Preparing Activity: NAVFAC Replacing without change
UFGS-03420N (August 2004)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
****

SECTION TABLE OF CONTENTS

DIVISION 35 - WATERWAY AND MARINE CONSTRUCTION

SECTION 35 51 13.00 20

CONCRETE FLOATING PIER FOR SMALL CRAFT

04/06

PART 1 GENERAL

1.1 REFERENCES
1.2 MODIFICATIONS TO REFERENCES
1.3 SUBMITTALS
1.4 PRECAST FLOATS
1.5 QUALITY CONTROL
1.5.1 Precast Concrete Float Design
1.5.1.1 Pier Loading
1.5.1.2 Performance
1.5.2 Gangway Design
1.5.2.1 Gangway Loading
1.5.2.2 Performance
1.5.3 PCI Quality Certifications
1.5.3.1 Product Quality Control
1.6 DELIVERY AND STORAGE
1.7 FACTORY INSPECTION
1.8 QUALITY ASSURANCE
1.8.1 Drawing Information
1.8.2 Design Calculations
1.8.3 Concrete Mix Design
1.8.4 Paint Coating System

PART 2 PRODUCTS

2.1 CONTRACTOR-FURNISHED MIX DESIGN
2.2 PRECAST FLOAT MATERIALS
2.2.1 Cement
2.2.1.1 Fly Ash and Pozzolan
2.2.1.2 Ground Iron Blast-Furnace Slag
2.2.2 Water
2.2.3 Aggregates
2.2.3.1 Aggregates Selection
2.2.4 Grout

2.2.4.1 Nonshrink Grout
2.2.4.2 Cementitious Grout
2.2.5 Admixtures
2.2.5.1 Air-Entraining
2.2.5.2 Accelerating
2.2.5.3 Water Reducing
2.2.5.4 Corrosion Inhibitor
2.2.6 Reinforcement
2.2.6.1 Reinforcing Bars
2.2.6.2 Welded Wire Fabric
2.2.7 Metal Accessories
2.2.7.1 Inserts
2.2.7.2 Structural Steel
2.2.7.3 Bolts
2.2.7.4 Nuts
2.2.7.5 Washers
2.2.7.6 Cleats
2.2.8 Foam Core
2.3 FABRICATION
2.3.1 Precast Floats
2.3.2 Forms
2.3.3 Reinforcement Placement
2.3.4 Concrete
2.3.4.1 Concrete Mixing
2.3.4.2 Concrete Placing
2.3.4.3 Concrete Curing
2.3.5 Surface Finish
2.3.5.1 Unformed Surfaces
2.3.5.2 Formed Surfaces
2.3.6 Float Identification
2.4 TIMBER AND WOOD PRODUCTS
2.4.1 Preservative Treatment
2.5 RUBBING SURFACE - ULTRA-HIGH MOLECULAR WEIGHT POLYETHYLENE (UHMWPE)
2.5.1 Resin
2.5.2 Composition and Fabricated Form
2.6 GUIDE PILES
2.6.1 Guide Pile Caps
2.7 GANGWAYS
2.7.1 Aluminum
2.7.2 Stainless Steel
2.7.3 Castings
2.7.4 Insulators
2.7.5 Rollers
2.8 Receptacle Stations
2.8.1 Enclosure
2.8.2 Mechanical Interlocks
2.8.3 Circuit Breakers
2.8.4 Ground-Fault Circuit Interrupter Receptacles

PART 3 EXECUTION

3.1 SURFACE REPAIR
3.2 LAUNCH AND ASSEMBLY
3.3 ANCHORAGE
3.4 WELDING
3.5 OPENINGS
3.6 GALVANIZING REPAIR
3.7 GROUTING
3.8 SEALANTS

-- End of Section Table of Contents --

Preparing Activity: NAVFAC

Replacing without change
UFGS-03420N (August 2004)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023

SECTION 35 51 13.00 20

CONCRETE FLOATING PIER FOR SMALL CRAFT
04/06

NOTE: This guide specification covers the requirements for precast non-prestressed concrete floating piers and associated hardware and accessories.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

PART 1 GENERAL

1.1 REFERENCES

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also

use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

The 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.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 211.2	(1998; R 2004) Standard Practice for Selecting Proportions for Structural Lightweight Concrete
ACI 304R	(2000; R 2009) Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI 305R	(2020) Guide to Hot Weather Concreting
ACI 306.1	(1990; R 2002) Standard Specification for Cold Weather Concreting
ACI 309R	(2005) Guide for Consolidation of Concrete
ACI 318	(2014; Errata 1-2 2014; Errata 3-5 2015; Errata 6 2016; Errata 7-9 2017) Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary (ACI 318R-14)
ACI 318M	(2014; ERTA 2015) Building Code Requirements for Structural Concrete & Commentary

AMERICAN WELDING SOCIETY (AWS)

