

Project 47065.3.1

Brunswick County

Project Special Provisions  
Structure

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A circular professional seal for a North Carolina Professional Engineer. The seal contains the text "NORTH CAROLINA PROFESSIONAL SEAL 20211" and "ENGINEER THOMAS G. PAYNE". The seal is stamped over a handwritten signature of Thomas G. Payne and the date "10/6/11".

**PROJECT SPECIAL PROVISIONS**  
**STRUCTURE**

WBS 47065.3.1

BRUNSWICK COUNTY

**SECURING OF VESSELS**

(10-12-01)

Secure vessels in accordance with Section 107 of the Standard Specifications and the following provision.

When utilizing barges, tugboats or other vessels, take all necessary precautions to ensure that such vessels are securely anchored or moored when not in active operation. Take all necessary measures to ensure that the vessels are operated in a manner that avoids damage to or unnecessary contact with bridges and other highway structures and attachments. If severe weather conditions are anticipated, or should be anticipated through reasonable monitoring of weather forecasts, take additional measures to protect bridges and other highway structures and attachments from extreme conditions. The Contractor is strictly liable for damages to any bridge or other highway structure or attachment caused by a vessel owned or controlled by the Contractor. The Contractor is also liable to third parties for property damages and loss of revenue caused by vessels under the Contractor's control.

**SUBMITTAL OF WORKING DRAWINGS**

(4-1-11)

**1.0 GENERAL**

Submit working drawings in accordance with Article 105-2 of the *Standard Specifications* and this provision. For this provision, "submittals" refers to only those listed in this provision. The list of submittals contained herein does not represent a list of required submittals for the project. Submittals are only necessary for those items as required by the contract. Make submittals that are not specifically noted in this provision directly to the Resident Engineer. Either the Structure Design Unit or the Geotechnical Engineering Unit or both units will jointly review submittals.

If a submittal contains variations from plan details or specifications or significantly affects project cost, field construction or operations, discuss the submittal with and submit all copies to the Resident Engineer. State the reason for the proposed variation in the submittal. To minimize review time, make sure all submittals are complete when initially submitted. Provide a contact name and information with each submittal. Direct any questions regarding submittal requirements to the Resident Engineer, Structure Design Unit contacts or the Geotechnical Engineering Unit contacts noted below.

In order to facilitate in-plant inspection by NCDOT and approval of working drawings, provide the name, address and telephone number of the facility where fabrication will actually be done if different than shown on the title block of the submitted working drawings. This includes, but is not limited to, precast concrete items, prestressed concrete items and fabricated steel or aluminum items.

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**2.0 ADDRESSES AND CONTACTS**

For submittals to the Structure Design Unit, use the following addresses:

Via US mail:

Mr. G. R. Perfetti, P. E.  
State Bridge Design Engineer  
North Carolina Department  
of Transportation  
Structure Design Unit  
1581 Mail Service Center  
Raleigh, NC 27699-1581

Attention: Mr. P. D. Lambert, P. E.

Via other delivery service:

Mr. G. R. Perfetti, P. E.  
State Bridge Design Engineer  
North Carolina Department  
of Transportation  
Structure Design Unit  
1000 Birch Ridge Drive  
Raleigh, NC 27610

Attention: Mr. P. D. Lambert, P. E.

Submittals may also be made via email.

Send submittals to:

[plambert@ncdot.gov](mailto:plambert@ncdot.gov) (Paul Lambert)

Send an additional e-copy of the submittal to the following address:

[jgaither@ncdot.gov](mailto:jgaither@ncdot.gov) (James Gaither)

For submittals to the Geotechnical Engineering Unit, use the following addresses:

For projects in Divisions 1-7, use the following Eastern Regional Office address:

Via US mail:

Mr. K. J. Kim, Ph. D., P. E.  
Eastern Regional Geotechnical  
Manager  
North Carolina Department  
of Transportation  
Geotechnical Engineering Unit  
Eastern Regional Office  
1570 Mail Service Center  
Raleigh, NC 27699-1570

Via other delivery service:

Mr. K. J. Kim, Ph. D., P. E.  
Eastern Regional Geotechnical  
Manager  
North Carolina Department  
of Transportation  
Geotechnical Engineering Unit  
Eastern Regional Office  
3301 Jones Sausage Road, Suite 100  
Garner, NC 27529

For projects in Divisions 8-14, use the following Western Regional Office address:

Via US mail:

Mr. John Pilipchuk, L. G., P. E.  
Western Regional Geotechnical  
Manager  
North Carolina Department  
of Transportation  
Geotechnical Engineering Unit  
Western Regional Office  
5253 Z Max Boulevard

Via other delivery service:

Mr. John Pilipchuk, L. G., P. E.  
Western Region Geotechnical  
Manager  
North Carolina Department  
of Transportation  
Geotechnical Engineering Unit  
Western Regional Office  
5253 Z Max Boulevard

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Harrisburg, NC 28075

Harrisburg, NC 28075

The status of the review of structure-related submittals sent to the Structure Design Unit can be viewed from the Unit's web site, via the "Contractor Submittal" link.

Direct any questions concerning submittal review status, review comments or drawing markups to the following contacts:

Primary Structures Contact:

Paul Lambert  
(919) 250 – 4041  
(919) 250 – 4082 facsimile  
[plambert@ncdot.gov](mailto:plambert@ncdot.gov)

Secondary Structures Contacts:

James Gaither (919) 250 – 4042  
David Stark (919) 250 – 4044

Eastern Regional Geotechnical Contact (Divisions 1-7):

K. J. Kim  
(919) 662 – 4710  
(919) 662 – 3095 facsimile  
[kkim@ncdot.gov](mailto:kkim@ncdot.gov)

Western Regional Geotechnical Contact (Divisions 8-14):

John Pilipchuk  
(704) 455 – 8902  
(704) 455 – 8912 facsimile  
[jpilipchuk@ncdot.gov](mailto:jpilipchuk@ncdot.gov)

### **3.0 SUBMITTAL COPIES**

Furnish one complete copy of each submittal, including all attachments, to the Resident Engineer. At the same time, submit the number of hard copies shown below of the same complete submittal directly to the Structure Design Unit and/or the Geotechnical Engineering Unit.

