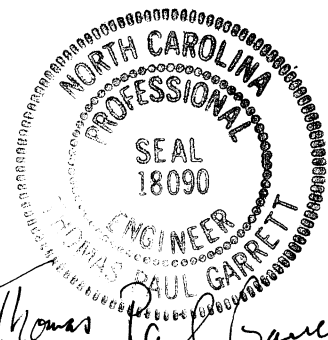


**Project Special Provisions  
Structures**

**Table of Contents**

		<b>Page #</b>
Falsework and Formwork	(7-18-06)	1
Submittal of Working Drawings	(7-18-06)	6
Construction of Superstructure	(SPECIAL)	13
Construction of Substructure	(2-14-04)	13
Crane Safety	(8-15-05)	13
Pile Driving Analyzer	(7-18-06)	14
Grout for Structures	(7-18-06)	18
Stone Slope Protection	(SPECIAL)	21
Concrete Penetrating Stain	(SPECIAL)	22
Spillway Construction	(SPECIAL)	24
Sluice Gate	(SPECIAL)	26
Epoxy Coating for Steel Members	(SPECIAL)	27
Energy Dissipation / Erosion Control Measures	(SPECIAL)	28
Fish Ladder	(SPECIAL)	29



*Thomas Paul Garrett*  
5-24-06  
(Excluding last 6 P&S's)

**PROJECT SPECIAL PROVISIONS**  
**STRUCTURES**

PROJECT B-3640

GATES COUNTY

**FALSEWORK AND FORMWORK**

(7-18-06)

**1.0 DESCRIPTION**

Use this Special Provision as a guide to develop temporary works submittals required by the Standard Specifications or other provisions; no additional submittals are required herein. Such temporary works include, but are not limited to, falsework and formwork.

Falsework is any temporary construction used to support the permanent structure until it becomes self-supporting. Formwork is the temporary structure or mold used to retain plastic or fluid concrete in its designated shape until it hardens. Access scaffolding is a temporary structure that functions as a work platform that supports construction personnel, materials, and tools, but is not intended to support the structure. Scaffolding systems that are used to temporarily support permanent structures (as opposed to functioning as work platforms) are considered to be falsework under the definitions given. Shoring is a component of falsework such as horizontal, vertical, or inclined support members. Where the term "temporary works" is used, it includes all of the temporary facilities used in bridge construction that do not become part of the permanent structure.

Design and construct safe and adequate temporary works that will support all loads imposed and provide the necessary rigidity to achieve the lines and grades shown on the plans in the final structure.

**2.0 MATERIALS**

Select materials suitable for temporary works; however, select materials that also ensure the safety and quality required by the design assumptions. The Engineer has authority to reject material on the basis of its condition, inappropriate use, safety, or nonconformance with the plans. Clearly identify allowable loads or stresses for all materials or manufactured devices on the plans. Revise the plan and notify the Engineer if any change to materials or material strengths is required.

**3.0 DESIGN REQUIREMENTS****A. Working Drawings**

Provide working drawings for items as specified in the contract, or as required by the Engineer, with design calculations and supporting data in sufficient detail to permit a structural and safety review of the proposed design of the temporary work.

When concrete placement is involved, include data such as the drawings of proposed sequence, rate of placement, direction of placement, and location of all construction joints. Submit the number of copies as called for by the contract.

When required, have the drawings and calculations prepared under the guidance of, and sealed by, a North Carolina Registered Professional Engineer who is knowledgeable in temporary works design.

Design falsework and formwork requiring submittals in accordance with the 1995 AASHTO *Guide Design Specifications for Bridge Temporary Works* except as noted herein.

#### 1. Wind Loads

Table 2.2 of Article 2.2.5.1 is modified to include wind velocities up to 110 mph (177 km/hr). In addition, Table 2.2A is included to provide the maximum wind speeds by county in North Carolina.

**Table 2.2 - Wind Pressure Values**

Height Zone feet (m) above ground	Pressure, lb/ft <sup>2</sup> (kPa) for Indicated Wind Velocity, mph (km/hr)				
	70 (112.7)	80 (128.7)	90 (144.8)	100 (160.9)	110 (177.0)
0 to 30 (0 to 9.1)	15 (0.72)	20 (0.96)	25 (1.20)	30 (1.44)	35 (1.68)
30 to 50 (9.1 to 15.2)	20 (0.96)	25 (1.20)	30 (1.44)	35 (1.68)	40 (1.92)
50 to 100 (15.2 to 30.5)	25 (1.20)	30 (1.44)	35 (1.68)	40 (1.92)	45 (2.15)
over 100 (30.5)	30 (1.44)	35 (1.68)	40 (1.92)	45 (2.15)	50 (2.39)

#### 2. Time of Removal

The following requirements replace those of Article 3.4.8.2.

Do not remove forms until the concrete has attained strengths required in Article 420-16 of the Standard Specifications and these Special Provisions.

Do not remove forms until the concrete has sufficient strength to prevent damage to the surface.

