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**END OF SECTION 00 01 10**

# SECTION 01 22 00 – UNIT PRICES

## PART 1 – GENERAL

1.1 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

1.2 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.3 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurement of actual Work will determine the payment amount.

1.4 MEASUREMENT OF QUANTITIES

A. Take all measurements and compute quantities. Measurements and quantities will be verified by Engineer.

B. Assist by providing necessary equipment, workers, and survey personnel as required.

C. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

D. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Engineer prior to starting work.

1.5 PAYMENT

A. Payment for work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Engineer, multiplied by the unit price.

1.6 DEFECT ASSESSMENT

A. Replace Work, or portions of the Work, not conforming to specified requirements.

1.7 SCHEDULE OF UNIT PRICES

A. Measurement and payment for unit prices will be as follows. For Bid items not listed, refer to WisDOT Standard Specifications for Construction, 2016 edition as modified by the plans, specifications, and project Special Provisions.

**Item 1A: Mobilization/Demobilization**

Measurement: Lump sum and according to the earning schedule below:

| Mobilization Partial Payments | | |
|---|---|---|
| % of Original Contract Amount Completed[1] | Pay Lesser of the Two | |
| | % of Mobilization | % of Original Contract Amount |
| 5 | 50 | 3 |
| 15 | 75 | 5 |
| 25 | 100 | 5 |
| 95 | 100 | N/A |

The Percent of Original Contract Amount Completed = the amount earned by the Contractor, excluding money earned for mobilization and material on hand, divided by the total value of the original contract (all bid items).

Payment: Payment for mobilization will be made at the contract unit price by lump sum. This item includes all labor, equipment, and materials to establish the construction site, complete submittal, secure performance/payment bonds, administrate project, manage project, and move equipment to and from the site. The total sum of all payments shall not exceed the original Contract amount bid for the mobilization item, regardless of the fact that the Contractor may have, for any reason, shut down work on the Project or move equipment away from the Project and then back again. When the amount bid for the mobilization exceeds 5 percent of the total original Contract amount, the City reserves the right to withhold (on any partial estimate) the portion in excess of 5 percent until 95 percent or more of the original Contract amount is earned.

**Item 2A: Floating Silt Curtain**

Measurement: Measurement will be made by lump sum for the installation and use of floating silt curtain throughout the duration of the project.

Payment: Payment will be made at the contract bid price by lump sum, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install as specified. Incidental costs shall include but not be limited to (1) providing anchoring systems for the silt curtain, (2) installation labor, (3) site preparation, (4) maintenance, (5) monitoring, (6) removal, and (7) furnishing all required submittals.

**Item 3A: Remove Existing Concrete Decking**

Measurement: Measurement will be made by the square feet of removed existing concrete decking material.

Payment: Payment will be made at the contract bid price per square foot, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to remove existing concrete decking as specified. Incidental costs shall include but not be limited to (1) mobilization and access for equipment, (2) proper debris handling and disposal, (3) installation of environmental controls as needed, (4) and permitting.

**Item 3B: Remove Sand Subgrade Under Concrete Decking**

Measurement: Measurement will be made by the cubic yard of removed sand subgrade from under the areas with removed concrete decking.

Payment: Payment will be made at the contract bid price per cubic yard, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to remove the sand subgrade from underneath the areas with removed concrete decking. Incidental costs shall include but not be limited to (1) mobilization and access for equipment, (2) proper material handling and disposal, (3) and installation of environmental controls as needed.

**Item3C: Ell Dock Removal**

Measurement: Measurement will be made by lump sum for the removal of the Ell Dock.

Payment: Payment will be made at the contract bid price by lump sum, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary for the removal of the Ell Dock as specified. Incidental costs shall include but not be limited to (1) the removal of the existing concrete decking and all equipment attached to it, (2) removal of the steel sheet pile and all fill within the Ell Dock down to the existing mudline, (3) removal of the existing tie rods holding the Ell Dock to the City Pier, (4) and the proper disposal of all removed material.

**Item 3D: Binwall Dock Removal**

Measurement: Measurement will be made by each for the removal of the binwall dock structures.

Payment: Payment will be made at the contract bid price per each, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to remove a binwall structure. Incidental costs shall include but not be limited to (1) the removal of the existing concrete decking and all equipment attached to it, (2) removal of the entire binwall structure below concrete decking down to existing mudline, (3) and proper disposal of all removed material and debris.

**Item 3E: Remove Rub Rail**

Measurement: Measurement will be made by the lineal foot of removed rub rail.

Payment: Payment will be made at the contract bid price per lineal foot, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to remove the rub rail. Incidental costs shall include but not be limited to (1) the removal of rub rail and associated connections to the steel sheet pile wall and (2) the proper disposal of all removed material.

**Item 3F: Existing Conduit Removal**

Measurement: Measurement will be made by the lineal foot of removed conduit.

Payment: Payment will be made at the contract bid price per lineal foot, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to remove conduit as specified. Incidental costs shall include but not be limited to the proper disposal of conduit and wires/hoses.

**Item 3G: Remove Pelican Piles**

Measurement: Measurement will be made by each of the existing pelican pile removed.

Payment: Payment will be made at the contract bid price by each, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to remove existing pelican piles. Incidental costs shall include but not be limited to (1) the proper disposal of existing piles.

**Item 4A: Remove Pedestals**

Measurement: Measurement will be made by each for the existing utility pedestals acceptably removed.

Payment: Payment will be made at the contract bid price by each, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to remove existing utility pedestals. Incidental costs shall include but not be limited to (1) the proper disposal of removed pedestals (2) and repairing and capping of existing slabs.

**Item 4B: New Utility Trench Cover**

Measurement: Measurement will be made by the lineal foot for the installation of new utility trench cover.

Payment: Payment will be made at the contract bid price by the lineal foot, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to install the new utility trench. Incidental costs shall include but not be limited to (1) forming and pouring trenches, (2) rebar reinforcement cost and installation, (3) installing trench coverings, and (4) furnishing all required submittals.

**Item 4C: Replace Water Lines**

Measurement: Measurement will be made by the lineal foot for the replacement of water lines.

Payment: Payment will be made at the contract bid price per lineal foot, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to replace existing water lines. Incidental costs shall include but not be limited to (1) the removal and proper disposal of existing water lines, (2) installation of new water lines, (3) routing and connection of water lines to the utility pedestals, and (4) furnishing all required submittals.

**Item 5A: Install New Reinforced Concrete Deck**

Measurement: Measurement will be made by the cubic yard for the installation of new reinforced concrete decking.

Payment: Payment will be made at the contract bid price per cubic yard, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to install new reinforced concrete decking. Incidental costs shall include but not be limited to (1) rebar reinforcement cost and installation, (2) tying in new concrete deck to existing, (3) cutting joints, and (4) furnishing all required submittals.

**Item 5B: Additional Fill Material (1-1/2" Base Course Material)**

Measurement: Measurement will be made by the ton for the additional fill material required to bring the subgrade below the new concrete decking to the proper elevation.

Payment: Payment will be made at the contract bid price per ton, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary for the additional fill material. Incidental costs shall include but not be limited to (1) the

hauling and placement of fill material, (2) stockpiling, (3) the proper compaction and leveling of the material in preparation for pouring of new concrete decking, and (4) furnishing all required submittals.

**Item 5C: Geotextile Fabric**

Measurement: Measurement will be made by the square yard for the installation of geotextile fabric.

Payment: Payment will be made at the contract bid price per square yard, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to install geotextile fabric. Incidental costs shall include but not be limited to furnishing all required submittals.

**Item 6A: 12" Diameter Pelican Pile**

Measurement: Measurement will be made by the lineal foot of 12" diameter pelican pole acceptably furnished and installed.

Payment: Payment will be made at the contract bid price per lineal foot, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install 12" diameter pelican poles as specified. Incidental costs shall include but not be limited to furnishing all required submittals.

**Item 6B: 16" Diameter Steel Pipe Guide Pile**

Measurement: Measurement will be made by the lineal foot of 16" diameter steel pipe guide piles acceptably furnished and installed.

Payment: Payment will be made at the contract bid price per lineal foot, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install 16" diameter steel pipe guide piles as specified. Incidental costs shall include but not be limited to (1) adding pile guides for the guide piles to move within and (2) furnishing all required submittals.

**Item 6C: Install New Safety Ladder**

Measurement: Measurement will be made by each for safety ladders that are acceptably furnished and installed along the commercial docks.

Payment: Payment will be made at the contract bid price per each, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install safety ladders on the commercial docks as specified. Incidental costs shall include but not be limited to furnishing all required submittals.

**Item 6D: Concrete Floating Dock**

Measurement: Measurement will be made by the square foot for concrete floating docks acceptably furnished and installed.

Payment: Payment will be made at the contract bid price per square foot, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install concrete floating docks as specified. Incidental costs shall include but not be limited to (1) providing utility runs on the dock and (2) furnishing all required submittals.

**Item 6E: Gangway – 6ft Width**

Measurement: Measurement will be made by each 6-foot-wide gangway acceptably furnished and installed.

Payment: Payment will be made at the contract bid price per each, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install 6-foot-wide steel transition plate as specified. Incidental costs shall include but not be limited to (1) the delivery and proper handling of steel transition plates, (2) the installation and connection of the plates to the floating dock and main pier, and (3) furnishing all required submittals.

**Item 7A: 12” Diameter Pelican Pile**

Measurement: Measurement will be made by the lineal foot of 12” diameter pelican pole acceptably furnished and installed.

Payment: Payment will be made at the contract bid price per lineal foot, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install 12” diameter pelican poles as specified. Incidental costs shall include but not be limited to furnishing all required submittals.

**Item7B: 12” Diameter Steel Pipe Guide Pile**

Measurement: Measurement will be made by the lineal foot of 12” diameter steel pipe guide piles acceptably furnished and installed.

Payment: Payment will be made at the contract bid price per lineal foot, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install 12” diameter steel pipe guide piles as specified. Incidental costs shall include but not be limited to (1) adding pile guides for the guide piles to move within and (2) furnishing all required submittals.

**Item 7C: Install New Safety Ladder**

Measurement: Measurement will be made by each for safety ladders that are acceptably furnished and installed along the transient docks.

Payment: Payment will be made at the contract bid price per each, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install safety ladders along the transient docks as specified. Incidental costs shall include but not be limited to furnishing all required submittals.

**Item 7D: Steel Floating Dock – Timber Decking**

Measurement: Measurement will be made by the square foot for galvanized steel frame floating docks with timber decking.

Payment: Payment will be made at the contract bid price per square foot, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to install galvanized steel frame floating docks with timber decking. Incidental costs shall include but not be limited to (1) timber decking and (2) furnishing all required submittals.

**Item 7E: Gangway – 4ft Width**

Measurement: Measurement will be made by each 4-foot-wide steel transition plates acceptably furnished and installed.

Payment: Payment will be made at the contract bid price per each, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install 4-foot-wide steel transition plate as specified. Incidental costs shall include but not be limited to (1) the delivery and proper handling of steel transition plates, (2) the installation and connection of the plates to the floating dock and main pier, and (3) furnishing all required submittals.

**Item 8A: Steel Cap Gap Filler**

Measurement: Measurement will be made by the lineal foot for installing a steel cap over the gap in the City Pier where the existing binwall docks were removed.

Payment: Payment will be made at the contract bid price per lineal foot, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install a steel cap over the gap in the City Pier where the existing binwall docks were removed as specified. Incidental costs shall include but not be limited to (1) cutting steel cap to fit within the gap, (2) welding new steel cap to existing cap, (3) and furnishing all required submittals.

**Item 8B: Steel Sheet Pile Wall**

Measurement: Measurement will be made by the square foot of steel sheet pile wall acceptably furnished and installed as specified.

Payment: Payment will be made at the contract bid price per square foot, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install steel sheet pile wall as specified. Incidental costs shall include but not be limited to (1) the transportation of SSP to the jobsite, (2) threading the SSP together, sheets will be delivered as singles, (3) furnishing and installing driving template, (4) trimming the top of the sheet pile, one foot maximum, (5) clearing of the driving lane, (6) installation of lifting and holes in tops of sheets, if required, and (7) furnishing all required submittals.

**Item 8C: New Tie Rods**

Measurement: Measurement will be made by the lineal foot for acceptably furnished and installed tie rods.

Payment: Payment will be made at the contract bid price per lineal foot, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install tie rods as specified. Incidental costs shall include but not be limited to (1) drilling holes through the sheet pile as necessary to install the tie rod at the proper location and elevation as specified, (2) furnishing and installing all plate washers & couplers, if required, (3) furnishing and installing attachment of tie-rod to wale & SSP, and (4) furnishing all required submittals.

**Item 8D: Double Channel Wale**

Measurement: Measurement will be made by the lineal foot of double channel wale acceptably furnished and installed at the specified elevation.

Payment: Payment will be made at the contract bid price per lineal foot, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install the double channel wale as specified. Incidental costs shall include but not be limited to (1) transportation of wale from storage location to the jobsite, (2) trimming channels to proper length, (3) installing steel plate and pipe spacers, (4) attaching the wale to the sheet pile by furnishing and installing bolts/ threaded rods through drilled holes in the sheet pile, (5) furnishing and installing all plate washers, (6) furnishing and installing plates and bolts at wale splice locations, and (7) furnishing all submittals.

**Item 8E: Steel Dock Cap**

Measurement: Measurement will be made by the lineal foot of steel dock cap acceptably furnished and installed at the specified elevation.

Payment: Payment will be made at the contract bid price per lineal foot, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to

furnish and install the steel dock cap as specified. Incidental costs shall include but not be limited to (1) transportation of dock cap from storage location to the jobsite, (2) furnishing and installing dock cap angle brackets, and (3) furnishing submittals.

**Item 9A: New Electrical Utility Service**

Measurement: Measurement will be made by lump sum for installation of the new electric utility service to feed the rehabilitated docking facilities.

Payment: Payment will be made at the contract unit price by lump sum, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install a new electric utility service as specified. Incidental costs shall include but not be limited to (1) installation of new concrete pad for utility transformer, as required by utility, (2) installation of new conduit and service conductors from utility transformer to new substation 'SS1', (3) Installation of meters and CT cabinets as required by utility.

**Item 9B: Distribution Equipment (Substations)**

Measurement: Measurement will be made by lump sum for furnishing and installation of the substations 'SS1' and 'SS2' as indicated on the electrical drawings.

Payment: Payment will be made at the contract unit price by lump sum, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install all electrical equipment as specified. Incidental costs shall include but not be limited to (1) procurement / furnishing of electrical substations as shown on the electrical drawings, (2) terminating branch circuit and feeder conductors within substation as required by the electrical drawings, (3) preliminary testing of the ground fault protection systems within the substations as indicated on the electrical drawings.

**Item 9C: Shore Power Pedestals**

Measurement: Measurement will be made by each for shore power pedestal that is acceptably furnished and installed along the transient docks.

Payment: Payment will be made at the contract bid price per each, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install the shore power pedestals. Incidental costs shall include but not be limited to (1) furnish and installation of shore power pedestals in accordance with the electrical drawings, (2) preliminary testing of ground fault protection systems within each shore power pedestal as indicated on the electrical drawings.

**Item 9D: Fire Pedestals / E-Stops**

Measurement: Measurement will be made by each for fire / e-stop pedestal that is acceptably furnished and installed along the transient docks.

Payment: Payment will be made at the contract bid price per each, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install the fire / e-stop pedestals. Incidental costs shall include but not be limited to (1) furnish and installation of fire / e-stop pedestals in accordance with the electrical drawings.

**Item 9E: Wiring (Feeders)**

Measurement: Measurement will be made by the lineal foot for feeders routed between substations 'SS1' and 'SS2'.

Payment: Payment will be made at the contract bid price per lineal foot, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install the new feeders as specified. Incidental costs shall include but not be

limited to (1) all excavation of grade and/or concrete as required for routing of feeders, (2) wiring and conduit associated with the new feeders.

**Item 9F: Wiring (Branch Circuits)**

Measurement: Measurement will be made by the lineal foot for branch circuits routed from substations to pedestals and e-stops.

Payment: Payment will be made at the contract bid price per lineal foot, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install the new branch circuits as specified. Incidental costs shall include but not be limited to (1) all excavation of grade and/or concrete as required for routing of feeders, (2) wiring and conduit associated with the new branch circuits, (3) termination of branch circuit wiring within the pedestals.

**Item 9G: Electrical Demolition**

Measurement: Measurement will be made by lump sum for removal of the existing electrical systems as required for the rehabilitation of the transient docking facilities.

Payment: Payment will be made at the contract bid price per cubic yard, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to remove existing electrical systems as specified. Incidental costs shall include but not be limited to (1) removal of existing electrical service panel, (2) removal of existing conduit and wiring routed along the southern edge of the pier, (3) removal of existing shore power pedestals.

**Item 9H: Ground Fault Protection (GFPE) Testing**

Measurement: Measurement will be made by lump sum for the labor required by the contractor to assist the Engineer with testing of the GFPE testing.

Payment: Payment will be made at the contract unit price by lump sum, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to assist the Engineer with testing of the GFPE systems as specified. Incidental costs shall include but not be limited to (1) provide two qualified individuals to assist with the testing, (2) the testing is estimated to require one day to complete, (3) the qualified individuals shall have knowledge of the electrical installation.

**Item 10A: Reinforced Concrete Slab**

Measurement: Measurement will be made by the cubic yard for the reinforced concrete slab acceptably furnished and installed to hold the new electrical transformer.

Payment: Payment will be made at the contract bid price per cubic yard, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install the reinforced concrete slab as specified. Incidental costs shall include but not be limited to furnishing all required submittals.

**Item 10B: Steel Support Shape**

Measurement: Measurement will be made by the lineal foot for the reinforcing steel shape to support the concrete slab and transformer over the water.

Payment: Payment will be made at the contract bid price per lineal foot, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to furnish and install a reinforcing steel shape to support the concrete and transformer as specified. Incidental costs shall include but not be limited to furnishing all required submittals.