AWS D1.4/D1.4M	(2011) Structural Welding Code - Reinforcing Steel

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA C1	(2003) All Timber Products - Preservative Treatment by Pressure Processes
AWPA C2	(2003) Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes
AWPA C18	(2003) Standard For Pressure Treated Material in Marine Construction
AWPA C28	(2003) Standard for Preservative Treatment of Structural Glued Laminated Members and Lamination Before Gluing of Southern Pine, Coastal Douglas Fir, Hemfir and Western

	Hemlock by Pressure Processes
AWPA C33	(2003) Standard for Preservative Treatment of Structural Composite Lumber by Pressure Processes
AWPA P5	(2015) Standard for Waterborne Preservatives

ASTM INTERNATIONAL (ASTM)

ASTM A27/A27M	(2020) Standard Specification for Steel Castings, Carbon, for General Application
ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A47/A47M	(1999; R 2022; E 2022) Standard Specification for Ferritic Malleable Iron Castings
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2023) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A307	(2021) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A563	(2021; E 2022a) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A563M	(2007; R 2013) Standard Specification for Carbon and Alloy Steel Nuts (Metric)
ASTM A615/A615M	(2022) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A706/A706M	(2022a) Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A780/A780M	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A1064/A1064M	(2022) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C94/C94M	(2022a) Standard Specification for Ready-Mixed Concrete

ASTM C150/C150M	(2022) Standard Specification for Portland Cement
ASTM C260/C260M	(2010a; R 2016) Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C272/C272M	(2018) Standard Test Method for Water Absorption of Core Materials for Sandwich Constructions
ASTM C330/C330M	(2017a) Standard Specification for Lightweight Aggregates for Structural Concrete
ASTM C494/C494M	(2019; E 2022) Standard Specification for Chemical Admixtures for Concrete
ASTM C578	(2022) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C595/C595M	(2021) Standard Specification for Blended Hydraulic Cements
ASTM C618	(2023; E 2023) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C989/C989M	(2022) Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1107/C1107M	(2020) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM D256	(2010; R 2018) Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics
ASTM D570	(1998; E 2010; R 2010) Standard Test Method for Water Absorption of Plastics
ASTM D638	(2014) Standard Test Method for Tensile Properties of Plastics
ASTM D792	(2013) Density and Specific Gravity (Relative Density) of Plastics by Displacement
ASTM D1535	(2014; R 2018) Standard Practice for Specifying Color by the Munsell System
ASTM D1894	(2014) Static and Kinetic Coefficients of Friction of Plastic Film and Sheeting
ASTM D2240	(2015; E 2017) Standard Test Method for Rubber Property - Durometer Hardness
ASTM D4020	(2011) Ultra-High-Molecular-Weight Polyethylene Molding and Extrusion Materials

ASTM D5456	(2017) Standard Specification for Evaluation of Structural Composite Lumber Products
ASTM F844	(2019) Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use
ASTM G109	(2007; R 2013) Determining the Effects of Chemical Admixtures on the Corrosion of Embedded Steel Reinforcement in Concrete Exposed to Chloride Environments E(2000)

EUROPEAN COMMITTEE FOR STANDARDIZATION (CEN/CENELEC)

CENELEC EN 60529	(1991; A1 2000; A2 2013) Degrees of Protection Provided By Enclosures (IP Code)
EN 60309-1	(1999; A1 2007; A2 2012) Plugs, Socket-Outlets and Couplers for Industrial Purposes Part 1: General Requirements
EN 60309-2	(1999; A1 2004; A11 2007; A2 2012) Plugs, Socket-Outlets and Couplers for Industrial Purposes Part 2: Dimensional Interchangeability Requirements for Pin and Contact-Tube Accessories

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C57.12.29	(2014) Standard for Pad-Mounted Equipment - Enclosure Integrity for Coastal Environments

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 6	(1993; R 2016) Industrial Control and Systems: Enclosures

PRECAST/PRESTRESSED CONCRETE INSTITUTE (PCI)

PCI MNL-116	(2021) Manual for Quality Control for Plants and Production of Structural Precast Concrete Products, 5th Edition
PCI MNL-120	(2021) PCI Design Handbook - Precast and Prestressed Concrete, 8th Edition

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE AMS-QQ-A-200/8	(1997; R 2012) Aluminum Alloy 6061, Bar, Rod, Shapes, Tube, and Wire, Extruded

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-I-24768/14	(1992; Notice 1 2020) Insulation, Plastic, Laminated, Thermosetting, Cotton-Fabric-Base, Phenolic-Resin (FBG)

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-55619	(Rev C; Notice 1) Casters, Industrial, Heavy Duty

UNDERWRITERS LABORATORIES (UL)

UL 98	(2016; Reprint Jan 2022) UL Standard for Safety Enclosed and Dead-Front Switches
UL 231	(2016; Reprint Oct 2022) UL Standard for Safety Power Outlets
UL 489	(2016; Rev 2019) UL Standard for Safety Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
UL 943	(2016; Reprint Feb 2018) UL Standard for Safety Ground-Fault Circuit-Interrupters
UL 1686	(2012; Reprint Jan 2014) Standard for Pin and Sleeve Configurations

1.2 MODIFICATIONS TO REFERENCES

In the ACI publications, the advisory provisions shall be considered to be mandatory, as though the word "shall" has been substituted for "should" wherever it appears; reference to the "Building Official," the "Structural Engineer" and the "Architect/Engineer" shall be interpreted to mean the Contracting Officer.