**Table 2.2A - Steady State Maximum Wind Speeds by Counties in North Carolina**

COUNTY	25 YR (mph) (km/hr)	COUNTY	25 YR (mph) (km/hr)	COUNTY	25 YR (mph) (km/hr)
Alamance	70 (112.7)	Franklin	70 (112.7)	Pamlico	100 (160.9)
Alexander	70 (112.7)	Gaston	70 (112.7)	Pasquotank	100 (160.9)
Alleghany	70 (112.7)	Gates	90 (144.8)	Pender	100 (160.9)
Anson	70 (112.7)	Graham	80 (128.7)	Perquimans	100 (160.9)
Ashe	70 (112.7)	Granville	70 (112.7)	Person	70 (112.7)
Avery	70 (112.7)	Greene	80 (128.7)	Pitt	90 (144.8)
Beaufort	100 (160.9)	Guilford	70 (112.7)	Polk	80 (128.7)
Bertie	90 (144.8)	Halifax	80 (128.7)	Randolph	70 (112.7)
Bladen	90 (144.8)	Harnett	70 (112.7)	Richmond	70 (112.7)
Brunswick	100 (160.9)	Haywood	80 (128.7)	Robeson	80 (128.7)
Buncombe	80 (128.7)	Henderson	80 (128.7)	Rockingham	70 (112.7)
Burke	70 (112.7)	Hertford	90 (144.8)	Rowan	70 (112.7)
Cabarrus	70 (112.7)	Hoke	70 (112.7)	Rutherford	70 (112.7)
Caldwell	70 (112.7)	Hyde	110 (177.0)	Sampson	90 (144.8)
Camden	100 (160.9)	Iredell	70 (112.7)	Scotland	70 (112.7)
Carteret	110 (177.0)	Jackson	80 (128.7)	Stanley	70 (112.7)
Caswell	70 (112.7)	Johnston	80 (128.7)	Stokes	70 (112.7)
Catawba	70 (112.7)	Jones	100 (160.9)	Surry	70 (112.7)
Cherokee	80 (128.7)	Lee	70 (112.7)	Swain	80 (128.7)
Chatham	70 (112.7)	Lenoir	90 (144.8)	Transylvania	80 (128.7)
Chowan	90 (144.8)	Lincoln	70 (112.7)	Tyrell	100 (160.9)
Clay	80 (128.7)	Macon	80 (128.7)	Union	70 (112.7)
Cleveland	70 (112.7)	Madison	80 (128.7)	Vance	70 (112.7)
Columbus	90 (144.8)	Martin	90 (144.8)	Wake	70 (112.7)
Craven	100 (160.9)	McDowell	70 (112.7)	Warren	70 (112.7)
Cumberland	80 (128.7)	Mecklenburg	70 (112.7)	Washington	100 (160.9)
Currituck	100 (160.9)	Mitchell	70 (112.7)	Watauga	70 (112.7)
Dare	110 (177.0)	Montgomery	70(112.7)	Wayne	80 (128.7)
Davidson	70 (112.7)	Moore	70 (112.7)	Wilkes	70 (112.7)
Davie	70 (112.7)	Nash	80 (128.7)	Wilson	80 (128.7)
Duplin	90 (144.8)	New Hanover	100 (160.9)	Yadkin	70 (112.7)
Durham	70 (112.7)	Northampton	80 (128.7)	Yancey	70 (112.7)
Edgecombe	80 (128.7)	Onslow	100 (160.9)		
Forsyth	70 (112.7)	Orange	70 (112.7)		

Note on the working drawings any anchorages, connectors, inserts, steel sleeves or other such devices used as part of the falsework or formwork that remains in the permanent structure. If the plan notes indicate that the structure contains the necessary corrosion protection required for a Corrosive Site, epoxy coat, galvanize, metallize or otherwise protect these devices as directed by the Engineer. Any coating required by the Engineer will be considered incidental to the various pay items requiring temporary works.

#### B. Review and Approval

The Engineer is responsible for the review and approval of temporary works' drawings.

Submit the working drawings sufficiently in advance of proposed use to allow for their review, revision (if needed), and approval without delay to the work.

Do not start construction of any temporary work for which working drawings are required until the drawings have been approved. Such approval does not relieve the Contractor of the responsibility for the accuracy and adequacy of the working drawings.

The time period for review of the working drawings does not begin until complete drawings and design calculations, when required, are received by the Engineer.

On the drawings, show all information necessary to allow the design of any component to be checked independently as determined by the Engineer.

If requested by the Engineer, submit with the working drawings manufacturer's catalog data listing the weight of all construction equipment that will be supported on the temporary work. Show anticipated total settlements and/or deflections of falsework and forms on the working drawings. Include falsework footing settlements, joint take-up, and deflection of beams or girders. Falsework hangers that support concentrated loads and are installed at the edge of thin top flange concrete girders (such as bulb tee girders) shall be spaced so as not to exceed 75% of the manufacturer's stated safe working load. Use of dual leg hangers (such as Meadow Burke HF-42 and HF-43) are not allowed. Design the falsework and forms supporting deck slabs and overhangs on girder bridges so that there will be no differential settlement between the girders and the deck forms during placement of deck concrete.

#### 4.0 CONSTRUCTION REQUIREMENTS

All requirements of Section 420 of the Standard Specifications apply.

Construct temporary works in conformance with the approved working drawings. Ensure that the quality of materials and workmanship employed is consistent with that assumed in the design of the temporary works. Do not weld falsework members to any portion of the permanent structure unless approved. Show any welding to the permanent structure on the approved construction drawings.

Provide tell-tales attached to the forms and extending to the ground, or other means, for accurate measurement of falsework settlement. Make sure that the anticipated compressive settlement and/or deflection of falsework does not exceed 1 inch (25 mm). For cast-in-place concrete structures, make sure that the calculated deflection of falsework flexural members does not exceed 1/240 of their span regardless of whether or not the deflection is compensated by camber strips.

#### A. Maintenance and Inspection

Inspect and maintain the temporary work in an acceptable condition throughout the period of its use. Certify that the manufactured devices have been maintained in a condition to allow them to safely carry their rated loads. Clearly mark each piece so that its capacity can be readily determined at the job site.