**Item 11B: Steel Floating Dock – Ipe Decking**

Measurement: Measurement will be made by the square foot for galvanized steel frame floating docks with Ipe timber decking.

Payment: Payment will be made at the contract bid price per square foot, which shall be compensation in full for all labor, materials, equipment, and other incidentals necessary to install galvanized steel frame floating docks with composite decking. Incidental costs shall include but not be limited to (1) composite decking and (2) furnishing all required submittals.

## PART 2 – PRODUCTS – NOT USED

## PART 3 – EXECUTION – NOT USED

END OF SECTION

# SECTION 02 41 13 – SELECTIVE SITE DEMOLITION

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Demolition and Removal of designated items from existing structure as identified in the Contract Drawings.
    a. Metal bin-wall mooring pier structures.
    b. “Ell Dock” structure.
    c. Concrete pavement from “T Dock” structures and adjacent to “Ell Dock”.
    d. Timber ramps
    e. Safety ladders
    f. Mooring piles
    g. Timber rub rail
    h. Fencing
2. Salvage of Designated Items
    a. Utility pedestals
    b. Safety ladders
    c. Light poles
3. Special Precautions.
    a. Hazardous Waste or Contaminated Material.
    b. Existing Utilities to be removed.
4. Disposal of Material.

### 1.2 REFERENCES

A. Wisconsin Department of Transportation (WisDOT) Standard Specifications for Construction 2024 Edition.

### 1.3 SUBMITTALS

A. Submit schedule indicating Work sequence.

1. Coordinate the schedule to allow sufficient time for required testing, inspections, and installation of work of Related Sections.
2. Coordinate with continuations of Owner’s onsite operations.

B. Submit pre-demolition photographs or video before Work begins.

C. Provide Plans indicating location of salvageable items, location and construction of barricades, fences, and temporary work.

D. Provide accurate record locations of abandoned utilities, subsurface obstructions, and any item relocated or buried.

E. Demolition Closeout:

**1.** Upon completion of work incidental to demolition, provide certification that the work has been completed in accordance with the intent of the Contract Documents and that the site is ready for subsequent work.

1.4 QUALITY CONTROL

A. The Contractor is solely responsible for the cleanup of any rivers, streams, lakes, ground or roadway surfaces or other property damaged by construction activity related to this project.

B. Remove temporary devices after protected areas have been stabilized.

C. Contractor is to repair or replace any damaged utility line or structure at no additional cost to the Owner.

D. When alterations to existing utilities are shown to avoid conflicts, Contractor is to coordinate the removal and/or relocation of conflicting existing utilities with the utility's Owner at no additional cost to the Owner.

E. All expenses incurred in complying with the provisions hereof and effectively providing a quality product shall be borne by the Contractor with no direct compensation being made.

F. A copy of all inspection and test records shall be furnished to the Contractor by the Engineer within two (2) days of completion of the work if deficiencies are discovered. Quality control tests and inspections shall be performed by and at the expense of the Contractor.

1.5 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen under the supervision of a Project Manager who is experienced in the necessary crafts required for proper performance of the Work Qualifications:

1. Project Manager shall be completely familiar with the specified requirements.

a. Project Manager shall be authorized to render decisions on behalf of the Contractor.

B. Use equipment adequate in size, capacity, and number to accomplish the Work in a timely manner.

C. Comply with governing EPA notification regulations before beginning Work. Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Conform to applicable Federal and Wisconsin State Statutes and Rules, WisDOT Specifications, the Wisconsin State Building Code, and local codes and ordinances for performance of Work, dewatering, transport and disposal of excess material, dust and run-off control, and emergency access to the site.

1.6 SEQUENCING & SCHEDULING

A. Do not begin work until temporary erosion prevention and sedimentation control is in place.

B. Obtain prior written approval from the Owner and/or regulatory authorities before deviating from the following sequence of initiation of work elements:

1. Do not begin work until applicable permits are issued by authorities having jurisdiction.

2. Install temporary erosion prevention and sedimentation control measures and devices.
3. Construct temporary construction access, parking, and staging areas.
4. Conduct demolition operations.
5. Remove debris and clean up the site.

C. Coordinate the schedule for demolition Work necessary to maintain the Critical Path for subsequent Work specified in related sections.

D. Obtain necessary permission from Owner and/or regulatory authorities for Work that must be performed outside of normal work hours, on weekends, or over holidays, either as necessary to minimize the impact of temporary shutdown of utility services and traffic, or for the Contractor's convenience.

E. Coordinate the schedule to provide for the Owner's continuing operations on or adjacent to the site.

## PART 2 - PRODUCTS

2.1 NOT USED

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that erosion and sedimentation control devices are in place prior to beginning work.

3.2 PREPARATION

A. Notify affected Public and private utilities before starting work and comply with their requirements.

B. Protect existing plants, equipment and structures which are in areas where Work will be performed, which are to remain.

1. Provide bracing or shoring as needed to prevent movement or settlement of adjacent structures.
2. Provide barricades to prohibit unauthorized entry to project site.
3. Maintain benchmarks and monuments existing on the site.
    a. If relocation is required, employ service of Licensed Land Surveyor.

C. Obtain written permission from adjacent property owners (both private and public) when demolition equipment will traverse, infringe upon or limit access to their property.

3.3 INSTALLATION

A. Salvage

1. Remove material to be salvaged in a manner to prevent damage.
    a. Dismantle as necessary to permit convenient handling.
    b. Clean for storage.

2. Stockpile or store salvaged materials for use by Owner in a secured location on site until delivered to or picked up by Owner.
3. Stockpile or store salvaged materials for use on the Project until time of reinstallation.
4. Materials salvaged by the Contractor for the Contractor's own benefit shall be immediately removed from the site.
    a. Brokerage of Contractor salvage material is not permitted on site.

B. Demolition & Disposal Requirements

1. Remove structures and facilities as indicated on the Plans.
    a. Remove and dispose of all structures, except for that which is permitted to remain upon determination being made by the Owner that their existence does not interfere with, endanger, or detract from the new construction in any way.
2. Demolition and disposal shall be per WisDOT section 203.3.2.2.3
3. Conduct operations with minimum interference to public or private accesses.
    a. Maintain protected egress and access at all times.
4. Perform removal operations that may endanger new construction prior to construction of affected Work.
5. Cease operations immediately if adjacent structures appear to be in danger.
    a. Notify the Owner and do not resume operations until directed.
6. All materials, except existing designated for salvage, demolished under this section shall be removed from the site.
    a. The cost of legal disposal of the materials shall be included in the Bid, and no additional compensation will be allowed.

C. Special Precautions

1. Allow for installation of necessary erosion control devices as work progresses according to the means and methods of construction.
2. Suspend Work and provide required notifications to the Owner and regulatory authorities upon discovery or verifiable suspicion of hazardous waste or contaminated material.

D. Cleaning/Repair

1. Clean the site of all debris and unused materials and remove from site.
2. Repair or replace existing property which is to remain that is damaged by the Work of this Section at no cost to the Owner.

**END OF SECTION 02 41 13**

# SECTION 03 30 00 – CAST-IN-PLACE CONCRETE

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes:

**1.** Cast-in-place concrete.

**2.** Formwork.

**3.** Reinforcement.

**4.** Concrete materials.

**5.** Mixture design.

**6.** Placement procedures.

B. The cast-in-place concrete includes the following:

1. Concrete Slabs

### 1.2 REFERENCES

A. Codes

1. ACI 301 – Specifications for Structural Concrete for Buildings.
2. ACI 304 – Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
3. ACI 305 – Guide to Hot Weather Concreting
4. ACI 306.1 – Standard Specification for Cold Weather Concreting
5. ACI 318 – Building Code Requirements for Structural Concrete.
6. AWS D1.4 – Structural Welding Code: Steel Reinforcing Bars
7. FS TT-C-800 – Curing Compound Concrete for New and Existing Surfaces.
8. Contract, General, Supplementary and Other Conditions of Division 00, the General Requirements Sections of Division 01 and the Drawings apply to Work of this Section.

B. Related Sections include:

1. Section 05 12 00 “Structural Steel”
2. Section 31 62 16 “Steel Piling”
3. Section 35 31 16.19 “Steel Sheet Piling”

C. Wisconsin Department of Transportation (WisDOT) Standard Specifications for Construction.

D. ASTM Standards that apply to this Section include:

1. ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete
2. ASTM C143 – Standard Test Method for Slump of Hydraulic Cement Concrete
3. ASTM C 231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

4. ASTM C 1064 – Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
5. ASTM C 31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field
6. ASTM C 39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
7. ASTM C 42 – Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
8. ASTM E 1155 – Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers
9. ASTM A 185 – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
10. ASTM A 615 – Standard Specification of Deformed and Plain Carbon- Steel Bars for Concrete Reinforcement
11. ASTM A 496 – Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement
12. ASTM C 94 – Standard Specification for Ready-Mixed Concrete
13. ASTM C 1077 – Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
14. ASTM E 329 – Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
15. ASTM A 29 – Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought

1.3 SUBMITTALS

A. Schedule indicating Work sequence.
   1. Coordinate the schedule to allow sufficient time for required testing, inspections, and installation of work of Related Sections.
   2. Coordinate with continuations of Owner's onsite operations.
B. All materials under the provisions of Division 01 sections.
   1. Submit product data for all materials required for a complete installation prior to installation demonstrating that materials meet the specifications.
   2. Submit manufacturer's installation instructions and recommendations prior to installation.
C. Observation Reports.
D. Experienced Land Surveyor qualifications and supervision.
E. Test reports from the independent testing facility on materials and testing showing compliance with the Specifications.
F. Copies of all permits received along with any special conditions or requirements of compliance.

G. Substantiating data for concrete mix design to the Owner and the Independent Testing Agency not less than two weeks prior to concrete placement.

1. Data for mix shall, as a minimum, include the following:

a. Mix identification designation.

b. Statement of intended use for mix.

c. Mix proportions, including all admixtures.

d. Manufacturer's data and/or certification verifying conformance of all mix materials, including admixtures with specific requirements.

e. Wet and dry aggregate unit weight.

f. Entrained air content.

g. Design slump.

h. Required average strength qualification data per ACI 3201; 3.9.1, 3.9.2 and WisDOT Specification 715.3.2.

2. Indicate amounts of mixing water to be withheld for later addition at Project site.

H. Steel Reinforcement Shop Drawings: Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

I. Formwork Shop Drawings: Prepared by or under the supervision of a qualified Professional Engineer, detailing fabrication, assembly, and support of formwork.

1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.

J. Joint Layout: Indicate proposed construction, isolation, and expansion joints required to construct the structure.

1. Location of construction joints is subject to approval by the Engineer.

K. Testing Agency Qualifications.

L. Welding Certificates.

M. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.

2. Admixtures.

3. Steel reinforcement and accessories.

4. Curing compounds.

5. Joint-filler strips.

N. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

O. Samples and/or mockup of formed surfaces for approval.

P. Field quality-control reports.

Q. Meeting minutes from pre-installation conference.

1.4 QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector or qualified testing and inspecting agency to perform field tests and inspecting and prepare test reports.

B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel reinforcement placement.
2. Headed bolts and studs.
3. Verification of use of required design mixture.
4. Concrete placement, including conveying and depositing.
5. Curing procedures and maintenance of curing temperature.
6. Verification of concrete strength before removal of shores and forms from slabs.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing frequency: Obtain one set of five concrete test cylinders will be taken for each individual concrete structure (i.e., dolphin, pier, bollard pad, wall, etc.) or every 50 cubic yards or less of concrete placed daily.
2. Slump: ASTM C 143; one test at point of placement for each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31.
6. Cast and cure one set of five standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C 39.
8. Test one specimen at 7 days, three specimens at 28 days, and reserve one cylinder for contingency testing at 56 days.
9. When the strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
11. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28- day tests.
12. Nondestructive Testing: Impact hammer, Soniscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.
13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Engineer.
14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

F. Detail reinforcing steel in accordance with "ACI Detailing Manual" ACI SP66 and "CRSI: Manual of Standard Practice and Recommended Practice for Placing Reinforcing Bars", except where shown otherwise.

G. Development Length and Lap Splice Length of reinforcing bars shall be as shown on the plans. Reinforcing bar splices shall be class "B" tension lap splices, unless noted otherwise.

H. Welded wire fabric shall conform to ASTM A185.

I. Reinforcing steel meeting ASTM A615 shall not be welded without prior approval from Engineer.

J. Welded wire fabric shall be lapped two full mesh panels and tied securely.

K. Reinforcing steel to be welded shall be weldable rebar meeting ASTM A 706 specification or deformed bar anchors meeting ASTM A496 standard. All welding of rebar shall be submitted for approval to Engineer prior to welding.

L. Anchor tests: Performance tests shall be performed on 5% of the anchors installed. Proof tests shall be performed on all of the remaining anchors. All of the tests shall conform to manufacutrers recommendations and ASTM A981 & D4435 where applicable. Any anchors that fail during the testing shall be reported to the Engineer and the achor shall be replaced at no additional cost to the Owner.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field-Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4.

E. Perform the Work in accordance with ACI 301 and ACI r.

F. Do not commence placement of concrete until mix design has been reviewed and approved by the Engineer and until copies are at the jobsite, the batch plant, and the building inspection department.

G. The complete concrete pavement Work shall give the appearance of uniformity in color, surface contour, and texture and shall be accurately constructed to line and grade.

1. The required joints shall show neat workmanship.

H. The Contractor is to employ the services of an experienced Land Surveyor with at least four (4) years of surveying experience related to the Work. The experienced Land Surveyor shall complete all Survey Work under the direct supervision of a Licensed Land Surveyor or Professional Engineer.

I. Conform to applicable Federal and Wisconsin State Statutes and Rules, WisDOT Specifications, the Wisconsin State Building Code, the Wisconsin State Plumbing Code, project Response Action Plan (RAP) and local codes and ordinances for performance of Work, dewatering, transport and disposal of excess material, dust and run-off control, and emergency access to the site.

1.6 SEQUENCING & SCHEDULING

A. Do not begin work until temporary erosion prevention and sedimentation control is in place.

B. Conduct operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied facilities.

1. Do not close or obstruct roadways or sidewalks without permits.

2. Provide traffic control and/or alternate routes if required.

3. Maintain access to adjacent areas at all times.

C. Contractor to provide notification:

1. Provide proper advance notification to regulatory authorities in accordance with applicable code and permit requirements for observation and inspection.

D. Verify actual locations of other construction into which systems must fit by accurate field measurements before installation.

E. Coordinate installation schedule with construction progress to avoid delay of the Work.

F. All new Work shall be laid out by an experienced Land Surveyor.

G. All work is to proceed from downstream to upstream.

H. Obtain prior written approval from the Owner and/or regulatory authorities before deviating from the following sequence of initiation of work elements:

1. Do not begin work until applicable permits are issued by authorities having jurisdiction.
2. Contractor to stage Work to minimize, as practicable, large expanses of exposed soil.
3. Install temporary erosion prevention and sedimentation control measures and devices.
4. Construct temporary construction access, parking, and staging areas.
5. Conduct paving operations.
6. Remove debris and clean up site.
7. Conduct finish grading and topsoil spreading operations per BMPs.

I. Coordinate the schedule for Concrete Work necessary to maintain the Critical Path for subsequent work specified in related sections.

J. Obtain necessary permission from Owner and/or regulatory authorities for Work that must be performed outside of normal work hours, on weekends, or over holidays, either as necessary to minimize the impact of temporary shutdown of utility services and traffic, or for the Contractor's convenience.

K. Coordinate the schedule to provide for the Owner's continuing operations on or adjacent to the site.

1.7 PROJECT CONDITIONS

A. Instruments of record including but not limited to; studies, reports, facility condition assessments, surveys, or plans; furnished with the Project Manual, Project Plans are available for inspection at the office of the Owner are made available for information only and are not guaranteed to be inclusive.

B. Contractor is to perform verification of existing site conditions.

C. Cold-Weather Placement: comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

D. Hot-Weather Placement: Comply with ACI 301 and ACI 305, and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

E. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

F. Maintain benchmarks, monuments and other reference points.

1. If benchmarks, monuments, and other reference points are disturbed or destroyed, benchmarks, monuments and other reference points shall be replaced or relocated by a Licensed Land Surveyor.

2. Cost of replacing or relocating benchmarks, monuments and other reference points shall be incidental to the project.

G. Contractor shall provide at the Contractor's expense, dewatering and unwatering as necessary for the Work that must be performed to complete this Project.

1. Comply with conditions for dewatering, unwatering, and drainage as specified in Related Sections.

1.8 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

## PART 2 - PRODUCTS

2.1 MATERIALS

A. FORM-FACING MATERIALS

1. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practical sizes to minimize number of joints.

a. Plywood, metal, or other approved panel materials.

2. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

3. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4-inch, unless noted otherwise.

B. STEEL REINFORCEMENT

1. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

2. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064, plain, fabricated from as-drawn steel wire into flat sheets.
3. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete.
4. Deformed Bar Anchors: ASTM A 496 Steel Wire, Deformed, For Concrete Reinforcement.
5. Headed Stud Anchors: ASTM A 29, and meet the mechanical property requirements for Type B studs as specified in AWS D1.1-10.
6. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

C. CONCRETE MATERIALS

1. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
   a. A backup concrete Supplier may be used only if all the required submittals have been approved.
2. Cementitious Materials:
   a. Portland Cement: ASTM C 150, Type II, gray or white.
   b. Fly Ash: ASTM C 618, Class F.
   c. Slag Cement: ASTM C 989, Grade 100 or 120.
   d. Silica Fume: ASTM C 1240, amorphous silica.
3. Normal-Weight Aggregates: ASTM C 33 coarse aggregate or better, graded. Provide aggregates from a single source.
   a. Maximum Coarse-Aggregate Size: ¾-inch
   b. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
4. Air-Entraining Admixture: ASTM C 260.
   a. Entrained Air shall be 6.5% +/- 1.5% (measured at truck discharge).
5. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   a. Water-Reducing Admixture: ASTM C 494, Type A.
   b. Retarding Admixture: ASTM C 494, Type B.
   c. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
   d. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
   e. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
   f. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

6. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494, Type C.
7. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
8. Water: ASTM C 1602 and potable.