The first table below covers "Structure Submittals". The Resident Engineer will receive review comments and drawing markups for these submittals from the Structure Design Unit. The second table in this section covers "Geotechnical Submittals". The Resident Engineer will receive review comments and drawing markups for these submittals from the Geotechnical Engineering Unit.

Unless otherwise required, submit one set of supporting calculations to either the Structure Design Unit or the Geotechnical Engineering Unit unless both units require submittal copies in which case submit a set of supporting calculations to each unit. Provide additional copies of any submittal as directed.

### **STRUCTURE SUBMITTALS**

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<b>Submittal</b>	<b>Copies Required by Structure Design Unit</b>	<b>Copies Required by Geotechnical Engineering Unit</b>	<b>Contract Reference Requiring Submittal <sup>1</sup></b>
Arch Culvert Falsework	5	0	Plan Note, SN Sheet & "Falsework and Formwork"
Box Culvert Falsework <sup>7</sup>	5	0	Plan Note, SN Sheet & "Falsework and Formwork"
Cofferdams	6	2	Article 410-4
Evazote Joint Seals <sup>6</sup>	9	0	"Evazote Joint Seals"
Expansion Joint Seals (hold down plate type with base angle)	9	0	"Expansion Joint Seals"
Expansion Joint Seals (modular)	2, then 9	0	"Modular Expansion Joint Seals"
Expansion Joint Seals (strip seals)	9	0	"Strip Seals"
Falsework & Forms <sup>2</sup> (substructure)	8	0	Article 420-3 & "Falsework and Formwork"
Falsework & Forms (superstructure)	8	0	Article 420-3 & "Falsework and Formwork"
Girder Erection over Railroad	5	0	Railroad Provisions
Maintenance and Protection of Traffic Beneath Proposed Structure	8	0	"Maintenance and Protection of Traffic Beneath Proposed Structure at Station ____"
Metal Bridge Railing	8	0	Plan Note
Metal Stay-in-Place Forms	8	0	Article 420-3
Metalwork for Elastomeric Bearings <sup>4,5</sup>	7	0	Article 1072-10
Miscellaneous Metalwork <sup>4,5</sup>	7	0	Article 1072-10
Optional Disc Bearings <sup>4</sup>	8	0	"Optional Disc Bearings"
Overhead Signs	13	0	Article 903-3(C) & Applicable Provisions

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Placement of Equipment on Structures (cranes, etc.)	7	0	Article 420-20
Pot Bearings <sup>4</sup>	8	0	“Pot Bearings”
Precast Concrete Box Culverts	2, then 1 reproducible	0	“Optional Precast Reinforced Concrete Box Culvert at Station ____”
Precast Retaining Wall Panels	10	1	Article 1077-2
Prestressed Concrete Cored Slab (detensioning sequences) <sup>3</sup>	6	0	Article 1078-11
Prestressed Concrete Deck Panels	6 and 1 reproducible	0	Article 420-3
Prestressed Concrete Girder (strand elongation and detensioning sequences)	6	0	Articles 1078-8 and 1078-11
Removal of Existing Structure over Railroad	5	0	Railroad Provisions
Revised Bridge Deck Plans (adaptation to prestressed deck panels)	2, then 1 reproducible	0	Article 420-3
Revised Bridge Deck Plans (adaptation to modular expansion joint seals)	2, then 1 reproducible	0	“Modular Expansion Joint Seals”
Sound Barrier Wall Casting Plans	10	0	Article 1077-2 & “Sound Barrier Wall”
Sound Barrier Wall Steel Fabrication Plans <sup>5</sup>	7	0	Article 1072-10 & “Sound Barrier Wall”
Structural Steel <sup>4</sup>	2, then 7	0	Article 1072-10
Temporary Detour Structures	10	2	Article 400-3 & “Construction, Maintenance and Removal of Temporary Structure at Station ____”
TFE Expansion Bearings <sup>4</sup>	8	0	Article 1072-10

## FOOTNOTES

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1. References are provided to help locate the part of the contract where the submittals are required. References in quotes refer to the provision by that name. Articles and subarticles refer to the *Standard Specifications*.
2. Submittals for these items are necessary only when required by a note on plans.
3. Submittals for these items may not be required. A list of pre-approved sequences is available from the producer or the Materials & Tests Unit.
4. The fabricator may submit these items directly to the Structure Design Unit.
5. The two sets of preliminary submittals required by Article 1072-10 of the *Standard Specifications* are not required for these items.
6. Submittals for Fabrication Drawings are not required. Submittals for Catalogue Cuts of Proposed Material are required. See Section 5.A of the referenced provision.
7. Submittals are necessary only when the top slab thickness is 18” or greater.