Perform an in-depth inspection of an applicable portion(s) of the temporary works, in the presence of the Engineer, not more than 24 hours prior to the beginning of each concrete placement. Inspect other temporary works at least once a month to ensure that they are functioning properly. Have a North Carolina Registered Professional Engineer inspect the cofferdams, shoring, sheathing, support of excavation structures, and support systems for load tests prior to loading.

#### B. Foundations

Determine the safe bearing capacity of the foundation material on which the supports for temporary works rest. If required by the Engineer, conduct load tests to verify proposed bearing capacity values that are marginal or in other high-risk situations.

The use of the foundation support values shown on the contract plans of the permanent structure is permitted if the foundations are on the same level and on the same soil as those of the permanent structure.

Allow for adequate site drainage or soil protection to prevent soil saturation and washout of the soil supporting the temporary works supports.

If piles are used, the estimation of capacities and later confirmation during construction using standard procedures based on the driving characteristics of the pile is permitted. If preferred, use load tests to confirm the estimated capacities; or, if required by the Engineer conduct load tests to verify bearing capacity values that are marginal or in other high risk situations.

The Engineer reviews and approves the proposed pile and soil bearing capacities.

### 5.0 REMOVAL

Unless otherwise permitted, remove and keep all temporary works upon completion of the work. Do not disturb or otherwise damage the finished work.

Remove temporary works in conformance with the contract documents. Remove them in such a manner as to permit the structure to uniformly and gradually take the stresses due to its own weight.

**6.0 METHOD OF MEASUREMENT**

Unless otherwise specified, temporary works will not be directly measured.

**7.0 BASIS OF PAYMENT**

Payment at the contract unit prices for the various pay items requiring temporary works will be full compensation for the above falsework and formwork.

**SUBMITTAL OF WORKING DRAWINGS**

**7-18-06**

**1.0 GENERAL**

Submit working drawings in accordance with Article 105-2 of the Standard Specifications and the requirements of this special provision. For the purposes of 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 this project. Submittals are only necessary for those items as required by the Standard Specifications, other Special Provisions or contract plans. Make submittals that are not specifically noted in this Special 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.

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.

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  
Harrisburg, NC 28075

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  
Harrisburg, NC 28075



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 <a href="mailto:plambert@dot.state.nc.us">plambert@dot.state.nc.us</a>
Secondary Structures Contacts:	James Gaither (919) 250 – 4042 Man-Pan Hui (919) 250 – 4044
Eastern Regional Geotechnical Contact (Divisions 1-7):	K. J. Kim (919) 662 – 4710 (919) 662 – 3095 facsimile <a href="mailto:kkim@dot.state.nc.us">kkim@dot.state.nc.us</a>
Western Regional Geotechnical Contact (Divisions 8-14):	John Pilipchuk (704) 455 – 8902 (704) 455 – 8912 facsimile <a href="mailto:jpilipchuk@dot.state.nc.us">jpilipchuk@dot.state.nc.us</a>

### 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 by the Engineer.

**STRUCTURE SUBMITTALS**

Submittal	Copies Required by Structure Design Unit	Copies Required by Geotechnical Engineering Unit	Contract Reference Requiring Submittal <sup>1</sup>
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 Special 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 Project Special Provisions
Pile Splicer	7	2	Subarticle 450-7(C)
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 Special 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 _____”
Temporary Shoring	6	2	“Temporary Shoring”
TFE Expansion Bearings <sup>4</sup>	8	0	Article 1072-10

#### FOOTNOTES

1. References are provided to help locate the part of the contract where the submittals are required. References in quotes refer to the Project Special Provision by that name. Articles or 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 and 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 Project Special Provision.
7. Submittals are necessary only when the top slab thickness is 18 inches or greater.

**GEOTECHNICAL SUBMITTALS**

<b>Submittal</b>	<b>Copies Required by Geotechnical Engineering Unit</b>	<b>Copies Required by Structure Design Unit</b>	<b>Contract Reference Requiring Submittal <sup>1</sup></b>
Crosshole Sonic Logging (CSL) Reports <sup>2</sup>	1	0	“Crosshole Sonic Logging”
Drilled Pier Construction Sequence Plans	1	0	“Drilled Piers”
Mechanically Stabilized Earth (MSE) Retaining Walls	8	2	“MSE Retaining Walls”
Pile Driving Analyzer (PDA) Reports <sup>2</sup>	2	0	“Pile Driving Analyzer”
Pile Driving Equipment Data <sup>3</sup>	1	0	Article 450-5
Proprietary Retaining Walls	8	2	Applicable Project Special Provision
Permanent Anchored Tieback Retaining Walls	8	2	Applicable Project Special Provision
Soil Nail Retaining Walls	8	2	Applicable Project Special Provision
Temporary Mechanically Stabilized (MSE) Earth Wall	2	0	Applicable Project Special Provision

**FOOTNOTES**

- References are provided to help locate the part of the contract where the working drawing submittals are required. References in quotes refer to the Project Special Provision by that name. Articles refer to the Standard Specifications.
- Hard and electronic copies of submittals are required. See referenced Project Special Provision.
- Download Pile Driving Equipment Data Form from following link:

<http://www.ncdot.org/doh/preconstruct/highway/geotech/formprovdet/>

Submit one hard copy of the completed form to the Resident Engineer. Submit a second copy of the completed form electronically, by facsimile or via US Mail or other delivery service to the Geotechnical Engineering Unit. Electronic submission is preferred. See second page of form for submittal instructions.

**CONSTRUCTION OF SUPERSTRUCTURE**

**(SPECIAL)**

Furnish and erect prestressed concrete cored slabs and elastomeric bearings. Construct all parapets, rails, and curbs on the bridge, apply concrete penetrating stain. Class AA Concrete shall be used for the curbs.