1.3 SUBMITTALS

****

NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G". Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force, and NASA projects, or choose the second bracketed item for Army projects.

****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Drawings of Precast Floats; G[, [_____]]

Gangways

[Receptacle Stations; G[, [_____]]

] SD-03 Product Data

Anchorage and lifting inserts and devices

[Receptacle Stations; G[, [_____]]

] Guide Pile Caps

SD-05 Design Data

Precast Concrete Floats Design Calculations; G[, [_____]]

Gangway Design

Concrete Mix Design

SD-06 Test Reports

Contractor-Furnished Mix Design

Submit copies of test reports showing that the mix has been successfully tested to produce concrete with the properties specified and will be suitable for the job conditions. Obtain approval before concrete placement.

SD-07 Certificates

Fabrication

Rubbing Surface

[Paint Coating System

] Submit quality control procedures established in accordance with PCI MNL-116 by the precast manufacturer.

1.4 PRECAST FLOATS

The work includes the provision of precast, non-prestressed concrete floating pier modules herein referred to as precast floats, and all other items relating to the precast floating pier system. Precast floats shall be the product of a manufacturer specializing in the production of precast concrete floats with a minimum of 10 years experience in the manufacture of precast concrete floating piers.

1.5 QUALITY CONTROL

1.5.1 Precast Concrete Float Design

ACI 318M, ACI 318 and the PCI MNL-120. Design precast floats (including connections) for the design load conditions and spans indicated, and for additional loads imposed by the work of other trades. Design precast floats for handling without cracking in accordance with the PCI MNL-120.

1.5.1.1 Pier Loading

Float and anchorage systems shall be designed for the following load conditions as a minimum. Load cases shall be combined based upon their probability of simultaneous occurrence, and in accordance with applicable codes and standards. Wind and current exposure areas shall be based on average vessel profile and draft, respectively. To account for sheltering effects, 15 percent of the full load shall be applied to all vessels sheltered by the vessels exposed to full load. Calculations shall be performed for wind and current loads both parallel and perpendicular to the pier.

****

NOTE: Designer should consult with a manufacturer of precast concrete floats to determine maximum allowable loadings for a given float size. The use of values exceeding the recommended default maximums should be confirmed with a reputable manufacturer prior to inclusion.

Environmental loadings (wind, wave, current & tide surge) will be site specific.

Default values for berthing and mooring loads are recommended maximum values, based on limitations of the precast modules. Berthing load is vessel and pier configuration specific. Mooring load is maximum, based on anchorage strength of (default) cleat size (confirm with manufacturer). The designer should input berthing and mooring loads based on the actual vessels berthed.

****

a. Dead load, including all work of other trades (utilities, etc.)

b. Live load: [_____] [3.83] kPa [80 PSF]

c. Wind pressure: As indicated on drawings
Acting on the projected area of the pier and moored vessels, assuming full occupancy. For vessel area, assume an average height of [_____] m feet above the waterline.

d. Minimum current pressure: [_____] kPa [PSF][FPS velocity]
Acting on the projected area of the pier and moored vessels, assuming normal occupancy.

e. Berthing load: [_____] [136] N/m [100] PLF horizontal

f. Mooring load: [_____] [1.78] kN [400] lb.
Line pull acting in any direction at a 45 degree angle from the horizontal.

g. Vertical wave load: As determined from a [_____] [0.9] m [3] ft. wave height

h. Lateral wave load:As determined from a [_____] [0.9] m [3] ft. wave height

i. Lateral pile loads at maximum surge level: For surge level indicated on drawings

1.5.1.2 Performance

a. Precast float modules shall be sized so that a single module (excluding walers) is used to attain the indicated pier width. The use of more than one module connected side by side to attain pier width is unacceptable.

b. Freeboard under dead load only shall not be less than [_____] 610mm 24 in. nor exceed [_____] 762mm 30 in. Precast floats shall be designed to float level under dead load only. Maximum out of level tolerance for transverse and longitudinal slope is [_____] 25mm per 3m 1 in. per 10 ft. Freeboard under dead and live load shall not be less than [_____] 203mm 8 in.

c. Special precast floats must be designed to support the additional concentrated loads as imposed by gangways, transformers, or other equipment. Modules with special loadings shall have the same freeboard as standard modules without special loading, so that there will be no residual stresses or tilting when modules are interconnected.

d. Flotation units shall be located within the structure so as to be capable of supporting a [_____] 136 kg 300 lb moving point load in any area on a module without causing excessive rolling or tilting of the pier. The pier shall be capable of supporting a [_____] 181 kg 400 lb point load at 305mm 1 ft from the offshore end of the pier and loose no more than 101mm 4 in of freeboard; and supporting a [_____] 136 kg 300 lb point load applied to the corner of the offshore end of the pier and loose no more than 51mm 2 in of freeboard differential per 914mm 3 ft of pier width between the offshore corners.