**GEOTECHNICAL SUBMITTALS**

Submittal	Copies Required by Geotechnical Engineering Unit	Copies Required by Structure Design Unit	Contract Reference Requiring Submittal <sup>1</sup>
Drilled Pier Construction Plans <sup>2</sup>	1	0	“Drilled Piers”
Crosshole Sonic Logging (CSL) Reports <sup>2</sup>	1	0	“Crosshole Sonic Logging” & “Drilled Piers”
Pile Driving Equipment Data Forms <sup>2,3</sup>	1	0	Article 450-5 & “Piles”
Pile Driving Analyzer (PDA) Reports <sup>2</sup>	1	0	“Pile Driving Analyzer” & “Piles”

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Retaining Walls <sup>4</sup>	8	2	Applicable Provisions
Contractor Designed Shoring <sup>4</sup>	7	2	“Temporary Shoring”, “Anchored Temporary Shoring” & “Temporary Soil Nail Walls”

**FOOTNOTES**

1. References are provided to help locate the part of the contract where the submittals are required. References in quotes refer to the provision by that name. Articles refer to the *Standard Specifications*.
2. Submit one hard copy of submittal to the Resident or Bridge Maintenance Engineer. Submit a second copy of submittal electronically (PDF via email) or by facsimile, US mail or other delivery service to the appropriate Geotechnical Engineering Unit regional office. Electronic submission is preferred.
3. Download Pile Driving Equipment Data Form from the following link:  
[www.ncdot.org/doh/preconstruct/highway/geotech/formdet/](http://www.ncdot.org/doh/preconstruct/highway/geotech/formdet/)  
See second page of form for submittal instructions.
4. Electronic copies of submittal are required. See referenced provision.



**CRANE SAFETY****(8-15-05)**

Comply with the manufacturer specifications and limitations applicable to the operation of any and all cranes and derricks. Prime contractors, sub-contractors, and fully operated rental companies shall comply with the current Occupational Safety and Health Administration regulations (OSHA).

Submit all items listed below to the Engineer prior to beginning crane operations involving critical lifts. A critical lift is defined as any lift that exceeds 75 percent of the manufacturer's crane chart capacity for the radius at which the load will be lifted or requires the use of more than one crane. Changes in personnel or equipment must be reported to the Engineer and all applicable items listed below must be updated and submitted prior to continuing with crane operations.

**CRANE SAFETY SUBMITTAL LIST**

- A. **Competent Person:** Provide the name and qualifications of the "Competent Person" responsible for crane safety and lifting operations. The named competent person will have the responsibility and authority to stop any work activity due to safety concerns.
- B. **Riggers:** Provide the qualifications and experience of the persons responsible for rigging operations. Qualifications and experience should include, but not be limited to, weight calculations, center of gravity determinations, selection and inspection of sling and rigging equipment, and safe rigging practices.
- C. **Crane Inspections:** Inspection records for all cranes shall be current and readily accessible for review upon request.
- D. **Certifications:** By July 1, 2006, crane operators performing critical lifts shall be certified by NC CCO (National Commission for the Certification of Crane Operators), or satisfactorily complete the Carolinas AGC's Professional Crane Operator's Proficiency Program. Other approved nationally accredited programs will be considered upon request. All crane operators shall also have a current CDL medical card. Submit a list of anticipated critical lifts and corresponding crane operator(s). Include current certification for the type of crane operated (small hydraulic, large hydraulic, small lattice, large lattice) and medical evaluations for each operator.

**COORDINATION WITH THE U. S. COAST GUARD****(SPECIAL)**

At no time during work will the waterway be closed to navigation without prior approval from the Coast Guard. The contractor is required to maintain close and regular contact with Coast Guard Sector North Carolina to keep them informed to activities in the waterway at (252)-247-4570.

All waterway closures shall be requested in writing and shall be received by the District Commander of the Coast Guard at least 30 days in advance of the closure so that the appropriate

marine notifications can be made. The Contractor shall send a copy of each request to Stephen Lane, Division of Coastal Management, 400 Commerce Avenue, Morehead City, NC 28557.

All work shall be conducted so that free navigation of the waterway is not unreasonably interfered with and the present navigable depths are not impaired. The contractor shall organize and plan operations so as to minimize channel restrictions. Timely notice of any and all events that affect navigation shall be given to the District Commander during the removal of the existing fender and the installation of the proposed fender system. The channel at the fender site shall be promptly cleared of all obstructions placed therein or caused by the contractor.

Prior to any work commencing in the waterway, temporary navigational lighting will be required by the Coast Guard. Additional lighting or obstruction lighting may also be required. All temporary navigational lighting shall be coordinated with the District Commander and shall be provided and installed by the Contractor.

After installation of the temporary navigation lighting and prior to the removal of the existing structure, the Contractor shall notify the Engineer so NCDOT Bridge Management can remove the existing fender system navigation lighting system. When the fender system is complete and prior to removal of the temporary navigation lighting, the Contractor shall notify the Engineer so NCDOT Bridge Management can install the navigation lighting system on the fender system.

The Contractor shall give the Engineer a minimum of 5 days notice so NCDOT Bridge Management may schedule the removal or installation of the navigation lighting system and clearance gauge.

### **REMOVAL OF EXISTING FENDER SYSTEM**

**(SPECIAL)**

The existing fender system shall be removed in accordance with Section 402 of the Standard Specifications and this special provision.

In order to protect the bridge at all times, the replacement of the fender system, both removal and construction, shall be limited to replacing three new panels of fender system at any one time. Therefore, removal of the existing fender system shall be done in stages consisting of removing the existing length necessary to build three new panels of fender system and then building the three new panels prior to starting the next stage.

Piles from the existing fender system and any remnant piles from previous fender systems shall be removed in their entirety. In the event that a pile breaks during removal and cannot be removed in its entirety, the pile may be cut off flush with the bed of the water body, and the NCDOT shall be notified of each occurrence within one working day.

The lump sum price bid for "Removal of Existing Fender System" will be full compensation for the above work covered by Section 402 of the Standard Specifications, the applicable permits, and this Special Provision including all materials, equipment, tools, labor, disposal, and incidentals necessary to complete this work.

**PLASTIC AND COMPOSITE LUMBER****(SPECIAL)****1.0 Description**

The work for providing plastic and composite lumber consists of furnishing and installing the materials and all miscellaneous hardware to complete the work in accordance with the plans and this special provision.