Complete all work in accordance with the contract plans and the Standard Specifications except payment for these items will be as described below.

No measurement will be made for these items. The price and payment below will be full compensation for all items required to complete the work described above.

Payment will be made under:

Construction of Superstructure.....Lump Sum

**CONSTRUCTION OF SUBSTRUCTURE**

**(2/14/04)**

Furnish and place all reinforcing steel and concrete necessary to construct all end bents and bents. Exclude all piles from the pay item.

Complete all work in accordance with the contract plans and the Standard Specifications except payment for these items will be as described below.

No measurement will be made for these items. The price and payment below will be full compensation for all items required to complete the work described above.

Payment will be made under:

Construction of Substructure.....Lump Sum

**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.

**PILE DRIVING ANALYZER****(7-18-06)****1.0 GENERAL**

This special provision governs driving piles with a pile dynamic analyzer (PDA) in accordance with the plans and as directed by the Engineer. The PDA test method is described in ASTM D 4945-00, “Standard Test Method for High-Strain Dynamic Testing of Piles”. Install piles in accordance with Section 450 of the Standard Specifications and this provision.

Submit the proposed pile driving methods and equipment in accordance with the Standard Specifications. The Engineer will respond with preliminary approval or rejection of the proposed pile driving methods and equipment within ten (10) calendar days. Preliminary approval is required before driving piles with a PDA. Notify the Engineer of the pile driving schedule a minimum of fourteen (14) calendar days in advance.

Either an approved PDA Consultant or the NCDOT Geotechnical Engineering Unit, as directed by the Engineer, shall perform PDA testing and CAPWAP analysis. If required, retain a PDA Consultant to provide PDA testing. Contact the Geotechnical Engineering Unit Contract Administrator for a list of approved PDA Consultants.

The Engineer will determine the number of piles and which piles to be tested with the PDA based upon the subsurface conditions and the pile installation sequence and progress.

The Engineer will complete the review of the proposed pile driving methods and equipment and provide the required driving resistance within ten (10) calendar days after the Engineer receives the complete PDA report or the Geotechnical Engineering Unit completes the PDA testing. A PDA report for PDA testing on multiple piles may be required as directed by the Engineer before the 10 day time period begins.

## **2.0 PREPARATION FOR PDA TESTING**

Provide piles for PDA testing that are 5 ft (1.5 m) longer, or as directed by the Engineer, than the estimated pile lengths shown on the plans. Supply 110 V, 60 Hz, 30 Amp of AC electrical power to operate the PDA equipment. Direct current welders or non-constant power sources are unacceptable.

Provide a suitable 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 x 6 ft (2 m x 2 m) and a minimum roof height of 8 ft (2.5 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 sixteen (16) bolt holes in either two or four sides of the pile, as directed by the PDA Consultant or the Engineer, at an approximate distance equal to three (3) times the pile diameter below the head of the pile. If the PDA Consultant or the Engineer choose to drill the bolt holes, provide the necessary equipment, tools and assistance to do so. A hammer drill is required for concrete piles and up to two (2) hours may be required to drill the holes.

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

The PDA Consultant or the Engineer will furnish the PDA measuring instruments and materials for installing the instruments. Attach the PDA instruments as directed by the PDA Consultant or the Engineer after the pile is placed in the leads and the template.

## **3.0 PDA TESTING**

Use only the preliminarily approved pile driving methods and equipment to drive piles with the PDA instruments attached. Drive the pile as directed by the PDA Consultant or the Engineer in order to measure the wavespeed of the pile.

Drive the pile to the required bearing capacity and specified tip elevation, if applicable, as shown on the plans or as directed by the PDA Consultant or the Engineer. During pile driving, the PDA will be used to evaluate, including but not limited to, the following: hammer performance, bearing capacity, distribution of soil resistance, pile driving stresses, energy transfer, pile integrity and various soil parameters such as quake and damping.



The PDA Consultant or the Engineer may require the Contractor to modify the pile installation procedure during driving as follows:

- Reduce the hammer energy
- Drive deeper or shallower because of variations in the subsurface conditions
- Readjust the transducers
- Realign the pile

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.

#### **4.0 REDRIVING PILES**

When directed by the Engineer, reattach the PDA instruments and restrike or redrive the pile in accordance with Section 3.0 above and Subarticle 450-7(E) of the Standard Specifications. Obtain the required stroke and penetration (at least 6 in or 150 mm) or as directed by the PDA Consultant or the Engineer. The PDA Consultant or the Engineer will record dynamic measurements during restriking and redriving. The Engineer may require restriking and redriving more than once on the same pile. The Engineer will determine when PDA testing has been satisfactorily completed.

#### **5.0 CAPWAP ANALYSIS AND PDA REPORT**

The PDA Consultant shall perform analysis of the PDA raw data with the Case Pile Wave Analysis Program (CAPWAP). 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 the Engineer.

Submit the PDA report to the Engineer in both electronic and hard copy form, including three (3) original hard copies, within seven (7) calendar days after the field testing is completed. The PDA report shall include but not be limited to the following:

##### **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 bearing capacity and factor of safety
  - Concrete compressive strength and/or steel pile yield strength
  - Pile splice type and locations
  - Pile batter
  - Installation methods including use of jetting, preaugering, 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 resistance (ram stroke, blows per foot (0.3 meter) and set for last ten 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 project inspector)
  - 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 raw data and executable CAPWAP input and output files

## **6.0 MEASUREMENT AND PAYMENT**

The complete and accepted PDA testing will be paid for at the unit bid price for “PDA Testing” per each. Include in the unit bid price for “PDA Testing” all costs for providing the PDA, PDA instruments and materials for installing the instruments and recording the dynamic measurements the first time the pile is tested with the PDA. Costs for providing these items for the same pile after the pile is initially tested with the PDA will be considered incidental to the unit bid price for “Pile Redrives”. Also include in the unit bid price for “PDA Testing” all costs for performing the CAPWAP analysis on data collected during initial drive, restrikes and redrives and preparing and submitting the PDA report. No payment for “PDA Testing” will be made if the PDA report submitted is incomplete as described in Section 5.0. No payment for “PDA Testing” will be made if the Department performs PDA testing. If the Department does not perform PDA testing, the number of “PDA Testing” per pile will be equal to one.