D. CURING MATERIALS

1. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
2. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
3. Water: Potable.
4. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

E. RELATED MATERIALS

1. Expansion and Isolation Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

F. REPAIR MATERIALS

1. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
   a. Cement Binder: ASTM C 150, Portland cement.
   b. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
   c. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
   d. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109.

G. CONCRETE MIXTURES, GENERAL

1. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
2. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
3. Cementitious Materials: Use fly ash, slag cement, and silica fume as needed to reduce the total amount of Portland cement, which would otherwise be used, by no greater than 40 percent.
4. Admixtures: Use admixtures according to manufacturer's written instructions.

5. Use water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
6. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

H. CONCRETE MIXTURES – SLABS

1. Concrete for slabs: Normal-weight concrete.
   a. Minimum Compressive Strength: 5000 psi at 28 days.
   b. Maximum w/cm Ratio: 0.40.
   c. Air Content: 6.5% +/- 1.5% at point of delivery.
   d. Slump: 4 inches +/- 1 inch with allowance to use superplasticizing admixture to increase up to 8" if desired.

I. CONCRETE MIXING

1. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.
2. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 90 minutes to 75 minutes; when air temperature is between 90 deg F and 95 deg F, reduce mixing and delivery time to 60 minutes. Concrete temperatures greater than 95 deg F shall be cause for rejection.

J. NON-SHRINK GROUT

1. Non-shrink grout shall be Sikagrout® 212 as manufactured by the Sika Corporation, NC GROUT as manufactured by the Euclid Chemical Company, or approved equivalent.

2.2 WARRANTY

1. Provide one year written warranty for all materials and workmanship against defects after completion and final acceptance of the Work under the provisions of Division 1000 sections.
2. Defects dure to faulty materials or workmanship developed during the warranty period shall be satisfactorily repaired or replaced at the Contractor's expense.

## PART 3 - EXECUTION

3.1 HANDLING AND STORAGE

A. Unless otherwise indicated, all required materials shall be furnished by the Contractor.

B. Materials for this Work shall be new material conforming to the requirements of the referenced Specifications for the class, kind, type, size, grade, and other details indicated in these Specifications or on the Plans.

C. Contractor shall schedule the delivery of material to arrive as near as possible to the time of the placement of the material for incorporation into the Work.

D. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending, damage, and rust.

E. Excess Material Management

1. Excess material and unsuitable material become the property of the Contractor and shall be removed from the site.
2. The Contractor is responsible for determining the quantities of material necessary for the Work including the costs of removal of excess and unsuitable material.

3.2 PREPARATION

A. Formwork

1. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
2. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
3. Construct formwork true and straight in accordance with ACI standards.
4. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
5. Class A, 1/8 inch for smooth-formed finished surfaces.
6. Construct forms tight enough to prevent loss of concrete mortar.
7. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
8. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
9. Chamfer exterior corners and edges of permanently exposed concrete.
10. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
11. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
12. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

B. Embedded Item Installation

1. Embedded items and openings required for mooring, utility, electrical, and mechanical services shall be incorporated into the structures regardless of whether they are detailed or indicated on the civil transportation drawings. Opening dimensions shown on the drawings for equipment and components shall be coordinated with the actual equipment and components to be used, and the dimensions adjusted in accordance with the Manufacturer's requirements. Refer to the other discipline drawings for floor finishes, slopes, drains, depressions, cells, equipment pads, etc.
2. Items embedded in the concrete shall be cleaned to remove all loose scale, rust, and marine growth. Refer to the respective drawings for the details of embedded items and openings.

3. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    a. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

C. Steel Reinforcement Installation

1. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
2. Clean reinforcement of loose rust and mill scale, concrete, earth, ice, oil, and other foreign materials that reduce bond to new concrete.
3. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
4. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
5. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least two mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
6. Install deformed bar anchors in accordance with AWS D1.1 Structural Welding Code – Steel Type C.
7. Install headed stud anchors in accordance with AWS D1.1 Structural Welding Code – Steel Type B.

D. Joints

1. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
2. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.
3. Contraction and Expansion Joints: Install in accordance with plans, at locations indicated or approved by Engineer.

## 3.3 INSTALLATION

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Horizontal reinforcing bars shall be continuous around corners.

C. Reinforcing bar dimensions shown on the drawings are to centerline of bars unless noted otherwise.

D. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.

E. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

F. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Arrange equipment so that the concrete has a vertical free-fall no greater than 5 ft.
2. Deposit concrete at or near its final position to avoid segregation from lateral flow of the concrete.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
5. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

G. Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

H. Apply finishes in accordance with plans and schedules.

1. All horizontal concrete surfaces shall have a broom finish unless otherwise indicated in the Contract Drawings.
2. All other exposed, or that could potentially become exposed, surfaces shall be grained smooth and have a sack rub finish approved by the Engineer.
3. All non-exposed surfaces shall have smooth form finish approved by the engineer; this finish shall not have honeycombing, bug holes over 1/4”, and shal comply with ACI smooth form finish guidelines.

I. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305 for hot-weather protection during curing.

J. Unformed Surfaces:

1. Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

K. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

L. Keep surfaces continuously moist for not less than seven (7) days with the following materials:

1. Water.
2. Continuous water-fog spray.

3. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

## 3.4 CONCRETE SURFACE REPAIRS

A. Defective concrete: repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

B. Patching mortar: mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a no. 16 sieve, using only enough water for handling and placing.

C. Repairing formed surfaces: surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.

D. Repairing unformed surfaces: test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Engineer's approval.

**END OF SECTION 03 30 00**

# SECTION 05 12 00 – STRUCTURAL STEEL

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes:

1. Structural steel
2. The structural steel includes the following:
   a. Channel Cap
   b. Transition Plate

### 1.2 REFERENCES

A. Society for Testing and Materials (ASTM International)

B. Contract, General, Supplementary and Other Conditions of the general Construction Contract and the Drawings apply to Work of this Section.

C. City of Bayfield, Wisconsin Construction Standards.

D. Wisconsin Department of Transportation (WisDOT) Standard Specifications for Construction. If there is a conflict between WisDOT and the City of Bayfield specifications, the City of Bayfield specifications shall govern.

E. Related Sections:

1. Section 03 30 00 “Cast-In-Place Concrete”
2. Section 06 13 23 “Heavy Timber Construction”
3. Section 31 62 16 “Steel Piling”
4. Section 35 31 16 “Steel Sheet Piling”

### 1.3 SUBMITTALS

A. Schedule indicating Work sequence.

1. Coordinate the schedule to allow sufficient time for required testing, inspections, and installation of work of Related Sections.
2. Coordinate with continuations of Owner’s onsite operations.

B. Experienced Land Surveyor qualifications and supervision.

C. Pre-Work photographs or video before Work begins.

D. Test reports from the independent testing facility on materials showing compliance with the Specifications.

E. Copies of all permits received along with any special conditions or requirements of compliance.

F. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.

3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts.
5. Identify demand critical welds.

G. Welding certificates.

H. Certified mill test reports for structural steel, including chemical and physical properties.

I. Product Test Reports: For the following:

1. Bolts, nuts, and washers including mechanical properties and chemical analysis.

J. Source quality-control reports.

1.4 QUALITY CONTROL

A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

B. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections may be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at the testing agency's option:

E. Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high strength bolted connections.

F. Bolted Connections: Bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

G. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.

1. In addition to visual inspection, field welds may be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:
   a. Liquid Penetrant Inspection: ASTM E 165.
   b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.

H. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

1.5 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen under the supervision of a Project Manager who is experienced in the necessary crafts required for proper performance of the Work Qualifications:

1. Project Manager shall be completely familiar with the specified requirements.

2. Project Manager shall be authorized to render decisions on behalf of the Contractor.

B. Use equipment adequate in size, capacity and number to accomplish the Work in a timely manner.

C. Conform to applicable Federal and Wisconsin State Statutes and Rules, City of Bayfield Specifications, WisDOT Specifications, the Wisconsin State Building Code, and local codes and ordinances for performance of Work, dewatering, transport and disposal of excess material, dust and run-off control, and emergency access to the site.

D. Testing and observations paid for by the Owner shall be conducted by an Independent Testing Laboratory and by, or under the direct supervision of, a Licensed Professional.

1. Subsequent tests required as a result of non-conforming work shall be paid for by the Contractor.

E. The Contractor is to employ the services of an experienced Land Surveyor with at least four (4) years of surveying experience related to the Work. The experienced Land Surveyor shall complete all Survey Work under the direct supervision of a Licensed Land Surveyor or Professional Engineer.

F. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program.

G. Above Waterline Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8.

2. Elements involving connections of sheet steel or strip steel shall also be in accordance with the latest edition of AWS D1.3, specification for welding sheet steel in structures.

H. Below Waterline Welding Qualifications: Qualify procedures and personnel according to AWS D3.6/D3.6M, "Underwater Welding Code Structural Welding Code - Steel."

1. A proficiency weld test will be performed on-site prior to the beginning of work. A fillet and groove weld will be tested to AWS standards for testing underwater welds. The test will be completed by every diver who will be welding during the course of the project. Engineer will administer the tests to the divers, provide the test plates, perform visual inspection and utilize an independent testing agency to assess the adequacy of the welds. Contractor will not be compensated for any additional time and welding rod rods utilized for the test. Cost shall be included in the overall unit costs for the project.

I. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.

2. AISC 341 and 341s1.

3. AISC 360.

4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A490 Bolts."

J. Pre-installation Conferences: Conduct pre-installation conferences at Project Site. Note that more than one pre-installation conference may be required for each of the following:

1. Structural Steel Members.

1.6 PROJECT CONDITIIONS

A. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

B. Instruments of record including, but not limited to; studies, reports, facility condition assessments, surveys, or plans; furnished with the Project Manual, Project Plans or available for inspection at the office of the Owner/Engineer/Architect are made available for information only and are not guaranteed to be inclusive.

1.7 SEQUENCING & SCHEDULING

A. Do not begin work until temporary erosion prevention and sedimentation control is in place.

B. Conduct operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied facilities.

1. Do not close or obstruct roadways or sidewalks without permits.
2. Provide traffic control and/or alternate routes if required.
3. Maintain access to adjacent areas at all times.

C. Contractor to provide notification:

1. Provide proper advance notification to regulatory authorities in accordance with applicable code and permit requirements for observation and inspection.

D. Verify actual locations of other construction into which systems must fit by accurate field measurements before installation.

E. Coordinate installation schedule with construction progress to avoid delay of the Work.

F. All new Work shall be laid out by an experienced Land Surveyor.

G. Obtain prior written approval from the Owner and/or regulatory authorities before deviating from the following sequence of initiation of work elements:

1. Do not begin work until applicable permits are issued by authorities having jurisdiction.
2. Contractor to stage Work to minimize, as practicable, large expanses of exposed soil.
3. Install temporary erosion prevention and sedimentation control measures and devices.
4. Construct temporary construction access, parking, and staging areas.
5. Conduct paving operations.
6. Remove debris and clean-up site.
7. Conduct finish grading and topsoil spreading operations per BMPs.

H. Coordinate the schedule for Concrete Work necessary to maintain the Critical Path for subsequent work specified in related sections.

I. Obtain necessary permission from Owner and/or regulatory authorities for Work that must be performed outside of normal work hours, on weekends, or over holidays, either as necessary to minimize the impact of temporary shutdown of utility services and traffic, or for the Contractor's convenience.

J. Coordinate the schedule to provide for the Owner's continuing operations on or adjacent to the site.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structure. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer’s labels intact.

1. Fasteners may be repackaged provided Owner’s testing and inspecting agency observes repackaging and seals containers.

2. Clean and re-lubricate bolts and nuts that become dry or rusty before use.

3. Comply with manufacturer’s written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.9 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator or Contract as detailed on construction documents.

1.10 WARRANTY

A. Provide one year written warranty for all materials and workmanship against defects after completion and final acceptance of the Work under provisions of Division 01 sections.

B. Defects due to faulty materials or workmanship developed during the warranty period shall be satisfactorily repaired or replaced at the Contractor’s expense.

## PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. The Contractor is responsible for determining the quantities of material necessary for completing the Work.

B. Unless otherwise indicated, all required materials shall be furnished by the Contractor.

C. Materials required for this Work shall be new material conforming to the requirements of the referenced Specifications for the class, kind, type, size, grade and other details indicated in these Specifications or on the Plans.

D. Steel members and connections were designed assuming a type PR (partially restrained) or “simple framing” construction type.

2.2 MATERIAL PROPERTIES

A. Wide Flange Shapes: ASTM A992

B. Channel and Angle Shapes: ASTM A36.

C. Plate and Bar: ASTM A36.

D. Welding Electrodes: Comply with AWS requirements.

1. Welding Electrodes utilized in underwater welding shall meet the standards of AWS D3.6.

E. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel

1. structural bolts; ASTM A 563 heavy-hex carbon-steel nuts; and ASTM F 436, Type 1,

2. hardened carbon-steel washers; all with plain finish.

F. Bolted connections shall be with 7/8" high strength bolts conforming to ASTM A325 with threads excluded from the shear plane unless indicated otherwise on the Drawings. The use of high strength steel bolts shall be governed by "Specification for Structural Joints using ASTM A325 or A490 Bolts".

G. Anchor Rods: ASTM 1554 Grade 36.

H. Welded Studs: ASTM A108.

I. Weld Electrodes: E70XX.

J. Galvanized Bolts: ASTM A307.

K. Galvanized Nut: ASTM A A563.

L. Galvanized Washer: ASTM F436.

M. Stainless Steel Bolts: Type 304 or 316.

N. All hardware and structural steel shapes to be painted shall be designated in the construction documents or project specifications.

1. All hardware and structural steel shapes to be pained shall be completed in accordance with the general specifications and plans or galvanized by the hot dipped process in accordance with he requirements of ASTM A123 and/or A153, as applicable, after fabrication, unless otherwise noted.

O. Field treat damaged galvanized finish with two coats of high zinc dust oxide paint, cold galvanizing compounds or approved equal conforming to the requirements of ASTM A780.

P. Field treat all coating damaged with maufacturers recommended repair process. All processes for repair must be approved by the engineer prior to the repair.

2.3 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

1. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.

2. Mark and match-mark materials for field assembly.

3. Complete structural-steel assemblies, including welding of units, before starting shop- priming operations.

B. Thermal Cutting: Perform thermal cutting machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

1. All nominal bolt hole diameters through structural elements shall be standard size unless noted otherwise.

2. Cut, drill, punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.

3. Drilled holes through steel sheet pile for tie rod connections shall be no greater than the approximate thread major diameter + 1/8 inch.

E. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

F. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

## 2.4 PAINTED STEEL

A. Paint Shall be Hi-Solids Polyurethane by the Sherwin Williams Corp. or approved equal and applied per manufacturer’s recommendations.

B. Paint shall be applied with zinc rich primer and in two top coats each 4 mil DFT. Color shall be verified with owner prior to application.

C. All surfaces to be coated shall be sandblasted in preparation for application of the coatin. Sandblasting shall be to near-white metal, at least equivalent to a commercial blast as defined by SSPC-SP10. All surfaces to be coated must be completely dry, free of moisture, soil, dust, and grit at the time coating is applied.

D. Any coatings damaged from fasteners, welding, or during installation shall be field repaired with he appropriate coating per the manufacturer’s recommendations.

E. All coatings paint shall be a high solids two component polyurethane resin coating.

## 2.5 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC’s “Specification for Structural Joints Using ASTM A 325 or A 490 Bolts” for type of bolts and type of joint specified.

1. Joint type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete-bearing surfaces and locations of anchor rods, bearing plates, and other embedment's for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

B. Provide fire watch during all welding, flame cutting and burning.

### 3.3 INSTALLATION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

C. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

D. Splice members only where indicated.

E. Do not use thermal cutting during erection unless approved by Engineer. Finish thermally cut sections within smoothness limits in AWS D1.1. Cut edges shall meet or exceed surface roughness standards for Sample 3 as specified by AWS C4.1-77.

1. All steel removed by flame cutting (torches, plasma, broco, etc.) shall be performed in general accordance with AWS D1.1. Unless noted otherwise, all remaining surfaces after steel removal shall have grinded smooth surfaces. All surfaces shall have no more than 10% material loss at an location (i.e. at any pit) unless noted otherwise. In the event that over 10% material loss is discovered, the contractor shall, at no additional cost to the owner, repair the surfaces as directed by the engineer.

F. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

G. Bolt Connections: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Snug tightened or Pre-tensioned as noted in the Plan Sheets.

H. Pre-Tensioned Bolted connections:

1. Faying surfaces of pre-tensioned bolts shall be free of all loose rust, loose mill scale, and loose paint to a degree specified by hand chipping, scraping, sanding, and wire brushing to obtain a Class A faying surface.

2. A tension calibrator shall be used where bolts are to be pre-tensioned to confirm the suitability of the completed fastener assembly, including lubrication, for the pre-tensioned installation; and, to confirm the procedure and paroper use by the bolting crew of the pre-tensioning method to be used.

a. The accuracy of a hydraulic tension calibrator shall be confirmed through calibration at least annually.

3. The hardware shall be pre-tensioned once the surfaces of the joining material are in firm contact.

I. Beveled washers shall be utilized when the outer face of the joint has a slope that is greater than 1:20 with respect to a plane that is normal to the bolt axis.

J. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.

3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material

**END OF SECTION 05 12 00**

# SECTION 06 13 23 – HEAVY TIMBER CONSTRUCTION

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Timber Rub Rail

### 1.2 REFERENCES

A. Codes

1. ANSI / AWC National Design Specifications (NDS).
2. Wisconsin Department of Transportation (WisDOT) Standard Specifications for Construction.

B. Contract, General, Supplementary and Other Conditions of Division 00, the General Requirements Sections of Division 01 and the Drawings apply to Work of this Section.

