3.5)

Distance to Building (ft)	Distance to FDC (ft)	Fire Truck Access (ft)
350	150	33

7.4 TECHNOLOGY

7.4.1 Telecommunications

The Telecommunications design, installation, and testing for this project will be done in accordance with the following standards/codes: TIA-568, TIA-569, TIA/EIA-606, TIA/EIA-J-STD-607 and TDMM standards and the NFPA 70. Testing of all Telecommunications cabling, and systems will be performed per the specifications. Telecommunications conduit will be a minimum size of 1 inch and sized appropriately above 1 inch based on cable counts and diameters. Conduit bends will be limited to a total of 180 degrees between pull points and conduit size will provide for 100% growth when calculating cross-sectional area of the cabling.

Conduit penetrations for Telecommunications, that require fire-stopping, will be constructed per the NEC and TIA-569. One 3/4 inch by 4 feet by 8 feet fire rated sheet of plywood will be provided on one wall in the mechanical room for mounting all Telecommunications equipment.

7.4.2 Grounding and Bonding

A Telecommunications Main Grounding Busbar (TMGB) will be provided at the service entrance and Telecommunications equipment. The bus-bar will be 1/4 inch by 4 inch by 20 inch flat copper and drill holes will be configured to accept two-hole bolt-on lugs. TMGB will be bonded to the main Electrical Service grounding Electrode system for the building and all telecom equipment, to include BEP's, cabinet, panels, etc. will be tied to the TMGB with a #6AWG CU cable with two-hole compression type lugs.

7.4.3 Outside Plant (OSP) and Campus Pathways and Cabling

A ductbank will be provided consisting of two 4-inch conduits from the new building's Mechanical Room to existing Telecommunications Manhole 32B next to Building 47. One conduit will have two 1 inch innerducts included for optical fiber cabling. Concrete encasement for the ductbank will have a minimum compressive strength of 2500 psi. Steel reinforcement will be provided within encasement under paved areas for vehicular traffic above. Two manholes (6' x 6' x 6' & 6' x 6' x 8') will be required and the estimated total length of ductbank is 560 feet.

A 12-strand Single Mode Optical Fiber cable, a 25-pair PE89 copper twisted pair cable and a 24-strand indoor/outdoor rated, multi-mode, 62.5u, optical fiber cable will be provided and installed within the new ductbank. Wall mount fiber enclosures will be provided with ST style connectors for the two optical fiber cables in the Mechanical Room. A Building Entrance Protector (BEP) and two wall mount 110 blocks will be provided for copper twisted pair cabling protection and distribution. Origination point of each cable on the site to be determined.

7.4.4 Building Backbone/Riser Pathway and Cabling

Pathways for backbone cabling will not exceed 180 degrees of bends between pull points and the pathway will not exceed 100 feet without a pull box. All conduit bends will have a bend radius of 10 times the conduit diameter.

7.4.5 Horizontal Pathway and Cabling

Conduit for Telecommunications cabling will be a minimum 1-inch diameter and will be dedicated to Telecommunications cabling only.

Horizontal cabling will be CAT 5e and terminations will be configured per the T568A standard. All conduit and horizontal cabling penetrations will be fire-stopped per the TIA-569 standard.

7.4.6 Telecommunications Work Area (WAO) Requirements

A telephone outlet will be provided within 10 feet of the north entry point of each boat bay.

7.4.7 Public Address (PA) System

A Public Address (PA) System will be provided based on a Bogen 70V system to provide whole-building announcements as well as building exterior. The system will be provided with a loop-start trunk interface to allow for dial paging from the telephone system and tied back to the Base Central PA System with the final connection to be done by the CG Yard personnel.

All PA system materials will be provided by the same manufacturer. Loudspeakers will be 70V rated and located throughout in common areas. Interior loudspeakers will be 5-watt and exterior loudspeakers will be 15-watt. The PA system will have digital feedback elimination. Speaker cabling (2-conductor, #18AWG, PVC jacketed) will be installed in

1/2 inch dedicated conduit in open ceiling areas and open cabling where possible above ceiling and at the PA system equipment location. Each speaker will be wired separately back to the PA system.

8.0 MECHANICAL

8.1 PLUMBING

8.1.1 Codes and Standards

The mechanical design and construction will comply with the most current version in accordance with the RFP of:

- ANSI B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
- ANSI Z358.1
- American Society of Heating Refrigeration and Air Conditioning (ASHRAE)
- 2007 Energy Independence and Security Act (EISA 2007)
- Energy Policy Act (EPACT) as updated in 2009
- International Plumbing Code (IPC)

8.1.2 Design Overview

The PEMB plumbing design and construction will comply with the most recent versions of the IPC & ASHRAE standards as well as EISA 2007 and EPACT 2005 with amendments in 2009. Plumbing energy consumption will be designed to abide by the baseline set by ASHRAE 90.1-2019. Plumbing systems will be selected based upon site constraints, building constraints, and energy source availability.