The complete and accepted PDA assistance will be paid for at the unit bid price for “PDA Assistance” per each. Include in the unit bid price for “PDA Assistance” all costs for PDA preparation and support including all materials, labor, tools, equipment, mobilization and incidentals necessary to complete the work described in this provision excluding the costs for the PDA testing described above. Costs for PDA preparation and support for restrikes and redrives will not be paid for separately. The number of “PDA Assistance” per pile will be equal to one for each pile tested with the PDA.

The cost of the pile and the installation including driving, restriking and redriving will be paid for separately in accordance with the Standard Specifications and will not be part of these PDA pay items.

## **GROUT FOR STRUCTURES**

**(7-18-06)**

### **1.0 DESCRIPTION**

This special provision addresses grout to be used in structures, including continuous flight auger (CFA) piles, micropiles, soil nail and permanent anchor tieback retaining walls and backfilling crosshole sonic logging (CSL) tubes or grout pockets, shear keys, dowel holes and recesses for cored slabs and box beams. Provide grout composed of portland cement, water, fine aggregate and, at the Contractor’s option, pozzolan. If necessary, use set controlling admixtures. Proportion, mix and place grout in accordance with the plans, the applicable section of the Standard Specifications or special provision for the structure and this provision as directed by the Engineer.

## 2.0 MATERIALS

Refer to Division 10 of the Standard Specifications:

<b>Item</b>	<b>Article</b>
Portland Cement	1024-1
Water	1024-4
Fine Aggregate	1014-1
Fly Ash	1024-5
Ground Granulated Blast Furnace Slag	1024-6
Admixtures	1024-3

At the Contractor's option, use an approved packaged grout in lieu of the materials above with the exception of the water. Contact the Materials and Tests (M&T) Unit for a list of approved packaged grouts. Consult the manufacturer to determine if the packaged grout selected is suitable for the application and meets the compressive strength and shrinkage requirements.

## 3.0 REQUIREMENTS

If no compressive strength or shrinkage is specified on the plans or in the applicable section of the Standard Specifications or special provision for the structure, provide non-metallic, non-shrink grout with minimum compressive strengths and shrinkage in the vertical direction as follows:

<b>Property</b>	<b>Requirement</b>
Compressive Strength @ 3 days	2500 psi (17.2 Mpa)
Compressive Strength @ 28 days	4500 psi (31.0 Mpa)
Shrinkage	<0.15%

Unless using packaged grout, submit grout mix designs in terms of saturated surface dry weights on M&T Form 312U in accordance with the applicable section of the Standard Specifications or special provision for the structure. A testing laboratory approved by the Department shall determine the grout mix proportions. Adjust proportions to compensate for surface moisture contained in the aggregates at the time of mixing. Changes in the saturated surface dry mix proportions will not be permitted unless a revised grout mix design submittal has been accepted.

When submitting grout mix designs, provide laboratory test results for aggregate gradation, shrinkage, compressive strength and fluidity with each mix design. Submit compressive strength for at least two 2 in (50 mm) cube specimens at the age of 3, 7, 14 and 28 days for a total of at least eight cube specimens tested. Perform laboratory tests in accordance with the following:

Property	Test Method
Aggregate Gradation	AASHTO T27
Shrinkage	ASTM C1090
Compressive Strength	AASHTO T106
Fluidity	ASTM C939 (as modified below)

When testing grout for fluidity in accordance with ASTM C939, modify the flow cone outlet diameter from  $\frac{1}{2}$  to  $\frac{3}{4}$  in (13 to 19 mm).

Unless otherwise required in the Contract or by the Engineer, a grout mix design submittal is not required when using an approved packaged grout. When grout mix designs are submitted, the Engineer will review the mix designs and notify the Contractor as to their acceptability. Do not use grout mix designs until written acceptance has been received. Acceptance of grout mix designs or use of approved packaged grouts does not relieve the Contractor of responsibility to furnish a product that meets the Contract requirements.

Upon written request from the Contractor, a grout mix design accepted and used satisfactorily on a Department project may be accepted for use on other projects.

#### 4.0 SAMPLING AND PLACEMENT

The applicable section of the Standard Specifications or special provision for the structure and the Engineer will determine the locations to sample grout and the number and type of samples collected for field and laboratory testing. The compressive strength of the grout will be considered the average compressive strength test results of two cube specimens at 28 days.

Do not place grout if the grout temperature is less than 50°F (10°C) or more than 95°F (35°C) or if the air temperature measured at the location of the grouting operation in the shade away from artificial heat is below 35°F (2°C).

Provide grout at a rate that permits proper handling, placing and finishing in accordance with the manufacturer’s recommendations unless directed otherwise by the Engineer. Control grout delivery so the interval between placing batches in the same component does not exceed 20 minutes. Solids in the grout shall remain in suspension without excessive bleed-water. Place grout before the time between adding the mixing water and placing the grout exceeds that in the table below.