C. Related Sections include:

1. 05 12 00 “Structural Steel”
2. Section 35 31 16 “Steel Sheet Piling”

### 1.3 SUBMITTALS

A. Certificates of Inspection: For exposed timber not marked with grade stamp, a letter must be issued by an independent lumber grading agency to the engineer, prior to installation.

B. Schedule indicating Work sequence.

1. Coordinate the schedule to allow sufficient time for required testing, inspections, and installation of work of Related Sections.
2. Coordinate with continuations of Owner’s onsite operations.

### 1.4 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen under the supervision of a Project Manager who is experienced in the necessary crafts required for proper performance of the Work Qualifications:

1. Project Manager shall be completely familiar with the specified requirements.
2. Project Manager shall be authorized to render decisions on behalf of the Contractor.

B. Testing and observations paid for by the Owner shall be conducted by an Independent Testing Laboratory and by, or under the direct supervision of, a Licensed Professional.

1. Subsequent tests required as a result of non-conforming work shall be paid for by the Contractor.

C. Timber Standard: Comply with ANSI / AWC National Design Specifications (NDS).

### 1.5 SEQUENCING & SCHEDULING

A. Coordinate the schedule for Work necessary to maintain the Critical Path for subsequent work specified in related sections.

B. Obtain necessary permission from Owner and/or regulatory authorities for Work that must be performed outside of normal work hours, on weekends, or over holidays, either as necessary to minimize the impact of temporary shutdown of utility services and traffic, or for the Contractor's convenience.

C. Coordinate the schedule to provide for the Owner's continuing operations on or adjacent to the site.

1.6 DEFINITIONS

A. Timbers: Lumber sized as indicated on the plan for use as dock fendering.

B. Inspection agencies, and the abbreviations used to reference them, include the following:

1. ALSC: American Lumber Standard Committee.
2. NELMA: Northeastern Lumber Manufacturers Association.
3. NHLA: National Hardwood Lumber Association.
4. NLGA: National Lumber Grades Authority.
5. SPIB : Southern Pine Inspection Bureau.
6. WCLIB: West Coast Lumber Inspection Bureau.
7. WWPA: Western Wood Products Association.

1.7 SYSTEM DESCRIPTION

A. The Contractor is responsible for determining the quantities of material necessary for completing the Work.

B. Single rough sawn timber fender rub rail shall be installed along the length of the dock.

**PART 2 - PRODUCTS**

2.1 MATERIALS:

A. Comply with ALSC 20 and grading rules of lumber grading agencies certified by American Lumber Standards Committee Board of Review.

1. Factory mark each item of timber with grade stamp of grading agency.
2. For exposed timber indicated to receive a stained or natural finish, apply grade stamps to surfaces that will not be exposed to view or omit grade stamps and provide certificates of grade compliance issued by grading agency.

B. Timber Species and Grade:

1. White Oak; Grade No. 1, or better as determined by NELMA, NHLA, NLGA, SPIB, WCLIB, or WWPA.
2. Red Oak; Grade No. 1, or better as determined by NELMA, NHLA, NLGA, SPIB, WCLIB, or WWPA.

C. Provide timber with 22 percent maximum moisture content at time of dressing. For maximum moisture contents between 22 percent and 30 percent, a one-year warranty of the timber maintaining a Grade No. 1 as determined by NELMA, NHLA, NLGA, SPIB, WCLIB, or WWPA will be required.

1. Moisture contents greater than 30 percent at time of dressing will not be accepted.

D. Provide timber that is rough sawn (Rgh).

E. Chamfer heavy timbers as noted in plans.

F. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts.

G. Timber Connectors

1. Fabricate as directed by the plans in accordance with appropriate specifications.

2. Bolts: See Specification Section 05-12 00 – Structural Steel.

2.2 FABRICATION

A. Shop fabricate members by cutting to the cross-section designated in the construction plan set of appropriate length. Pre-drill for fasteners and assembly of units.

B. Seal Coat: After fabricating each unit, apply a saturation coat of penetrating sealer on surfaces of each unit.

2.3 WARRANTY

**A.** If timber has a moisture content at time of dressing greater than 22 percent but less than 30 percent, then the Contractor shall provide a one-year warranty stating that the timber will maintain a Grade No. 1 as determined by NELMA, NHLA, NLGA, SPIB, WCLIB, or WWPA. Moisture contents greater than 30 percent at time of dressing will not be accepted.

## PART 3 - EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

A. Schedule delivery of heavy timer construction to avoid extended on-site storage and to avoid delaying the Work.

3.2 INSTALLATION

A. Install timber as indicated on the plans, maintaining lines and levels.

B. All materials, except existing designated for reused, salvage, reinstalled, or otherwise indicated on the Plans to remain Owner’s property. Remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

C. Do not burn demolished materials.

D. Disposal shall be per WisDOT Specifications and per state and local ordinances.

E. The cost of legal disposal of the materials shall be included in the Bid, and no additional compensation will be allowed.

**END OF SECTION 06 13 23**

# SECTION 31 20 00 – EARTH MOVING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Aggregate Backfill.
2. Granular Backfill.
3. Furnishing and Placing Borrow Material.
4. Temporary Staging Areas.

### 1.2 REFERENCES

A. American Society for Testing and Materials (ASTM International).

B. Wisconsin Department of Transportation (WisDOT) Standard Specifications for Construction 2024 Edition.

C. Occupational Safety and Health Administration (OSHA) 29 CFR, Part 1926, Sub Part P, "Excavations and Trenches" which states that excavation safety is the sole responsibility of the Contractor.

D. United States Department of Agriculture, Natural Resources Conservation Service (NRCS).

E. Related Sections:

1. 31 32 19.13 Geogrid Soil Stabilization

### 1.3 SUBMITTALS

A. Materials under the provisions of Division 01 sections.

B. Stockpile locations.

C. Project Record Documents shall include:

1. All borrow material delivered to the site; indicating type, weight, and moisture content; at appropriate intervals to assure uninterrupted progress.

### 1.4 QUALITY CONTROL

A. Contractor to provide notification:

1. Contact Gopher One-Call online, at (651) 454-0002 or at (800) 252-1166 to arrange for utility location services 48 hours minimum prior to performing any work on site.
2. Provide proper advance notification to regulatory authorities in accordance with applicable code and permit requirements for observation and inspection.

B. The Contractor is solely responsible for the cleanup of any rivers, streams, lakes, ground or roadway surfaces or other property damaged by construction activity related to this project.

C. Remove temporary devices after protected areas have been stabilized.

D. Contractor is to repair or replace any damaged utility line or structure at no additional cost to the Owner.

E. When alterations to existing utilities are shown to avoid conflicts, Contractor is to coordinate the removal and/or relocation of conflicting existing utilities with the utility's Owner at no additional cost to the Owner.

F. Maintain benchmarks, monuments, and other reference points.

1. If benchmarks, monuments, and other reference points are disturbed or destroyed, benchmarks, monuments and other reference points shall be replaced or relocated by a Licensed Land Surveyor.

2. Cost of replacing or relocating benchmarks, monuments and other reference points shall be incidental to the project.

G. Comply with conditions for drainage as specified herein.

1.5 QUALITY ASSURANCE

A. Use equipment adequate in size, capacity, and number to accomplish the Work in a timely manner.

B. Comply with governing EPA notification regulations before beginning Work. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Conform to applicable Federal and State Statutes and Rules, WisDOT Specifications, the Wisconsin State Building Code, and local codes and ordinances for performance of Work, dewatering, transport and disposal of excess material, dust and run-off control, and emergency access to the site.

D. Contractor to provide all necessary means and equipment to contain existing debris during demo including: Absorbent Boom, Screen Fence, H.D. Silt Fence, etc.

E. All excavations and trenches shall comply with the requirements of OSHA.

1.6 SEQUENCING & SCHEDULING

A. Do not begin work until temporary erosion prevention and sedimentation control is in place.

B. Comply with conditions for unwatering and drainage as specified in Related Documents and References Section.

C. Obtain prior written approval from the Owner and/or regulatory authorities before deviating from the following sequence of initiation of work elements:

1. Do not begin work until applicable permits are issued by authorities having jurisdiction

2. Install temporary erosion prevention and sedimentation control measures and devices.

3. Construct temporary construction access, parking, and staging areas.

4. Conduct mass excavation and embankment of the site.

5. Remove debris and cleanup site.

D. Coordinate the schedule for earth moving Work necessary to maintain the Critical Path for subsequent work specified in related sections.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall schedule the delivery of material to arrive as near as possible to the time of the placement of the material for incorporation into the Work.

1. The Contractor shall ship material near its optimum moisture content and protect the material from adverse weather conditions during transport.

B. Material from offsite sources shall not be accepted for delivery until tested and approved, or certified, as specified Acceptance at Site.

1. Material from offsite sources shall not be accepted for temporary storage until stockpile areas have been approved or verified.

2. Materials in a frozen condition, containing ice or snow, or with excessive moisture content, shall not be accepted for delivery.

C. Verify, or obtain approval of, locations for temporary stockpiles.

1. Construct stockpiles to provide free drainage of water from top of stockpiles and across site.

2. Provide coordination for provision of protection of stockpiles to prevent erosion by wind and water.

3. Protect stockpiles from contamination.

4. Secure stockpiles against unauthorized use or removal.

D. Excess Material Management

1. Excess material and unsuitable material becomes the property of the Contractor and shall be removed from the site.

2. The Contractor is responsible for determining the quantities of material necessary for the Work including the costs of removal of excess and unsuitable material.

3. The Contractor is not permitted to maintain a consistent high elevation within the stated tolerance to avoid removal of excess.

4. Brokerage of excess material on the site is not permitted.

## PART 2 - PRODUCTS

2.1 GENERAL

A. The Contractor is responsible for determining the quantities of material necessary for completing the Work.

B. Unless otherwise indicated, all required materials shall be furnished by the Contractor.

C. Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

D. To the greatest extent practical, soil materials used for the Work shall consist of suitable material, as generated during prosecution of the Work until such supply of on-site material is depleted.

E. Fill shall be near optimum moisture content at the time of placement and compaction.

1. Remove and replace or uniformly apply moisture to dry material and blend until suitable moisture content is obtained.

2. Remove and replace or scarify and dry material that is too wet until suitable moisture content is obtained.

F. Do not use materials that are frozen or that contain frost, ice, or snow.

1. Non-Frost Susceptible (NFS) Soil is defined as no more than 6% of the mass of undisturbed soils or fill material must pass through a #200 mesh sieve in accordance with ASTM D422.

G. Materials shall be free from chemical contaminants including, but not limited to:

1. Direct contamination or contamination of runoff from industrial areas.
2. Insecticides and herbicides used in commercial agricultural or nursery production.

H. Materials shall not contain rocks larger than six inches in greatest dimension and not more than fifteen percent of the rocks, by weight, larger than 2.5 inches in the greatest dimension unless noted otherwise on the Drawings.

I. Unless specifically noted, materials shall not contain any amount of slag, recycled bituminous or concrete material.

2.2 MATERIAL PROPERTIES

A. Recycled material is not permitted.

B. Granular materials shall meet the requirements of MnDOT Specification, Table 3149.2-1, “Granular Material”.

C. Open Graded Aggregate Base (OGAB) shall meet the requirements of MnDOT Specification, Table 3136.2-1 “Drainable Base Requirements”.

D. All Geotextile Fabric shall be Propex Geotex 315ST or approved equivalent.

E. All Erosion Mat shall be Propex Landlok C2 or approved equivalent.

F. All Silt Fence shall be Propex Geotex 2131 or approved equivalent.

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Identify required lines, levels, and contours and verify that survey benchmark and intended elevations for the Work are as indicated on the Plans.

3.2 PREPARATION

A. Verify that erosion and sedimentation control devices are in place prior to beginning Work.

B. Verify that Work of related sections necessary for initiation of Backfilling has been completed and approved.

1. Provide notification to Owner's authorized representative of unsatisfactory conditions preventing timely and proper completion of the Work.
2. Beginning Backfilling without notification indicates acceptance and assumed responsibility.

C. Verify locations for temporary material stockpiles.

1. Refer to Drawings to ensure that protected vegetation areas remain unaffected by the temporary material stockpiles.

D. Provide barricades to prohibit unauthorized entry to project site.

1. Maintain secured and protected egress and access at all times.

E. Slopes of excavations shall comply with OSHA requirements and applicable building codes and ordinances.

1. Provide necessary shoring and bracing where adequate slopes are prohibited by space restrictions and/or stability of material encountered.

2. Close excavations with side slopes steeper than three horizontal to one vertical at the end of the workday or barricade and post with warning lights.

F. The Owner's activities may continue in and about the site during construction.

3.3 INSTALLATION

A. Vibro-compact OGAB to minimum 95% compaction.

B. Use of explosives is not permitted.

C. Repair or replace property which is to remain, that is damaged by the work, to the satisfaction of the Owner.

D. Obtain written permission or permits from adjacent property owners, public and private, if construction activities will infringe upon or limit access to their property.

E. Do not place backfill or fill material on surfaces that are muddy, frozen, covered with snow, or contain frost or ice.

1. Protect excavation bottoms and bearing surfaces against freezing when temperatures are below 35 degrees Fahrenheit and falling.

F. Construct accurately to the cross section and grades shown on the Plans.

G. The Contractor shall assume total responsibility for design, construction, and maintenance of access and haul roads, and construction parking and staging areas.

1. Use of permanent facilities for these purposes will require prior written approval from the Owner's authorized representative.

3.4 FIELD QUALITY CONTROL

A. The Independent Testing Laboratory shall conduct testing of materials proposed for use on the project, perform observation of earthwork operations and provide recommendations to the Owner as subsoil conditions and/or materials may vary; including but not limited to the following:

1. Testing and approval of materials from off site locations shall be provided.

2. Observation, testing, and reports of embankment construction, fill, and backfill.

3. Other tests as recommended by the Testing Laboratory and approved by the Owner.

B. Methods of testing shall be conducted in accordance with Section References or as recommended by the Testing Laboratory and approved by the Owner.

C. Compaction shall be not less than the following percentages of maximum dry density as determined by the Standard Proctor test (ASTM D1557), or equivalent density standard determined by other method(s).

1. All subsoil, unless otherwise noted on the plans or specifications: 95 percent.

## SECTION 31 20 00 – EARTH MOVING

**END OF SECTION 31 20 00**

# SECTION 31 62 16 – STEEL PILING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes:

1. Steel Pipe Piles – Guide Piles
2. Steel Pipe Piles – Pelican Piles

### 1.2 REFERENCES

A. Society for Testing and Materials (ASTM International)

B. Contract, General, Supplementary and Other Conditions of the Governing Specification Sections and the Drawings apply to Work of this Section.

C. Wisconsin Construction Standards.

D. Wisconsin Department of Transportation (WisDOT) Standard Specifications for Construction.

E. Related Sections:

1. Section 03 30 00 “Cast-In-Place Concrete”
2. Section 05 12 00 “Structural Steel”

### 1.3 SUBMITTALS

A. Preconstruction Submittals:

1. Installer Qualifications
2. Installation Procedures
3. Contractor’s Geotechnical Consultant Documentation
4. Testing Agency Qualifications
5. Initial Wave Equation Analysis
6. Geotechnical Exploration Results

B. Product Data:

1. Driving
2. Pile Driving Equipment
    a. Include type, make, and rated energy range; weight of striking part of hammer; weight of drive cap; and type, size, and properties of hammer cushion.
3. Pile Test
4. Pulling and Redriving

C. Shop Drawings:

1. Pipe Piles
    a. Show fabrication and installation details as necessary to install piling and fabricate specialty connectors.

b. Include member sizes, lengths, and cuts.

c. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.

d. Pile Splicing

e. Pile Placement

f. As-Driven Survey

g. Final Certified Piles Survey: Submit within seven (7) days of pile-driving completion.

h. Geotechnical Instrumentation

2. Design Data

a. Quantities List

b. Procedure for Insufficient Pile Length

D. Test Reports

1. Materials Tests

2. Dynamic Pile Analysis

3. Refined Wave Equation Analysis

E. Certificates

1. Pile Splices

2. Welder Certification

3. Safety Data Sheets (SDS) and Content Information Sheets (CIS)

F. Closeout Submittals

1. Pile Driving Records

2. Readout Results

G. Field quality-control reports.

1.4 QUALITY CONTROL

A. Material Tests: Provide one certified copy of mill test reports with heat numbers identified, including physical test reports and chemical analyses, and mill shipping papers to the Engineer before delivering the material to the project. Include the actual carbon, manganese, and phosphorus contents in the chemical analysis report. The Engineer may reject the material shipment if the mill certificates are not received.

B. No seconds, reject, or used piling will be considered unless approved by engineer of record.

C. Specifications for Steel Piling product for use on this Project must be submitted to the Engineer for review not less than seven (7) calendar days prior to the bid date. The request must include:

1. Product data and all necessary technical data to qualify the proposed product substitution.

2. Evidence showing manufacturer has at least five (5) years' experience in the design and manufacture of Steel Piling.

D. Special Inspections: Contractor will perform special inspections as necessary to observe for proper installation of piling and is responsible for all testing and inspections.

E. All Steels Piles shall be driven utilizing the driving criteria established by the PDA testing.

F. Perform dynamic pile tests as indicated on drawings. PDA tests shall conform to ATM D4945 and Contractor may use production piles for the load test at their option. Piling must have a minimum of compression and tension capacity per pile as indicated on drawings. The Contractor may use the same pile firstly for a compression test and secondly for a tension test. Perform a drive test for the purpose of confirming pile lengths required and establishing driving criteria for all piles. Drive test piles shall be a minimum 15' longer than as shown.

1. Perform a minimum of two dynamic pile tests.

2. Piling must have a minimum 25 Ton net uplift capacity per pile and a minimum embedment of 20'-0" below the mudline.

G. Steel Piles will be considered defective if they do not pass tests or inspections.

H. Corrosion protection shall consist of sacrificial steel in the form of extra thickness on each steel item. Thicknesses noted on drawings include sacrificial steel amounts. No other coatings or galvanizing are necessary.