**2.0 Materials**

Plastic and composite lumber shall be made of polyethylene, contain appropriate colorants and UV inhibitors, and shall meet the material property requirements specified in Table 1. Plastic and composite lumber shall contain glass filament. The lumber must not corrode, rot, warp, splinter or crack. The outer surface of the lumber shall be black in color unless otherwise specified in the Contract Documents. The outer surface shall be generally smooth, uniform and consolidated but may contain occasional small blisters or pockmarks. Small voids shall be repaired as directed by the Engineer with a repair procedure approved by the Engineer.

Manufacture plastic and composite lumber as one continuous piece with no joints or splices. Plastic and composite lumber shall be free of twist and curvature. Steel reinforcement in the lumber is not permitted.

Plastic and composite lumber must meet the minimum structural properties listed in Table 4 and the dimensions and tolerances of Table 2. In addition, 10"x10" wales must meet the minimum structural properties listed in Table 3.

Applicable ASTM Code	Applies To	Requirement
Density ASTM D792	Skin of lumber	55 pcf min.
Density ASTM D792	Core of lumber	48 pcf min.
Water Absorption ASTM D570	Skin of lumber	24 hrs: <3.0% weight increase
Impact Resistance ASTM D256 Method A or ASTM D256 Method D	Skin of lumber	Greater than 0.55 ft-lbs/in
Hardness ASTM D2240	Skin of lumber	44-75 (Shore D)
Abrasion ASTM D4060	Skin of lumber	Weight Loss: < 0.03oz Cycles = 10,000 Wheel = CS17 Load: 2.2 lbs
Chemical Resistance ASTM D756 or ASTM D543 Sea Water Gasoline No. 2 Diesel	All Materials	< 1.5% weight increase < 9.5% weight increase < 6.0% weight increase
Tensile Properties ASTM D638	Core of lumber	Minimum 2200 psi at break
Compressive Modulus ASTM D695	Core of lumber	Minimum 40 ksi
Static Coefficient of Friction ASTM D1894	Skin of lumber	Maximum 0.25, wet
Nail Pull-Out ASTM D6117	All Materials	Minimum 60 lbs

Plastic and Composite lumber	Dimension	Tolerance
Length	Per order (80ft max)	+6 -0 in
Width	See Contract Plans	± ¼ in
Height	See Contract Plans	± ¼ in
Corner Radius –Lumber with reinforcing rods - Lumber without reinforcing rods	1 ¼ in ¼ in	± ½ in ± 1/16 in
Outer Skin Thickness – (if reinforced with rods)	3/16 in	± 1/8 in
Distance from outer surface to rod elements (if reinforced with rods)	1 ½ in	± 5/8 in
Straightness (gap, bend or inside while lying on a flat surface)		<1 ½ in per 10 feet

Table 3 Structural Properties for 10 in x10 in Lumber	
Member Size	10 in x 10 in
Modulus of Elasticity as derived below	424 ksi min.
Stiffness, E.I.	3.28E+08 lb-in <sup>2</sup> min.
Flexural Strength or Flexural Yield Strength*	5.8 ksi min.
Weight	30-37 lb/ft

\*As defined in ASTM D6109.

Determine the modulus of elasticity for plastic and composite lumber by conducting a three point or four point bend test as per ASTM D790 or D6109. The modulus for lumber with reinforcing rods is to be taken at a strain of 0.01 inches per inch. The modulus for lumber reinforced without reinforcing rods may be taken by one of the methods suggested in ASTM D6109.

Table 4 Structural Properties for Composite Lumber	
Modulus of Elasticity (ASTM D6109)	300 ksi min.
Flexural Strength (ASTM D6109)	No fracture at 2500 psi
Compressive Strength (ASTM D6108)	2200 psi min. parallel to grain 700 psi min. perpendicular to grain
Screw / Nail Withdrawal (ASTM D6117)	400 lbs min. screw 250 lbs min. nail

Calculate properties for Tables 3 utilizing standard elastic beam flexure formulas. Conduct each test on a full size product specimen of the cross section dimensions indicated. Results of the test may be extended to a product of similar or smaller cross section. The specified minimum yield stress in bending shall be reached before failure of the test specimen.

### 3.0 Acceptance

The Contractor shall submit the following information to the Resident Engineer and Steve Walton of Materials & Tests (336-993-2300) at least 20 days prior to shipping any plastic and composite lumber:

- Copies of the plastic and composite lumber manufacturer's standards and most recent brochure for the lumber products covered by these specifications.
- Independent test lab report confirming the plastic and composite lumber products meet the plastic material properties found in Table 1.
- Independent test lab report confirming the submitted lumber products meet the minimum structural property requirements found in Table 3 and Table 4.
- Written certification from the manufacturer that the submitted plastic and composite lumber products satisfy the requirements of this specification.

The independent test lab reports must be no older than five (5) years.

The Department reserves the right to place a duly authorized inspector in the plant prior to shipment of any plastic and composite lumber product for the purpose of determining preapproval. Notify the Engineer at least 7 days in advance of any shipment. Preapproval of lumber products shall be on the basis of tests of materials, inspection of lumber products, conformance with specified dimensions, appearance, and freedom from defect. Each individual plastic and composite lumber piece shall be available for inspection by the inspector. The inspector shall have the authority to reject any or all lumber products not manufactured in accordance with these specifications. Any plastic and composite lumber products found to be defective in any manner at any time shall be rejected and replaced by an acceptable plastic and composite lumber product or repaired in a manner approved by the Engineer. All lumber products preapproved by the inspector shall be stamped as approved. Preapproval does not guarantee final acceptance.