[e. Precast floats shall have PVC sleeves and pull boxes embedded as required for electrical and communications systems. Pull boxes shall have a nominal 25mm 1 in concrete bottom with a light brushed, slip resistant finish. All bolts and inserts for pull box lids shall be

316 stainless steel. Pull box lids shall be flush with the deck surface and rated for the pier deck loading. Sleeves shall remain above water surface under dead load conditions and shall be designed to facilitate installation, removal, and servicing of utilities. Pull boxes and access openings shall be sized and located as indicated on the drawings.

]1.5.2 Gangway Design

Provide gangways of prefabricated aluminum for floating pier access, including connections at the bulkhead and bearing on the floating pier. Gangway shall be designed in accordance with "Specifications for Aluminum Structures", AA, latest edition, using allowable stresses for bridges.

1.5.2.1 Gangway Loading

Gangways shall be subject to the same load conditions identified in the paragraph titled "Pier Loading", except for berthing, mooring, current, wave, and pile loading conditions. Additionally, the gangway bulkhead end connections shall be designed to withstand a lateral force equal to 20 percent of the total dead load and 50 percent of the live load acting simultaneously with the dead and live loads. Handrails shall be designed for the following independent load cases: 1) a continuous horizontal load of 27.1 N/m 20 PLF applied along the full length of the top rail, and 2) a horizontal point load of 113.4 kg 250 lbs acting at any point along the top rail.

1.5.2.2 Performance

a. Gangways shall have a minimum clear walkway width of [_____] 1.07m 3.5 ft, and an overall outside width not to exceed [_____] 1.37m 4.5 ft. Length of gangways shall be as indicated on the drawings. Gangways shall have continuous handrails that are a minimum of 1.07m 3.5 ft above the walking surface, but not to exceed 1.14m 3.75 ft.

b. Walking surface shall be skid resistant.

c. Gangway pier end connections shall allow unrestricted vertical movement through tidal variation. Gangway bearing on floating piers shall be fitted with UHMW polyurethane rollers of adequate bearing area. Gangways shall be fitted with hinged apron plates to assure a safe uniform transition between gangway and deck surfaces. Apron plates will be designed so as to not damage or mar the floating pier surface.

d. Maximum midspan deflection under live load shall not exceed L/240.

e. Contact between aluminum and dissimilar metals or concrete shall be avoided, except for the use of compatible stainless steel pins. Where potential for galvanic corrosion exists, the aluminum shall be isolated from direct contact with other metals or concrete by use of suitable non-conducting insulators or bushings.

1.5.3 PCI Quality Certifications

****

NOTE: For normal routine projects, use the first paragraph. For complex or large precast/prestressed projects, use the second paragraph. Note that use

of the second paragraph may limit competition. Verify the availability of certified PCI precasters in the bidding area.
****

PCI MNL-116. At the precast manufacturer's option, in lieu of core samples, ACI 318M and ACI 318, full scale load tests may be performed. Perform on randomly selected precast floats, as directed by the Contracting Officer.

[1.5.3.1 Product Quality Control

PCI MNL-116 for PCI enrolled plants. Where precast floats are manufactured by specialists in plants not currently enrolled in the PCI "Quality Control Program," provide a product quality control system in accordance with PCI MNL-116 and perform concrete and aggregate quality control testing using an approved, independent commercial testing laboratory. Submit test results to the Contracting Officer.

]1.6 DELIVERY AND STORAGE

Lift and support precast floats at the lifting and supporting points indicated on the shop drawings. Store precast floats off the ground. Separate stacked precast floats by battens across the full width of each bearing point. Protect from weather, marring, damage, and overload.

1.7 FACTORY INSPECTION

At the option of the Contracting Officer, precast floats shall be inspected by the QC Representative prior to being transported to the job site. The Contractor shall give notice 14 days prior to the time the units will be available for plant inspection. Neither the exercise nor waiver of inspection at the plant will affect the Government's right to enforce contractual provisions after units are transported or erected.