Fixtures shall be provided complete with fittings with chromium or nickel-plated brass (polished bright) trim. All shutoff valves shall be metal construction. All fixtures, fittings and trim in the project will be by the same manufacturer and shall have the same finish.

Water meters will be provided to report water use to the Coast Guard with the capability of remote reading intervals and totalization for the Boat Bay Building.

8.1.3 Domestic Water

Domestic water heating systems will be an electric, instantaneous (tank-less) water heater. It shall be sized for the greater of the two items 1) emergency eyewash/shower or 2) wash-up sink, mop sink, and hot and cold hose bibb. Any required temperature and pressure relief valves will be piped and routed in a visible location outside to alert if there is discharge from this device.

Water piping will be designed per the IPC and in conformance with industry standard practices. Solder for copper pipe shall be lead free. All distribution water piping shall be protected from freezing and insulated.

Above ground water piping will be Type K hard-drawn copper or PEX type 1. Fittings for hard-drawn copper will conform to ANSI B16.22, Wrought Copper and Copper Alloy

Solder Joint Pressure Fittings. Under slab water supply piping shall be limited to the building service entrance only.

Domestic water supply lines will have a single shut off for cold water and a single shut off for hot water for all fixtures in the building. Angle stops may be used for the wash up sink if the faucet does not have integral stops. A pressure reducing valve will be provided on each of the incoming water systems if required. Reduced principle backflow preventers will be installed on the incoming domestic water system. The backflow preventer will be drained to the mop sink.

The utility sink will be provided in the Boat Bay Building and constructed of 16-gauge, type 304 stainless steel and floor supported with galvanized or stainless steel legs with 1 inch adjustable feet. Faucets will be combination back mounted and provided with a vacuum breaker, wall supported pail-hook spout and 3/4 inch external hose threads.

The mop sink will be provided in the Boat Bay Building and include a dome strainer and lint basket made from stainless steel. Service faucets will be chrome plated with vacuum breakers, integral stops, adjustable wall braces, pail hooks and 3/4 inch hose thread spout and include 30 inch hose and hose brackets.

The emergency shower/eye and face wash will be a combination design meeting ANSI Z358.1 standard. Units will be impact resistant and include an emergency sign. Units will be capable of being operated individually from a common fixture supply line. Self-cleaning, non-clogging eye and face wash with quick opening, full flow stay-open valves, stainless steel eye and face wash receptor with float-off dust caps will be provided. Emergency signs on the wall will be mounted in the immediate proximity of the shower fixture.

Wall mounted mixing unit-hose station will be provided between the emergency eyewash and utility sink. Mixing unit will be bronze or stainless steel and provided with a blending chamber, dial-type dual temperature gauge, 3/4 inch NPT hose connection and angle valves for back entry of water pipes. Mixing unity shall be rated for a maximum water temperature of 200 F and maximum working pressure 150 psi.

8.1.4 Drain, Waste and Vent

Drain, Waste and Vent (DWV) pipe and fittings will be as approved by the IPC and in conformance with industry standard practices. Waste piping below ground supported slabs will be cast iron or PVC to a point five feet beyond face of building. Exposed PVC vent pipe shall be protected from damage up to 8 feet above finished floor.

Floor drains shall be provided with drainage flange and slotted or perforated bronze of polished stainless-steel strainers. Floor drains will have trap primers or barrier-type trap seal protection devices.

8.2 HVAC FOR BOAT BAY BUILDING

8.2.1 Codes and Standards

The mechanical design and construction will comply with the most current version in accordance with the RFP of:

- DoD Unified Facilities Criteria - UFC 3-410-01 Heating, Ventilating, and Air Conditioning Systems
- International Mechanical Code (IMC)
- American Society of Heating Refrigeration and Air Conditioning (ASHRAE)
    - 55-2020 Thermal Environmental Conditions for Human Occupancy
    - 90.1-2019 Energy Standard for Buildings Except Low-Rise Residential Buildings
    - 62.1-2022 Ventilation and Acceptable Indoor Air Quality
- Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
- 2007 Energy Independence and Security Act (EISA 2007)
- Energy Policy Act (EPACT) as updated in 2009
- National Fire Protection Association (NFPA)
    - NFPA 72 National Fire Alarm and Signaling Code
    - NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems
    - NFPA 90B Standard for the Installation of Warm Air Heating and Air-Conditioning Systems