1.5 QUALITY ASSURANCE

A. Contractor's Geotechnical Consultant: The Contractor shall hire the services of an independent, Professional Geotechnical Engineer registered in the State of Wisconsin, experienced in soil mechanics and PDA, to observe the test pile installation and production pile installation as specified herein. The Contractor's Geotechnical Consultant must be independent of the Contractor and must have no employee or employer relationship which could constitute a conflict of interest. All services of the Contractor's Geotechnical Consultant shall be paid for by the Contractor. The Contractor's Geotechnical Consultant shall be available through the pile driving operation to consult with the Engineer when required.

B. Material Certificates: For each shipment, submit certificates identified with specific lots prior to installing piling. Include in the identification data piling type, dimensions, chemical composition, mechanical properties, section properties, heat number, and mill identification mark.

C. Installer Qualifications: Authorized representative who is trained and approved for installation of units required for this Project.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

E. Pre-installation Conference:

1. A preconstruction meeting shall be held at the jobsite at least 5 business days prior to the start of test pile driving operations. The preconstruction meeting shall be arranged by the Contractor. The purpose of the meeting is to review the requirements of this specification and the associated drawings. The following individuals as a minimum will be in attendance at this meeting: Contractor's Project Manager and Project Superintendent, Piling Foreman, Contractor's Geotechnical Consultant, Supervisory Engineer, and Engineer. The minutes of this meeting shall be recorded by the Contractor and published via email within 48 hours to all attendees. The minutes shall be re-published within 48 hours via email pending any subsequent comments from the attendees.

F. Installation Procedures

1. Submit information on the type of equipment proposed to be used, proposed methods of operation, pile driving plan including proposed sequence of driving, and details of all pile driving equipment and accessories.

2. Provide details of pile driving equipment and a Wave Equation Analysis of pile drivability for selection of the hammer along with a statement of driving procedures. Provide instructions and procedures on how the Contractor will perform Dynamic Pile Testing, Inspection and Monitoring of piles during installation and testing. The Wave Equation Analysis is to be completed by the Contractor's Geotechnical Consultant for each test pile location where different subsurface conditions exist and is to include the following information pertaining to the proposed pile driving equipment:

a. Complete Pile and Driving Equipment Data Form, (which can be downloaded at https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/forms-graphics-tables) for each proposed pile hammer and pile type combination.

i. Copies of computer input and output sheets and graphs showing soil resistance versus blow count as well as maximum tension and compression stresses versus blow count. Analysis must be run at the estimated tip elevation as well as other required elevations to define maximum stress levels in the pile during driving.

3. Provide detailed procedures for conducting the dynamic pile load test and equipment to be used for conducting the load test. The detailed description must explain how specific information of pile performance will be evaluated.

## 1.6 SEQUENCING & SCHEDULING

A. Coordinate the schedule for Steel Pile Work necessary to maintain the Critical Path for subsequent work specified in related sections.

B. Obtain necessary permission from the Owner and/or regulatory authorities for Work that must be performed outside of normal work hours, on weekends, or over holidays, either as necessary to minimize the impact of temporary shutdown of utility services and traffic, or for the Contractor's convenience.

C. Coordinate the schedule to provide for the Owner's continuing operations on or adjacent to the site.

## 1.7 PROJECT CONDITIONS

A. Subsurface soil assumptions are based on the subsurface soil data logs appended to the contract requirements. The following assumptions were used for the purpose of determining pile lengths for bidding purposes.

1. Site Soil Conditions:

a. Reference Braun Intertec Report #B2403951 dated November 21, 2024, for soil conditions.

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTION

A. The Contractor is responsible for determining the quantities of material necessary for completing the Work.

B. See plan for estimated pile lengths and pile tip elevations.

C. Unless otherwise indicated, all required materials shall be furnished by the Contractor.

D. Materials required for this Work shall be new material conforming to the requirements of the referenced Specifications for the class, kind, type, size, grade, and other details indicated in these Specifications or on the Plans.

### 2.2 MATERIAL PROPERTIES

A. Steel Pipe Piles: All Steel Piles shall be 10” diameter pipe piles with 3/8” minimum wall thickness conforming to ASTM A252 Grade 3 with a minimum tensile strength of 66 ksi. Provide test piles identical to those used elsewhere in the project. Provide steel pipe piles of the shape, size and sections shown in the drawings. Pipe piles must be either seamless pipe or full penetration welded with straight or spiral seams. Pipe must be welded in a manner that welding will not crack or fail when the pile is subjected to its intended use, including during installation. The weld seam of each length of pipe must be tested for acceptance by ultrasonic testing in accordance with the provisions for Nondestructive Electric Test of Weld Seam of ASTM A53.

B. Pile splices: Submit detail drawings of shop field pile splices prior to fabrication. Provide ASTM A148, Grade 90-60 proprietary pile splicer sleeves or provide ASTM A109 or ASTM A36 backing rings to prevent weld blow out during weld process. Submit procedure for insufficient pile length.

C. Fabrication must conform to the requirements shown. Submit steel plant certification.

D. Concrete infill must conform to the requirements as identified in Section 033000 Cast-in-Place Concrete.

### 2.3 PILE DRIVING EQUIPMENT

A. Submit complete descriptions of pile driving equipment, including hammers, power packs, driving helmets, hammer cushions, pile cushions, leads, jetting equipment, extractors, protection caps, preboring equipment, and other installation appurtenances, at least 30 days prior to commencement of work.

B. Select the proposed pile driving equipment, including hammers and other required items, and submit complete descriptions of the proposed equipment in accordance with paragraph SUBMITTALS. Final approval of the proposed equipment is subject to satisfactory completion and approval of pile tests. Submit pile test plan at least 30 calendar days prior to installing any test piles. Approval of the plan will not relieve the Contractor of the responsibility for structural and operational adequacies of the testing system. Changes in the selected pile driving equipment will not be allowed after the equipment has been approved except as directed. No additional contract time will be allowed for Contractor proposed changes in the equipment.

C. Driving Hammers

1. Hammers must be steam, air, or diesel drop, single-acting, double-acting, differential-acting, or vibratory type. The driving energy of the hammers must be as recommended by the manufacturer for the piling weights and subsurface materials to be encountered. Repair damage to piling caused by use of a pile hammer with excess delivered force or energy. Provide impact or vibratory type pile driving hammers.

2. Impact Hammers

a. Provide air, hydraulic or diesel-powered impact pile hammers of the single-acting, or differential-acting type. The size or capacity of hammers must be as recommended by the hammer manufacturer for the total pile weight and the character of the soil formation to be penetrated. Hammers must be capable of hard driving in excess of 20 blows per one inch. Provide boiler, compressor, or engine capacity sufficient to operate hammers continuously at the full rated speed. Hammers must have a gage to monitor hammer bounce chamber pressure for diesel hammers or pressure at the hammer for air hammers. This gage must be operational during the driving of piles and be mounted in an accessible location for monitoring by the Contractor and the Engineer. Provide two spare operational bounce chamber read out units on site. Provide bounce chamber pressure gage correction tables and charts for the type and length of hose to be used with the pressure gage to the Engineer. Hydraulic hammers must be equipped with a system for measurement of ram energy. The system must be in good working order and the results must be easily and immediately available to the Engineer. Install an energy monitor on the hydraulic hammers and record headings every 10 inches of pile installation. Use wave equation analysis to verify that the hammer will develop stresses within acceptable limits in the pile. Position a pile cap or drive cap between the pile and hammer. Place hammer cushion or cap block must have consistent elastic properties, minimize energy absorption, and transmit hammer energy uniformly and consistently during the entire driving period. In accordance with paragraph SUBMITTALS, submit the following information for each impact hammer proposed:

i. Make and Model

ii. Ram weight (pounds)

iii. Anvil weight (pounds)

iv. Rated stroke inches

v. Rated energy range foot-pounds

vi. Rate speed (blows per minute)

vii. Air pressure, hammer, and boiler or compressor psi

viii. Rated bounce chamber pressure curves or charts, including pressure correction chart for type and length of hose used with pounds per square inch

ix. Pile driving cap, make, and weight (pounds)

x. Cushion block dimensions and material type

xi. Power pack description

3. Vibratory Hammers

a. The use of vibratory hammers to install steel pipe piles is dependent upon satisfactory driving and load testing of piles. Final approval of the proposed hammer and other driving equipment is subject to satisfactory completion and approval of the pile tests. The size or capacity of hammers must be as recommended by the hammer manufacturer for the total pile weight and the character of the soil formation to be penetrated. The hammer must provide for maintaining a rigid connection between the hammer and the pile. In accordance with paragraph SUBMITTALS, submit the following information for each vibratory hammer proposed:

i. Make and model

ii. Eccentric moment (inch-pounds)

iii. Dynamic force (tons)

iv. Steady state frequency or frequency range (cycles per minute)

v. Vibrating weight (pounds)

vi. Amplitude (inches)

vii. Maximum pull capacity (tons)

viii. Non-vibrating mass weight (pounds)

ix. Power pack description

D. Pile Driving Leads

1. Support and guide hammers with fixed extended leads or fixed underhung leads. Provide two intermediate supports for the pile in the leads to reduce the unbraced length of the pile during driving and pulling.

E. Pile Extractors

1. Pile extractors may be vibratory or impact pile driving hammers. Impact hammers are required for pulling piles not extractable with vibratory hammers.

F. Jetting Equipment

1. Jetting will not be permitted.

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Contractor shall engage an independent testing and inspecting agency to perform special inspections as necessary to observe for proper installation of piling.

1. Independent testing agency shall be qualified according to ASTM E329 for testing indicated, as documented according to ASTM E548, and approved by Engineer.

3.2 PREPARATION

A. Pile-Length Markings: Mark each pile with horizontal lines at 12-inch intervals; label the distance from pile tip at 60-inch intervals. Maintain markings on piles until driven.

B. Fabricate full-length piles to eliminate splicing during driving, with ends square.

C. Fit and weld driving points or barbs to tip of pile (if required) according to manufacturer's written instructions and AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

D. Wave Equation Analysis of Pile Drivability

1. Prior to driving any pile, submit a pile Wave Equation Analysis, performed by Contractor's Geotechnical Consultant, for each size pile and distinct subsurface profile condition. These analyses must take into account the proposed hammer assembly, pile cap block and cushion characteristics, the pile properties and estimated lengths and the soil properties anticipated to be encountered throughout the installed pile length based on static capacity analysis with consideration of driving gain/loss factors. Only one specific model of pile hammer may be used for each pile type and capacity.

2. Demonstrate using the Wave Equation Analysis that the piles will not be damaged during driving, indicate that the driving stresses will be maintained within the limits below and indicate the blow count necessary to achieve the required ultimate static pile capacities.

| | |
|---|---|
| 3. Steel Piles | 4. Allowable Driving Stresses |
| 5. Compression | 6. 0.9fy |
| 7. Tension | 8. 0.9fy |
| 9. Where fy is yield strength of steel | |

10. Perform a refined Wave Equation Analysis upon completion of the dynamic and static testing programs outlined in this specification section, taking into consideration the evaluated capacities, gain/loss factors and recommended production pile lengths. Develop production pile driving criteria based on the results of the refined Wave Equation Evaluations.

11. All pile driving equipment provided by the Contractor will be subjected to the approval of the Contractor's Geotechnical Consultant. Complete the attached pile and driving equipment data form, including hammer information, in full as part of the submittal of the results of the Wave Equation Analyses.

12. Pay for the cost of performing the Wave Equation Analyses and include in the base bid.

3.3 GEOTECHNICAL EXPLORATION

## SECTION 31 62 16 – STEEL PILING

A. Contractor shall hire the services of an independent, Registered Professional Geotechnical Engineer licensed in the State of Wisconsin, experienced in soil mechanics to obtain and review soil borings at site prior to construction.

B. The soil borings shall be completed in the water from a barge or other support vessel down to a minimum depth of 90 feet below the mudline. Selected geotechnical firm shall perform the following services:

1. Public and private utility locate prior to geotechnical exploration.
2. Two standard penetration test (SPT) borings to minimum depth specified above. Geotechnical firm shall determine the exact length based on the attached bathymetric survey. Standard penetration tests shall be performed at 2.5-foot vertical intervals until refusal.
3. Collect field samples and perform the necessary laboratory testing to provide the following design information:
    a. Boring log
    b. Blow Counts
    c. Soil Classification
    d. Water content
    e. In-situ unit weight, saturated weight, and effective unit weight of soils
    f. Internal Friction Angle or Cohesion for all soil layers
4. In addition to the required parameters listed above, the geotechnical firm shall provide the required design parameters for the software, Group by Ensoft. The required parameters are shown below for reference.

| Soil Type | Soil Parameters (UNITS) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Effective Unit Weight | Undrained Cohesion, c | Strain Factor, $\varepsilon_{50}$ | Friction Angle, $\phi$ | p-y Modulus, k | Uniaxial Comp. Strength, qu | Initial Modulus of Rock Mass, Er | Strain Factor, $k_{rm}$ | RQD | J | Ultimate Unit Side Friction | Ultimate Unit Tip Resistance |
| | ($F/L^3$) | ($F/L^2$) | (L/L) | (DEG) | ($F/L^3$) | ($F/L^2$) | ($F/L^2$) | (L/L) | % | | ($F/L^2$) | ($F/L^2$) |
| Soft Clay (Matlock) | X | X | X | | | | | | | | X | X |
| Stiff Clay with Free Water (Reese) | X | X | X | | X | | | | | | X | X |
| Stiff Clay without Free Water (Reese) | X | X | X | | | | | | | | X | X |
| Sand (Reese) | X | | | X | X | | | | | | X | X |
| User Defined p-y curves | X | | | | | | | | | | X | X |
| Strong Rock (Vuggy Limestone) | X | | | | | X | | | | | X | X |
| Silt (Cemented c-phi) | X | X | X | X | X | | | | | | X | X |
| API Sand (O'neil) | X | | | X | X | | | | | | X | X |
| Weak Rock (Reese) | X | | | | | X | X | X | X | | X | X |
| Mod. Stiff Clay without Free Water | X | X | X | | X | | | | | | X | X |
| Liquefiable Sand (Rollins) | X | | | | | | | | | | X | X |
| Elastic Subgrade | X | | | | | | | | | | X | X |
| API Soft Clay with User-def J | X | X | X | | | | | | | X | X | X |
| Mod. Soft Clay with Initial K | X | X | X | | X | | | | | X | X | X |

5. If bedrock is encountered prior to the planned termination elevation, the selected firm shall collect a minimum of a 10-foot-long rock core to determine the design parameters required by Group software.

6. Geotechnical report to be prepared including design parameters and a description of the field and laboratory testing procedures.

## 3.4 INSTALLATION

A. General: Continuously drive piles to elevations indicated. Establish and maintain axial alignment of leads and piles before and during driving. Inspect piles when delivered and when in the leads immediately before driving. Cut piles at cutoff grade by an approved method.

1. All piles shall be driven open-ended.

B. Lengths of Production Pile

1. The estimated quantities of piles are given for bidding purposes only. Drive piles to "calculated" or indicated tip elevation to reach a driving resistance established by the wave equation analyses (WEAP) in accordance with the schedule which the Contractor's Geotechnical Consultant will prepare from the test-pile driving data.

C. Pile Driving Records

1. Keep a complete and accurate record of each pile driven. Indicate the pile location, deviations from pile location, cross section shape and dimensions, original length, ground elevation, tip elevation, cut-off elevations, number of blows required for each foot of penetration and number of blows for the last 6 inches penetration or fraction thereof as required for the "calculated" driving resistance. Include in the record the beginning and ending times of each operation during driving of pile, type and size of hammer used, rate of operation, stroke or equivalent stroke for diesel hammer, type of driving helmet, and type and dimension of hammer cushion (cap block) and pile cushion used. Record retap data and unusual occurrences during pile driving such as redriving, heaving, weaving, splicing, obstructions, and any driving interruptions.
2. Additional data required to be recorded for impact hammers includes the rate of hammer operation. Additional data required to be recorded for vibratory hammers includes hammer power pack description, make size, horsepower applied to pile, and hammer operating frequency.

D. Placing and Driving

1. Placing
    a. Submit a written description of the site-specific pile installation procedures for Engineer review and approval. Pile placement installation drawings and details must also be provided.
    b. Excavate minimum 5 feet below the mudline to clear any debris in the drive line which may impede the installation of the piles. Any excavation required within the area where pilings are to be installed must be completed prior to placing pilings. The production pile may not be used to clear the drive line.
    c. Piling must be carefully located as indicated. Pilings must be placed plumb with out-of-plumbness not exceeding 1/8 inch per foot of length and true to line. Place the pile so the face will not be more than 6 inches from vertical alignment at any point. Top of pile at elevation cut-off must be within 1/2 inch horizontally and 2 inches vertically of the location indicated. Manipulation of piles to force them into position will not be permitted. Check all piles for heave. Re-drive all heaved piles to the required tip elevation.
2. Driving

a. Submit records of the completed pile driving operations, including a system of identification which shows the disposition of approved piling in the work, driving equipment performance data, piling penetration rate data, piling dimensions and top and bottom elevations of installed piling. Prior to driving piles in water, paint a horizontal line on both sides of each piling at a fixed distance from the bottom so it will be visible above the water line after installation. This line must indicate the profile of the bottom elevation of installed pilings and potential problem areas can be identified by abrupt changes in elevation. Drive pilings with the proper size hammer and by approved methods so as not to subject the pilings to damage.

i. Maintain driving hammers in proper alignment during driving operations by use of leads or guides attached to the hammer. Caution must be taken in the sustained use of vibratory hammers when a hard driving condition is encountered to avoid damage. Discontinue the use of vibratory hammers and impact hammers employed when the penetration rate due to vibratory loading is one foot or less per minute.

ii. Piles may be installed with vibratory hammers for the first 20 feet. The final 10 feet must be driven with an impact hammer.

iii. Employ a protective cap in driving when using impact hammers to prevent damage to the tops of pilings. Remove and replace pilings damaged during driving at the Contractor's expense.

iv. Drive pilings without the aid of a water jet.

v. Take adequate precautions to ensure that pilings are driven plumb.