1.8 QUALITY ASSURANCE

1.8.1 Drawing Information

Submit drawings indicating complete information for the fabrication, handling, and erection of the precast floats and gangways. Drawings shall not be reproductions of contract drawings. Design drawings of precast floats and gangways (including connections) shall be prepared and sealed by a registered professional engineer, and submitted for approval prior to fabrication. The drawings shall indicate, as a minimum, the following information:

a. Floating pier system layout

b. Marking of floats for assembly

c. Connections between floats, and connections between floats and other construction

d. Location and anchorage of mooring fittings

e. Waler size and splice pattern

f. Guide pile size, length, location and connection to pier

g. Reinforcing details

h. Material properties of all materials used

i. Lifting and assembly inserts and embedded items

j. Dimensions and surface finishes of each float

k. Erection sequence and handling requirements

l. All loads used in design (such as live, dead, wind, current, berthing, handling, and erection)

m. Bracing/shoring required

n. Gangways

[o. Utility routing and connections for work of other trades

] 1.8.2 Design Calculations

Submit calculations reflecting design conforming to requirements of paragraph entitled "Precast Concrete Float Design" and "Gangway Design". Design calculations of precast floats and gangways (including connections) shall be prepared and sealed by a registered professional engineer, and submitted for approval prior to fabrication. In addition to member sizing calculations, submit calculations for the pier system which include:

a. Anchorage attachment points to insure reactions shall be appropriately and rationally distributed throughout the system

b. Overall system loads under full occupancy, with consideration for shielding factors, and deflection of the system and its effects on anchor loading

c. Anchorage system capacity for individual and overall load considerations

d. Guide pile size, length, cross section, and minimum embedment

1.8.3 Concrete Mix Design

Thirty days minimum prior to concrete placement, submit a mix design for each strength and type of concrete. Include a complete list of materials including type; brand; source and amount of cement, pozzolan, and admixtures; and applicable reference specifications.

[1.8.4 Paint Coating System

Submit IEEE C57.12.29 coating system performance requirements test on "test specimens" of the same material used in fabrication of the receptacle stations.

]PART 2 PRODUCTS

2.1 CONTRACTOR-FURNISHED MIX DESIGN

****

NOTE: Normal precast design is based on concrete having a compressive strength of 35 MPa 5000 psi at 28 days. Some precast manufacturers like to speed up production by using Type III (high early strength) concrete.

****

****

NOTE: Delete air entraining requirements when the project is located in a nonfreezing climate.

****

ACI 211.2, using weight method. The minimum compressive strength of concrete at 28 days shall be [_____] [35] MPa [5000] psi with a unit weight of 1800 kg/m^3 115 pcf dry. Mix shall contain a corrosion inhibitor[and air-entraining admixtures at the mixer to produce between 5 to 7 percent air by volume]. The use of foaming agents is prohibited.

2.2 PRECAST FLOAT MATERIALS

2.2.1 Cement

****

NOTE: For normal precasting (not requiring sulfate resistance), use the first bracketed item. If sulfate resistance is required, use the second bracketed item.

****

ASTM C150/C150M, Type [I][II]; or ASTM C595/C595M Type IP(MS) or IS(MS) blended cement, except as modified herein. The blended cement shall consist of a mixture of ASTM C150/C150M cement and one of the following materials: ASTM C618pozzolan or fly ash, or ASTM C989/C989M ground iron blast furnace slag. The pozzolan/fly ash content shall not be less than 20 percent nor exceed 40 percent by total mass of cementitious material. The content of ground granulated blast-furnace slag shall not exceed 50 percent of the mass of cement. The minimum amount of portland cement is 50 percent of the total mass of cementitious material. For exposed concrete, use one manufacturer for each type of cement, ground slag, fly ash, and pozzolan.

2.2.1.1 Fly Ash and Pozzolan

ASTM C618, Type N, F, or C, except that the maximum allowable loss on ignition shall be 6 percent for Type N and F.

2.2.1.2 Ground Iron Blast-Furnace Slag

ASTM C989/C989M, Grade 100 or 120.

2.2.2 Water

Water shall be fresh, clean, and potable.

2.2.3 Aggregates

2.2.3.1 Aggregates Selection

****

NOTE: Select gradation(s) based on job requirements and constraints. The maximum aggregate size shall not exceed three-quarters the minimum cover over reinforcing. Aggregate grading sizes with their general grading ranges are as follows: Size 57 (25 mm one inch to No. 4 sieve), Size 67 (20 mm 3/ 4 inch to No. 4 sieve), and Size 7 (12 mm 1/2 inch to No. 4 sieve).

****

ASTM C330/C330M, Size 8 (3/8 inch), except as modified herein. Obtain aggregates for exposed concrete surfaces from one source. Aggregates shall not contain any substance which may be deleteriously reactive with the alkalies in the cement.

2.2.4 Grout

2.2.4.1 Nonshrink Grout

ASTM C1107/C1107M.

2.2.4.2 Cementitious Grout

****

NOTE: Delete air entraining requirements when the project is located in a nonfreezing climate.