**ELAPSED TIME FOR PLACING GROUT**

**(with continuous agitation)**

<b>Air or Grout Temperature Whichever is Higher</b>	<b>Maximum Elapsed Time</b>	
	<b>No Set Retarding Admixture Used</b>	<b>Set Retarding Admixture Used</b>
90°F (31°C) or above	30 minutes	1 hr. 15 minutes
80°F (27°C) through 89°F (31°C)	45 minutes	1 hr. 30 minutes
79°F (26°C) or below	60 minutes	1 hr. 45 minutes

**5.0 MISCELLANEOUS**

Comply with Articles 1000-9 through 1000-12 of the Standard Specifications to the extent applicable for grout in lieu of concrete.

**STONE SLOPE PROTECTION**

**(SPECIAL)**

Provide stone slope protection in accordance with Section 876 of the Standard Specifications with the following exceptions and / or additions.

The type of stone slope protection will be plain rip rap as described in Section 1042 of the Standard Specifications. Place rip rap two feet thick. The size of stone will be similar to the mid to high range of Class 2 rip rap as follows:

Provide a minimum stone size of 200 lbs. to a maximum of 700 lbs. with 50% of the stone being at least 400 lbs.

**B-3640**

Measurement and Payment:

The quantity of stone slope protection measured will be the actual number of tons of stone, which has been incorporated into the completed and accepted work, and weighed in trucks on certified platform scales or other certified weighing devices.

The quantity of stone slope protection, measured as provided above, will be paid for at the contract unit price per ton for "Stone Slope Protection". Such price and payment will be full compensation for all work necessary to provide the stone including hauling, furnishing, and placing the stone.

Payment will be made under:

Stone Slope Protection.....Ton

**CONCRETE PENETRATING STAIN**

**(SPECIAL)**

A. Description

The work covered by this item consists of the field preparation and application of a concrete penetrating stain to concrete surfaces as indicated on the plans. The stain shall be applied in two uniform coats and shall provide protection from water and chlorides.

B. Materials

1. Material shall be delivered in original sealed containers, clearly labeled with manufacturer's name and batch number of the material.
2. The stain shall be a water-based emulsion with inorganic oxide toning pigments which carries its color and water repellent protection into the surface of the concrete.
3. The coating shall conform to the following requirements:

Physical Properties:

<u>CONDITIONS</u>	<u>RESULTS</u>	<u>TEST METHOD</u>
Dry time @ 75°, 50% R.H.	20 Min. Max.	ASTM D1640
Recoat time @ 75°, 50% R.H.	12 Hour Max.	ASTM D1640

The penetrating stain material shall not oxidize and shall show no appreciable change in color after 1,000 hours when tested according to ASTM D1729. It shall have excellent resistance to acids, alkalies, gasoline, and mineral spirits when tested according to ASTM D543. It shall allow moisture vapor from the concrete

interior to pass through the coating when tested according to ASTM E398 or D1653. It shall reduce the absorption rate of exterior moisture into the pores of the concrete surface.

4. The color of the applied concrete surface shall match Federal Standard Color #20040. Color chips shall be submitted to the Engineer for selection of several trial colors to be applied to the sample area as described in the construction methods section.
5. The Contractor shall submit five (5) catalog cut sheets to the Engineer for approval. The technical data provided shall indicate that the material supplied is in accordance with the specifications.

C. Construction

1. The Contractor shall prepare a sample area of approximately 50 square feet and shall apply the trial colors of concrete penetrating stain to this area as directed by the Engineer. The sample area shall be located on the unexposed fill face side of the end bents or wingwalls. The sample area shall be prepared and stain applied in the same manner as will occur on the actual finished surfaced. Upon the Engineer's approval, the sample area shall serve as a standard of acceptance for all further work.
2. Concrete surfaces shall be prepared in accordance with the stain manufacturer's recommendations and as directed by the Engineer. Surfaces must be clean and free of oil, grease, laitance, efflorescence and any other contaminants that could prevent good adhesion. All concrete surfaces to which the stain is to be applied shall receive a high pressure power washing (minimum of 3500 psi) with water prior to application unless the manufacturer's recommendations prohibits this type of surface preparation.
3. The concrete penetration shall be mixed and applied in accordance with the manufacturer's recommendations and as directed by the Engineer.
4. In order to apply stain, both the concrete and air temperatures must be between 45°F and 90°F and within manufacturer's specifications. Stain shall not be applied unless weather conditions will permit complete drying of material prior to rain, fog, dew or temperatures beyond the prescribed limits.
5. Stain shall not be applied to damp concrete surfaces.
6. Stain may be applied by brush, spray or roller. Once a method has been adopted, the method must be utilized throughout the application process. Material should not be flooded on the surface but applied evenly avoiding rundowns or overlaps.



7. Stain shall be applied in two thin coats (minimum) providing a uniform appearance. The first coat must be allowed to become tack free before the second coat is applied. The final coat shall be consistent with the quality and appearance of the approved sample area. Note that care should be taken to provide a uniform appearance between the cored slab surface (precast concrete) and the curb and parapet surfaces (cast-in-place concrete). Additional coats of stain may be required to provide this uniform appearance.
8. Adequate protection shall be provided to protect adjacent persons, vehicles and property from concrete surface preparation activities and from overspray during staining operations.
9. Stain shall be applied to the concrete surfaces prior to the attachment of the two bar metal rail and wood hand railing to the bridge.

D. Basis of Payment

No separate measurement or payment will be made for preparing, furnishing, and applying of the concrete penetrating stain to the specified concrete surfaces.

Payment at the lump sum price for “construction of superstructure” will be full compensation for the above work including all materials, equipment, tools, labor, and incidentals necessary to complete the work.

