STRUCTURE SPECIAL PROVISIONS

Project	Sheet #'s
P-5208A	Pages 1 thru 33
P-5208C	Pages 1 thru 41
P-5208G	Pages 1 thru 42

137

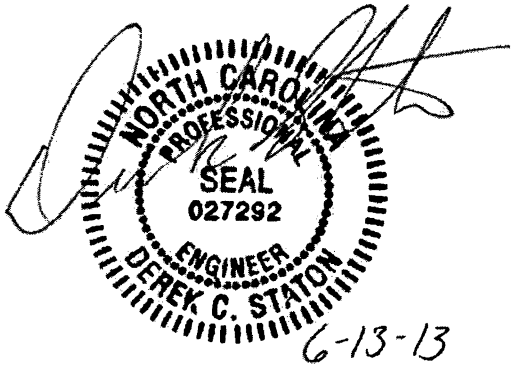
P-5208A Haydock to Junker Railroad Roadbed

Coddle Creek Railroad Bridge and Culvert

Project Special Provisions: Structures

Prepared for:

NCDOT Rail Division



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PROJECT SPECIAL PROVISIONS STRUCTURE

Table of Contents

TERMS AND DEFINITIONS (SPECIAL)

Unless noted otherwise, the following terms and their associated definitions are applicable throughout these Project Special Provisions:

Terms	Definitions
Railway, Railway Company, Railroad, Railroad Company	Norfolk Southern Corporation
Railroad Engineer	The authorized representative of the Railway.
AREMA	American Railway Engineering and Maintenance-of-Way Association.
NCDOT, Department, Department of Transportation	North Carolina Department of Transportation.
Standard Specifications, Specifications	NCDOT Standard Specifications for Roads and Structures, January 2012.
Engineer, Department's Engineer Project Engineer, Highway Engineer	The authorized representative of the NCDOT.
Inspector, Department's Inspector	The authorized inspector of the NCDOT.

TEMPORARY RAILROAD SHORING (3-6-09)

1.0 GENERAL

Provide temporary railroad shoring for each bent indicated in the plans in accordance with the Standard Specifications and this Special Provision.

2.0 ALTERNATE DESIGN AND PLANS

The submittal of an alternate design and plans for excavation and shoring is permitted in lieu of the excavation and shoring detailed on the plans. The alternate design shall be in accordance with the current railway design criteria. Have the alternate design computations and plans sealed by a North Carolina Registered Professional Engineer and submit them for review, comments and acceptance. After the appropriate State agency accepts them, they are submitted by the State agency to the Railroad for review, comments and acceptance. Allow a minimum of 30 days for the Railroad's review. Do not begin excavation at the excavation site or sites in question until the Engineer confirms that both the State and Railroad accept the alternate design and plans. No extension of intermediate completion dates and/or final completion dates will be allowed due to delays in review of alternate excavation and shoring design and plans.

3.0 BASIS OF PAYMENT

Payment for the temporary railroad shoring will be made at the lump sum price bid for "Temporary Railroad Shoring for End Bent Nos. 1 and 2, Sta. 10282+62.09-M1-". Such lump sum price will be full compensation for all materials, equipment, tools, labor, and incidentals necessary to complete the work.

PLACING LOAD ON STRUCTURE MEMBERS (11-27-12)

The 2012 Standard Specifications shall be revised as follows:
In **Section 420-20 – Placing Load on Structure Members** replace the first sentence of the fifth paragraph with the following:

Do not place vehicles or construction equipment on a bridge deck until the deck concrete develops the minimum specified 28 day compressive strength and attains an age of at least 7 curing days.

FALSEWORK AND FORMWORK (4-5-12)

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.

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

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.

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.

As an option for the Contractor, overhang falsework hangers may be uniformly spaced, at a maximum of 36 inches, provided the following conditions are met:

Member Type (PCG)	Member Depth, (inches)	Max. Overhang Width, (inches)	Max. Slab Edge Thickness, (inches)	Max. Screed Wheel Weight, (lbs.)	Bracket Min. Vertical Leg Extension, (inches)
II	36	39	14	2000	26
III	45	42	14	2000	35
IV	54	45	14	2000	44
MBT	63	51	12	2000	50
MBT	72	55	12	1700	48

Overhang width is measured from the centerline of the girder to the edge of the deck slab.

For Type II, III & IV prestressed concrete girders (PCG), 45-degree cast-in-place half hangers and rods must have a minimum safe working load of 6,000 lbs.

For MBT prestressed concrete girders, 45-degree angle holes for falsework hanger rods shall be cast through the girder top flange and located, measuring along the top of the member, 1'-2 ½" from the edge of the top flange. Hanger hardware and rods must have a minimum safe working load of 6,000 lbs.

The overhang bracket provided for the diagonal leg shall have a minimum safe working load of 3,750 lbs. The vertical leg of the bracket shall extend to the point that the heel bears on the girder bottom flange, no closer than 4 inches from the bottom of the member. However, for 72-inch members, the heel of the bracket shall bear on the web, near the bottom flange transition.

Provide adequate overhang falsework and determine the appropriate adjustments for deck geometry, equipment, casting procedures and casting conditions.

If the optional overhang falsework spacing is used, indicate this on the falsework submittal and advise the girder producer of the proposed details. Failure to notify the Engineer of hanger type and hanger spacing on prestressed concrete girder casting drawings may delay the approval of those drawings.

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 on concrete girders with thin top flanges. 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.

When staged construction of the bridge deck is required, detail falsework and forms for screed and fluid concrete loads to be independent of any previous deck pour components when the mid-span girder deflection due to deck weight is greater than ¾".

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 or metalize

these devices. Electroplating will not be allowed. Any coating required by the Engineer will be considered incidental to the various pay items requiring temporary works.

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. 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 above ground	Pressure, lb/ft^2 for Indicated Wind Velocity, mph				
	70	80	90	100	110
0 to 30	15	20	25	30	35
30 to 50	20	25	30	35	40
50 to 100	25	30	35	40	45
over 100	30	35	40	45	50

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

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.

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.

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.

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. 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 (2-10-12)

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.

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 (Paul Lambert)

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

jgaither@ncdot.gov (James Gaither)

jlbolden@ncdot.gov (James Bolden)

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

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) 707 – 6407
(919) 250 – 4082 facsimile
plambert@ncdot.gov

Secondary Structures Contacts:	James Gaither	(919) 707 – 6409
	James Bolden	(919) 707 – 6408

Eastern Regional Geotechnical Contact (Divisions 1-7):
K. J. Kim (919) 662 – 4710
(919) 662 – 3095 facsimile
kkim@ncdot.gov

Western Regional Geotechnical Contact (Divisions 8-14):
John Pilipchuk(704) 455 – 8902
(704) 455 – 8912 facsimile
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.

Project P-5208A

151

Cabarrus County

STRUCTURE SUBMITTALS

Submittal	Copies Required by Structure Design Unit	Copies Required by Geotechnical Engineering Unit	Contract Reference Requiring Submittal [1]
Arch Culvert Falsework	5	0	Plan Note, SN Sheet & Falsework and Formwork"
Box Culvert Falsework [7]	5	0	Plan Note, SN Sheet & "Falsework and Formwork"
Cofferdams	6	2	Article 410-4
Foam Joint Seals [6]	9	0	"Foam 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 [2] (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 [4,5]	7	0	Article 1072-8
Miscellaneous Metalwork [4,5]	7	0	Article 1072-8
Optional Disc Bearings [4]	8	0	"Optional Disc Bearings"
Overhead and Digital Message Signs (DMS) (metalwork and foundations)	13	0	Applicable Provisions

Placement of Equipment on Structures (cranes, etc.)	7	0	Article 420-20
Pot Bearings [4]	8	0	"Pot Bearings"
Precast Concrete Box Culverts	2, then 1 reproducible	0	"Optional Precast Reinforced Concrete Box Culvert at Station ___"
Prestressed Concrete Cored Slab (detensioning sequences) [3]	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 (precast item)	10	0	Article 1077-2 & "Sound Barrier Wall"
Sound Barrier Wall Steel Fabrication Plans [5]	7	0	Article 1072-8 & "Sound Barrier Wall"
Structural Steel [4]	2, then 7	0	Article 1072-8
Temporary Detour Structures	10	2	Article 400-3 & "Construction, Maintenance and Removal of Temporary Structure at Station ____"
TFE Expansion Bearings [4]	8	0	Article 1072-8

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. 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 1072-8 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 [1]
Drilled Pier Construction Plans [2]	1	0	Subarticle 411-3(A)
Crosshole Sonic Logging (CSL) Reports [2]	1	0	Subarticle 411-(A)(2)
Pile Driving Equipment Data Forms [2,3]	1	0	Subarticle 450-3(D)(2)
Pile Driving Analyzer (PDA) Reports [2]	1	0	Subarticle 450-3(F)(3)
Retaining Walls [4]	8 drawings, 2 calculations	2 drawings	Applicable Provisions "Temporary Shoring
Temporary Shoring [4]	5 drawings, 2 calculations	2 drawings	"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. Subarticles 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. The Pile Driving Equipment Data Form is available from:
www.ncdot.org/doh/preconstruct/highway/geotech/formdet/
See second page of form for submittal instructions.

4. Electronic copy of submittal is 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.

GROUT FOR STRUCTURES

9-30-11

1.0 DESCRIPTION

This special provision addresses grout for use in pile blockouts, grout pockets, shear keys, dowel holes and recesses for structures. This provision does not apply to grout placed in post-tensioning ducts for bridge beams, girders, or decks. Mix and place grout in accordance with the manufacturer's recommendations, the applicable sections of the Standard Specifications and this provision.

2.0 MATERIAL REQUIREMENTS

Use a Department approved pre-packaged, non-shrink, non-metallic grout. Contact the Materials and Tests Unit for a list of approved pre-packaged grouts and consult the manufacturer to determine if the pre-packaged grout selected is suitable for the required application.

When using an approved pre-packaged grout, a grout mix design submittal is not required.

The grout shall be free of soluble chlorides and contain less than one percent soluble sulfate. Supply water in compliance with Article 1024-4 of the Standard Specifications.

Aggregate may be added to the mix only where recommended or permitted by the manufacturer and Engineer. The quantity and gradation of the aggregate shall be in accordance with the manufacturer's recommendations.

Admixtures, if approved by the Department, shall be used in accordance with the manufacturer's recommendations. The manufacture date shall be clearly stamped on each container. Admixtures with an expired shelf life shall not be used.

The Engineer reserves the right to reject material based on unsatisfactory performance.

Initial setting time shall not be less than 10 minutes when tested in accordance with ASTM C266.

Test the expansion and shrinkage of the grout in accordance with ASTM C1090. The grout shall expand no more than 0.2% and shall exhibit no shrinkage. Furnish a Type 4 material certification showing results of tests conducted to determine the properties listed in the Standard Specifications and to assure the material is non-shrink.

Unless required elsewhere in the contract the compressive strength at 3 days shall be at least 5000 psi. Compressive strength in the laboratory shall be determined in accordance with ASTM C109 except the test mix shall contain only water and the dry manufactured material. Compressive strength in the field will be determined by molding and testing 4" x 8" cylinders in accordance with AASHTO T22. Construction loading and traffic loading shall not be allowed until the 3 day compressive strength is achieved.