E. Driving Tolerances: Drive piles without exceeding the following tolerances, measured at pile heads:

1. Within 2 inches from baseline indicated on plans after driving completed.
2. Maintain maximum 2% out of plumb within either plane.

F. Inspection of Driven Piling

1. Perform continuous inspection during pile driving. Inspect all piles for compliance with tolerance requirements. Bring any unusual problems which may occur to the attention of the Engineer.
2. Allow testing and inspecting agency to visually inspect and verify that each pile pipe is clean, watertight, plumb, and free of distortion or other defects.
3. Any pile damaged by reason of internal defects or by improper driving must be corrected by one of the following methods approved by the Engineer for the pile in question:

a. The pile is withdrawn, if practicable, and replaced by a new and, if necessary, longer pile.

b. A PDA and/or low integrity testing must be performed by the Contractor's Geotechnical Consultant to assess the structural integrity of the driven pile(s).

c. Contractor is responsible for replacement of damaged piling due to improper driving and or handling of piling during the driving process. Contractor will be allowed to re-drive piles not damaged during extraction after inspection by engineer if approved by Engineer.

G. Pulling and Redriving

1. Submit the proposed method for pulling piling, prior to pulling any piling. Pull, as directed, selected pilings after driving to determine the condition of the underground portions of pilings. Any piling so pulled and found to be damaged, to the extent that its usefulness in the structure is impaired, must be removed and replaced at the Contractor's expense.

H. Cutting-Off:

1. Pilings driven to refusal or to the point where additional penetration cannot be attained and are extending above the required top elevation in excess of the specified tolerance must be cut off to the required elevation. Pilings driven below the required top elevation and pilings damaged by driving and cut off to permit further driving must be extended as required to reach the top elevation by splicing when directed at no additional cost to the Owner. Submit procedure for insufficient pile length. Provide pile splicing information and details for Engineer review and approval prior to installation in the field. If directed, pilings must be spliced as required to drive them to depths greater than shown and extend them up to the required top elevation.

a. Pilings adjoining spliced pilings must be full length unless otherwise approved. If splices are allowed in adjoining pilings, the splices must be spaced at least 10 feet apart in elevation. Splicing of pilings must be as indicated. Ends of pilings to be spliced must be squared before splicing to eliminate dips or camber. Shop and field welding, qualification of welding procedures, welders, and welding operators must be in accordance with AWS D1.1. Submit welding certifications for all welders and welding operators for Engineer review and approval.

b. The tops of pilings excessively battered during driving must be trimmed when directed, at no cost to the Owner. Piling cut-offs will become the property of the Contractor and must be removed from the site.

I. Cut off tops of driven piles square with pile axis and at elevations indicated.

J. Do not place concrete until other piles within a radius of 20 feet have been driven and approved.

K. Remove withdrawn piles that are not re-useable and cutoff sections of piles from site and legally dispose of them off the Owner's property at no additional cost to Owner.

L. After the driving of each pile group is complete, provide the Engineer with an as-driven survey showing actual location and top elevation of each pile. Submit an as-driven survey showing actual location and top elevation of each production pile within 7 calendar days of completing the pile installation. Present survey in such form that it gives deviation from plan location in two perpendicular directions and elevations of each pile to nearest half inch. Survey must be prepared and certified by a land surveyor licensed in the State of Wisconsin.

3.5 OBSTRUCTIONS

A. Contractor shall anticipate encountering obstructions below the mudline during driving of the steel pipe piles. Anticipate shallow obstructions at 40% of the piles and deep obstructions at 10% of the piles for bidding purposes.

B. Practical Refusal: The presence of obstructions shall be determined by practical refusal of the pile, defined as: pile penetration resistance (blow count) of 10 blows per inch for a maximum of 3 consecutive inches of pile penetration using an approved hammer system operating properly at its maximum fuel or stroke setting.

C. Shallow Obstructions: Defined as obstructions greater than 5 feet and less than 20 feet below the mudline. Shallow obstructions should be anticipated during driving.

D. Deep Obstructions: Defined as obstructions greater than or equal to 20 feet below the mudline. Deep obstructions should be anticipated during driving.

E. Obstruction Mitigation Procedures:

1. Mitigation of obstructions encountered will follow the below general procedure:

   a. Contractor encounters an obstruction as defined by practical refusal.

   b. Contractor notifies Engineer immediately that an obstruction has been encountered and provides information regarding the depth and apparent size of the obstruction.

   c. Contractor obtains approval from Engineer that obstruction has been encountered and which depth category the obstruction is categorized as (Deep or Shallow).

   d. Once categorized and approved by Engineer, Contractor implements mitigation efforts in accordance with the suggested procedures indicated below. Suggested procedures for mitigating obstructions encountered during driving are provided in this Section. Note that Contractor may also submit alternate methods for mitigating obstructions for approval by the Engineer. Personnel and equipment required to perform any and all obstruction mitigation measures include at a minimum a spudding device and a down-the-hole (DTH) hammer.

F. Shallow Obstructions: If the driven pile encounters an obstruction shallower than 20 feet below the mudline at the time of driving, possible Contractor options to mitigate the obstruction include, but are not limited to:

1. If the obstruction is determined to be relatively close to the approximate mudline elevation at the time of driving, extract the pile, attempt to extract the obstruction by means and methods determined by the Contractor, and re-drive the pile to the pile tip elevations shown on the drawings.

2. Use a steel H-pile, thick-walled steel pipe section, or other spudding device and attempt to break up the obstruction and re-drive the pile through the obstruction to the pile tip elevations shown on the drawings.

3. Use a DTH hammer to drill through the obstruction and attempt to re-drive the pile through the obstruction to the pile tip elevations shown on the drawings.

G. Deep Obstructions: If the driven steel pipe pile encounters an obstruction greater than or to 20 feet below the mudline at the time of driving, the Contractor shall perform additional PDA testing according to the project specifications to determine if the pile was damaged during installation. The PDA report shall be provided to the Engineer within 72 hours of encountering the obstruction. If it is determined that the pile was damaged during installation, the Contractor shall remove and replace the pile at no additional cost to the Owner. If the pile has not been damaged, the Contractor shall notify the Engineer and provide final tip elevations of the pile encountering an obstruction and the two (2) adjacent piles. The Engineer will utilize this information to determine if the pile can structurally accommodate the shorter pile length at the obstruction location. Acceptance of the pile will be determined by the Engineer within 96 hours of receipt of the pile tip elevations.

1. If the driven steel pipe pile encounters an obstruction greater than or equal to 20 feet below the mudline at the time of driving, but the Engineer determines that the pile cannot be accepted, possible Contractor options to mitigate the obstruction include, but are not limited to:

   a. Use a steel H-pile, thick-walled steel pipe section, or other spudding device and attempt to break up the obstruction and re-drive the pile through the obstruction to the pile tip elevations shown on the drawings.

   b. Use a DTH hammer to drill through the obstruction and attempt to re-drive the pile through the obstruction to the pile tip elevations shown on the drawings.

## 3.6 INSTALLATION RECORDS

A. Maintain a pile driving record for each pile driven. Indicate on the installation record: installation dates and times, type and size of hammer, rate of operation, total driving time, dimensions of driving helmet and cap used, blows required per foot for each foot of penetration, final driving resistance in blows for final 6 inches, pile locations, tip elevations, ground elevations, cut-off elevations, splice locations, plumbness checks before and after driving, and any reheading or cutting of piles. Record any unusual pile driving problems while driving. Submit complete records to the Engineer.

## 3.7 FIELD QUALITY CONTROL

A. Test Piles

1. Drive test piles at the locations indicated and as determined by the Contractor's Geotechnical Consultant. Drive test piles to indicated tip elevation and required driving criteria. Use test piles, if located properly and offering adequate driving resistance in finished work. Provide and operate a pile driving analyzer as specified in paragraph DYNAMIC PILE ANALYSIS during the driving of each test pile.

B. Dynamic Pile Analysis

1. Submit a performance report summarizing dynamic test results for test piles within 7 calendar days of completing field work. Dynamic testing provides supplemental information for evaluating pile integrity, hammer and drive system performance, assess pile installation driving stresses, and pile capacities. Provide equipment to obtain dynamic measurements, record, reduce and display its data that meet the requirements of ASTM D4945. The equipment must have been calibrated within 6 months prior to the start of the testing operations and thereafter throughout the contract duration. Drive test piles at the locations indicated. Perform dynamic pile analysis as follows:
2. Pile Analyzing
    a. 15 working days prior to driving the test piles, submit PDA testing plan including the pile and complete driving equipment data. The Contractor must use the submitted information to perform wave equation analyses and must prepare a summary report of the wave equation results. The wave equation analysis using GRLWEAP software by Pile Dynamics, Inc. or equivalent must be used to assess the ability of the proposed driving system to install the pile to the required capacity and desired penetration depth within the allowable driving stresses. Approval of the proposed driving system must be based upon the wave equation analyses indicating that the proposed driving system can develop a pile capacity within allowable driving stress limits. The hammer must also be sized or adjustable such that the penetration per blow at the required ultimate capacity does not exceed 0.5 inches.

C. Pile Drivability

1. Perform each dynamic pile analysis in two steps. The first step is to check the hammer, pile and soil performance, and to determine the suitability of the proposed hammer for the size, length and type of pile being installed for the soil types encountered as the piles are driven. This initial monitoring must determine whether efficiency of the hammer relative to the specified efficiency, effectiveness or cushion, level of compressive and tensile stress in pile and extent/location of any pile damage caused by the initial driving. With each blow of the pile, record the information listed below electronically and analyze the information using the Pile Driving Analyzer:
    a. Blow Number
    b. Blow rate per minute and stroke
    c. Input and reflected values of force and velocity
    d. Value of upward and downward traveling force wave with time
    e. Maximum and final transferred energy to pile, hammer system efficiency
    f. Maximum compressive stress, velocity, acceleration and displacement
    g. Maximum tensile stress in pile
    h. Pile structural integrity, damage detection, extent and location
    i. Bearing capacity of pile by Case method

2. If the pile, hammer and soil performance evaluation recommends changes to the hammer stroke, pile cushioning, augering or any other aspect for the pile driving operation, incorporate these changes into production pile driving in an effort to control excessive stresses and pile damage. Replace test piles damaged or broken during installation, incorporating driving modifications as determined. Repeat this procedure until allowable tensile and compressive stresses are achieved in the pile and pile damage is minimized. Subject selected initial driving records to rigorous computer analysis by the Case Pile Wave Analysis Program (CAPWAP) for determination of resistance distribution, soil resistance and properties, and estimation of anticipated gain/loss factors.

3. CAPWAP

   a. Signal matching analysis by CAPWAP software of the dynamic pile testing data must be performed on data obtained from the end of initial driving and the beginning of restrike of all control piles. CAPWAP analyses must be performed by an engineer who has achieved Advanced Level or better on the PDI / PDCA Dynamic Measurement and Analysis Proficiency Test for Providers of PDA Testing Services.

   b. Upon completion of test pile driving, allow the piles to set-up for at least 5 days. After analysis may proceed. This portion of the evaluation requires striking the set-up piles a minimum of 20-50 times, or as directed using the same hammer which was used for the test pile driving and which will be used for production pile driving. "Warm up" the hammer and make it optimally ready prior to restriking, in order to avoid capacity losses during evaluation of restrike data. Apply maximum hammer energy during restrike in order to fully mobilize the soil resistance. However, exercise care so as to not overstress the pile. In addition to those items listed above, selected restrike driving records (as directed) are to be subjected to rigorous computer analysis by the Case Pile Wave Analysis Program (CAPWAP) for determination of resistance distribution, soil resistance and properties, and plot of applied load vs. average pile displacement based on the calculated soil properties.

D. Dynamic Load Test Reporting

1. Upon satisfactory completion of each dynamic load test, submit a Pile Performance Report. The submittal must be prepared and sealed by a Professional Engineer. The report for the Dynamic Pile Analysis must contain the following information:

   a. Capacity of pile from Case Pile Wave Analysis Program (CAPWAP). Information resulting from analysis of a selected restrike blow.

   b. Maximum and final transferred energy, hammer system efficiency during pile installation.

   c. Maximum compressive stress, velocity, acceleration and displacement.

   d. Maximum tensile stress in pile.

   e. Pile structural integrity, damage detection, extend and location.

   f. Blows per minute and blow number.

   g. Input and reflection values of force and velocity, upward and downward traveling force wave with time.

   h. Pile skin friction and toe resistance distribution.

i. Maximum energy transferred to pile.

2. The maximum allowable pile design load must be based upon the results of a satisfactory pile load test conducted on a pile driven as specified herein and must include the effects of load transfer to the soil above the foundation stratum.

3. Use either a Model 8G or PAX Pile Driving Analyzer as manufactured by Pile Dynamics, Inc., of Cleveland Ohio or approved equivalent, for dynamic testing of the pile hammer and for dynamic load testing of the test pile. All equipment necessary for dynamic monitoring such as sensors, cables or wireless transmitters, must be furnished by the Contractor's Geotechnical Consultant. The equipment must conform to the requirements of ASTM D4945.

E. Welding Inspection

1. Employ a testing agency to perform the welding inspections as specified in the statement of special inspection.

F. Weld Testing

1. In addition to visual inspection, welds must be tested and inspected according to AWS D1.1 and inspection procedures listed below, at testing agency's option. Correct deficiencies in work that test reports and inspections indicate do not comply with the Contract Documents. Test 10 percent of pile splices.

a. Liquid Penetrant Inspection: ASTM E165

b. Magnetic Particle Inspection: ASTM E709 performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not acceptable.

c. Radiographic Inspection: ASTM E94, minimum quality level "2-2T".

d. Ultrasonic Inspection: ASTM E164

3.8 REMOVAL

A. The removal of pilings must consist of pulling, sorting, cleaning, inventorying, and storing previously installed pilings as shown and directed.

B. Pulling

1. The method of pulling piling must be approved. Provide pulling holes in pilings, as required. Extractors must be of suitable type and size. Exercise care during pulling of pilings to avoid damaging adjacent construction. If the Engineer determines that adjacent construction has been damaged during pulling, the Contractor will be required to repair this construction at no cost to the Owner. The Contractor will not be paid for the removal of pilings damaged beyond structural use due to proper care not being exercised during pulling.

C. Sorting, Cleaning, Inventorying, and Storing

1. Pulled pilings must be sorted, cleaned, inventoried, and sorted by type into groups as:

a. Piling usable without reconditioning.

b. Piling requiring reconditioning.

c. Piling damaged beyond structural use.

**END OF SECTION 31 62 16**

# SECTION 35 31 16 – STEEL SHEET PILING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes:

1. Steel Sheet Piles.

### 1.2 REFERENCES

A. Society for Testing and Materials (ASTM International).

B. Contract, General, Supplementary and Other Conditions of Division 01 and the Drawings that apply to Work of this Section.

C. Wisconsin Construction Standards.

D. Wisconsin Department of Transportation (WisDOT) Standard Specifications for Construction.

E. Related Sections Include:

1. Section 05 12 00 “Structural Steel”

2. Section 06 13 23 “Heavy Timber Construction”

### 1.3 SUBMITTALS

A. Schedule indicating Work sequence.

1. Coordinate the schedule to allow sufficient time for required testing, inspections, and installation of work of Related Sections.

2. Coordinate with continuations of Owner’s onsite operations.

B. Plan for clearing driving lane up to 5 ft depth below the existing grade at the time of bidding. Submittal shall include methods to be utilized for detecting and removal of any debris which may damage or prevent the installation of sheet pile. The drive line shall be cleared prior to the installation of the steel sheet pile. The steel sheet pile shall not be utilized for clearing of the drive line.

C. Hammer brand, model, type, and size used for the installation of sheet piles.

D. Experienced Land Surveyor qualifications and supervision.

E. Test reports from the independent testing facility on materials showing compliance with the Specifications.

F. Preconstruction Photographs: Photographs or video of existing conditions of adjacent construction. Submit before the Work begins.

G. Product Data: For each type of product indicated.

H. All steel sheet pile sizes to be utilized during construction shall be submitted to the engineer for approval prior to purchase.

I. Shop Drawings: For steel sheet piling, show fabrication and installation details as necessary to install piling and fabricate specialty connectors.

1. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.

J. The steel mill shall submit the fabrication tolerances for the steel sheet pile to be utilized on the project and Quality Control documents utilized to verify that the sheet pile comply with the specified fabrication tolerances.

K. The Steel Mill or Supplier shall provide a certified document stating that the steel sheet pile provided meet the performance requirements specified in the construction documents, including dimensional and section properties and the sheet pile has been manufactured within the specified fabrication tolerances.

L. Installer qualifications.

M. Welding certificates.

N. Provide a certified copy of each mill test report with heat numbers identified, including physical test reports and chemical analyses, and mill shipping papers. Include the actual carbon, manganese, and phosphorus contents in the chemical analysis report. Certified Mill Test Certificates shall accompany the steel sheet pile when delivered to the project site or material storage area.

O. Baseline driving lane. Prepare proposed driving lane in field using reference markers based off of driving lane shown in plans. Baseline driving lane shall be approved by Engineer prior to start of Work.

P. The Contractor shall prepare daily driving records for all piles including:

1. Project name and number, name of Contractor.

2. Pile location and identification mark, sequence of driving, pile dimensions, and ground elevation.

3. Hammer type, make, model, rated energy, weight and stroke.

4. Splice locations and type, tip and cutoff elevations after driving.

5. Plumbneess checks before and after driving, vertical and horizontal alignment verifications.

6. Driving resistance per foot, records of re-driving, total driving time, and any unusual occurrences.

7. Daily records shall be turned over to the engineer for review the same day work is performed.

1.4 QUALITY CONTROL

A. A minimum pile driver for this work shall be as follows:

1. Start the wall with a vibratory hammer of 170 ton dynamic force or larger.

2. With blow counts above 50 in sands, an impact hammer with a minimum size of Delmag D19 Diesel or Dawson 2500 Hydraulic Hammer may be needed to final drive into very dense sands.