Final acceptance of all plastic and composite lumber products shall be determined by the Engineer.

#### 4.0 Construction Details

Protect materials at all times against exposure to extreme heat or impact. Transport plastic and composite lumber in a manner that will minimize scratching or damage to the outer surfaces, stack on dunnage above ground so that it may be easily inspected and store in a manner that will avoid damage. Lumber damaged in shipping or handling will be rejected as determined by the Engineer.

Cut, bevel, drill, countersink, and otherwise fabricate plastic and composite lumber in accordance with the manufacturer's recommendations. Set all material accurately to required levels and lines, with members plumb and true and accurately cut and fitted. Securely attach all composite lumber to substrate by anchoring and fastening as shown on plans. Perform all cutting and drilling in a manner that allows for the collection of all debris and dispose of properly.

#### 5.0 Basis of Payment

The lump sum price bid for "Plastic and Composite Lumber" will be the full compensation for all lumber and all equipment, tools, and work necessary for their installation. The lump sum price bid for "Plastic and Composite Lumber" will be full compensation for all other work including but not limited to material, equipment, tools, disposal, fasteners, plates, spare parts package, wire rope, as-built plans, and other necessary items or effort required for completing the work.

#### **WIRE ROPE FOR FENDER PILE CLUSTER**

**(SPECIAL)**

Unless otherwise shown on the plans, galvanized aircraft quality wire rope with ultraviolet ray resistant polypropylene impregnation shall be used. The polypropylene plastic shall form a wall of protection by using spacer wires in the outer gallery of each strand and shall be effectively bonded to the outer plastic jacket. The rope diameter shall be 1/2 inch and the outside diameter of the covering shall be 5/8 inch. The rope construction shall be a 6 by 19 independent wire rope core with nominal strength of 22,800 pounds. All ends shall be protected with heat shrinkable

end caps, compatible with the rope's polypropylene. The caps shall provide an effective water-tight seal and shall be installed in accordance with the manufacturer's instructions. The rope shall conform to Federal Specifications W83420 for aircraft quality and the protective coating shall conform to ASTM A 475 (Type 1 coating).

No separate payment will be made for the above work. All costs associated with providing the Wire Rope shall be considered incidental to the lump sum cost of the "Plastic and Composite Lumber".

### **AS-BUILT PLANS**

**(SPECIAL)**

The Contractor shall provide As-Built plans to both the Resident Engineer and the Navigational Branch of the U.S. Army Corps of Engineers showing the location of the new fender system. The As-Built plans shall primarily consist of but not be limited to a scaled plan view showing the fender system including fender system piles and pile clusters, centerline of the channel, north arrow, centerline of the road above, minimum clear channel width provided by the fender system, top of fender system elevation (top of walkway) at each flare control point. The survey must be performed by a North Carolina Registered Professional Land Surveyor and referenced to the North Carolina State Plain Coordinate System NAD 1983 US survey feet horizontal datum and NGVD 1929 US survey feet vertical datum. Copies of the As-Built plans shall be submitted within thirty (30) days of completion of construction activities to the Resident Engineer and to the Chief of Navigation, Navigation Branch, US Army Corps of Engineers, Wilmington District, 69 Darlington Ave., Wilmington, North Carolina 28403.

No separate payment will be made for the above work. All costs associated with providing the As-Built plans shall be considered incidental to the lump sum cost of the "Plastic and Composite Lumber".

### **SPARE PARTS PACKAGE**

**(SPECIAL)**

In addition to the Bill of Materials list shown on the plans for materials required to build the plastic fender system, the Contractor shall also provide the Department with the following materials for future repair purposes.

Plastic and Composite Lumber		
Mark	Size	Quantity
A1	10" X 10" X 32'	8
B	8" X 8" X 8"	21
C	2" X 6" X 16'	10
D	4" X 6" X 4'-4"	6
E	2" X 12" X 2'-6"	20
F2	6" X 10" X 16'	8

Wire rope as described above of sufficient length for use at one pile cluster.

The Contractor shall contact Mr. Chuck Francka at phone number 910-371-6580 at least 48 hours prior to delivery and shall deliver the materials to the bridge maintenance yard at 25 Old River Road, Leland, NC 28451. NCDOT forces will unload the materials.

No separate payment will be made for the above work. All costs associated with providing the Spare Parts Package shall be considered incidental to the lump sum cost of the "Plastic and Composite Lumber".

### **LOCATION OF NEW FENDER SYSTEM**

**(SPECIAL)**

The new fender system is shown at the same location of the existing fender system and shall not encroach into the existing 90' navigational channel. The Contractor may request building both sides of the fender system up to two foot up or down stream from the existing location. The Contractor may also request building one side or both sides of the fender system up to two feet away from/outside of the existing 90' navigational channel; thereby, increasing the navigational channel width.

Any requests to move the location of the new fender system is subject to the Engineer's approval.

### **PILES**

**(SPECIAL)**

Revise the *Standard Specifications* as follows:

Page 4-71, Delete Section 450 **BEARING PILES** and replace it with the following:

#### **2.0 DESCRIPTION**

Furnish and install piles with sufficient lengths in accordance with the contract and accepted submittals. Provide steel piles with steel sections as shown on the plans. Drive and drill in piles and accessories as shown on the plans. Paint, restrike, redrive, splice, cut off and build up piles and perform predrilling, spudding and pile driving analyzer (PDA) testing as necessary or required. For this provision, "pile penetration" refers to the minimum required pile tip elevation.

#### **3.0 MATERIALS**

Refer to Division 10 of the *Standard Specifications*:

<b>Item</b>	<b>Section</b>
Portland Cement Concrete, Class A	1000
Reinforcing Steel	1070
Steel Pipe Pile Plates	1072
Steel and Prestressed Concrete Piles	1084



Piles shall be painted in accordance with Section 442 of the *Standard Specifications*. Piles shall be painted their entire length and system 2 of section 442-7 shall be used. Piles shall contain 0.2% copper.