When tested in accordance with ASTM C666, Procedure A, the durability factor of the grout shall not be less than 80.

3.0 SAMPLING AND PLACEMENT

Place and maintain components in final position until grout placement is complete and accepted. Concrete surfaces to receive grout shall be free of defective concrete, laitance, oil, grease and other foreign matter. Saturate concrete surfaces with clean water and remove excess water prior to placing grout.

Do not place grout if the grout temperature is less than 50°F or more than 90°F or if the air temperature measured at the location of the grouting operation in the shade away from artificial heat is below 45°F.

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. Use grout free of any lumps and undispersed cement. Agitate grout continuously before placement.

Control grout delivery so the interval between placing batches in the same component does not exceed 20 minutes.

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 3 cube or 2 cylinder specimens at 28 days.

4.0 BASIS OF PAYMENT

No separate payment will be made for "Grout for Structures". The cost of the material, equipment, labor, placement, and any incidentals necessary to complete the work shall be considered incidental to the structure item requiring grout.

WATERPROOFING (SPECIAL)

Waterproof the top surface of the bridge deck and all construction joints which will be covered by fill with a cold liquid-applied elastomeric membrane to the limits shown in the contract plans. Waterproofing membrane shall be a two coat, rapid cure, seamless, cold liquid spray applied membrane such as the "Eliminator" system manufactured by Stirling Lloyd Products, Inc., or the "Bridge Deck Membrane" system manufactured by Bridge Preservation L.L.C. (R.J. Watson, Inc.) or approved equal. Apply waterproofing in strict accordance with manufacturer's recommendations. Immediately prior to application of membrane, clean the surfaces to be waterproofed per the manufacturer's recommendations. Membrane protection is not required, i.e. ballast may be placed directly on top of the fully cured membrane waterproofing.

The entire cost of the waterproofing complete in place shall be included in the unit contract price bid for "Waterproofing".

PORTLAND CEMENT (SPECIAL)

Portland Cement shall meet the requirements of the Standard Specifications for the type specified for the work. In addition, in order to minimize alkali content, the total percentage of sodium oxide (Na_2O) present plus 0.658 times the total percentage of potassium oxide (K_20) present shall not exceed 0.60 percent. The Contractor shall furnish the Engineer with two (2) copies of certified mill test reports from the manufacturer stating that all cement meets the above requirements.

Flyash may be substituted for cement in the amounts shown in Section 1024-1 of the Standard Specifications provided that the minimum cement requirement as shown on the Plans has been satisfied. In no case shall the substitution of flyash or other admixtures approved by the Engineer be in lieu of the minimum cement requirements.

FINE AND COARSE AGGREGRATE (SPECIAL)

The fine and coarse aggregates used in all concrete on the railway structure shall be non-reactive in accordance with the "Method of Test for Potential Reactivity of Aggregates (Chemical Method)", ASTM Designation C289-81. The Contractor shall furnish the Engineer two (2) copies of the above test reports certifying that the fine and coarse aggregates are non-reactive and will not cause an alkali reaction.

STRUCTURE DRAINAGE SYSTEM (SPECIAL)

Materials

Ductile iron pipe (D.I.P) drains shall be as detailed and specified on the Plans.

Installation

Deck drains shall be located as shown on the Plans. The D.I.P. drains shall be installed as detailed and specified on the Plans.

Copies of shop drawings showing details of the drainage system shall be submitted by the Contractor to the Engineer for approval. The drainage system must be approved prior to fabrication.

Basis of Payment

Payment for the "Structure Drainage System at Sta. 10282+62.09-M1-" will be made at the contract lump sum price bid, which price and payment shall be full compensation for furnishing all materials and labor to install the drainage system complete, including ductile iron pipe, deck drains and fittings.

BACKFILLING AROUND STRUCTURES (SPECIAL)

Backfill material behind abutments (except No. 467M crushed stone or gravel for French drains over perforated drain pipes) shall be Type A Aggregate Base Course (ABC) in accordance with the Standard Specifications. Placing and compacting shall be as provided for in Section 410-8 of the Standard Specifications.

Backfill around structures, except as specified above, shall be suitable material available from the excavations. In the event material excavated is not approved for use as backfill by the Engineer, the Contractor will be required to furnish and haul to the structure site the necessary suitable backfill material. Placing and compacting shall be as provided in Section 410-8 of the Standard Specifications.

Disposal of surplus excavated material shall be as specified in Section 410-1 of the Standard Specifications.

Payment for furnishing ABC backfill material and any suitable material to replace excavated material and for placing and compacting all backfill material shall be included in the contract unit price for the several other pay items.

CONCRETE PARAPET (SPECIAL)

Concrete Parapet shall be as shown on the plans and shall comply with Section 460 of the Standard Specifications. The quantity of concrete parapet to be paid for will be measured and paid as the number of linear feet of concrete parapet provided in the plans. Full compensation for the work shall include, but is not limited to, falsework and formwork, concrete, reinforcing steel, admixtures, all other materials and placing, finishing and curing the concrete. The quantity of concrete parapet as measured above will be paid for at the contract unit price per linear foot for "Concrete Parapet".

STRUCTURAL STEEL (SPECIAL)

1.0 STRUCTURAL STEEL

A. Scope

This Special Provision shall cover the furnishing, fabrication, preparation, assembly, welding, painting, and erection of all structural steel shown on the Plans.

B. General Specifications

Except as otherwise specified hereinafter, the current AREMA Specifications, Chapter 15, Steel Structures, apply to all work under this section.

C. Structural Steel

1. Fracture Critical Members

a. All fracture critical members are identified on the Plans.

b. All fracture critical members will be fabricated in accordance with the Fracture Control Plan stated in the AREMA Specifications, Chapter 15, Section 1.14.

c. Fabricator shall be certified under the AISC Quality Certification Program as follows:

Welded Plate Girders Category III
Rolled Beam Bridges Category I.

d. Structural steel shall meet the current requirements of the ASTM Specifications for Structural Steel, Designation A-709, Grade 50, S84-F2, S91, S93.

S84-F2	(Fracture Critical – Charpy Test Zone 2)
S91	(Fine Austenitic Grain Size)
S93	(Limitation on Weld Repairs)

Except as noted in the AREMA Fracture Control Plan.

2. Non-Fracture Critical Members

a. All primary members or components requiring improved notch toughness are identified on the Plans.

b. Fabricator shall be certified under the AISC Quality Certification Program as follows:

Welded Plate Girders	Category III
Rolled Beam Bridges	Category I

c. Structural steel shapes and plates used as primary members or components shall meet the current requirements of the ASTM Specifications for Structural Steel, Designation A-709, Grade 50, S83-T2, S91.

S83-T2	(Non-Fracture Critical – Charpy Test Zone 2)
S91	(Fine Austenitic Grain Size)

3. Other Structural Steel

a. It is preferred that the Fabricator be certified under the AISC Quality Certification Program, Category I.

b. All structural steel shall meet the current requirements of the Specification for ASTM Designation A-709, Grade 50, unless specified otherwise in this Special Provision or on the Plans.

D. Other Materials

1. High strength bolts shall meet the current requirements of the ASTM Specifications for High Strength Bolts for Structural Steel Joints, Designation A 325.

2. Anchor bolts shall be threaded rods with heavy hex nut meeting the current requirements of ASTM specification for fasteners, Designation A-449.

3. Welding electrodes for arc welding shall meet the current requirements of the Specifications for mild steel arc-welding electrodes Series E70, AWS 5.1, Low Hydrogen Classification for SMAW and AWS 5.17 for SAW.

4. Preformed fabric bearing pads shall be Shock Pad Style No. 15175 as manufactured by Alert Manufacturing and Supply Company, Chicago, Illinois, or FABREEKA Pads as manufactured by Fabreeka Products Company, 1190 Adams Street, Boston, Massachusetts, or SORBTREX Pads as manufactured by Voss Engineering, Inc., Chicago, Illinois, or approved equal.

E. Welding Processes

Only submerged arc welding (SAW) or shielded metal arc welding (SMAW) may be used. No other process will be allowed.

F. Bolted Connections

Permanent bolted connections using High Strength Bolts shall be installed and tightened using the Turn-of-the-Nut Method.

G. Paint

All steel preparation and painting shall be in accordance with the Special Provision PAINTING STRUCTURAL STEEL.

H. Shop Drawings

1. The Contractor's attention is called to the requirements for shop drawings, Chapter 15, Article 1.1.3 Shop Drawings, AREMA Specifications.

2. The Contractor's shall furnish three (3) complete sets of detailed shop drawings to the Company for approval prior to starting fabrication. Unchecked drawings shall not be submitted for approval. After approval of shop drawings, the Contractor shall supply the Company with one set of reproducibles of the approved drawings.

3. The rejection of or the procedure for the correction of shop drawings will not be considered as cause for delay.

4. Approval by the Engineer of the shop drawings shall not relieve the Contractor from furnishing material of proper dimensions, quantity, and quality, nor will such approval relieve the Contractor from the responsibility for errors of any sort in the shop drawings.

5. Original drawings or photographic reproducibles on mylar, or equivalent film, shall be furnished at the completion of the Contract in accordance with Chapter 15, Article 1.1.3, AREMA Specifications. Reproducibles made by the diazo process are not acceptable. The plans shall be sent to:

Chief Engineer – Bridges & Structures
Norfolk Southern Corporation
99 Spring Street, SW, Box 142
Atlanta, GA 30303

2.0 SHOP INSPECTION & TESTING

A. The Company may arrange for inspection by an independent inspection firm under a separate contract. This inspection will be in addition to the Fabricator's Quality Control Program.

B. The Fabricator shall notify the Company and it's inspector of the scheduled date for beginning fabrication and shall not begin fabrication until the Company's Inspector is present.

C. The Fabricator shall furnish copies of certified mill inspection reports to the Company for all structural steel requiring improved notch toughness.

D. The Fabricator shall meet the requirements of the AREMA Fracture Control Plan described in Chapter 15, Section 1.14 for all members and components designated as fracture critical.

E. Welding Inspection shall verify that all welds and welding procedures meet the requirements of the American Welding Society (A.W.S.) Bridge Welding Code, D1.5, current edition.

F. All welds shall be inspected visually and by use of nondestructive testing. All nondestructive testing shall be performed by the Fabricator and witnessed by the Company's Inspector.

G. Witnessing of weld inspection shall be done in a timely manner without disruption of normal shop operations. Copies of all weld inspections and nondestructive testing reports shall be furnished to the Company.

H. The Fabricator shall perform the following weld inspection and testing:

1. All transverse tension groove welds in FCM members, when allowed by the Engineer, shall be RT and UT tested 100%. In non-FCM components of FCM's all transverse groove welds shall be RT or UT tested 100%.

2. All flange to web welds shall be tested on both sides as follows:

   a. Top flange to web welds will be UT tested 100% over 10% of the length from each end and the remaining length of weld will be UT tested 10%.

   b. Bottom flange to web welds will be UT 100%.