****

Shall be a mixture of portland cement, sand, and water. Proportion one part cement to approximately 2.5 parts sand, with the amount of water based on placement method.[Provide air entrainment for grout exposed to the weather.]

2.2.5 Admixtures

[2.2.5.1 Air-Entraining

****

NOTE: Delete air entraining requirements when the project is located in a nonfreezing climate.

****

ASTM C260/C260M.

]2.2.5.2 Accelerating

ASTM C494/C494M, Type C or E.

2.2.5.3 Water Reducing

ASTM C494/C494M, Type A, E, or F.

2.2.5.4 Corrosion Inhibitor

Calcium nitrite, ASTM G109. Add at the rate of 22.25 l per cubic meter 4.5 gallons per cubic yard.

2.2.6 Reinforcement

All reinforcement shall be hot-dipped galvanized, ASTM A123/A123M or ASTM A153/A153M.

2.2.6.1 Reinforcing Bars

****
NOTE: Specify ASTM A706/A706M reinforcing where welding or bending of reinforcement bars is important.
****

ASTM A615/A615M[ASTM A706/A706M], Grade 420 [40] [60].

2.2.6.2 Welded Wire Fabric

ASTM A1064/A1064M. Provide flat sheets of welded wire fabric, rolled fabric is not acceptable. Maximum fabric grid is 50mm x 50mm 2 in. x 2 in..

2.2.7 Metal Accessories

Provide ASTM A123/A123M or ASTM A153/A153M, hot-dipped galvanized.

2.2.7.1 Inserts

ASTM A47/A47M, Grade 22010 32510 or 35018, or ASTM A27/A27M Grade 415-205 U-60-30.

2.2.7.2 Structural Steel

ASTM A36/A36M.

2.2.7.3 Bolts

ASTM A307 and ASTM A36/A36M. Waler rods shall be continuous laterally through the pier, with a minimum diameter of 19 mm 3/4 inch. All continuous waler rods shall be placed within PVC sleeves cast into the precast float modules.

2.2.7.4 Nuts

ASTM A563M ASTM A563.

2.2.7.5 Washers

ASTM F844 washers for ASTM A307 bolts.

2.2.7.6 Cleats

Provide [_____] 457 mm 18 in boat cleats spaced at approximately [_____] 6100 mm 20 ft.

2.2.8 Foam Core

Closed cell, expanded polystyrene (EPS), ASTM C578. Foam core laminations shall be glued with a low solvent glue. Core shall not be made from more than four laminated sections. Horizontal laminations in the upper 254mm 10 in are not permitted. Core shall be strapped to prevent de-lamination

during transportation and handling. Core shall not contain more than 10 percent reground EPS foam material. Reground foam pieces shall not exceed 10mm 3/8 in diameter.

Unit Weight: 12 - 48 kg/m^3 0.70 - 3.00 pcf

Water absorption (ASTM C272/C272M): 3 percent (by volume)

Dimensional tolerance: plus or minus 3mm 1/8 in

2.3 FABRICATION

PCI MNL-116 unless specified otherwise.

2.3.1 Precast Floats

Precast floats shall be cast monolithically, cold joints of any type are not acceptable. Modules shall have a minimum deck and wall thickness of 51mm 2 in. Precast float decks shall be constructed to drain freely and there shall be no floodable enclosed spaces.

2.3.2 Forms

Brace forms to prevent deformation. Forms shall produce a smooth, dense surface. Chamfer exposed edges of floats 13 mm 1/2 inch, unless otherwise indicated. Form tolerance shall not exceed 3mm 1/8 in dimensions indicated on shop drawings. When measured diagonally, floats more than 13mm 1/2 in out of square shall be rejected.

2.3.3 Reinforcement Placement

ACI 318M and ACI 318 for placement and splicing. Reinforcement may be preassembled before placement in forms.

2.3.4 Concrete

2.3.4.1 Concrete Mixing

ASTM C94/C94M. Mixing operations shall produce batch-to-batch uniformity of strength, consistency, and appearance.

2.3.4.2 Concrete Placing

ACI 304R, ACI 305R for hot weather concreting , ACI 306.1for cold weather concreting, and ACI 309R, unless otherwise specified. Concrete shall be vibrated internally and/or externally to assure a smooth, dense finish.

2.3.4.3 Concrete Curing

Commence curing immediately following the initial set and completion of surface finishing. Provide curing procedures to keep the temperature of the concrete between 10 and 90 degrees C 50 and 190 degrees F. When accelerated curing is used, apply heat at controlled rate and uniformly along the casting beds. Monitor temperatures at various points in a product line in different casts. Cure for a minimum of seven days prior to transporting, launching and assembly.