#### 4.0 PILE LENGTHS

The estimated pile lengths shown on the plans are for bid purposes only. Provide piles of sufficient lengths for the required pile cutoff elevations and pile penetration.

#### 5.0 CONSTRUCTION METHODS

##### A. Handling and Storing Piles

- Handle, transport and store piles so that piles are kept clean and undamaged. Do not use chains, cables or hooks that can damage or scar piles. Do not damage coatings on steel piles. Store piles above ground upon platform skids, or other supports, and keep free from dirt, grease, vegetation and other foreign material. Damaged or bent piles will be rejected.

##### B. Pile Installation

- Install piles with the following tolerances.
  1. Axial alignment within  $\frac{1}{4}$  inch per foot (21 mm per meter) of vertical or batter shown on the plans
  2. Horizontal alignment within 3" (75 mm) of plan location, longitudinally and transversely
  3. Pile embedment within 1' (305 mm) more and 2" (50 mm) less of the embedment shown on the plans
- No additional payment will be made for changes to the fender system due to piles installed out of position.
- If necessary, splice steel piles as shown on the plans. Do not use more than 3 sections (2 splices) of steel piling per pile. Cut off piles at required elevations along a plane normal to the axis of the pile as necessary.

##### C. Pile Accessories

- If required, use pile accessories including pipe pile plates and steel pile points and splicers as shown on the plans. Perform any welding in accordance with the contract. Weld pipe pile plates with the specified dimensions to steel pipe piles as shown on the plans.
- Attach steel pile points to steel piles in accordance with the manufacturer's instructions.

#### D. Driven Piles

- When predrilling, spudding and installing the initial portions of steel piles with vibratory hammers, submit these pile installation methods with the proposed pile driving methods and equipment for review and acceptance. Spudding is defined as driving or dropping a steel pile and then removing it. The Engineer will approve the predrilling depth and diameter, spudding depth and pile size and depth of pile installation with a vibratory hammer.
- Drive piles in accordance with the accepted submittals and this provision.
- Limit driving stresses in accordance with the *AASHTO LRFD Bridge Design Specifications*. If a tip elevation is noted on the plans for steel piles, drive piles to the minimum required tip elevation.
- Also, drive piles to the minimum required tip elevation in a continuous operation unless stopped due to exceeding the maximum blow count or driving stresses, insufficient pile length or other approved reasons.
- Protect coatings in an approved manner when driving coated steel piles through templates. Redrive piles raised or moved laterally due to driving adjacent piles.

##### 1. Predrilling and Spudding

If necessary or required, perform predrilling for piles and spudding with a steel pile as noted on the plans or in accordance with the accepted submittals. Predrill pile locations to the specified elevations noted on the plans, revised elevations approved by the Engineer or depths in accordance with the accepted submittals. When noted on the plans and at the Contractor's option, spudding may be used in lieu of predrilling. Do not perform spudding below specified predrilling elevations, revised elevations approved by the Engineer or depths in accordance with the accepted submittals.

When noted on the plans or predrilling in water or wetlands, use temporary steel casings meeting the requirements of steel casings for pile excavation in accordance with this provision with the exception of casing diameter. For steel casing diameters, use casings with a minimum inside diameter equal to the predrilling diameter. Use steel casings from a minimum of 2 ft (0.6 m) above the static water elevation or ground line, whichever is higher, to a minimum of 5 ft (1.5 m) below the ground or mud line. More than 5 ft (1.5 m) embedment may be necessary if steel casings are not stable or predrilling or spudding disturbs material outside the casings.

Perform predrilling and spudding such that large ground movements and voids below ground do not occur and piles can be driven to the required pile penetration. Do not deposit spoils above the ground or mud line in water or wetlands. Dispose of spoils in accordance with Section 802 of the *Standard Specifications* and as

directed by the Engineer. When predrilling or spudding is complete, remove all steel casings before driving piles.

## 2. Driving Equipment

Submit the proposed pile driving methods and equipment (pile driving equipment data form) including the pile driving hammer, hammer cushion, pile helmet and cushion for all piles for review and acceptance. Do not submit more than two pile driving hammers per pile type per submittal. Provide 2 copies of this form at least 30 calendar days before driving piles. All equipment is subject to satisfactory field performance.

Drive piles with accepted driving equipment using air, steam or diesel hammers. Use pile driving hammers that will not overstress piles at a blows per foot ranging from 30 to 180.

Operate air and steam hammers within the manufacturer's specified ranges and 10% of the manufacturer's rated speed in blows per minute or a rate approved by the Engineer. Use a plant and equipment for air or steam hammers with sufficient capacity to maintain, under working conditions, the volume and pressure specified by the manufacturer. Equip the plant and equipment with accurate pressure gauges that are easily accessible. Provide striking parts of air and steam hammers that weigh at least one-third the weight of the pile helmet and pile, with a minimum weight of 2,750 lbs (1,250 kg).

Equip open-end (single acting) diesel hammers with a graduated scale (jump stick) extending above the ram cylinder, graduated rings or grooves on the ram or an electric sound activated remote measuring instrument to determine the hammer stroke during driving. Equip closed-end (double acting) diesel hammers with a calibrated bounce chamber pressure gauge mounted near the ground and provide a current calibrated chart or graph equating bounce chamber pressure and gauge hose length to equivalent energy. Submit this chart or graph with the proposed pile driving methods and equipment for closed-end diesel hammers.