3. All flange to web fillet welds, when allowed by the Engineer, are to be magnetic particle tested 100%.

   Ten percent (10%) of all welds not mentioned above shall be magnetic particle tested.

3.0. MEASUREMENT AND PAYMENT

Payment will be made at the contract lump sum price for the bid item "Approx. 580,580 Lbs. Structural Steel" and shall constitute full payment for all costs of plant, superintendent, labor, material, and equipment necessary to furnish, fabricate, shop paint, and shop assemble and deliver all the structural steel required for the project in accordance with the Plans, Specifications, and Special Provisions, including furnishing the shock pads, bearing assemblies and anchor bolts.

PAINTING STRUCTURAL STEEL (SPECIAL)

1.0. PLANS AND SPECIFICATIONS

A. Scope

1. This work consists of furnishing all labor, material, plant and equipment, and performing all operations in connection with Shop Painting (prime coat, wash coat, and top coat applied in the fabricators plant or unless otherwise specified by the Railway). All painting shall be in accordance with AREMA Specifications, Chapter 15, Section 3.4, and recommendations of the Steel Painting Council Specifications with the following specific requirements.

2. The paint thickness will be measured according to "SSPC-PA2" Method for Measurement of Dry Paint Thickness with Magnetic Gages.

3. In addition to the requirements specified herein, all structural steel shall receive a stripe coat of paint per the Standard Specifications.

B. Surface Preparation

1. The surface preparation shall be in accordance with Steel Structures Painting Council Specifications SP 10 (NEAR WHITE BLAST) latest revision and Visual Standard NACE No. 2. Average surface profile to be 2 mils.

2. Application: The paint shall be applied in accordance with SSPC Specifications for Paint Application – PA1.

3. The Prime Coat shall be applied in the shop promptly after blast cleaning, but in no case shall the Prime Coat be applied more than 8 hours after blast cleaning or after visible or detrimental rusting occurs.

4. Steel shall be cleaned by washing or other mechanical means to remove all residues (loose zinc dust and foreign matter) prior to applying Wash and Top Coat.

5. Surfaces damaged during shipment and handling shall be repaired using the same paint system as applied in the shop except that the Prime Coat shall be repaired using an ***Organic Zinc Primer*** when the Prime Coat is repaired in the field.

C. Welded Areas and Faying (Contact) Surfaces

No paint shall be applied to areas to be welded in the field. No acrylic paint (wash or top coat) shall be applied to any faying surfaces.

2.0 PAINTING REQUIREMENTS

A. Paint System

1. The fabricator will be given the option of using one of the following paint systems ***(Prime Coat, Intermediate and Top Coats shall be applied in the fabricator's plant unless otherwise specified by the Railway)***. If the Intermediate Coat and Top Coat are applied in the field, the steel shall be solvent wiped to remove all grease and oil and a ***"High Pressure Power Washing" with clean water (3500 psi minimum)*** shall be used to clean all mud and dirt off prior to applying the touch-up Primer or Intermediate and Top Coats. The Chief Engineer Bridges and Structures is to be notified of the fabricator's choice. Priming of the contact surfaces with ***Inorganic Zinc-Rich Primer*** is required.

2. If approved or further specified by the Railway, the Wash Coat and Top Coat shall be applied in the shop. Intermediate Coat color shall be White and Stripe Coat color shall be Light Gray. Top Coat color shall be Light Gray, Paint Code: 26306 (Federal Standard 595B).

B. SYSTEM #1 (ELITE)

1. Prime coat: Elite 1312 Inorganic Zinc Rich Primer applied at 4.0 – 5.0 mils Dry Film Thickness. Intermediate Coat:

2. Elite 156 Exterior Acrylic Latex applied at 3.0 – 4.0 mils Dry Film Thickness.

3. Finish (Top) Coat: Elite 156 Exterior Acrylic Latex applied at 3.0 – mils Dry Film Thickness.

4. Touch Up Primer: Elite 305 Organic Zinc-Rich Primer applied at 4.0 – 5.0 mils Dry Film Thickness.

Suggested Supplier: Elite Coatings Company, Inc.
P.O. Box 130
Gordon, GA 31031
Telephone: (912) 628-2111

C. SYSTEM #2 (DEVOE)

1. Prime Coat: Cata-Coat 301 Inorganic Zinc-Rich Primer applied at 4.0 – 5.0 mils Dry Film Thickness.

2. Intermediate Coat: DEVRAN 646 Water Based Epoxy primer applied at 3.0 – 4.0 mils Dry Film Thickness.

3. Finish (Top) Coat: DEVFLEX 604-S-9903 Water Based Gloss Enamel applied at 3.0 – 4.0 mils Dry Film Thickness.

5. Touch Up Primer: Cata-Coat 303H Organic Zinc-Rich Epoxy applied at 4.0 – 5.0 mils Dry Film Thickness.

Suggested Supplier: Devoe Coatings Company
1519 West Liberty Avenue
Pittsburgh, PA 15226
Telephone: (412) 561-8930
Attn: Joe Basile

D. SYSTEM #3 (SHERWIN-WILLIAMS)

1. Prime Coat: ZINC CLAD II HS-(B69VZ1 B69VZ3 B69D11) Inorganic Zinc-Rich Primer applied at 4.0 – 5.0 mils Dry Film Thickness

2. Intermediate Coat: B66 Series DTM ACRYLIC GLOSS applied at 3.0 – 4.0 mils Dry Film Thickness.

3. Finish (Top) Coat: B66 Series DTM ACRYLIC GLOSS applied at 3.0 – 4.0 mils Dry Film Thickness.

4. Touch Up Primer: ZINC CLAD IV-(B69 A8/B69 V8) applied at 4.0 – 5.0 mils Dry Film Thickness.

Suggested Supplier: The Sherwin-Williams Company
765 North Avenue, NE Atlanta, GA 30306
Telephone: (404) 873-6723

E. SYSTEM #4 (AMERON)

1. Prime Coat: Amercoat 21-5 Inorganic Zinc-Rich Primer applied at 4.0 – 5.0 mils Dry Film Thickness.

2. Intermediate Coat: Amercoat 148 Waterborne Acrylic primer applied at 3.0 – 4.0 mils Dry Film Thickness.

3. Finish (Top) Coat: Amercoat 220 Waterborne Acrylic applied at 3.0 – 4.0 mils Dry Film Thickness.

4. Touch Up Primer: Amercoat 68HS Zinc-Rich Primer applied at 4.0 – 5.0 mils Dry Film Thickness.

Suggested Supplier: Ameron Protective Coatings Division
11605 Vimy Ridge Road
Little Rock, AK 72209
Telephone: 1-800-283-6627

F. Post-Painting Requirements

1. Steel shall be cleaned by washing or other mechanical means to remove all residues (loose zinc dust and foreign matter) prior to applying Wash and Top Coat. An ***"M.E.K. Rub Test"*** shall be used to assure proper cure of the inorganic zinc primer prior to applying the next coat.

2. **The Intermediate Coat may have to be thinned to prevent gassing.**

3.0 PAINTING MATERIAL REQUIREMENTS

A. Packaging and Shipping.

1. All paint shall be received at the point of use in original containers and carefully stored. All paint to be used shall be freshly mixed and shall be ordered only a sufficient length of time in advance of its use to insure an adequate supply being on hand at all times so as not to delay the work.

2. Paint shipped to the job shall arrive in sealed containers clearly marked with the type of paint and specifications controlling its manufacture.

There shall be no modification of the paint except upon, and in accordance manufacturer and with specific approval of the Engineer.

B. Storage.

Paint in storage at the shop or in the field shall have the position of the containers reversed at least once a week to prevent settlement and separation of the pigment from the vehicle. There shall be suitable devices maintained at the point of storage and used for agitation and thorough mixing of the paint prior to its use on this work.

C. Sample Panel.

If directed by the Engineer, a sample panel shall be made up. The panel shall be used as a basis of comparison of the work on this contract. The panel shall be of size designated by the Engineer and shall be prepared and painted in all respects in the same manner as the work will be done.

4.0 WORKMANSHIP

A. Weather Conditions.

Paint shall not be applied when the temperature of the air is less than 40 degrees F, the surface of the metal is not dry, the relative humidity is above 85%, or when, in the opinion of the Engineer, conditions are

otherwise unsatisfactory for such work. Paint shall not be applied upon damp frosted surfaces. Material painted under cover in damp or cold weather shall remain under cover until dry or until weather conditions permit its exposure in the open. Painting shall not be done when the metal is hot enough to cause the paint to blister and produce a porous paint film.

B. Application.

Paint shall be applied in accordance with SSPC Specifications for Paint Application-PA1 and in accordance with manufacturer's recommendations.

All blast cleaned steel surfaces shall be primed before completion of the work day.

Steel shall be cleaned by washing, brushing or other mechanical means of residue (loose foreign matter) prior to applying the finish coat (Top Coat)

C. Removal of Unsatisfactory Paint.

If the Prime Coat "mud-cracks", the Top Coat wrinkles or shows evidence of having been applied under unfavorable conditions, or if the workmanship is poor, the Engineer may order it removed and the metal thoroughly cleaned and repainted. Any "Blushing" of the Acrylic Top Coat shall be corrected by solvent wiping and/or recoating before final acceptance by the Railway Company.

D. Thinning.

No thinner shall be used if the paint can be applied in a neat workmanlike manner without thinning. If the paint is too thick to spray, only the manufacturer's specified thinner (in hot weather, acrylic paint shall be thinned with M.I.B.K. to reduce the chances of "Blushing" occurring) may be added to the paint up to 25% by volume or as otherwise specified by the manufacturer. Thinning shall not relieve the contractor from applying the specified coating Dry Film Thickness.

E. Paint Touch-Up.

After erection, all damaged areas shall be cleaned of mud and dirt by ***High Pressure Power Washing with clean water (3500 psi minimum)***; grease and oil by ***solvent wiping***; and rusted areas shall be cleaned by ***sand blasting*** or ***power tool cleaning*** with non-woven abrasives prior to touch-up or Top coating. The paint used for touch-up shall be the same system used in the shop. The contractor and/or fabricator shall be responsible for cleaning all damaged surfaces and applying all field touch-up coatings in accordance with all manufacturer's recommendations. The Zinc Primer shall be touched up with only ***Organic Zinc Primer*** when applied in the field.

F. Warranty.

The fabricator and/or contractor will be required to guarantee his work against defective workmanship or the use of defective materials for a period of one (1) year from completion of the contract.

G. Handling Shop Primed Steel.

Only nylon web slings or padded lifting points shall be used to move shop primed steel to prevent damage to the coating.

5.0 AIR QUALITY REQUIREMENTS

Abrasive blasting operations shall be conducted in full compliance with all current ***National primary and secondary ambient air quality standards 40 CFR 50*** (for Particulate matter – 40
CFR 50.6; Lead – 40 CFR 50.12; and nuisance dust). Abrasive blasting operations shall also be compliant with any and all local state and air quality requirements.

6.0 ENVIRONMENTAL PROTECTION STATEMENT

"All collection, containment, disposal and transportation for disposal must be compliant with all applicable State, Federal and Local air pollution, water pollution, solid waste and hazardous waste regulations, ordinances or statutes."