8.2.2 Design Overview

The Boat Bay Building is a low occupancy building that is not routinely occupied by 11 or more people. The building is heated to 55°F in the winter with ventilation system enabled. The heating load is calculated using Carrier HAP software and in accordance with the ASHRAE Handbook of Fundamentals. The building is ventilated with an inline exhaust fan sized for 1.5 cfm per square foot in accordance with the IMC and ASHRAE Standard 62.1, Table 6-2 "Auto Repair Rooms" category.

Outside air design conditions are based on ASHRAE's 1% dry bulb (DB) and corresponding wet bulb for summer (64.1°F DB, 57.5°F MCWB) and 99% dry bulb for heating (21.3°F DB) in Sitka, AK. Outside air intake is drawn through a wall louver located a minimum of 10 feet above grade, located near the electric unit heater to heat the incoming air.

Each of the two hazardous material cabinets is ventilated with high/low pipe: high intake air and low exhaust. The hazardous material cabinets have built-in flame arrestors for connecting rigid steel (Schedule 40) intake and exhaust pipes. The exhaust pipes are connected to a non-sparking fan blower sized to exhaust 50 cfm from each cabinet and are ducted from the fan to the building exterior.

Building design will target 30% energy consumption reduction from the baseline set by ASHRAE 90.1, unless deemed unfeasible based on site and building constraints, energy source availability, and a 40-year life cycle cost analysis.

8.2.3 Equipment and Controls

The electric unit heater is suspended in the overhead space and is provided with a standalone thermostat to enable and modulate its 2-stage heating. For more than one unit heater, a multiple-unit control option will be provided.

The ventilation exhaust fan is suspended in the overhead space and is enabled via an occupancy sensor and a hand/off/auto wall switch, where auto mode is detected by the occupancy sensor. Exhaust air is ducted out to the sidewall louver located at a minimum of 10 feet above grade, 10 feet from any outside air intakes, and 3 feet from any openings into the building.

The hazardous materials cabinet exhaust fan is suspended in the overhead space and will run continuously.

8.2.4 Testing and Balancing

Systems and equipment will be tested and balanced to provide the specified operation. The TAB agency will be either a member of the Associated Air Balance Council (AABC) or certified by National Environmental Balancing Bureau (NEBB) or Testing, Adjusting, and Balancing Bureau (TABB).

8.2.5 Commissioning

All HVAC systems and water heater, including controls, will be commissioned in accordance with ASHRAE Guideline 0. A third party Commissioning Authority will be retained by the Design-Build Contractor, certified as a Commissioning Authority by AABC, BCA, TABB or NEBB, as described in Guideline 0. The Commissioning Authority shall be a first-tier subcontractor to the Design-Build Contractor. The Contracting Officer's Representative (COR) will act as the Owner's representative (CxP) in performing duties spelled in ASHRAE Guideline 0 for each project phase.

8.2.6 Additional Requirements

Outside air and exhaust ducts are insulated the last 6 feet to the building exterior.

8.3 PIER UTILITIES

8.3.1 Codes and Standards

The mechanical design and construction will comply with the most current version in accordance with the RFP of:

- UFC 4-150-02 Dockside Utilities for Ship Service, 12 November 2020
- UFC 3-230-01 Water Storage and Distribution, with Change 3, 01 July 2021
- UFC 3-240-01 Wastewater Collection and Treatment, with Change 2, 1 January 2021
- UFC 3-401-01 Mechanical Engineering, with Change 3, 28 July 2025
- UFC 3-420-01 Plumbing Systems, 01 April 2021
- UFC 3-430-09 Exterior Mechanical Utility Distribution, 28 July 2025
- UFC 3-420-02 Compressed Air, 8 November 2022
- NFPA 30, Flammable and Combustible Liquids Code, 2024
- NFPA 307, Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves, 2021

8.3.2 Design Overview

Mechanical wharf utilities for this project support mooring and hoteling activities at a replacement pier with floating dock at Polaris Point. The AS-X Submarine Tender will not be considered as a design vessel for pier mechanical utilities. Mechanical systems for the new pier include equipment, distribution, collection and / or delivery systems for the following.