Hold pile heads in position with pile helmets that closely fit over the pile heads and extend down the sides of piles a sufficient distance. Use pile cushions made of pine plywood with a minimum thickness of 4" (100 mm). Replace pile cushions during driving when a cushion is compressed more than one-half its original thickness or begins to burn.

The Engineer may inspect the hammer cushion before beginning driving and periodically throughout the project. Expose the hammer cushion for inspection as directed by the Engineer. Replace or repair any hammer cushion that is less than 25% of its original thickness.

## 3. Required Driving Resistance

The Engineer will determine the acceptability of the proposed pile driving methods and equipment and provide the blows per foot and equivalent set for 10 blows for the required driving resistance. When performing PDA testing in accordance with the *AASHTO LRFD Bridge Design Specifications*, the resistance factor is 0.75. Otherwise, the resistance factor for the wave equation analysis is 0.60.

Unless otherwise approved, stop driving piles when refusal or minimum pile tip elevation is reached. Refusal is defined as 240 blows per foot or any equivalent set.

#### 4. Redriving Piles

Once the required pile penetration is achieved, the Contractor may choose to or the Engineer may require the Contractor to stop driving, wait and restrike or redrive piles to achieve the required driving resistance. If the Contractor chooses to restrike or redrive piles, no payment will be made for restrikes or redrives. If the Engineer requires the Contractor to restrike or redrive piles, payment will be made in accordance with section 5.0 of this provision. When the Engineer requires restrikes or redrives, the Engineer will determine the number of restrikes or redrives and the time to wait after stopping driving and between restrikes and redrives. The time to wait will range from 4 to **48 hours**.

Use the same pile driving methods, equipment and compressed pile cushion from the previous driving to restrike or redrive the pile unless the cushion is unacceptable due to deterioration. Do not use a cold diesel hammer for a restrike or redrive, unless it is impractical to do otherwise as determined by the Engineer. In general, warm up the hammer by applying at least 20 blows to a previously driven pile or timber mats on the ground.

#### E. Drilled-in Piles

- If required, perform pile excavation to specified elevations shown on the plans or revised elevations approved by the Engineer. Excavate holes at pile locations with diameters that will result in at least 3" (75 mm) of clearance all around piles. Before filling holes, support and center piles in excavations and when noted on the plans, drive piles to the required driving resistance. Remove any fluid from excavations, and at the Contractor's option, fill holes with either concrete or flowable fill unless required otherwise in the contract.

##### 1. Pile Excavation

Use equipment of adequate capacity and capable of drilling through soil, rock, boulders, debris, man-made objects and any other materials encountered. Blasting is not permitted to advance excavations. Blasting for core removal is only permitted when approved by the Engineer. Dispose of drilling spoils in accordance with Section 802 of the *Standard Specifications* and as directed by the Engineer. Drilling spoils consist of all excavated materials including fluids removed from excavations by pumps or drilling tools.

If unstable, caving or sloughing soils are anticipated or encountered, stabilize holes with either slurry or temporary steel casings. When using slurry, submit slurry details including product information, manufacturer's recommendations for use, slurry equipment details and written approval from the slurry supplier that the mixing water is acceptable before beginning drilling. When using steel casings, use either the sectional type or one continuous corrugated or non-corrugated piece. Steel casings should consist of clean watertight steel of ample strength to withstand handling and driving stresses and the pressures imposed by concrete, earth and backfill. Use steel casings with an outside diameter equal to the hole size and a minimum wall thickness of ¼ inch (6 mm).

## 2. Filling Holes

Check the water inflow rate at the bottom of holes after all pumps have been removed. If the inflow rate is less than 6" (150 mm) per half hour, remove any fluid and free fall concrete or flowable fill into excavations. Ensure that concrete or flowable fill flows completely around piles. If the water inflow rate is greater than 6" (150 mm) per half hour, propose and obtain acceptance of a procedure for placing concrete or flowable fill before filling holes. Place concrete or flowable fill in a continuous manner and remove all steel casings.

## F. Pile Driving Analyzer

- If required, test piles with a pile driving analyzer (PDA) manufactured by Pile Dynamics, Inc., analyze data and provide PDA reports. Perform PDA testing in accordance with ASTM D4945. Either the Engineer will perform PDA testing and analysis or use a PDA Consultant prequalified by the NCDOT Contractual Services Unit for Pile Driving Analyzer Work (work code 3060) to perform PDA testing and analysis and provide PDA reports. When using a PDA Consultant, use a PDA Operator approved as a Field Engineer (key person) for the PDA Consultant. Also, provide PDA reports sealed by a Professional Engineer approved as a Project Engineer (key person) for the same PDA Consultant.
- The Engineer will determine the number of piles and which piles to be tested with a PDA. Do not drive piles with a PDA until the proposed pile driving methods and equipment has been preliminarily accepted. Notify the Engineer of the pile driving schedule a minimum of 7 calendar days in advance.
- The Engineer will complete the review and acceptance of the proposed pile driving methods and equipment and provide the blows per foot and equivalent set for 10 blows for the required driving resistance within 10 calendar days after the Engineer receives the PDA report or the Engineer finishes PDA testing. A PDA report for or PDA testing on multiple piles may be required as determined by the Engineer before the 10 day time period begins.

### 1. Preparation

Provide piles for PDA testing that are 5 ft (1.5 m) longer than the estimated pile lengths shown on the plans. Supply an AC electrical power source of a voltage and frequency suitable for computer equipment.

Provide a shelter to protect the PDA equipment and operator from conditions of sun, water, wind and temperature. The shelter should have a minimum floor size of 6 ft by 6 ft (1.8 m by 1.8 m) and a minimum roof height of 8 ft (2.4 m). If necessary, heat or cool the shelter to maintain a temperature between 50 and 85 degrees F (10 and 30 degrees C). Place the shelter within 75 ft (23 m) of the pile such that the PDA cables reach the computer and the operator can clearly observe the pile. The Engineer may waive the shelter requirement if weather conditions allow.