7.0 COMPENSATION

A. All work covered by this section except for shop painting will be paid for at the contract lump sum price for "Painting of Structural Steel." Payment at the contract lump sum price for "Approx. 580,580 Lbs. Structural Steel" will be full compensation for the work of shop painting.

B. The above prices and payments will be full compensation for all work including but not limited to furnishing all paint, cleaning abrasives, cleaning solvents, and all other materials; protecting the work; protecting traffic and property; preparing and cleaning surfaces to be painted; applying paint in the shop and field; and furnishing blast cleaning equipment, paint spraying equipment, brushes, rollers, and any other hand or power tools, and any other equipment.

METAL RAIL (SPECIAL)

The Metal Rail shall be as shown on the Plans. The quantity of Metal Rail to be paid for will be the actual number of linear feet of Metal Rail measured continuously along the top bar of the metal rail from end to end which has been completed and accepted. Full compensation for the work shall include, but is not limited to, furnishing posts, rails, fittings and all other materials and fabricating and erecting the metal rail. The quantity of metal rail as measured above will be paid for at the contract unit price per linear foot for "Metal Rail".

PROJECT SPECIAL PROVISIONS
STRUCTURE

Table of Contents

6/12/13

TERMS AND DEFINITIONS (SPECIAL)

Unless noted otherwise, the following terms and their associated definitions are applicable throughout these Project Special Provisions:

Terms	Definitions
Railway, Railway Company, Railroad, Railroad Company	Norfolk Southern Corporation
Railroad Engineer	The authorized representative of the Railway.
AREMA	American Railway Engineering and Maintenance-of-Way Association.
NCDOT, Department, Department of Transportation	North Carolina Department of Transportation.
Standard Specifications, Specifications	NCDOT Standard Specifications for Roads and Structures, January 2012.
Engineer, Department's Engineer Project Engineer, Highway Engineer	The authorized representative of the NCDOT.
Inspector, Department's Inspector	The authorized inspector of the NCDOT.

PLACING LOAD ON STRUCTURE MEMBERS (11-27-12)

The 2012 Standard Specifications shall be revised as follows:
In **Section 420-20 – Placing Load on Structure Members** replace the first sentence of the fifth paragraph with the following:

Do not place vehicles or construction equipment on a bridge deck until the deck concrete develops the minimum specified 28 day compressive strength and attains an age of at least 7 curing days.

FALSEWORK AND FORMWORK (4-5-12)

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.

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

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.

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.

As an option for the Contractor, overhang falsework hangers may be uniformly spaced, at a maximum of 36 inches, provided the following conditions are met:

Member Type (PCG)	Member Depth, (inches)	Max. Overhang Width, (inches)	Max. Slab Edge Thickness, (inches)	Max. Screed Wheel Weight, (lbs.)	Bracket Min. Vertical Leg Extension, (inches)
II	36	39	14	2000	26
III	45	42	14	2000	35
IV	54	45	14	2000	44
MBT	63	51	12	2000	50
MBT	72	55	12	1700	48

Overhang width is measured from the centerline of the girder to the edge of the deck slab.

For Type II, III & IV prestressed concrete girders (PCG), 45-degree cast-in-place half hangers and rods must have a minimum safe working load of 6,000 lbs.

For MBT prestressed concrete girders, 45-degree angle holes for falsework hanger rods shall be cast through the girder top flange and located, measuring along the top of the

member, 1'-2 ½" from the edge of the top flange. Hanger hardware and rods must have a minimum safe working load of 6,000 lbs.

The overhang bracket provided for the diagonal leg shall have a minimum safe working load of 3,750 lbs. The vertical leg of the bracket shall extend to the point that the heel bears on the girder bottom flange, no closer than 4 inches from the bottom of the member. However, for 72-inch members, the heel of the bracket shall bear on the web, near the bottom flange transition.

Provide adequate overhang falsework and determine the appropriate adjustments for deck geometry, equipment, casting procedures and casting conditions.

If the optional overhang falsework spacing is used, indicate this on the falsework submittal and advise the girder producer of the proposed details. Failure to notify the Engineer of hanger type and hanger spacing on prestressed concrete girder casting drawings may delay the approval of those drawings.

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 on concrete girders with thin top flanges. 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.

When staged construction of the bridge deck is required, detail falsework and forms for screed and fluid concrete loads to be independent of any previous deck pour components when the mid-span girder deflection due to deck weight is greater than ¾".

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 or metalize these devices. Electroplating will not be allowed. Any coating required by the Engineer will be considered incidental to the various pay items requiring temporary works.

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. 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 above ground	Pressure, lb/ft^2 for Indicated Wind Velocity, mph				
	70	80	90	100	110
0 to 30	15	20	25	30	35
30 to 50	20	25	30	35	40
50 to 100	25	30	35	40	45
over 100	30	35	40	45	50

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

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.

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.

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.

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. 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 (2-10-12)

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.

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 (Paul Lambert)

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

jgaither@ncdot.gov (James Gaither)

jlbolden@ncdot.gov (James Bolden)

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

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) 707 – 6407
(919) 250 – 4082 facsimile
plambert@ncdot.gov

Secondary Structures Contacts: James Gaither (919) 707 – 6409
James Bolden (919) 707 – 6408

Eastern Regional Geotechnical Contact (Divisions 1-7):
K. J. Kim (919) 662 – 4710
(919) 662 – 3095 facsimile
kkim@ncdot.gov

Western Regional Geotechnical Contact (Divisions 8-14):
John Pilipchuk(704) 455 – 8902
(704) 455 – 8912 facsimile
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

Submittal	Copies Required by Structure Design Unit	Copies Required by Geotechnical Engineering Unit	Contract Reference Requiring Submittal [1]
Arch Culvert Falsework	5	0	Plan Note, SN Sheet & "Falsework and Formwork"
Box Culvert Falsework [7]	5	0	Plan Note, SN Sheet & "Falsework and Formwork"
Cofferdams	6	2	Article 410-4
Foam Joint Seals [6]	9	0	"Foam 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 [2] (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 [4,5]	7	0	Article 1072-8
Miscellaneous Metalwork [4,5]	7	0	Article 1072-8
Optional Disc Bearings [4]	8	0	"Optional Disc Bearings"
Overhead and Digital Message Signs (DMS) (metalwork and foundations)	13	0	Applicable Provisions
Placement of Equipment on Structures (cranes, etc.)	7	0	Article 420-20
Pot Bearings [4]	8	0	"Pot Bearings"
Precast Concrete Box Culverts	2, then 1 reproducible	0	"Optional Precast Reinforced Concrete Box Culvert at Station ___"
Prestressed Concrete Cored Slab (detensioning sequences) [3]	6	0	Article 1078-11
Prestressed Concrete Deck Panels	6 and	0	Article 420-3

	1 reproducible		
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 (precast items)	10	0	Article 1077-2 & "Sound Barrier Wall"
Sound Barrier Wall Steel Fabrication Plans [5]	7	0	Article 1072-8 & "Sound Barrier Wall"
Structural Steel [4]	2, then 7	0	Article 1072-8
Temporary Detour Structures	10	2	Article 400-3 & "Construction, Maintenance and Removal of Temporary Structure at Station ____"
TFE Expansion Bearings [4]	8	0	Article 1072-8

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. 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 1072-8 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 [1]
Drilled Pier Construction Plans [2]	1	0	Subarticle 411-3(A)
Crosshole Sonic Logging (CSL) Reports [2]	1	0	Subarticle 411-5(A)(2)
Pile Driving Equipment Data Forms [2,3]	1	0	Subarticle 450-3(D)(2)
Pile Driving Analyzer (PDA) Reports [2]	1	0	Subarticle 450-3(F)(3)
Retaining Walls [4]	8 drawings, 2 calculations	2 drawings	Applicable Provisions
Temporary Shoring [4]	5 drawings, 2 calculations	2 drawings	"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. Subarticles 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. The Pile Driving Equipment Data Form is available from:
www.ncdot.org/doh/preconstruct/highway/geotech/formdet/
See second page of form for submittal instructions.

4. Electronic copy of submittal is 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.

GROUT FOR STRUCTURES

9-30-11

1.0 DESCRIPTION

This special provision addresses grout for use in pile blockouts, grout pockets, shear keys, dowel holes and recesses for structures. This provision does not apply to grout placed in post-tensioning ducts for bridge beams, girders, or decks. Mix and place grout in accordance with the manufacturer's recommendations, the applicable sections of the Standard Specifications and this provision.

2.0 MATERIAL REQUIREMENTS

Use a Department approved pre-packaged, non-shrink, non-metallic grout. Contact the Materials and Tests Unit for a list of approved pre-packaged grouts and consult the manufacturer to determine if the pre-packaged grout selected is suitable for the required application.

When using an approved pre-packaged grout, a grout mix design submittal is not required.

The grout shall be free of soluble chlorides and contain less than one percent soluble sulfate. Supply water in compliance with Article 1024-4 of the Standard Specifications.

Aggregate may be added to the mix only where recommended or permitted by the manufacturer and Engineer. The quantity and gradation of the aggregate shall be in accordance with the manufacturer's recommendations.

Admixtures, if approved by the Department, shall be used in accordance with the manufacturer's recommendations. The manufacture date shall be clearly stamped on each container. Admixtures with an expired shelf life shall not be used.

The Engineer reserves the right to reject material based on unsatisfactory performance.

Initial setting time shall not be less than 10 minutes when tested in accordance with ASTM C266.

Test the expansion and shrinkage of the grout in accordance with ASTM C1090. The grout shall expand no more than 0.2% and shall exhibit no shrinkage. Furnish a Type 4 material certification showing results of tests conducted to determine the properties listed in the Standard Specifications and to assure the material is non-shrink.

Unless required elsewhere in the contract the compressive strength at 3 days shall be at least 5000 psi. Compressive strength in the laboratory shall be determined in accordance with ASTM C109 except the test mix shall contain only water and the dry manufactured material. Compressive strength in the field will be determined by molding and testing 4" x 8" cylinders in accordance with AASHTO T22. Construction loading and traffic loading shall not be allowed until the 3 day compressive strength is achieved.

When tested in accordance with ASTM C666, Procedure A, the durability factor of the grout shall not be less than 80.

3.0 SAMPLING AND PLACEMENT

Place and maintain components in final position until grout placement is complete and accepted. Concrete surfaces to receive grout shall be free of defective concrete, laitance, oil, grease and other foreign matter. Saturate concrete surfaces with clean water and remove excess water prior to placing grout.

Do not place grout if the grout temperature is less than 50°F or more than 90°F or if the air temperature measured at the location of the grouting operation in the shade away from artificial heat is below 45°F.

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. Use grout free of any lumps and undispersed cement. Agitate grout continuously before placement.

Control grout delivery so the interval between placing batches in the same component does not exceed 20 minutes.

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 3 cube or 2 cylinder specimens at 28 days.

4.0 BASIS OF PAYMENT

No separate payment will be made for "Grout for Structures". The cost of the material, equipment, labor, placement, and any incidentals necessary to complete the work shall be considered incidental to the structure item requiring grout.