B. Special Inspections: Engineer or Owner's representative will perform special inspections as necessary to observe for proper installation of piling.

C. Steel Sheet Pile shall be considered defective if they do not pass tests or inspections.

D. Corrosion protection shall consist of sacrificial steel in the form of extra thickness on each steel item. Thicknesses noted on drawings include sacrificial steel amounts. No other coatings or galvanizing are necessary.

1.5 QUALITY ASSURANCE

A. Specifications for the Steel Sheet Piling product for use on this project must be submitted to the Engineer for review not less than seven (7) calendar days prior to the bid date. The request must include:

1. Product data and all necessary technical data to qualify the proposed product substitution.

2. Evidence showing manufacturer has at least five (5) years' experience in the design and manufacture of Steel Sheet Piling.

B. Use adequate numbers of skilled workmen under the supervision of a Project Manager who is experienced in the necessary crafts required for proper performance of the Work Qualifications.

1. Project Manager shall be completely familiar with the specified requirements.

2. Project Manager shall be authorized to render decisions on behalf of the Contractor.

C. Use equipment adequate in size, capacity and number to accomplish the Work in a timely manner.

D. Conform to applicable Federal and Wisconsin State Statutes and Rules, WisDOT Specifications, the Wisconsin State Building Code, the Wisconsin State Plumbing Code, project Response Action Plan (RAP) and local codes and ordinances for performance of Work, dewatering, transport and disposal of excess material, dust and run-off control, and emergency access to the site.

E. Testing and observations paid for by the Owner shall be conducted by an Independent Testing Laboratory and by, or under the direct supervision of, a Licensed Professional.

1. Subsequent tests required as a result of non-conforming work shall be paid for by the Contractor.

F. The Contractor is to employ the services of an experienced Land Surveyor with at least four (4) years of surveying experience related to the Work. The experienced Land Surveyor shall complete all Survey Work under the direct supervision of a Licensed Land Surveyor or Professional Engineer.

G. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

H. Installer Qualifications: Authorized representative who is trained and approved for installation of units required for this project.

I. Pre-installation Conference: Conduct conference at the project site.

1.6 SEQUENCING & SCHEDULING

A. Coordinate the schedule for Steel Sheet Pile Work necessary to maintain the Critical Path for subsequent work specified in related sections.

B. Obtain necessary permission from Owner and/or regulatory authorities for Work that must be performed outside of normal work hours, on weekends, or over holidays, either as necessary to minimize the impact of temporary shutdown of utility services and traffic, or for the Contractor's convenience.

C. Coordinate the schedule to provide for the Owner's continuing operations on or adjacent to the site.

1.7 PROJECT CONDITIONS

A. Instruments of record including, but not limited to; studies, reports, facility condition assessments, surveys, or plans; furnished with the Project Manual, Project Plans or available for inspection at the office of the Owner are made available for information only and are not guaranteed to be inclusive.

B. Protect structures, underground utilities, and other construction from damage caused by pile driving.

C. Contractor is to perform verification of existing site conditions.

1. Contact Gopher One-Call online, at (651) 454-0002 or at (800) 252-1166 to arrange for utility location services 48 hours minimum prior to performing any work on site.

2. Perform minor investigative excavations to verify location of various existing underground facilities at sufficient locations to ensure that no conflict with the proposed work exists and sufficient clearance is available to avoid damage to existing facilities.

3. Upon discovery of conflicts or problems with the existing facilities, notify Owner’s authorized representative.

   a. If requested, follow notification with letter and diagrams indicating conflict or problem and sufficient measurements and details to evaluate.

4. Contractor shall determine, to the Contractor’s satisfaction, the exact soils and groundwater conditions prior to submitting the Contractor’s bid.

   a. Contractor shall identify and describe unexpected variations to subsoil conditions encountered during construction.

   b. If requested, Contractor shall follow notification with letter and diagrams indicating conflict or problem and sufficient measurements and details to evaluate.

D. Contractor is to repair or replace any damaged utility line or structure at no additional cost to the Owner.

E. When alterations to existing utilities are shown to avoid conflicts, Contractor is to coordinate the removal and/or relocation of conflicting existing utilities with the utility’s Owner at no additional cost to the Owner.

F. Maintain benchmarks, monuments, and other reference points.

1. If benchmarks, monuments and other reference points are disturbed or destroyed, benchmarks, monuments and other reference points shall be replaced or relocated by a Licensed Land Surveyor.
2. Cost of replacing or relocating benchmarks, monuments and other reference points shall be incidental to the project.

G. Site Information: The geotechnical report for this Project is included in this specification as a reference document

H. Preconstruction Photographs: Inventory and record the condition of adjacent structures, underground utilities, and other construction. Provide photographs of conditions that might be misconstrued as damaged caused by pile driving.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Steel Sheet Pile: deliver, store, and handle steel sheet pile to prevent bending and damage.

1.9 WARRANTY

A. Provide one year written warranty for all materials and workmanship against defects after completion and final acceptance of the Work under the provisions of Division 01 sections.

B. Defects due to faulty materials or workmanship developed during the warranty period shall be satisfactorily repaired or replaced at the Contractor's expense.

## PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. The Contractor is responsible for determining the quantities of material necessary for completing the Work.

B. Unless otherwise indicated, all required materials shall be furnished by the Contractor.

C. Materials required for this Work shall be new material conforming to the requirements of the referenced Specifications for the class, kind, type, size, grade, and other details indicated in these Specifications or on the Plans.

2.2 MATERIAL PROPERTIES

A. Hot rolled steel sheet piling shall conform to ASTM A6 "Standard specification for general requirements for rolled structural steel bars, plates, shapes, and sheet piling" while cold rolled steel sheet piling shall conform to ASTM A857 "Standard specification for steel sheet piling, cold formed, light gage."

B. Interlocks

1. The interlocks of the sheet piling must be free-sliding, provide a swing angle suitable for intended installation but not less than 5 degrees when interlocked, and maintain continuous interlocking when installed.

C. XX ## OR EQUIVALENT (Minimum Section Modulus 30.2 in^3/ft, & Minimum flange thickness of 0.375 in & web thickness of 0.375 in): ASTM A572, Grade 50.

1. Contractor shall submit proposed substitutions to Engineer 7 calendar days prior to bid date for approval.
2. If equivalent steel sheet pile is requested to be utilized after within 7 calendar days of the bid date or after the bid date, the Contractor is responsible for any additional drawings, engineering deviations, or construction/quantity changes including all associated costs.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Site Conditions: Work from the top of the existing dock site by use of crane or excavator is prohibited within 30 feet of the dock edge due to dock deterioration, unless noted otherwise on the plans. General site conditions and the existing dock are currently stable, but vibration from driving equipment could cause the existing docks to move creating additional sink holes or failures.

B. Existing dock alignments and reference points shown have been surveyed and their coordinates are shown on the plan sheets (if applicable). No deviation shall be allowed without prior authorization from the Engineer of record. Contractor shall set baseline and have it approved by Engineer prior to start of any driving of steel sheet piling.

### 3.2 PREPARATION

A. Special Inspections: Engineer or Owner's representative will perform special inspections as necessary to observe for proper installation of piling.

B. Steel Sheet piles will be considered defective if they do not pass tests or inspections.

### 3.3 INSTALLATION

A. General: Drive piles to elevations indicated on drawings. Establish axial alignment of piles before and during driving.

B. Lifting: Straight web sheet piles more than 50 ft long should be lifted at two or more points including when pitching piles into the vertical position.

C. Driving Tolerances: Drive piles without exceeding the following tolerances, measured at pile heads:

1. Location: Within 2 inches from baseline indicated on plans after driving completed.
2. Plumb: Maintain 1/8 inch per foot out of plumb in the parallel and perpendicular plane of the wall.

D. Withdraw damaged or defective piles and piles that exceed driving tolerances and install new piles within driving tolerances at no additional expense to the owner.

1. Contractor is responsible for replacement of damaged piling due to improper driving and or handling of piling during the driving process. Contractor will be allowed to re-drive piles not damaged during extraction after inspection and approval by Engineer.

2. Contractor is responsible for providing alternative methods of driveline clearing to reach design depth. Such methods include pre-augering or driving a spud pile and then removing spud pile to drive sheet pile thereafter to design depth. Other methods may be used upon written approval by Engineer.

E. Use caution in the sustained use of vibratory hammers when a hard driving condition is encountered to avoid interlock melt or damage. The use of vibratory hammers should be discontinued, and impact hammers employed when the penetration rate due to vibratory loading is one foot or less per minute. The work of using an impact hammer in such circumstances shall be at no additional cost to the Owner. A protecting cap covering all the pile area, leaving free the outside interlocks, shall be employed in driving when using impact hammers to prevent damage to the tops of pilings. Care shall be taken not to overstress the pile or the cap during driving.

F. If diesel hammers are used, its rated gross energy in foot-pounds shall be a minimum of 2 ½ times the weight of the pile in pounds. The hammer shall develop a minimum of 9,000 foot-pounds of energy per blow.

G. Driving conditions may require hammers with more energy than the minimum required as stated above. Any downtime or additional costs associated with obtaining alternate hammers shall be at no cost to the Owner and will not permit any timeline extensions.

H. Cutting Off: Cut off tops of driven piles square with pile axis and at elevations indicated.

I. Contractor is responsible for clearing the driving line and removal of any debris up to 5 ft below the existing mudline which may damage or prevent the installation of the steel sheet pile.

J. New sheet pile may not be utilized to clear the drive line.

K. Contractor shall maintain daily field quality-control reports including driving logs, final tip and cutoff elevations, tolerance checks, make and model of hammer, obstructions encountered while driving, hours worked, etc. These reports shall be submitted daily to the Engineer.

L. Remove withdrawn piles that are not re-useable and cutoff sections of piles from site and legally dispose of them off Owner's property.

M. Remove debris encountered in the driving lane and legally dispose of them off Owner’s property.

END OF SECTION 35 31 16.19

# SECTION 35 51 13 – FLOATING DOCK

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes:

1. Concrete Floating Docks
2. Steel Frame Floating Docks
3. Installation of Floating Docks

### 1.2 REFERENCES

A. American Society for Testing and Materials (ASTM International).

B. American Welding Society (AWS)

C. Steel Structures Painting Council (SSPC), SSPC-SP6!

D. ASCE Report No. 50 Design of Small Craft Harbors, Third Edition

E. American Wood Protection Association (AWPA), Standard LP-22, LP-44, C-2, M4-79

F. City of Bayfield, Wisconsin Construction Standards.

G. Wisconsin Department of Transportation (WisDOT) Standard Specifications for Construction. If there is a conflict between WisDOT and the City of Bayfield specifications, the City of Bayfield specifications shall govern.

H. The North American Vertical Datum of 1988 (NAVD88).

I. Related Sections

1. Section 05 14 00 Aluminum Gangways

### 1.3 SUBMITTALS

A. The Floating Dock Company shall provide the following information to the Owner and Engineer up to the time of bid:

1. The Floating Dock Company shall submit an affidavit from the intended floating dock system supplier, signed by an authorized representative, attesting that the supplier meets all experience and qualification requirements outlined in this Section.
2. Evidence showing intended Floating Dock System supplier in its current organization has successfully completed a minimum of five (5) similar projects of type, quality, and scope.
3. For purposes of this submittal, “similar project” shall be understood to include the following project elements:

a. Similar environments with wave energy.

b. Similar environments with ice considerations.

c. Design of the floating dock system, anchorage, & connections.

d. Manufacture of the floating dock system & furnishing of connections.

e. Collaboration with the contractor for installation.

f. Performance of floating dock system to date.

4. The following are the minimum requirements for each of the similar projects to be included:
   a. Each similar project shall have the owner's contact information provided.
      i. The Owner reserves the right to contact the owners listed in the case studies to evaluate the quality and performance of the Floating Dock System proposed.
   b. Each similar project shall have the project completion date, record of claims, change orders, warranty issues, and lawsuits noted on the study.
   c. Minimum of five (5) similar projects within the past ten (10) years.
5. The Floating Dock Company shall submit complete warranty information for the proposed floating dock system, including coverage terms, duration, limitations, and procedures for warranty claims. The warranty shall cover defects in materials and workmanship for all components of the floating dock system. The Owner and Engineer will review the warranty documentation to ensure it meets project requirements and industry standards.
6. Floating Dock Companies Contractor shall provide information to the following email addresses:
7. Chase.Dewhirst@amiengineers.com

B. Product Data:
   1. Contractor shall supply product data that applies directly to the dockage systems being used for the project.

C. Shop Drawings:
   1. The Contractor shall submit shop drawings to the Engineer for review and approval.
   2. Contractor shall supply shop drawings for all project assemblies and subassemblies. An electronic copy (PDF or AutoCAD) shall be submitted for review prior to the start of construction of the assemblies. Installation may not begin prior to approval of the shop drawings by the project engineer. Shop drawings shall be stamped by the dockage engineer. Shop drawing set shall include, but is not limited to:
      a. Plan view of complete pier including framing, joints, anchorage system, and cleat layout.
      b. Decking
      c. Connection details
      d. Typical dock sections
      e. Gangway section and elevations
      f. Anchorage system details
      g. Float layout and details
      h. Rub rail profiles
      i. Connections between dock units and access structures

D. Dockage Engineer Qualifications:

1. The dockage engineer shall be a Professional Engineer licensed in the State of Wisconsin experienced in floating dock and anchorage design. Upon request, by the Owner or the project engineer, the dockage engineer shall submit references for floating dockage systems designed by them. The Owner has the right to refuse or reject the dockage engineer. After review of the references, either the engineer's qualifications will be accepted or further justification for acceptance will be requested.

E. Engineering Calculations:

1. Calculations for the design of the dockage system and the connections to anchorage shall be submitted by the manufacturer's engineer for review prior to acceptance of the shop drawings and prior to the start of the dockage installation. The dockage engineer shall stamp and seal the calculations.
2. Calculations shall include but are not limited to:
3. Flotation loads
4. Freeboards and dock deflections
5. Structural frame design for applied loads
    a. Ensure mooring loads from cleats are considered during design of structure.
6. Adequacy of all weld & bolting design, connections, anchorage, and anchor attachment design.

F. Operations and Maintenance Manual:

1. Prior to final payment, submit complete Operations and Maintenance manual in PDF format. The Operations and Maintenance Manual shall contain, but are not limited to:
    a. Manufacturer's contact information:
        i. Name
        ii. Address
        iii. Email
        iv. Phone Number
    b. Anchorage connection details
    c. Drawings, diagrams, installation instructions and parts lists
    d. Manufacturer's data sheets for floats and other components
    e. Design Calculation summary
    f. Maintenance recommendations for winterization, including installation and removal instructions.
    g. Maintenance recommendations for seasonal cleaning, including but not limited to approved cleaning practices, approved cleaning solvents, and application of protective coatings (if applicable).
    h. Yearly inspection recommendations, including an inspection checklist and inspection log.

G. As-Built Drawings:

1. Upon completion of the installation and prior to final payment, the Contractor shall provide a final as-built set of dockage drawings in PDF format.

H. Dock manufacturers will need to be pre-approved by the Engineer prior to the bid opening. Information shall be submitted to the Engineer 5 days prior to the bid opening for consideration.

I. Furnish an affidavit from the material supplier certifying that the material and systems delivered to the project meet the requirements specified. In addition, an additional affidavit shall be stamped with the seal of and signed by a Professional Engineer licensed in the State of Wisconsin, experienced in floating dock design, testifying that the dockage and anchorage design meets the performance requirements stated herein.

J. Shop drawings, including detailed specifications and design calculations, shall be submitted for the following:

1. Dock Sections including but not limited to the following:

a. Decking material product specifications and layout

b. Float material product specifications, size and layout

c. Fender material, size, layout, performance, and testing data.

d. Cleat product specifications, layout, load rating, attachment requirements, and coating.

e. All connections and attachments between dock sections and gangways.

2. Complete explanation for system handling during the winter season and realignment for the boating season.

## 1.4 QUALITY CONTROL

A. Qualifications

1. Installation shall be performed by persons experienced and skilled in the trade.

2. The floating dockage manufacturer shall have not less than five years continuous experience in the fabrication of floating dockage.

3. The Contractor shall demonstrate to the Owner successful floating dockage installations in a similar physical and natural environment.

4. The dockage manufacturer or the Contractor shall provide at least one person who shall be present during installation of this work, who shall be thoroughly familiar with the type of materials being installed, the requirements of this work, and who shall direct all work.

5. All welding shall be performed by operators who have been recently qualified as prescribed in "Qualifications Procedure" of the American Welding Society.

## 1.5 WARRANTY

A. The Contractor shall execute and deliver to the Owner, before final payment, a written guarantee of form satisfactory to the Owner. The guarantee shall state that all labor and materials (including dockage and all associated work furnished by the Contractor) are in accordance with the contract plans and specifications, and authorized alterations and additions thereto; and that, should any defect develop during the contract guarantee period as hereinafter defined, due to improper materials, workmanship, arrangement or design, those defects be corrected by the Contractor without expense to the Owner.

B. The following warranties shall be applied to the appropriate components of the floating dock structure:

1. Flotation Units – 10 years
2. Balance of Components – 5 years
3. Decking Materials – 10 years

C. The floating dock system and all of its components shall have a minimum 10-year warranty.

1. Minimum warranty definition:
   a. Covers years 0 to 10 of the warranty period.
   b. Covers all defects in the floating dock system and its connection points which are provided by the floating dock designer.
   c. Includes all shipping, materials, and engineering costs associated with repair and restoration of any damage to the Floating Dock System within the first 5 years, at no cost to the Owner.
   d. Any damage to the system which impacts the system's performance, as determined by the Engineer-of-Record, shall be repaired or replaced by the warrantor.
   e. Is transferable to any Owner during the warranty period.
   f. For repairs or replacements which are deemed non-critical (i.e., the system is not at a high risk of failure), the repairs must be initiated within 90 days, and completed within 180 days.
   g. For repairs or replacements which are deemed critical (i.e., the system is at a moderate to high risk of failure), the repairs must be initiated within 30 days, and completed within 90 days.