**SPILLWAY CONSTRUCTION**

**(SPECIAL)**

**General:**

This work consists of constructing a new spillway and fish ladder in accordance with applicable sections of the Standard Specifications for Roads and Bridges and additional special provisions incorporated with this package.

Referenced special provisions:

Fish Ladder  
 Sluice Gate  
 Epoxy Coating for Steel Members

B-3640

**Materials:**

Steel Z-Section Sheet Piles: ASTM A572, grade 50, PZ 12 sheet piles or equivalent with a minimum section modulus of 22 in<sup>3</sup> per foot of wall. Dimensions shown on the design drawings are considered approximate.

Steel Spillway Cap: ASTM A572, grade 50 carbon steel.

Coating: A coal-tar epoxy coating shall be used to coat each carbon steel member of the spillway structure. Refer to the 'Epoxy Coating for Steel Members Special Provision'.

**Construction:**

- Coordinate layout of the spillway with a designated representative of the State Parks to maximize retention of existing cypress trees in the pond. Minor deviations in alignment and location can be made with approval of the design engineer.
- Access into the existing pond can be made from the State Park boat ramp area with approval of the State Parks designated representative. Obtain approval from the State Parks designated representative for types of equipment to be used.
- All surfaces to be epoxy coated shall be prepared in accordance to the 'Epoxy Coating for Steel Members Special Provision'.
- Drive all sheet pile sections to a minimum elevation of -35 feet msl. Align sheet piles vertically with maximum out of plumb of 1 percent of the driven length. Drive piles so as to prevent separation of interlocks.
- The top of each sheet where a spillway design top of elevation 6.0 is shown on the plans shall be at elevation 5.969 msl to allow for the top plate.
- The top of each sheet where a spillway design top of elevation 12.0 is shown on the plans shall be at elevation 11.969 msl to allow for the top plate. Refer to design drawings for exact locations.
- Install sheet piles with sluice gates as called for in the Sluice Gate Special Provision.
- Install the steel cap on top of the z-section sheet pile wall as shown on the design drawings.

**Compensation:**

Payment will be made under lump sum price bid for "Construction of Spillway".

**SLUICE GATE:****(SPECIAL)****General:**

Furnish sluice gates and install in accordance with the following provisions:

**Materials:**

Sluice Gates: Carbon-steel, self-contained sluice gates (2) with gate dimensions of 1' x 2'. Gates, stems, lifts and other appurtenances shall be the size, type, material and construction as shown on the drawings and specified herein. All component parts shall be of the type and material shown, and interchangeable where size and material are the same without grinding, chipping or special fitting in the field. All mating and sliding metal parts shall be fully machined. The sluice gate dimensions and materials may vary slightly with the manufacturer's specifications (Waterman S-5000 or Rodney Hunt B-240).

The frame shall be extended flange type and shall be provided with machined, drilled, and tapped pads for the mounting of the wedge devices. The back of the frame flange shall be machined to a plane and drilled to match the wall thimble.

The cover shall be of one piece cast bronze construction with sufficient ribs, a reinforced pocket to receive the thrust nut, and pads to receive the wedges. All wedge pads shall be machined, drilled and tapped to receive the wedge devices. The gate shall have a non-rising stem and the thrust nut shall be threaded to match the stem threads. Ball or roller bearings shall not be used at the thrust flange as the gate will be submerged.

Seats shall be of bronze which shall be permanently attached to both the frame and cover.

All wedges and wedge blocks shall be solid corrosion resistant material and shall be of sufficient number to provide a practical degree of watertightness. All wedge bearing surfaces and contact faces shall be machined to give maximum contact and wedging action. Wedges shall be fully adjustable, but once set, shall not rotate or move from the desired position. All fasteners and adjustment screws shall be corrosion resistant.

The sluice gate shall incorporate a corrosion resistant yoke which shall be designed to transfer the lift thrust to the gate frame and attaching hardware.

Stainless Steel Hardware: A316 stainless steel bolts and nuts shall be used to secure the sluice gates to the spillway. The bolts and nuts shall have a minimum diameter and length of 3/4-inch and 5-inches, respectively. Refer to the design drawing for other applicable notes or dimensions.

**Construction:**

- Cut an approximately 1' x 2' rectangle and drill the necessary holes in the appropriate sheet- pile sections.

- Attach the sluice gates to the sheet-pile sections and secure the gates with the stainless steel bolts and nuts. Field changes to the connection or design require design engineer approval.
- The invert of each sluice gate shall be located 1.0 feet above the bottom of the pond.
- Each sluice gate arm and wheel shall be removed from the gate during the installation of these sheet pile sections.
- Follow installation procedures or recommendations found on the design drawings in addition to the specifications provided herein.

**Compensation:**

Payment will be made under lump sum price bid for “Construction of Spillway”.

**EPOXY COATING FOR STEEL MEMBERS:**

**(SPECIAL)**

**General:**

This work consists of surface preparation and coating steel sheet piles, H-piles, the spillway cap plate, and the fish ladder in accordance with the applicable requirements of the Standard Specifications for Roads and Bridges except as follows:

**Materials:**

Coating: An EpoxySystems Product #216, Benjamin Moore Industrial Coating M47/M48, or Rust-Oleum C9578 shall be used to coat each steel member of the spillway structure and fish ladder structure.

**Construction:**

- All surfaces to be coated shall be sand blasted to a near white condition prior to application of coating.
- All members shall be coated with two layers, each layer being a minimum of 10 millimeters thick.
- Coat the steel sheet piles with a coal tar epoxy before the spillway members arrive on site. Only the top 11 feet (from elevation 6 msl to -5 msl) of the steel sheet piles shall be coated.
- Coat the steel H-piles with a coal tar epoxy before the fish ladder foundation supports arrive on site. The fish ladder H-piles shall be coated to 5 feet below grade.