EPOXY RESIN INJECTION (12-5-12)

1.0 GENERAL

For repairing cracks, an approved applicator is required to perform the epoxy resin injection. Make certain the supervisor and the workmen have completed an instruction program in the methods of restoring concrete structures utilizing the epoxy injection process and have a record of satisfactory performance on similar projects.

The applicator furnishes all materials, tools, equipment, appliances, labor and supervision required when repairing cracks with the injection of an epoxy resin adhesive.

2.0 SCOPE OF WORK

Using Epoxy Resin Injection, repair cracks 5 mils (125 µm) wide or greater in face of existing turnback concrete wingwall adjacent to north end of abutment 1 cap and abutment 2 cap.

Repair any crack, void, honeycomb or spall area unsuitable for repair by injection with epoxy mortar.

3.0 COOPERATION

Cooperate and coordinate with the Technical Representative of the epoxy resin manufacturer for satisfactory performance of the work.

Have the Technical Representative present when the job begins and until the Engineer is assured that his service is no longer needed.

The expense of having this representative on the job is the Contractor's responsibility and no direct payment will be made for this expense.

4.0 TESTING

The North Carolina Department of Transportation Materials and Tests Unit will obtain cores from the repaired concrete for testing. If the failure plane is located at the repaired crack, a minimum compressive strength of 3000 psi is required of these cores.

5.0 MATERIAL PROPERTIES

Provide a two-component structural epoxy adhesive for injection into cracks or other voids. Provide modified epoxy resin (Component "A") that conforms to the following requirements:

	Test Method	Specification Requirements
Viscosity @ 40 ± 3°F, cps	Brookfield RVT Spindle No. 4 @ 20 rpm	6000 - 8000
Viscosity @ 77 ± 3°F, cps	Brookfield RVT Spindle No. 2 @ 20 rpm	400 - 700

Epoxide Equivalent Weight	ASTM D1652	152 - 168
Ash Content, %	ASTM D482	1 max.

Provide the amine curing agent (Component "B") used with the epoxy resin that meets the following requirements:

	Test Method	Specification Requirements
Viscosity @ 40 ± 3°F, cps	Brookfield RVT Spindle No. 2 @ 20 rpm	700 - 1400
Viscosity @ 77 ± 3°F, cps	Brookfield RVT Spindle No. 2 @ 20 rpm	105 - 240
Amine Value, mg KOH/g	ASTM D664*	490 - 560
Ash Content, %	ASTM D482	1 max.
* Method modified to use perchloric acid in acetic acid.		

Certify that the Uncured Adhesive, when mixed in the mix ratio that the material supplier specifies, has the following properties:

Pot Life (60 gram mass)
@ 77 ± 3°F - 15 minutes minimum
@ 100 ± 3°F - 5 minutes minimum

Certify that the Adhesive, when cured for 7 days at 77 ± 3°F unless otherwise specified, has the following properties:

	Test Method	Specification Requirements
Ultimate Tensile Strength	ASTM D638	7000 psi (min.)
Tensile Elongation at Break	ASTM D638	4% max.
Flexural Strength	ASTM D790	10,000 psi (min.)
Flexural Modulus	ASTM D790	3.5×10^5 psi
Compressive Yield Strength	ASTM D695	11,000 psi (min.)
Compressive Modulus	ASTM D695	$2.0 - 3.5 \times 10^5$ psi
Heat Deflection Temperature Cured 28 days @ 77 ± 3°F	ASTM D648*	125°F min. 135°F min.
Slant Shear Strength, 5000 psi (34.5 MPa) compressive strength concrete	AASHTO T237	
Cured 3 days @ 40°F wet concrete		3500 psi (min.)
Cured 7 days @ 40°F wet concrete		4000 psi (min.)

Cured 1 day @ 77°F dry concrete		5000 psi (min.)
* Cure test specimens so that the peak exothermic temperature of the adhesive does not exceed 77°F.		

Use an epoxy bonding agent, as specified for epoxy mortar, as the surface seal (used to confine the epoxy resin during injection).

6.0 EQUIPMENT FOR INJECTION

Use portable positive displacement type pumps with interlock to provide positive ratio control of exact proportions of the two components at the nozzle to meter and mix the two injection adhesive components and inject the mixed adhesive into the crack. Use electric or air powered pumps that provide in-line metering and mixing.

Use injection equipment with automatic pressure control capable of discharging the mixed adhesive at any pre-set pressure up to 200 ± 5 psi and equipped with a manual pressure control override.

Use equipment capable of maintaining the volume ratio for the injection adhesive as prescribed by the manufacturer. A tolerance of ± 5% by volume at any discharge pressure up to 200 psi is permitted.

Provide injection equipment with sensors on both the Component A and B reservoirs that automatically stop the machine when only one component is being pumped to the mixing head.

7.0 PREPARATION

Follow these steps prior to injecting the epoxy resin:

- Remove all dirt, dust, grease, oil, efflorescence and other foreign matter detrimental to the bond of the epoxy injection surface seal system from the surfaces adjacent to the cracks or other areas of application. Acids and corrosives are not permitted.
- Provide entry ports along the crack at intervals not less than the thickness of the concrete at that location.
- Apply surface seal material to the face of the crack between the entry ports. For through cracks, apply surface seal to both faces.
- Allow enough time for the surface seal material to gain adequate strength before proceeding with the injection.

8.0 EPOXY INJECTION

Begin epoxy adhesive injection in vertical cracks at the lower entry port and continue until the epoxy adhesive appears at the next higher entry port adjacent to the entry port being pumped.

Begin epoxy adhesive injection in horizontal cracks at one end of the crack and continue as long as the injection equipment meter indicates adhesive is being dispensed or until adhesive shows at the next entry port.

When epoxy adhesive appears at the next adjacent port, stop the current injection and transfer the epoxy injection to the next adjacent port where epoxy adhesive appeared.

Perform epoxy adhesive injection continuously until cracks are completely filled.

If port to port travel of epoxy adhesive is not indicated, immediately stop the work and notify the Engineer.

9.0 FINISHING

When cracks are completely filled, allow the epoxy adhesive to cure for sufficient time to allow the removal of the surface seal without any draining or runback of epoxy material from the cracks.

Remove the surface seal material and injection adhesive runs or spills from concrete surfaces.

Finish the face of the crack flush to the adjacent concrete, removing any indentations or protrusions caused by the placement of entry ports.

10.0 BASIS OF PAYMENT

Payment for epoxy resin injection will be at the contract unit price per linear foot for "Epoxy Resin Injection". Such payment will be full compensation for all materials, tools, equipment, labor, and for all incidentals necessary to complete the work.

EPOXY MORTAR REPAIRS (12-5-12)

1.0 MATERIAL PROPERTIES

Use a two-component paste epoxy bonding agent for the epoxy mortar conforming to the following requirements:

Density, lbs/gal	10.5
Specific Gravity	1.3
Minimum Application Temperature, °F	50
Application Temperature Range, °F	60 to 105
Shelf Life	1 year (min.)

	@ 60°F	@ 85°F	@ 105°F
Potlife, hr., 1 gallon	2½	1	½
Open Time[1], minimum: hr.	4	1¾	¾
Non-sag Thickness, inches (ASTM D2730)	1	¾	½
Initial Cure[2], days (AASHTO T237)	10	6	3
Cure Time[3], days (ASTM D695)	20	10	7

Typical Mechanical Properties[4]	
Tensile Strength, psi Elongation at Break (ASTM D638)	1,500 4%
Compressive Yield Strength, psi Compressive Modulus, psi (ASTM D695)	8,000 4.0×10^5
Heat Deflection Temperature[5], °F (ASTM D648)	105
Slant Shear Strength, psi Damp to Damp Concrete (AASHTO T237)	5,000 100% Concrete Failure

1. From start of mixing to completion of repair
2. 5,000 psi minimum
3. Isothermal cure to eliminate effect of exotherm
4. Cure schedule 7 days @ 77°F, test temperature 77°F
5. 128°F after 28 day cure

2.0 SURFACE PREPARATION

Prior to the application of epoxy mortar, thoroughly clean surfaces to be repaired and remove all loose materials. Remove grease, wax, and oil contaminants by scrubbing with an industrial grade detergent or degreasing compound followed by a mechanical cleaning. Remove weak or deteriorated concrete to sound concrete by bush hammering, gritblasting, scarifying, waterblasting, or other approved methods. Remove dirt, dust, laitance and curing compounds by gritblasting, sanding, or etching with 15% hydrochloric acid.

Acid etch only if approved by the Engineer. Follow acid etching by scrubbing and flushing with copious amounts of clean water. Check the cleaning using moist pH paper. Water cleaning is complete when the paper reads 10 or higher.

Follow all mechanical cleaning with vacuum cleaning.

3.0 APPLICATION

When surface preparation is completed, apply epoxy mortar to the areas specified in the contract plans and established by the Engineer. Repair deep surface irregularities such as severe spalling with a 1:1 sand-epoxy mix. Use graded silica sand that is washed, kiln-dried, and bagged. Repair shallow surface irregularities with the epoxy bonding agent. The finishing of those areas receiving the sand-epoxy mix with the epoxy bonding agent is permitted.

Apply epoxy mortar to damp surfaces only when approved. In such instances, remove all free water by air-blasting.

After applying the epoxy mortar, remove excessive material and provide a smooth, flush surface. Remove the epoxy material in accordance with the supplier's instructions.

4.0 MEASUREMENT AND PAYMENT

Payment for Epoxy Mortar Repairs will be at the contract unit price per square foot for "Epoxy Mortar Repairs". Such payment will be full compensation for furnishing all material, labor, tools and equipment necessary for performing this work complete in place and accepted. For repairs of edge or corner areas, the surface to be measured for payment will be the largest surface and the other surfaces will not be measured.

WATERPROOFING (SPECIAL)

Waterproof the top surface of the bridge deck and all construction joints which will be covered by fill with a cold liquid-applied elastomeric membrane to the limits shown in the contract plans. Waterproofing membrane shall be a two coat, rapid cure, seamless, cold liquid spray applied membrane such as the "Eliminator" system manufactured by Stirling Lloyd Products, Inc., or the "Bridge Deck Membrane" system manufactured by Bridge Preservation L.L.C. (R.J. Watson, Inc.) or approved equal. Apply waterproofing in strict accordance with manufacturer's recommendations. Immediately prior to application of membrane, clean the surfaces to be waterproofed per the manufacturer's recommendations. Membrane protection is not required, i.e. ballast may be placed directly on top of the fully cured membrane waterproofing.

The entire cost of the waterproofing complete in place will be paid for at the contract unit price per square yard for "Waterproofing".

PORTLAND CEMENT (SPECIAL)

Portland Cement shall meet the requirements of the Standard Specifications for the type specified for the work. In addition, in order to minimize alkali content, the total percentage of sodium oxide (Na_2O) present plus 0.658 times the total percentage of potassium oxide (K_20) present shall not exceed 0.60 percent. The Contractor shall furnish the Engineer with two (2) copies of certified mill test reports from the manufacturer stating that all cement meets the above requirements.