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTION

A. System includes floating dock, galvanized steel frame, HDPE filled floats, composite lumber decking, cleats, spud pole anchors, and hardware & connection components.

1. Manufacturer to design additional reinforcement where necessary to provide support for utility systems and ADA chair lift.
2. Manufacturer to provide details for typical openings on decking for utilities and dock mounted accessories.

B. Piers, ramps, connections, and anchorages shall be designed for the following loads and conditions:

1. Vertical Loading:
    a. Dead load shall be the entire weight of the floating docks including loads imposed by gangways, superimposed structures, utilities and other appurtenances.
    b. Live load for floatation calculations shall be not less than 30 pounds per square foot (PSF) for floating docks.
    c. Structural members, deck surfaces and ramps shall be designed with a minimum live load of 50 psf. Maximum deflection under live and dead loading shall be L/240 of the span.
    d. Design of free board shall be indicated in the shop drawings. The free board on the overall dock system shall not vary more than 1 inch from the approved drawings. Piers at dead loading in the water shall maintain the following freeboard:
        i. Concrete Floating Docks: 28 inches.
        ii. Steel Frame Floating Docks: 21 inches to 24 inches.
    e. At the design load of dead load plus 30 PSF live load, floating docks shall maintain the following minimum free board:
        i. Concrete Floating Dock: 28 inches.
        ii. Steel Frame Floating Docks: 10 inches.
    f. Extra floatation shall be installed at end sections as required to compensate for end reactions of ramps due to combined loading. Additional floatation shall be adequate to ensure that the piers shall maintain a uniform free board over the length of the pier.
    g. In addition to the above, finger piers must be designed to withstand a 400 pound total live load 2 feet from the end of the finger pier without loss of free board of more than 4 inches.
    h. The outer ends of the finger piers shall be level. At dead load, the two outer ends of the fingers shall not vary in free board from side to side more than 5/8 inch for the 4-foot fingers, 15/16 inch for the 6 foot fingers, and 1 inch for the 10 foot fingers.
    i. At live load with a 200-pound load at one corner of the finger, there shall be not more than 2 inches of differential from corner to corner.
    j. Dock floatation, including ramps, shall be designed such that the free board criteria shall be maintained when the dock is free floating and disconnected from the main structure.
    k. Additional floatation shall be added when needed to support the additional loading from the gangway without producing any unique distortion in the floating structure.
    l. Floatation units and connections shall be designed such that the dock acts as one structural system and one floatation unit does not deflect without adjacent units deflecting.
2. Horizontal Loading:
    a. The floating dock system shall be designed to resist an impact from the largest vessel normally at the dock. The vessel shall strike the end of the dock at a maximum 10-degree angle from the centerline of the dock with a vessel speed of 2 knots (3 feet per second). The dock shall be designed for this impact even if fenders or bumpers are utilized. As a minimum, the floating docks shall be designed for the following vessel weights:

i. Concrete Floating Dock: 18,000 lbs.

ii. Steel Frame Floating Dock:

b. The floating dock system shall be designed to resist a maximum wind speed of 90 mph and a resulting uniform wind load pressure of 21 psf. The loading to the dock shall consider the maximum vessel profile height normally at the dock, but a minimum profile height of 8 ft shall be considered.

c. The structure and system shall be designed to withstand the following storm conditions on a periodic, but not continual, basis:

i. 1 ft wave during boating season

ii. 2.5 ft wave during winter (non-boating) season.

iii. 1.35 ft storm surge.

d. Tie down/mooring cleats and connection hardware shall be designed to withstand the following line loads in any direction:

i. Concrete Floating Dock: 6,000 lbs.

ii. Steel Frame Floating Dock: 4,000 lbs.

e. Positively prevent torsion, racking and twisting by providing sufficient built-in torsional resistance.

f. Ice loads shall be those imposed upon the docks in their proposed location. The design of the system and its operation shall reflect anticipated ice conditions so that the requirements of the warranty period are met. In addition, structures will withstand the forces imposed by thermal expansion of ice.

3. Design water level fluctuation shall be from 1205.5 ft (LWL) and 1217.0 ft (OHWL) NAVD88, range of 11.5 feet.

4. Flotation units & connections shall be designed so that the dock acts as one structural system, and one flotation unit does not deflect without adjacent units deflecting.%

5. Flotation units shall be constructed of fire-resistant materials.

6. All steel materials shall be hot dipped galvanized or stainless steel.

7. Connections shall be designed so the units may be disconnected and moved with relative ease.

8. Fenders or bumpers shall be provided on all sides of the dock and be capable of meeting the impact standards specified in the design load criteria.

9. All environmental loading shall be designed in accordance with the International Building Code 2018 or the Wisconsin State Building Code, whichever takes precedence.

2.2 MATERIAL PROPERTIES – CONCRETE FLOATING DOCKS

A. Galvanized Steel Frame

1. Structural steel shall conform to the requirements of the standard specification for structural steel, ASTM Designation A36 (Fy=36,000 psi). All steel for the floating dockage shall be zinc-coated (hot dip) in accordance with the requirements of ASTM Designation A123. Minimum zinc coating required are as follows:

| Product Form | Minimum Weight (oz/sq. ft.) | Minimum Thickness (Mils.) |
|---|---|---|
| 1/8" & 3/16" Steel | 2.0 | 3.0 |
| 1/4" and Thicker | 2.0 | 3.4 |

2. All steel members shall be zinc coated after fabrication. Minimal Field Welding or drilling will be allowed, if pre-approved by the Engineer.
3. Aluminum shall be Alloy 6061-T6 or 6351-T6 MIG welded with certified shop and welder. Filler alloy should be 5356 aluminum.
4. Hardware - bolts, lag bolts, screws, nails, flat washers, and lock washers shall be of the type and size best suited for the intended use. Low carbon bolts shall conform to the requirements for Grade A bolts, ASTM Designation A325. All fasteners and miscellaneous hardware shall be zinc or cadmium coated in accordance with the requirements of ASTM Designations A153 or A633.

B. Precast Flotation Materials

1. Cementitious Materials:
   a. 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.
   b. Fly Ash and Pozzolan shall be ASTM C618, Type N, F, or C, except that the maximum allowable loss on ignition shall be 6 percent for Type N and F.
   c. Ground Iron Blast-Furnace Slag shall be ASTM C989/C989M, Grade 100 or 120.
2. Water:
   a. Water shall be fresh, clean, and potable.
3. Aggregates:
   a. 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.
4. Grout
   a. Nonshrink grout shall meet the requirements of ASTM C1107/C1107M.

b. Cementitious grout 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.

5. Admixtures

   a. Air-Entraining admixture shall meet the requirements of ASTM C260/C260M.

   b. Accelerating admixture shall meet the requirements of ASTM C494/C494M, Type C or E.

   c. Water Reducing admixture shall meet the requirements of ASTM C494/C494M, Type A, E, or F.

   d. Corrosion Inhibitor shall be Calcium nitrite, ASTM G109. Add at the rate of 22.25 l per cubic meter 4.5 gallons per cubic yard.

6. Reinforcement:

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

   b. Reinforcing bars shall be ASTM A615/A615M, Grade 60.

   c. Welded wire fabric shall meet the requirements of ASTM A1064/A1064M. Provide flat sheets of welded wire fabric, rolled fabric is not acceptable. Maximum fabric grid is 2 in x 2 in.

7. Metal Accessories:

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

8. Inserts:

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

   b. Structural steel shall be ASTM A36/A36M.

   c. Bolts shall be 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.

   d. Nuts shall be ASTM A563/A563M.

   e. Washers shall be F844 for ASTM A307 bolts.

   f. Provide 18 inch boat cleats spaced at approximately 20 feet on center.

9. Foam Core:

   a. 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.

      i. Unit Weight: 0.70 - 3.00 pcf

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

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

10. Flotation units shall be designed to maintain buoyancy if structurally damaged.
11. Flotation units shall be manufactured in a fashion to allow full bearing of the float on the structural frame in both vertical and lateral directions. Lateral support by bolted connections only, through the encasement, will not be accepted.
12. Engineer reserves the right, and shall, test the flotation units at the job site.

C. Fabrication:

1. Shall meet PCI MNL-116 unless specified otherwise.
2. 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.
3. 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.
4. Reinforcement placement shall meet the requirements of ACI 318M and ACI 318 for placement and splicing. Reinforcement may be preassembled before placement in forms.
5. Concrete mixing shall meet the requirements of ASTM C94/C94M. Mixing operations shall produce batch-to-batch uniformity of strength, consistency, and appearance.
6. Concrete placing shall meet the requirements of 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.
7. 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.
8. Surface finish:

a. 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.

b. Unformed surfaces:

i. 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.

c. Formed surfaces shall meet the requirements of 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.

9. 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.

D. Timber and Wood Products:

1. 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. 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.

E. Rubbing Surfaces – Ultra-High Molecular Weight Polyethylene (UHMWPE)

1. 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. Resin shall meet the requirements of 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).

3. Composition and Fabricated Form:

F. Guide Piles:

1. Refer to section 31 62 16.

G. Gangways:

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

2. Stainless steel shall be Type 316 L.

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

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

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

H. Receptacle Stations:

1. Receptacle stations shall include enclosure, mechanical interlocks, and related wiring and devices as indicated.
2. 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.
3. Mechanical interlocks shall be 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.
4. Circuit breakers shall be 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.
5. Ground-fault circuit interrupter receptacles shall be 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."

## 2.3 MATERIAL PROPERTIES – STEEL FRAME FLOATING DOCKS

A. Galvanized Steel Frame

1. Structural steel shall conform to the requirements of the standard specification for structural steel, ASTM Designation A36 (Fy=36,000 psi). All steel for the floating dockage shall be zinc-coated (hot dip) in accordance with the requirements of ASTM Designation A123. Minimum zinc coating required are as follows:

| Product Form | Minimum Weight (oz/sq. ft.) | Minimum Thickness (Mils.) |
|---|---|---|
| 1/8" & 3/16" Steel | 2.0 | 3.0 |
| 1/4" and Thicker | 2.0 | 3.4 |

2. All steel members shall be zinc coated after fabrication. Minimal Field Welding or drilling will be allowed, if pre-approved by the Engineer.
3. Aluminum shall be Alloy 6061-T6 or 6351-T6 MIG welded with certified shop and welder. Filler alloy should be 5356 aluminum.

4. Hardware - bolts, lag bolts, screws, nails, flat washers, and lock washers shall be of the type and size best suited for the intended use. Low carbon bolts shall conform to the requirements for Grade A bolts, ASTM Designation A325. All fasteners and miscellaneous hardware shall be zinc or cadmium coated in accordance with the requirements of ASTM Designations A153 or A633.

B. Flotation Materials

1. Flotation units shall be designed to maintain buoyancy if structurally damaged.
2. Float units shall be expanded polystyrene encased all around. Encasement material shall be one piece rotational-molded construction with reinforced wall thickness to maintain shape. Flotation material shall fill the encasement. Gaps in the encasement shall be no more than 1/8" wide. Flotation material shall be closed cell polystyrene. Polystyrene shall have a minimum density of 0.9 pounds/cubic foot. Water absorption shall be less than 3 pounds per cubic foot at 7 days when tested by the Hunt absorption test.
3. Flotation units shall be constructed of fire-resistant materials.
4. Flotation units shall consist of a premolded high density polyethylene shell with rotational-molded construction with reinforced wall thickness to maintain shape.
5. Encasement material shall meet the following requirements:
   a. High-Density Cross-Linked Polyethylene:
      i. Minimum thickness = 0.125"
      ii. Molding = Rotational or Extruded
      iii. Minimum density (ASTM D1505) = 59 lbs/ft3
      iv. Minimum tensile yield (ASTM D638) = 3200 PSI
      v. Environmental Stress Crack_F50 (ASTM D1693) < 1000 HRS
      vi. Vicat softening temperature (ASTM D1525) = +240° F
      vii. Brittleness Temperature (ASTM D746) = -180° F
      viii. Flexural Modulus (ASTM D790) = 100,000 PSI
6. High density polyethylene shall be black, minimum 2 percent carbon black and UV stabilized.
7. Flotation units shall be manufactured in a fashion to allow full bearing of the float on the structural frame in both vertical and lateral directions. Lateral support by bolted connections only, through the encasement, will not be accepted.
8. Engineer reserves the right, and shall, test the flotation units at the job site.

C. Connections

1. Shall be designed so the units may be disconnected and moved with relative ease.
2. Connections and associated hardware shall conform to structural steel requirements as noted herein.

D. Anchorage System Criteria

1. The floating dock once anchored shall be able to adjust to the variable water elevations provided.
2. The dock shall be connected to the abutment to prevent it from floating away and/or moving off the abutment.
3. The contractor and dockage engineer shall review the layout and engineer the anchorage system to accommodate the dock system loads.
4. The contractor and dockage engineer shall provide seasonal requirements for anchorage system.

E. Supplier shall determine type, size, and spacing of spud poles. Anchor spuds for the dock shall be inboard of dock walls and not prohibit access to either side of the dock.

1. Wind forces shall be obtained from the International Building Code 2018 for spud pole selection.
2. All spud poles shall be provided with a cap on the end of the spud located above the waterline, to provide a finished appearance as well as prevent material from being deposited within the spuds. Caps shall be all white or black and made from weatherproof and UV stabilized material for longevity.
3. Wind forces shall be obtained from the International Building Code 2018 for spud pole selection.

F. Decking

1. Plastic Panel with open system shall have:
   a. Minimum span capability of L=16” O.C.
   b. Maximum allowable deflection of L/360.
   c. Minimum thickness of 1”.
2. Composite Decking (non-panelized)
   a. Minimum span capability of L=16” O.C.
   b. Maximum allowable deflection of L/360.
   c. HDPE products utilized in composite decking shall meet the following standards:
      i. Minimum Thickness = 0.125”
      ii. Density (ASTM D1505) = 59 lbs/ft3
      iii. Ultimate Tensile Strength (ASTM D638) = 3200 psi
      iv. Vicat softening temperature (ASTM D1525) = +240 ºF
      v. Brittleness Temperature (ASTM D746) = -180 ºF
      vi. Flexural Modulus (ASTM D790) = 100,000 psi
   d. Minimum Warranty of 10 years from the date of installation.
3. Fiberglass Decking – panelized system which looks like composite decking with a frame.

a. Minimum span capability of L=16” O.C.

b. Maximum allowable deflection of L/360.

c. Minimum thickness of 1”.

4. Spare Decking

a. The chosen decking system shall be provided with an additional 5,000 square feet of material to be utilized as spare material.

5. Accessories

a. Dock fenders or bumpers shall be provided on all sides and be a non-marring type, a minimum of 2 inches across consisting of rubber, neoprene, or extruded vinyl. The material shall be tough and tear-resistant and maintain flexibility to a temperature of 10 degrees Fahrenheit. Color shall be UV stabilized white.

b. Cleats (galvanized) shall be 12” long with recessed bolting through the structural frames.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Gangway shall be hinged on the concrete pier side with a minimum 2’-0” of overlap on floating dock.

B. Provide complete project details to the Site Manager prior to beginning.

C. Assemble all required materials and equipment to complete project in a timely manner.

### 3.2 INSTALLATION

A. Contractor shall follow manufacturer’s recommendations for the installation of the new floating dock structures.

B. Contractor shall not apply load to the floating dock while structure is not located in the water unless dock was specifically designed for that scenario.

C. Contractor shall clean all equipment, to leave free of dirt, dust, and fingerprints.

D. Clean adjacent structures from dust, dirt, and debris caused by Work operations.

E. Repair or replace existing property which is to remain that is damaged by the Work of this Section at no cost to the Owner.

### 3.3 CONCRETE FLOATING DOCKS:

A. 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.

B. 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.

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

D. Welding shall conform to 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.

E. 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.

F. 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.

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

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

3.4 CLOSEOUT

A. The contractor shall submit an Operations and Maintenance Manual at project closeout which is to include, but not be limited to, the following information:

1. Manufacturer contact information for each of the system components.

   a. Complete contact information for each component's manufacturer, including technical support numbers and website access for manuals, updates, and replacement parts.

2. Seasonal operations schedule and methods for maintaining the docks.

   a. Detailed instructions for seasonal setup and takedown procedures, if applicable.

   b. Recommended seasonal inspections and care instructions for different environmental conditions (e.g., winterization or storm season preparations).

3. Typical Inspection Schedule, and qualified individual definition.

   a. Definitions and certifications for personnel qualified to conduct inspections.

   b. Documentation and reporting templates for recording inspection findings.

4. Inspection schedule for atypical events.

   a. Specific protocols for inspecting after severe weather events, including thresholds for inspection triggers (e.g., storms over a certain wind speed or wave height).

5. Typical maintenance schedule for the floating structure, connections, and mooring apparatus.

   a. Maintenance activities for susceptible components to wear, such as connections and hinges, including recommendations for lubrication, tightening, or part replacement intervals.

   b. Requirements for cleaning to prevent biofouling and other environmentally sensitive maintenance practices.

6. Instructions for repair of the floating structure system and identification of criteria for replacement of system components.
    a. Step-by-step repair instructions for common issues such as minor structural damage, float punctures, or connection loosening.
    b. Criteria for component replacement versus repair, emphasizing safety thresholds and cost considerations.
7. Detailed warranty information.
    a. Detailed warranty terms, including duration, coverage limitations, and procedures for filing warranty claims.
    b. Specific exclusions and maintenance practices that may affect warranty validity.
8. Environmental Impact and Sustainability Measures
    a. Guidelines for environmentally responsible maintenance and disposal of parts.
    b. Recommendations for minimizing impact on aquatic life and ecosystems during operation and maintenance.
9. Emergency Procedures
    a. Emergency response procedures for scenarios such as dock separation, mooring failure, or structural damage.
    b. Contact information for emergency repairs and support if separate from general maintenance.
10. Record Keeping Requirements
    a. Requirements for logging all maintenance, inspections, repairs, and unusual events.
    b. Format and frequency for reporting maintenance and operational data for record retention.

**END OF SECTION 35 51 13**