- Potable water (PW)
- Fire protection water
- Sanitary sewer [ship Collection, Holding and Transfer (CHT) tank contents]
- Bilge and oily waste collection

8.3.3 Potable Water

The potable water system will support general potable water usage for the design vessel. The potable water system will be fed from the existing potable water systems landside of the pier. The new water system shall connect to the nearest existing water lines adequate to provide the required flow to the WLB wharf, FRC floating dock, and the Boat Bay Building.

A reduced pressure zone backflow preventer and water meter will be provided for the domestic water lateral service at each vessel riser connection.

Piping materials will be per RFP requirements and will be protected from freezing through heat trace and insulation. The water system will be provided with a thermostatic valve at the end of the domestic water line that will be fully open upon sensing a fluid temperature of 35°F, and fully closed for a temperature of 45°F or higher.

8.3.4 Pier Fire Protection Water

Pier fire protection design will include a dry standpipe system that terminates at a landside fire department connection (FDC) adjacent to a landside hydrant. The fire water system design will be per NFPA 14 and include the following features:

- Fire protection systems will be Manual Dry Class I System.
- FDCs will be located no more than 100 feet from the nearest fire hydrant and free of interference so that they are easily accessible by the fire department.
- Where nonmetallic pipe and fittings are used, no portion of the pipe shall extend above the water surface, in accordance with NFPA.
- Where nonmetallic piping systems are installed on floating piers, the portion of the piping system that protrudes above the water surface will be metallic piping rated for corrosive environments.
- When installed beneath the water surface, nonmetallic piping shall be installed in such a manner that maintenance of the piping system can be accomplished.
- Hose connections and hose stations will be unobstructed and located not less than 3 feet or more than 5 feet above the walking surface where they are installed. (NFPA 14 15.5.1.1.1)
- Hose connections will be provided every 150 feet, maximum. (NFPA 14 15.5.1.2.1)
- Hose connections will be provided so that all portions of the walking surface of the dock are within 130 feet of a hose connection. (NFPA 14 15.5.1.2.3)
- Standpipe systems shall be designed to provide 100 psi at the most remote outlet with the calculations terminating at the fire department connection. (15.5.4.2)
- The minimum flow rate for the hydraulically most remote standpipe will be 250 gpm through each of the two hydraulically most remote 2 ½-inch hose connections on the standpipe, for a total of 500 gpm. (NFPA 14 10.6.1.1.1)
- Where the system supplies three or more hose connections, each standpipe will be based on providing 250 gpm at the three hydraulically most remote hose connections on the standpipe and at the most remote outlet of each of the other standpipes at the minimum residual pressure required. (15.5.6.1)
    - The maximum fire system flow rate shall be 1000 gpm. (15.5.5.2)

  - Fire department connection shall include one 2 ½-inch inlet per every 250 gpm. (10.7.3)

- An approved water supply will be provided within 100 feet of the pier/land intersection or fire department connection serving fire protection systems per NFPA 303 (2021). (6.2.5)
- Portable Fire Extinguishers will be located along the docks where vessels are moored; they will be placed at a maximum travel distance of 75 feet in accordance with NFPA 10 for Class A Hazards. (6.2.1.2.2)

A minimum of 36 inches of clear space will be maintained to permit access to and operation of fire protection equipment, fire department inlet connections, or fire protection system control valves. (2024 NFPA 1, 13.1.5)

A 316 stainless steel schedule 40 vertical fire department connection pipe will be installed adjacent to the entrance of the new main approach pier and shall be routed to the new hose connection manifolds located around the pier to satisfy the requirements above.

The fire department connection piping will contain a low point drain to allow the water that collects in the vertical standpipe to drain and preventing freezing within the pipe. The fire department connection shall be two 2 ½ inch outlet connections, cap, and chain, or of a type required by the Sitka Fire department.

The piping serving the fire department connection will contain a swing check valve to prevent the flow of water in the wrong direction. Each new hose connection manifold will be provided with two 2 ½ inch bronze hose valves, unless otherwise specified by the Sitka Fire Department.

8.3.5 Sewer Collection

The design will include a sanitary wastewater collection force main system for the wharf and moorings, providing a vessel pump out connection at or near the mooring locations identified on the RFP documents.

The design will include all materials and equipment necessary to discharge sanitary sewer collected from the pier facilities to a landside gravity sewer interface point. Heat traced and insulated ductile iron piping, conforming with AWWA C110 or AWWA C153 will be designed in areas underneath the pier that are exposed to weather.

8.3.6 Bilge and Oily Waste Collection

The design will include a bilge and oily wastewater (BOW) collection force main system for the wharf and moorings, providing a vessel pump out connection at or near the mooring locations identified on the RFP documents.