- Coat the spillway cap pieces with a coal tar epoxy before the spillway cap arrive on site. Both sides of the cap shall be coated.
- Coat the fish ladder with a coal tar epoxy before the fish ladder arrives on site. The entire fish ladder shall be coated.
- Follow installation procedures and recommendations found on the design drawings and manufacturer's recommendations in addition to the specifications provided herein.

**Compensation:**

Payment will be made under lump sum price bid for “Construction of Spillway”.

**ENERGY DISSIPATION/EROSION CONTROL MATERIAL: (SPECIAL)**

Construct the required shoulder, slope, and spillway stilling basin rip-rap for this project in accordance with the applicable requirements of Section 226, Section 270, Section 510, Section 520, Section 545, Section 876, Section 1008, Section 1042, and Section 1056 of the Standard Specifications for Roads and Bridges except as follows:

**Materials:**

1000 – 1800 lb. Energy Dissipation Rip-Rap: Boulders meeting material requirements of NCDOT material types shall be used in the spillway stilling basin area.

200 – 700 lb. Energy Dissipation Rip Rap: Rocks meeting material requirements of NCDOT material types shall be used in the spillway stilling basin area.

Foundation Material for Energy Dissipation Rip-Rap. NCDOT 57 stone shall be used as the foundation material for the aggregate energy dissipation material in the stilling basin.

Geotextile Filter Fabric: NCDOT approved Type 2 geotextile filter fabric. The geotextile filter fabric shall be free from tears, punctures or other defects and shall be provided in plastic wrap to protect against ultraviolet rays until deployed.

**Construction:**

- Remove up to 2 feet of peat and muck material from the stilling basin area. The exposed foundation materials will be subject to approval by the Engineer.
- Grade the stilling basin soil by sloping the area towards the creek channel and away from the spillway wall and bridge abutments.

- Place the geotextile in the stilling basin area as shown in the detail drawings. Seams should be joined as described in the manufacturer's recommendations. The installation around the H-piles shall use methods that prevent damage to the fish ladder supports.
- Place the 57 stone over the entire footprint of the stilling basin area as shown on the drawings. Use rubber wheeled equipment and appropriate methods that prevent damage to the geotextile during placement of the stone.
- Place the 1000 - 1800 pound boulders in the areas shown on the detail drawings. The contractor shall use methods that prevent damage to the spillway and sluice gates during boulder placement.
- Once the large boulders have been placed and stabilized, place the 200 - 700 pound rip-rap downstream of the spillway for the extent of the stilling basin area. The contractor should take precautions to prevent damage to the fish ladder supports during rip-rap placement.

**Compensation:**

Payment for stone and geotextile will be included in lump sum price bid for "Construction of Spillway".

**FISH LADDER:****(SPECIAL)****General:**

Perform the required fish ladder foundation and fish ladder installation for this project in accordance with the applicable requirements of Section 440, Section 1042, Section 1056, Section 1072, and Section 1084 of the Standard Specifications for Roads and Bridges. Exceptions to these standard specifications are as follows:

**Materials:**

Steel H-Piles and Plate: Install 10 x 42, grade 50 H-piles for vertical support, as shown on the drawings. Splice the H-piles, if needed, in accordance to the latest edition of the American Welding Society Structural Welding Code and in accordance with the design drawings.

Furnish and weld a galvanized steel plate to the spillway, as shown on the design drawings.

Furnish and weld a galvanized steel frame to each H-pile, as shown on the design drawings.

Aluminum Fish Ladder: The fish ladder and connection brackets shall be constructed of 3/8-inch, prefabricated, 6061 grade aluminum, with similar dimensions to those provided on the design drawings. All fish ladder welds shall be completed in accordance with the latest edition of the American Welding Society Structural Welding Code D1.2/D1.2M for aluminum and in accordance with the design drawings. The ladder shall be bolted to the steel plate on the spillway and the steel frames on the H-piles, as shown on the design drawings. A neoprene spacer shall be placed between the steel and aluminum. The notch weirs in the fish ladder shall be spaced 3 feet apart, placed on alternate sides along the length of the fish ladder, as shown on the design drawings. Refer to the design drawings for other applicable notes or dimensions.

Stainless Steel Hardware: Stainless steel bolts and nuts shall be used to secure the fish ladder to the spillway and vertical supports. The bolts and nuts shall have a minimum diameter and length of 3/4-inch and 2-inches, respectively. Refer to the design drawings for other applicable notes or dimensions.

Neoprene Spacer: Class II, Grade 50 with a minimum thickness of 1/4-inch. Refer to the design drawings for other applicable notes or dimensions.

**Construction:**

- Install steel H-piles coated as required by special provision 'Epoxy Coating for Steel Members' to the specified depth and in the locations indicated on the design drawings.
- Attach the fish ladder to the spillway structure and vertical supports. Install the neoprene spacers between the dissimilar metals. Field changes to the connection or design of the fish ladder require design engineer approval.
- The connections between the fish ladder, spillway and H-piles shall be made using stainless steel bolts place through the fish ladder and steel plate/frames as shown on the design drawings. The inlet to the fish ladder shall be positioned at elevation 5.667 feet msl. The outlet invert shall be positioned at elevation -1.583 feet msl within the receiving stream.
- Follow installation procedures or recommendations found on the design drawings in addition to the specifications provided herein.

**Compensation:**

Payment will be made under lump sum price bid for “Construction of Spillway”.