Drill up to a total of 16 bolt holes in either 2 or 4 sides of the pile, as directed by the PDA Consultant or Engineer, at an approximate distance equal to 3 times the pile diameter below the pile head. If the PDA Consultant or Engineer chooses to drill the bolt holes, provide the necessary equipment, tools and assistance to do so. A hammer drill is required for concrete piles. Allow for 2 hours per pile to drill holes.

Lift, align and rotate the pile to be tested with a PDA as directed by the PDA Consultant or Engineer. Place the pile in the leads and template so that the PDA instruments and their accompanying wires will not be damaged. Attach PDA instruments as directed by the PDA Consultant or Engineer after the pile is placed in the leads and the template.

## 2. Testing

Use only the preliminarily accepted pile driving methods and equipment to drive piles with the PDA instruments attached. Drive piles in accordance with this provision and as directed by the PDA Operator or Engineer. The PDA Operator or Engineer may require the Contractor to modify the pile installation procedure during driving. Dynamic measurements will be recorded and used to evaluate the hammer performance, driving resistance and stresses, energy transfer, pile integrity and various soil parameters such as quake and damping.

If required, reattach the PDA instruments and restrike or redrive the pile in accordance with this provision. Obtain the required stroke and at least 6" (150 mm) of penetration as directed by the PDA Operator or Engineer. Dynamic measurements will be recorded during restriking and redriving. The Engineer will determine when PDA testing has been satisfactorily completed.

The Contractor is responsible in terms of both actual expense and time delays for any damage to the PDA instruments and supporting equipment due to the Contractor's fault or negligence. Replace any damaged equipment at no additional cost to the Department.

## 3. Analysis

When using a PDA Consultant, analyze data with the CAse Pile Wave Analysis Program (CAPWAP), version 2006 or later, manufactured by Pile Dynamics, Inc. At a minimum, analysis is required for a hammer blow near the end of initial drive and for each restrike and redrive. Additional CAPWAP analysis may be required as determined by the PDA Consultant or Engineer.

#### 4. Report

When using a PDA Consultant, submit 2 copies of each PDA report within 7 calendar days of completing field testing. Include the following in PDA reports:

a. Title Sheet

NCDOT TIP number and WBS element number

Project description

County

Bridge station number

Pile location

Personnel

Report date

b. Introduction

c. Site and Subsurface Conditions (including water table elevation)

d. Pile Details

Pile type and length

Required driving resistance and resistance factor

Concrete compressive strength and/or steel pile yield strength

Pile splice type and locations

Pile batter

Installation methods including use of predrilling, spudding, vibratory hammer, template, barge, etc.

e. Driving Details

Hammer make, model and type

Hammer and pile cushion type and thickness

Pile helmet weight

Hammer efficiency and operation data including fuel settings, bounce chamber pressure, blows per minute, equipment volume and pressure

Ground or mud line elevation and template reference elevation at the time of driving

Final pile tip elevation

Driving data (ram stroke, blows per foot (0.3 meter) and set for last 10 hammer blows)

Restrike and redrive information

f. PDA Field Work Details

g. CAPWAP Analysis Results

Table showing percent skin and tip, skin and toe damping, skin and toe quake and match quality

h. Summary/Conclusions

i. Attachments

Boring log(s)

Pile driving equipment data form (from Contractor)

Field pile driving inspection data (from Engineer)

Accelerometer and strain gauge locations

Accelerometer and strain gauge serial numbers and calibration information

PDA hardware model and CAPWAP software version information

Electronic copy of all PDA data and executable CAPWAP input and output files

## 6.0 MEASUREMENT AND PAYMENT

*PP 14"x0.5" Steel Piles and PP 16"x0.5" Steel Piles* will be measured and paid for in linear feet. Steel piles will be measured as the pile length before installation minus any pile cut-offs. No payment will be made for pile cut-offs or cutting off piles. No payment will be made for damaged, defective or rejected piles or any piles for falsework, bracing, templates or temporary work bridges. The contract unit prices for *PP 14"x0.5" Steel Piles and PP 16"x0.5" Steel Piles* will also be full compensation for driving piles.

For driven piles, once the pile penetration is achieved, the Contractor may drive the remaining portion of piles to grade in lieu of cutting off piles provided the remaining portions do not exceed 5 ft (1.5 m) and the piles can be driven without being damaged or reaching the maximum blow count or refusal. When this occurs, the additional length of piles driven will be measured and paid for at the contract unit prices for *PP 14"x0.5" Steel Piles and PP 16"x0.5" Steel Piles*.

*Pile Redrives* will be measured and paid for in units of each. *Pile Redrives* will be measured as the number of restrikes or redrives required by the Engineer. No payment will be made for restrikes or redrives when the Contractor chooses to restrike or redrive piles.



*PDA Testing* will be measured and paid for in units of each. No payment for *PDA Testing* will be made if the Engineer performs PDA testing. If the Engineer does not perform PDA testing, *PDA Testing* will be measured as one per pile. The contract unit price for *PDA Testing* will be full compensation for performing PDA testing the first time a pile is tested with a PDA, performing analysis on data collected during initial drive, restrikes and redrives and providing the PDA report. Subsequent PDA testing of the same piles will be considered incidental to the contract unit price for *Pile Redrives*.

*PDA Assistance* will be measured and paid for in units of each. *PDA Assistance* will be measured as one per pile. The contract unit price for *PDA Assistance* will be full compensation for the Contractor's assistance to perform the PDA testing during initial drive, restrikes and redrives.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
PP 14"x0.5" Steel Piles	Linear Foot
PP 16"x0.5" Steel Piles	Linear Foot