The design will include all materials and equipment necessary to discharge BOW collected from the pier facilities to a landside oily water separator that will discharge into a sewer interface point. Heat traced and insulated ductile iron piping, conforming with

AWWA C110 or AWWA C153 will be designed in areas underneath the pier that are exposed to weather.

9.0 ELECTRICAL

9.1 CODES AND STANDARDS

The electrical design and construction will comply with the most current version in accordance with the RFP of:

- NFPA 70 (2023 National Electrical Code)
- OSHA 1915.92; 1917.123; 1915.82
- NFPA 70E Standard for Electrical Safety in the Workplace (2024)
- IESNA HB-10 IES Lighting Handbook (2011)
- UFC 3-501-01 Electrical Engineering (2024)
- UFC 3-520-01 Interior Electrical Systems (2025)
- UFC 3-530-01 Interior and Exterior Lighting and Controls (2023)
- UFC 3-520-01 Exterior Electrical Power Distribution (2019)
- UFC 3-560-01 Electrical Safety, O&M (2023)
- UFC 4-150-02 Dockside Utilities For Ship Service (2020)
- IESNA standards on LED and SSL: LM-79-08
- IESNA standards on measuring Lumen on LED: LM-80-08

9.2 DESIGN OVERVIEW

9.2.1 Site Power Distribution

The USCG Sitka station receives power from City of Sitka. Currently the City provides one service feed to the existing pad-mounted 12.47kV-480Y/277V transformer at the entry of the existing wharf, which will be removed once the new service is energized, while the existing 1200A, 480V, 3-phase main switchboard will be kept serving existing loads. The existing underground 15kV primary cables originated behind the sliding gate and the underground secondary cables in between the transformer and switchboard will be removed once the new service is energized. The new 12.47kV-480Y/277V pad-mounted transformer will be located by the new pad-mounted meter at the entrance of the station.

From the new transformer, new feeders and conduits will travel in underground duckbank to the new 480V, 3-phase outdoor service switchboard located at the north-east corner of the new boat bay building, coupled with (2) shore power isolation transformer 480V-450V (300kVA and 500kVA), (2) shore power switchboard (400A and 800A), and handholes/manholes. The smaller shore power is for the new FRC floating dock (2x200A

shore power connection plus misc. receptacles power stands) while the larger shore power is for the new WLB wharf (2x400A shore power connection).

All new shore power cables will be travelling in fiberglass resin reinforced conduit under the approaching pier to the new WLB wharf and then FRC shore power cables will travel on the side of the WLB wharf to the FRC floating dock via the gangway in cable trays.

The new boat bay building will have adequate power for all required loads such as interior lighting (50FC minimum), heater and crane etc.

The existing USCG building and switchboard is to be fed from the new service switchboard with new feeders and conduits.

9.2.2 Lighting

b) Both FRC floating dock and WLB wharf will be illuminated by LED pole lights.

The new pole light at the approaching pier and around the perimeter of WLB wharf shall not exceed 25 feet; while the new twin head 15 foot pole light at the FRC floating dock will illuminate the area with 1FC in average and max:min ratio of 3:1. Lighting at all locations will be photocell controlled and meet the requirements of IESNA.

9.2.3 Grounding

Site grounding will be achieved by a buried perimeter ground ring around the building and equipment. The ground ring shall have copper clad steel ground rod into the earth below. Metallic structures will be tied into the copper ground grid , which will be connected to the system of driven ground rods.

9.2.4 Conductor Sizing and Insulation

Conductors to be sized to carry continuously maximum load, in accordance with the NEC. Conductors have been sized to ensure the total voltage drop is less than 2% for all feeders and 3% for all branch circuits.

10.0 SUSTAINABILITY

10.1 GUIDING PRINCIPLES

The Guiding Principles Compliance for New Construction & Modernization Scoping Checklist will be completed. The building will be designed in accordance with the Guiding Principles where technically feasible and life cycle cost effective (LCCE). Where sustainability requirements cannot be obtained due to mission preclusion, site constraints, or life cycle cost, these items will be documented on the Scoping checklist.

This facility shall be designed and constructed in an environmentally responsible manner, utilizing sustainable design concepts, systems, and materials to the maximum extent practical to provide a facility that meets the published requirements of the project.

APPENDIX A
Geotechnical Engineering Survey (PENDING)

APPENDIX B
Pre-Engineered Metal Building Concept Drawings and Structural Design Data (PENDING)

APPENDIX C
Pre-Engineered Metal Building Colors and Finishes (PENDING)

APPENDIX D
Mooring and Berthing Analysis (PENDING)