Flyash may be substituted for cement in the amounts shown in Section 1024-1 of the Standard Specifications provided that the minimum cement requirement as shown on the Plans has been satisfied. In no case shall the substitution of flyash or other admixtures approved by the Engineer be in lieu of the minimum cement requirements.

FINE AND COARSE AGGREGRATE (SPECIAL)

The fine and coarse aggregates used in all concrete on the railway structure shall be non-reactive in accordance with the "Method of Test for Potential Reactivity of Aggregates (Chemical Method)", ASTM Designation C289-81. The Contractor shall furnish the Engineer two (2) copies of the above test reports certifying that the fine and coarse aggregates are non-reactive and will not cause an alkali reaction.

WATERSTOPS (SPECIAL)

Waterstops shall be made of an approved flexible polyvinyl-chloride plastic conforming to U.S. Corps of Engineers Specification CRD-C-572-74 or rubber conforming to U.S. Corps of Engineers Specification CRD-C-513-75. Waterstops shall be made in the shape and of the material specified on the Plans. The material shall form a continuous waterstop across the slab and up the parapets of bridge decks, abutment wings, or other locations as shown on the Plans. Waterstops shall be fabricated in continuous units without splices, using material of the longest length available. Where bonded joints are necessary, like materials shall be bonded together by experienced men in accordance with the manufacturer's instructions. The entire cost of the waterstop complete in place shall be included in the unit contract price bid for "Reinforced Concrete Deck Slab."

ELASTOMERIC FLASHING (SPECIAL)

The elastomeric flashing at the expansion joint between deck slabs shall be a continuous sheet of synthetic rubber 1/16" thick by 10" wide or equal based on polychloroprene having properties specified by the following test data:

Tensile Strength, ASTM D-412-80	2,000 psi minimum
Elongation, ASTM D-412-80	300% minimum
Hardness, ASTM D-2240-81	60 ± 10
Water Absorption, ASTM D-471-79	10% maximum

The adhesive for use with the flashing shall be as recommended by the manufacturer of the synthetic rubber furnished and shall be applied according to the manufacturer's instructions.

The entire cost of the elastomeric flashing, complete in place, shall be included in the unit contract price bid for "Reinforced Concrete Deck Slab."

RUBBER JOINT COMPOUNDS (SPECIAL)

Expansion joints shall be sealed with a two component elastomeric polymer type cold-applied synthetic joint sealer, manufactured with Thiokol polysulfide liquid polymers. The material shall be grey polysulfide rubber base caulking compound conforming to Specification ANSI A-116.1. Pouring type compound shall be used for horizontal joints and non-sag type for other joints. The mixing and application of the joint sealing compound shall be performed with the equipment recommended and in strict accordance with the manufacturer's instructions. The entire cost of rubber joint compounds shall be included in the unit contract price bid for "Reinforced Concrete Deck Slab."

STRUCTURE DRAINAGE SYSTEM (SPECIAL)

Materials

Ductile iron pipe (D.I.P) drains shall be as detailed and specified on the Plans.

Installation

Deck drains shall be located as shown on the Plans. The D.I.P. drains shall be installed as detailed and specified on the Plans.

Copies of shop drawings showing details of the drainage system shall be submitted by the Contractor to the Engineer for approval. The drainage system must be approved prior to fabrication.

Basis of Payment

Payment for the Structure Drainage System will be made at the contract lump sum price bid for "Structure Drainage System at Sta. 10344+27.18 –M1–". Such lump sum price shall be full compensation for furnishing all materials and labor to install the drainage system complete, including ductile iron pipe, deck drains and fittings.

BACKFILLING AROUND STRUCTURES (SPECIAL)

Backfill material behind abutments (except No. 467M crushed stone or gravel for French drains over perforated drain pipes) shall be Type A Aggregate Base Course (ABC) in accordance with the Standard Specifications. Placing and compacting shall be as provided for in Section 410-8 of the Standard Specifications.

Backfill around structures, except as specified above, shall be suitable material available from the excavations. In the event material excavated is not approved for use as backfill by the Engineer, the Contractor will be required to furnish and haul to the structure site the necessary suitable backfill material. Placing and compacting shall be as provided in Section 410-8 of the Standard Specifications.

Disposal of surplus excavated material shall be as specified in Section 410-1 of the Standard Specifications.

Payment for furnishing ABC backfill material and any suitable material to replace excavated material and for placing and compacting all backfill material shall be included in the contract unit price for the several other pay items.

SELF-LUBRICATING EXPANSION BEARING ASSEMBLIES (SPECIAL)

Description

The self-lubricating expansion bearing assemblies each consist of an oilless self-lubricating copper alloy plate, a sole plate, a sliding plate with keeper bars, a masonry plate, any necessary fill plates, a bearing pad, an anchor bolt assembly which includes anchor bolts, nuts, and washers, pipe sleeves, a closure plate, grout, various sizes of standard pipe, and any other necessary material as detailed on the Plans. These bearing assemblies are located at the expansion ends of applicable spans as shown on the Plans.

Requirements

Use self-lubricating copper alloy bearing plates that are an approved article of standard production by an established manufacturer of such equipment installed in accordance with the manufacturer's recommendations and conforming to the following requirements:

- Copper alloy conforming to AASHTO M107 Alloy 911 or AASHTO M108 Alloy 510.
- Lubricant of the solid type and consisting of graphite, metallic substances having lubricating properties and a lubricating binder. Do not use materials without lubricating qualities or that promote chemical or electrolytic reactions. Use lubricant that is integrally molded and compressed into the lubrication recesses to form a dense, non-plastic lubricant.
- Recesses arranged in a geometric pattern so that successive rows overlap in the direction of motion and the distance between extremities of recesses is closer in the direction of motion than that perpendicular to motion. Lubricate the entire bearing area of all surfaces that have provision for motion by means of these lubricant filled recesses. Provide a total area of these recesses between 25% and 35% of the total bearing area of the plate.
- Furnish bearing plates in sizes specified on the drawings. Machine finish the bearing surfaces and make sure that the surface roughness does not exceed 125 micro inches (3.18 microns) when measured in accordance with ASA Standard B46.1-1955. Also finish the bearing surfaces of the opposing steel plates as above. Align the tool marks in the direction of motion. Finish the bearing surfaces so that all machine surfaces are flat within 0.0005 inch per inch of length and width.
- For mating curved surfaces of steel and copper alloy, the maximum positive tolerance for the concave surface is 0.010 inch and the maximum negative tolerance for the convex surface is 0.010 inch.
- The coefficient of friction between the copper alloy self-lubricating plates and the steel plates in contact with them does not exceed 0.10 when subjected to the designed unit loading and at twice the designed unit loading.

Basis of Payment

Payment for the bearing assemblies will be at the contract lump sum price bid for "Self-lubricating Expansion Bearing Assemblies." Such lump sum price will be full compensation for all materials, tools, equipment, labor and incidentals necessary to furnish and install the self-lubricating bearing assemblies.

Payment for the Fixed Bearing Assemblies as shown on the Plans will be included in the lump sum price bid for "Approx. 430,646 Lbs. Structural Steel".

CONDUIT IN PARAPETS **(SPECIAL)**

Conduit in the parapets shall be 4" diameter PVC conduit conforming to applicable Underwriters Laboratory specifications and shall be located as shown on the Plans. Provisions shall be made for expansion between the deck slab and abutment backwalls and between deck slabs at expansion joints. Couplings shall be provided behind backwalls for connection to the 4" diameter rigid pipe. If non-PVC fittings, couplings, or other incidental items are required, they must be fully compatible with PVC conduit. Details and material data shall be submitted by the Contractor to the Engineer for approval by the Railway Company of all materials required for this work.

Payment for furnishing and installing all conduit, expansion fittings, couplings and incidental items required for this work will be at the contract lump sum price bid for "Conduit in Parapet at Sta. 10344+27.18 –M1–".

CONCRETE PARAPET **(SPECIAL)**

Concrete Parapet shall be as shown on the plans and shall comply with Section 460 of the Standard Specifications. The quantity of concrete parapet to be paid for will be measured and paid as the number of linear feet of concrete parapet provided in the plans. Full compensation for the work shall include, but is not limited to, falsework and formwork, concrete, reinforcing steel, admixtures, all other materials and placing, finishing and curing the concrete. The quantity of concrete parapet as measured above will be paid for at the contract unit price per linear foot for "Concrete Parapet".

STRUCTURAL STEEL **(SPECIAL)**

I. STRUCTURAL STEEL

A. Scope

This Special Provision shall cover the furnishing, fabrication, preparation, assembly, welding, painting, and erection of all structural steel shown on the Plans.

B. General Specifications

1. Except as otherwise specified hereinafter, the current AREMA Specifications, Chapter 15, Steel Structures, apply to all work under this section.

C. Structural Steel

1. Fracture Critical Members

a. All fracture critical members are identified on the Plans.

b. All fracture critical members will be fabricated in accordance with the Fracture Control Plan stated in the AREMA Specifications, Chapter 15, Section 1.14.

c. Fabricator shall be certified under the AISC Quality Certification Program as follows:

Welded Plate Girders Category III
Rolled Beam Bridges Category I.

d. Structural steel shall meet the current requirements of the ASTM Specifications for Structural Steel, Designation A-709, Grade 50, S84-F2, S91, S93.

S84-F2	(Fracture Critical – Charpy Test Zone 2)
S91	(Fine Austenitic Grain Size)
S93	(Limitation on Weld Repairs)

Except as noted in the AREMA Fracture Control Plan.

2. Non-Fracture Critical Members

a. All primary members or components requiring improved notch toughness are identified on the Plans.

b. Fabricator shall be certified under the AISC Quality Certification Program as follows:

Welded Plate Girders	Category III
Rolled Beam Bridges	Category I

c. Structural steel shapes and plates used as primary members or components shall meet the current requirements of the ASTM Specifications for Structural Steel, Designation A-709, Grade 50, S83-T2, S91.

S83-T2	(Non-Fracture Critical – Charpy Test Zone 2)
S91	(Fine Austenitic Grain Size)

3. Other Structural Steel

a. It is preferred that the Fabricator be certified under the AISC Quality Certification Program, Category I.

b. All structural steel shall meet the current requirements of the Specification for ASTM Designation A-709, Grade 50, unless specified otherwise in this Special Provision or on the Plans.

D. Other Materials

1. High strength bolts shall meet the current requirements of the ASTM Specifications for High Strength Bolts for Structural Steel Joints, Designation A 325.

2. Anchor bolts shall be threaded rods with heavy hex nut meeting the current requirements of ASTM specification for fasteners, Designation A-449.

3. Welding electrodes for arc welding shall meet the current requirements of the Specifications for mild steel arc-welding electrodes Series E70, AWS 5.1, Low Hydrogen Classification for SMAW and AWS 5.17 for SAW.

4. Preformed fabric bearing pads shall be Shock Pad Style No. 15175 as manufactured by Alert Manufacturing and Supply Company, Chicago, Illinois, or FABREEKA Pads as manufactured by Fabreeka Products Company, 1190 Adams Street, Boston, Massachusetts, or SORBTREX Pads as manufactured by Voss Engineering, Inc., Chicago, Illinois, or approved equal.