2.3.5 Surface Finish

Precast floats containing hairline cracks which are visible and are less than 0.5 mm 0.02 inches in width, may be accepted, except that cracks larger than 0.1 mm 0.005 inches in width for surfaces exposed to the weather shall be repaired. Precast floats which contain cracks greater than 0.5 mm 0.02 inches in width shall be approved by the Contracting Officer, prior to being repaired. Any precast float that is structurally impaired or contains honeycombed section deep enough to expose reinforcing shall be rejected.

2.3.5.1 Unformed Surfaces

Provide a steel troweled and broomed finish for pier deck surface. Slip resistant broomed deck finish shall be transverse to pier orientation. All deck edges shall have a 10mm 3/8 in tooled radius with a minimum 38mm 1 1/2 in wide, smooth, hard steel finished face.

2.3.5.2 Formed Surfaces

****

NOTE: PCI MNL-116 different grades of formed surface finishes:

Commercial Grade: Concrete produced in forms that produce a rough finish. Fins are removed and large surface blemishes filled. Sharp edges that will be visible in the finished structure are ground down.

Standard Grade: Same finish as commercial grade, except the forms do not produce a texture on the concrete. Surface can be painted, but will have surface voids.

Finish Grade B: Same as standard grade, except all surface blemishes should be filled or finished to provide a smooth surface or uniform appearance if painted.

Finish Grade A: Same as Finish Grade B, except that the components of the completed structure, where exposed, shall be reasonably color matched. This finish is difficult to obtain.

****

PCI MNL-116 (Appendix A - Commentary), Chapter 3, for grades of surface finishes. Provide a standard grade surface finish for both exposed and unexposed areas.

2.3.6 Float Identification

All precast floats are to be clearly identified on one side and one end, between the bottom of the waler and the waterline. Identification shall include name of manufacturer, date of manufacture, specific float type, and job number.

2.4 TIMBER AND WOOD PRODUCTS

All walers shall be fabricated from parallel strand lumber (PSL) engineered structural beams. PSL structural beams shall be in accordance with ASTM D5456 All other structural lumber shall be No. 1 Southern Yellow Pine.

2.4.1 Preservative Treatment

Treat wood to be used in contact with salt water or salt water splash in accordance with AWPA C2 (Material Subject to Marine Borer Exposure) with waterborne preservative AWPA P5, (ACA - Ammoniacal Copper Arsenate, ACZA - Ammoniacal Copper Zinc Arsenate, CCA - Chromated Copper Arsenate) to 0.6 pcf retention. For wood continuously immersed, treat in accordance with AWPA C1 and AWPA C18 as applicable, to 2.5 pcf retention. For glue laminated engineered structural beams treat in accordance with AWPA C28 and AWPA C33 as applicable

2.5 RUBBING SURFACE - ULTRA-HIGH MOLECULAR WEIGHT POLYETHYLENE (UHMWPE)

Materials including additives shall be traceable by original lot number. Materials used shall be FDA approved or otherwise harmless to marine life. Fabricated form shall be from virgin resin.

2.5.1 Resin

ASTM D4020. Virgin resin shall be homopolymer of ethylene and have an intrinsic viscosity (IV) between 22.0 and 28.0 dl/g. No reprocessed resin shall be used. Resin shall be oil and moisture free (0.2 percent weight maximum).

2.5.2 Composition and Fabricated Form

Resin shall comprise a minimum 95.0 percent by weight concentration in the formulation. The finished form shall maintain ultraviolet stability for a minimum of 25 years and be free of saltwater or petroleum product leachable materials. No unfused areas or light patches greater than 300 micrometers No. 50 sieve shall be in the final fabricated form. Form shall be 38mm 1 1/2 in thick, depth equal to design depth of waler, and length as required but not less than 3m 10 ft. Exterior edges shall be rounded to 19mm 3/4 in radius. Color shall be black. The fabricated form shall have the following properties:

Density (ASTM D792)	0.92-0.94 g/cc 57.5-58.7 lb/cu.ft
Tensile Strength (ASTM D638)	
Ultimate, minimum	31.7 MPa 4600 psi
Ultimate Elongation, minimum	250 percent
Impact Strength (ASTM D256)	
Test Method A, Izod	Non-break for all five determinations in sample

Hardness (ASTM D2240), minimum	Shore D 65
Coefficient of Friction (ASTM D1894)	
Kinetic, maximum	0.13
Static, maximum	0.20
Water Absorption (ASTM D570)	Nil
Abrasion Index (relative to steel = 100), maximum	10

2.6 GUIDE PILES

Guide piles shall be prestressed concrete piles; fabricated and installed in accordance with section 31 62 13.20 PRECAST/PRESTRESSED CONCRETE PILES. Pile size, length, cross section and embedment shall be determined by pier manufacturer's design.[Recommended pile butt elevation is[_____] [1.5] m [5.0] ft above [extreme] high water.] Pile quantity and location shall be as indicated on the drawings. Relocation of pile layout and additional piles required by the manufacturer's design to resist the indicated design loads, shall be subject to approval by the government.

2.6.1 Guide Pile Caps

Provide heavy UV-resistant, low density polyethylene piling caps with an estimated life in excess of 10 years. Caps shall be cone or pyramid shaped and attached to the piling top with stainless fasteners.

2.7 GANGWAYS

2.7.1 Aluminum

Aluminum alloy shall be 6061-T6. Extruded in accordance with the applicable requirements of SAE AMS-QQ-A-200/8.

2.7.2 Stainless Steel

Type 316 L.

2.7.3 Castings

F-214 Cast aluminum. Castings shall be true to pattern, structurally sound and free from blow holes or other defects.

2.7.4 Insulators

MIL-I-24768/14. Bushings or separation sheets shall be a minimum of 1.5mm 1/16 in thickness.

2.7.5 Rollers

CID A-A-55619, UHMW polyurethane, with UV inhibitors added. Color shall be black.

[2.8 Receptacle Stations

Receptacle stations shall include enclosure, mechanical interlocks, and related wiring and devices as indicated.

2.8.1 Enclosure

Enclosure shall be NEMA ICS 6, type 3R, fabricated of 12 gauge stainless steel. Paint ASTM D1535 light gray No. 61. Paint coating system shall comply with IEEE C57.12.29.

2.8.2 Mechanical Interlocks

UL 231, UL 1686, UL 98. Mechanical interlock devices shall incorporate a fused disconnect safety switch and IEC receptacle in a non-metallic, watertight, enclosure. The interlock mechanism shall prevent making and breaking of power under load. Enclosure shall be rated NEMA 4X and also rated IP67 in accordance with CENELEC EN 60529. Include matching plug for each mechanical interlock provided. Plugs and receptacles shall be classified to EN 60309-1 and EN 60309-2.

2.8.3 Circuit Breakers

UL 489. Individual molded case circuit breakers with voltage and continuous current ratings, number of poles, overload trip setting, and short circuit current interrupting rating as indicated.

2.8.4 Ground-Fault Circuit Interrupter Receptacles

****

NOTE: For NAVFAC LANT projects, use GFI terminology in lieu of GFCI. NAVFACENGCOM has established these GFCI/GFI safety standards at a higher level of protection than NFPA 70's minimum requirements as a result of a GAO report and DOD concern about health and safety.

****

UL 943, duplex type for mounting in standard outlet box. Device shall be capable of detecting current leak of 6 milliamperes or greater and tripping per requirements of UL 943 for Class A GFI devices. Provide screw-type, side-wired wiring terminals or pre-wired (pigtail) leads. Provide in nonmetallic box with gasketed, weatherproof, nonmetallic cover plate and gasketed cap over each receptacle opening. Provide caps with a spring-hinged flap. Receptacle shall be UL listed for use in "wet locations with plug in use."

]PART 3 EXECUTION

3.1 SURFACE REPAIR

Prior to erection, and again after installation, precast floats shall be checked for damage, such as cracking, spalling, and honeycombing. As directed by the Contracting Officer, precast floats that do not meet the surface finish requirements specified in Part 2 in paragraph entitled "Surface Finish" shall be repaired, or removed and replaced with new precast floats.

3.2 LAUNCH AND ASSEMBLY

Precast floats shall be launched after the concrete has attained the specified compressive strength, unless otherwise approved by the precast manufacturer. Assemble in accordance with the approved shop drawings. PCI MNL-116 and PCI MNL-120 (Chapter 8), for tolerances. Brace precast floats, unless design calculations submitted with the shop drawings indicate bracing is not required. Follow the manufacturer's recommendations for maximum construction loads.

3.3 ANCHORAGE

Provide anchorage for fastening work in place. Conceal fasteners where practicable. Make threaded connections up tight and nick threads to prevent loosening.

3.4 WELDING

AWS D1.4/D1.4M for welding connections and reinforcing splices. Protect the concrete and other reinforcing from heat during welding. Weld continuously along the entire area of contact. Grind smooth visible welds in the finished installation. Welding of epoxy-coated reinforcing is not allowed.

3.5 OPENINGS

Holes or cuts requiring reinforcing to be cut, which are not indicated on the approved shop drawing, shall only be made with the approval of the Contracting Officer and the precast manufacturer. Drill holes less than 300 mm 12 inches in diameter with a diamond tipped core drill.

3.6 GALVANIZING REPAIR

Repair damage to galvanized coatings using ASTM A780/A780M zinc rich paint for galvanized surfaces damaged by handling, transporting, cutting, welding, bolting, or acid washing. Do not heat surfaces to which repair paint has been applied.

3.7 GROUTING

Clean and fill indicated areas, solidly with nonshrink grout or cementitious grout. Provide reinforcing where indicated. Remove excess grout before hardening.

3.8 SEALANTS

Provide as indicated and as specified in Section 07 92 00 JOINT SEALANTS.

-- End of Section --