E. Welding Processes

Only submerged arc welding (SAW) or shielded metal arc welding (SMAW) may be used. No other process will be allowed.

F. Bolted Connections

Permanent bolted connections using High Strength Bolts shall be installed and tightened using the Turn-of-the-Nut Method.

G. Paint

All steel preparation and painting shall be in accordance with the Special Provision PAINTING STRUCTURAL STEEL.

H. Shop Drawings

1. The Contractor's attention is called to the requirements for shop drawings, Chapter 15, Article 1.1.3 Shop Drawings, AREMA Specifications.

2. The Contractor's shall furnish three (3) complete sets of detailed shop drawings to the Company for approval prior to starting fabrication. Unchecked drawings shall not be submitted for approval. After approval of shop drawings, the Contractor shall supply the Company with one set of reproducibles of the approved drawings.

3. The rejection of or the procedure for the correction of shop drawings will not be considered as cause for delay.

4. Approval by the Engineer of the shop drawings shall not relieve the Contractor from furnishing material of proper dimensions, quantity, and quality, nor will such approval relieve the Contractor from the responsibility for errors of any sort in the shop drawings.

5. Original drawings or photographic reproducibles on mylar, or equivalent film, shall be furnished at the completion of the Contract in accordance with Chapter 15, Article 1.1.3, AREMA Specifications. Reproducibles made by the diazo process are not acceptable. The plans shall be sent to:

Chief Engineer – Bridges & Structures
Norfolk Southern Corporation
99 Spring Street, SW, Box 142
Atlanta, GA 30303

II. SHOP INSPECTION & TESTING

1. The Company may arrange for inspection by an independent inspection firm under a separate contract. This inspection will be in addition to the Fabricator's Quality Control Program.

2. The Fabricator shall notify the Company and it's inspector of the scheduled date for beginning fabrication and shall not begin fabrication until the Company's Inspector is present.

3. The Fabricator shall furnish copies of certified mill inspection reports to the Company for all structural steel requiring improved notch toughness.

4. The Fabricator shall meet the requirements of the AREMA Fracture Control Plan described in Chapter 15, Section 1.14 for all members and components designated as fracture critical.

5. Welding Inspection shall verify that all welds and welding procedures meet the requirements of the American Welding Society (A.W.S.) Bridge Welding Code, D1.5, current edition.

6. All welds shall be inspected visually and by use of nondestructive testing. All nondestructive testing shall be performed by the Fabricator and witnessed by the Company's Inspector.

7. Witnessing of weld inspection shall be done in a timely manner without disruption of normal shop operations. Copies of all weld inspections and nondestructive testing reports shall be furnished to the Company.

8. The Fabricator shall perform the following weld inspection and testing:

   (a) All transverse tension groove welds in FCM members, when allowed by the Engineer, shall be RT and UT tested 100%. In non-FCM components of FCM's all transverse groove welds shall be RT or UT tested 100%.

   (b) All flange to web welds shall be tested on both sides as follows:

      1. Top flange to web welds will be UT tested 100% over 10% of the length from each end and the remaining length of weld will be UT tested 10%.

      2. Bottom flange to web welds will be UT 100%.

   (c) All flange to web fillet welds, when allowed by the Engineer, are to be magnetic particle tested 100%.

   (d) Ten percent (10%) of all welds not mentioned above shall be magnetic particle tested.

III. MEASUREMENT AND PAYMENT

Payment will be made at the contract lump sum price for the bid item "Approx. 430,646 Lbs. Structural Steel" and shall constitute full payment for all costs of plant, superintendent, labor, material, and equipment necessary to furnish, fabricate, shop paint, and shop assemble and deliver all the structural steel required for the project in accordance with the Plans, Specifications, and Special Provisions, including furnishing the fabric bearing pads, the fixed bearing assemblies and anchor bolts.

PAINTING STRUCTURAL STEEL (SPECIAL)

Plans and Specifications

This work consists of furnishing all labor, material, plant and equipment, and performing all operations in connection with Shop Painting (prime coat, wash coat, and finish coat applied in the fabricators plant or unless otherwise specified by the Railway). All painting shall be in accordance with AREMA Specifications, Chapter 15, Section 3.4, and Society of Protective Coatings Specifications with the following specific requirements.

The paint thickness will be measured according to "SSPC-PA2" Method for Measurement of Dry Paint Thickness with Magnetic Gages.

In addition to the requirements specified herein, all structural steel shall receive a stripe coat of paint per the Standard Specifications.

Surface Preparation

The surface preparation shall be in accordance with Society of Protective Coatings Specifications SP 10 (NEAR WHITE BLAST) latest revision and Visual Standard NACE No. 2. Average surface profile to be 2 mils.

Application: The paint shall be applied in accordance with SSPC Specifications for Paint Application – PA1.

The Prime Coat shall be applied in the shop promptly after blast cleaning, but in no case shall the Prime Coat be applied more than 8 hours after blast cleaning or after visible or detrimental rusting occurs.

Steel shall be cleaned by washing or other mechanical means to remove all residue (loose zinc dust and foreign matter) prior to applying Wash and Finish Coat.

Surfaces damaged during shipment and handling shall be repaired using the same paint system as applied in the shop except that the Prime Coat shall be repaired using an ***Organic Zinc Primer*** when the Prime Coat is repaired in the field.

Welded Areas and Faying (Contact) Surfaces

No paint shall be applied to areas to be welded in the field. No vinyl paint (wash or finish coat) shall be applied to any faying surfaces.

Paint Systems

The fabricator will be given the option of using one of the following paint systems ***(Prime Coat, Intermediate and Finish Coats shall be applied in the fabricator's plant unless otherwise specified by the Railway)***. If the Intermediate Coat and Finish Coat are applied in the field, the

steel shall be solvent wiped to remove all grease and oil and a ***"High Pressure Power Washing" with clean water (3500 psi minimum)*** shall be used to clean all mud and dirt off prior to applying the touch-up Primer or Intermediate and Finish Coats. ***The fabricator shall supply sufficient quantities of touch-up Organic Zinc-Rich Primer, Intermediate Coat, Finish Coat and Thinner.*** The Chief Engineer Bridges and Structures is to be notified of the fabricator's choice. Priming of the contact surfaces with ***Inorganic Zinc-Rich Primer*** is required.

If approved or further specified by the Railway, the Wash Coat and Finish Coat shall be applied in the shop. Intermediate Coat color shall be White and Stripe Coat color shall be Light Gray. Finish Coat color shall be Light Gray, Paint Code: 26306 (Federal Standard 595B).

SYSTEM #1 (ELITE)

Prime coat: Elite 1312 Inorganic Zinc Rich Primer applied at 4.0 – 5.0 mils Dry Film Thickness.

Intermediate Coat: Elite 156 Exterior Acrylic Latex applied at 3.0 – 4.0 mils Dry Film Thickness.

Finish Coat: Elite 156 Exterior Acrylic Latex applied at 3.0 – 4.0 mils Dry Film Thickness.

Touch Up Primer: Elite 305 Organic Zinc-Rich Primer applied at 4.0 – 5.0 mils Dry Film Thickness.

Suggested Supplier: Elite Coatings Company, Inc.
P.O. Box 130
Gordon, GA 31031
Telephone: (912) 628-2111

SYSTEM #2 (DEVOE)

Prime Coat: Catha-Coat 301 Inorganic Zinc-Rich Primer applied at 4.0 – 5.0 mils Dry Film Thickness.

Intermediate Coat: DEVRAN 646 Water Based Epoxy primer applied at 3.0 – 4.0 mils Dry Film Thickness.

Finish Coat: DEVFLEX 604-S-9903 Water Based Gloss Enamel applied at 3.0 – 4.0 mils Dry Film Thickness.

Touch Up Primer: Catha-Coat 303H Organic Zinc-Rich Epoxy applied at 4.0 – 5.0 mils Dry Film Thickness.

Suggested Supplier: Devoe Coatings Company
320 Westbrook Drive
Butler, PA 16001
Telephone: (724) 283-1471
Attn: Gary M. Mato

SYSTEM #3 (SHERWIN-WILLIAMS)

Prime Coat: ZINC CLAD II HS-(B69VZ1 B69VZ3 B69D11) Inorganic Zinc-Rich Primer applied at 4.0 – 5.0 mils Dry Film Thickness

Intermediate Coat: B66 Series DTM ACRYLIC GLOSS applied at 3.0 – 4.0 mils Dry Film Thickness.

Finish Coat: B66 Series DTM ACRYLIC GLOSS applied at 3.0 – 4.0 mils Dry Film Thickness.

Touch Up Primer: ZINC CLAD IV-(B69 A8/B69 V8) applied at 4.0 – 5.0 mils Dry Film Thickness.

Suggested Supplier: The Sherwin-Williams Company
765 North Avenue, NE
Atlanta, GA 30306
Telephone: (404) 873-6723

SYSTEM #4 (AMERON)

Prime Coat: Amercoat 21-5 Inorganic Zinc-Rich Primer applied at 4.0 – 5.0 mils Dry Film Thickness.

Intermediate Coat: Amercoat 148 Waterborne Acrylic primer applied at 3.0 – 4.0 mils Dry Film Thickness.

Finish Coat: Amercoat 220 Waterborne Acrylic applied at 3.0 – 4.0 mils Dry Film Thickness.

Touch Up Primer: Amercoat 68HS Zinc-Rich Primer applied at 4.0 – 5.0 mils Dry Film Thickness.

Suggested Supplier: Ameron Protective Coatings Division
11605 Vimy Ridge Road
Little Rock, AK 72209
Telephone: 1-800-283-6627

Post-Painting Requirements

a) Steel shall be cleaned by washing or other mechanical means to remove all residue (loose zinc dust and foreign matter) prior to applying Wash and Top Coat. An ***"M.E.K. Rub Test"*** shall be used to assure proper cure of the inorganic zinc primer prior to applying the next coat.
b) **The Intermediate Coat may have to be thinned to prevent gassing.**

Painting Materials Requirements

a) Packaging and Shipping.

All paint shall be received at the point of use in original containers and carefully stored. All paint to be used shall be freshly mixed and shall be ordered only a sufficient length of time in advance of its use to insure an adequate supply being on hand at all times so as not to delay the work.

Paint shipped to the job shall arrive in sealed containers clearly marked with the type of paint and specifications controlling its manufacture.

There shall be no modification of the paint except upon, and in accordance with, express written stipulation by an authorized representative of the paint manufacturer and with specific approval of the Engineer.

b) Storage.

Paint in storage at the shop or in the field shall have the position of the containers reversed at least once a week to prevent settlement and separation of the pigment from the vehicle.

There shall be suitable devices maintained at the point of storage and used for agitation and thorough mixing of the paint prior to its use on this work.

c) Sample Panel.

If directed by the Engineer, a sample panel shall be made up. The panel shall be used as a basis of comparison of the work on this contract. The panel shall be of size designated by the Engineer and shall be prepared and painted in all respects in the same manner as the work will be done.

Workmanship

a) Weather Conditions.

Paint shall not be applied when the temperature of the air is less than 40 degrees F, the surface of the metal is not dry, the relative humidity is above 85%, or when, in the opinion of the Engineer, conditions are otherwise unsatisfactory for such work. Paint shall not be applied upon damp or frosted surfaces. Material painted under cover in damp or cold weather shall remain under cover until dry or until weather conditions permit its exposure in the open. Painting shall not be done when the metal is hot enough to cause the paint to blister and produce a porous paint film.

b) Application.

Paint shall be applied in accordance with SSPC Specifications for Paint Application-PA1 and in accordance with manufacturer's recommendations.

All blast cleaned steel surfaces shall be primed before completion of the work day.

Steel shall be cleaned by washing, brushing or other mechanical means of all residue (loose foreign matter) prior to applying the finish coat.

c) Removal of Unsatisfactory Paint.

If the Prime Coat "mud-cracks", the Finish Coat wrinkles or shows evidence of having been applied under unfavorable conditions, or if the workmanship is poor, the Engineer may order it removed and the metal thoroughly cleaned and repainted. Any "Blushing" of the Finish Coat shall be corrected by solvent wiping and/or recoating before final acceptance by the Company.

d) Thinning.

No thinner shall be used if the paint can be applied in a neat workmanlike manner without thinning. If the paint is too thick to spray, only the manufacturer's specified thinner (in hot weather, acrylic paint shall be thinned with M.I.B.K. to reduce the chances of "Blushing" occurring) may be added to the paint up to 25% by volume or as otherwise specified by the

manufacturer. Thinning shall not relieve the contractor from applying the specified coating Dry Film Thickness.

e) Paint Touch-Up.

After erection, all damaged areas shall be cleaned of mud and dirt by ***High Pressure Power Washing with clean water (3500 psi minimum)***; grease and oil by ***solvent wiping***; and rusted areas shall be cleaned by ***sand blasting*** or ***power tool cleaning*** with non-woven abrasives prior to touch-up or Finish coating. The paint used for touch-up shall be the same system used in the shop. The contractor and/or fabricator shall be responsible for cleaning all damaged surfaces and applying all field touch-up coatings in accordance with all manufacturer's recommendations. The Zinc Primer shall be touched up with only ***Organic Zinc Primer*** when applied in the field.

f) Warranty.

The fabricator and/or contractor will be required to guarantee his work against defective workmanship or the use of defective materials for a period of one (1) year from completion of the contract.

g) Handling Shop Primed Steel.

Only nylon web slings or padded lifting points shall be used to move shop primed steel to prevent damage to the coating.

Air Quality Requirements

Abrasive blasting operations shall be conducted in full compliance with all current ***National primary and secondary ambient air quality standards 40 CFR 50*** (for Particulate matter – 40 CFR 50.6; Lead – 40 CFR 50.12; and nuisance dust). Abrasive blasting operations shall also be compliant with any and all local state and air quality requirements.

Environmental Protection Statement

"All collection, containment, disposal and transportation for disposal must be compliant with all applicable State, Federal and Local air pollution, water pollution, solid waste and hazardous waste regulations, ordinances or statutes."

Compensation

All work covered by this section except for shop painting will be paid for at the contract lump sum price for "Painting of Structural Steel." Payment at the contract lump sum price for "Approx. 430,646 Lbs. Structural Steel" will be full compensation for the work of shop painting.

The above prices and payments will be full compensation for all work including but not limited to furnishing all paint, cleaning abrasives, cleaning solvents, and all other materials; protecting

the work; protecting traffic and property; preparing and cleaning surfaces to be painted; applying paint in the shop and field; and furnishing blast cleaning equipment, paint spraying equipment, brushes, rollers, and any other hand or power tools, and any other equipment.

METAL RAIL AND WALKWAY **(SPECIAL)**

The Metal Rail and Walkway shall be as shown on the Plans. The quantity of Metal Rail and Walkway to be paid for will be the actual number of linear feet of Metal Rail and Walkway measured continuously along the top bar of the metal rail from end to end which has been completed and accepted. Full compensation for the work shall include, but is not limited to, furnishing posts, rails, fittings and all other materials and fabricating and erecting the metal rail. The quantity of metal rail as measured above will be paid for at the contract unit price per linear foot for "Metal Rail and Walkway".

Payment for wingwall handrails shall be included in the contract unit price per linear foot for "Metal Rail and Walkway".

211

NC DEPARTMENT OF TRANSPORTATION
RAIL DIVISION
DESIGN AND CONSTRUCTION

NORFOLK SOUTHERN RAILWAY AND
NORTH CAROLINA RAILROAD

BRIDGE over PROPOSED MALLARD CREEK PARKWAY

NCDOT RAIL DIVISION
MECKLENBURG COUNTY, NC
P-5208G
STA. P.O.T. 10640+78.96 –M1—
NORFOLK SOUTHERN RAILWAY MILEPOST 367+4841

PROJECT SPECIAL PROVISIONS: STRUCTURES

NORTH CAROLINA PROFESSIONAL SEAL 20656 ENGINEER L. MARK PEARSON
6/12/13

AECOM
AECOM TECHNICAL SERVICES OF NORTH CAROLINA, INC.
701 CORPORATE CENTER DRIVE, SUITE 475
RALEIGH, NC 27607
License No. F-0342

Project Special Provisions: Structures 212

Project Number: P-5208G Mecklenburg County

TABLE OF CONTENTS

Project Number: P-5208G Mecklenburg County

The "Standard Specifications for Roads and Structures, January 2012" of the North Carolina Department of Transportation, hereinafter referred to as the Standard Specifications, shall apply to the articles of the Project Special Provisions.

TEMPORARY RAILROAD SHORING (SPECIAL)

GENERAL

Provide temporary railroad shoring for the Detour Track indicated in the plans in accordance with the Standard Specifications and this Special Provision.

ALTERNATE DESIGN AND PLANS

The submittal of an alternate design and plans for excavation and shoring is permitted in lieu of the excavation and shoring detailed on the plans. The alternate design shall be in accordance with the current railway design criteria. Have the alternate design computations and plans sealed by a North Carolina Registered Professional Engineer and submit them for review, comments and acceptance. After the appropriate State agency accepts them, they are submitted by the State agency to the Railroad for review, comments and acceptance. Allow a minimum of 30 days for the Railroad's review. Do not begin excavation at the excavation site or sites in question until the Engineer confirms that both the State and Railroad accept the alternate design and plans. No extension of intermediate completion dates and/or final completion dates will be allowed due to delays in review of alternate excavation and shoring design and plans.

BASIS OF PAYMENT

Payment for the temporary railroad shoring will be made at the lump sum price bid for 'Temporary Railroad Shoring for Bent 1, Sta. 10640+78.96-M1-." Such lump sum price will be full compensation for all materials, equipment, tools, labor, and incidentals necessary to complete the work. All shoring materials must be "like new".

PORTLAND CEMENT (SPECIAL)

Portland cement shall meet the requirements of the Standard Specifications for the type specified for the work. In addition to the other requirements, in order to prevent alkali reaction in concrete, all cement used on the railroad structure shall have a low alkali content. The total percentage of the sodium oxide (Na_2 O) present, plus 0.658 times the total percentage of potassium oxide (K_2 O) present, shall not exceed 0.60 percent. The Contractor shall furnish the Engineer with two (2) copies of certified mill test reports from the manufacturer of all cement, stating that the above requirements have been met. No substitution of fly ash, blast furnace slag or other material will be permitted in meeting these minimum cement requirements.

FINE AND COURSE AGGREGATE (SPECIAL)

The fine and coarse aggregates used in all concrete on the railway structure shall be non-reactive

in accordance with the "Method of Test for Potential Reactivity of Aggregates (Chemical Method)," ASTM Designation C289-81. The Contractor shall furnish the Engineer with two (2) copies of the above test reports certifying that the fine and coarse aggregates are non-reactive and will not cause an alkali reaction.

WATERSTOPS (SPECIAL)

Waterstops shall be made of an approved flexible polyvinyl-chloride plastic, conforming to the U.S. Corps of Engineers Specification CRD-C-572-74, or rubber conforming to U.S. Corps of Engineers Specification CRD-C-513-75. Waterstops shall be made in the shape and of the material specified on the plans. The material shall form a continuous waterstop across the slab and up the curb of bridge decks, in abutment wings, or other locations as shown on the plans. Waterstops shall be fabricated in continuous units without splice, using material of the longest length available. Where bonded joints are necessary, like materials shall be bonded together by experienced workers in accordance with the manufacturer's instructions. The entire cost of the waterstop, complete in place, shall be included in the unit contract price bid for "Reinforced Concrete Deck Slab."

ELASTOMERIC FLASHING (SPECIAL)

The elastomeric flashing at the expansion joint between deck slabs shall be a continuous sheet of synthetic rubber 1/16" thick by 10" wide, or equal based on polychloroprene having properties specified by the following test data:

Tensile Strength	ASTM D-412-80	13.8MPa (2000psi) min.
Elongation	ASTM D-412-80	300% minimum
Hardness	ASTM D-2240-81	60 ± 10
Water Absorption	ASTM D-471-79	10% maximum

The adhesive for use with the flashing shall be as recommended by the manufacturer of the synthetic rubber fiimished and shall be applied according to manufacturer's instructions. The entire cost of the elastomeric flashing, complete in place, shall be included in the unit contract price bid for "Reinforced Concrete Deck Slab."

RUBBER JOINT COMPOUNDS (SPECIAL)

Expansion joints shall be sealed with a two component elastomeric polymer type cold-applied synthetic joint sealer, manufactured with thiokol polysulfide liquid polymers. The material shall be grey polysulfide rubber base caulking compound conforming to Specification ANSI A-116.1. Pouring type compound shall be used for horizontal joints and non-sag type for other joints. The mixing and application of the joint sealing compound shall be performed with the equipment recommended and in strict accordance with the manufacturer's instructions. The entire cost of the rubber joint compounds shall be included in the unit contract price bid for "Reinforced Concrete Deck Slab."

Project Number: P-5208G Mecklenburg County

WATERPROOFING (SPECIAL)

Waterproofing for protection of concrete surfaces on substructure to be backfilled against shall consist of a two (2) part system having a membrane layer and a protection course layer meeting the requirements of the American Railway Engineering and Maintenance of Way Association's (AREMA) Manual of Railway Engineering Chapter 29, Waterproofing. The Waterproofing shall be installed per manufacture's instructions. The entire cost of the two (2) part system shall be included in the unit contract price bid per square yard for "Two Part Membrane Waterproofing System".
Waterproofing for protection of the concrete deck shall consist ofa two (2) part system having a membrane layer and an asphalt plank, or other Railroad approved, protection course meeting the requirements of the AREMA Manual Chapter 29, Waterproofing.
The Waterproofing shall be installed per manufacturer's instructions. The entire cost of the membrane waterproofing shall be included in the unit contract price bid per square yard for "Membrane Layer Waterproofing System for Deck".
The entire cost of the Asphalt Plank protective course for concrete deck shall be included in the unit contract price bid per square yard for "One Inch Asphalt Planking Protective Course for Deck".
The Contractor has the option to use a polyurethane based membrane waterproofing system on the deck in lieu of the Asphalt Plank when approved by the Engineer.

STRUCTURE DRAINAGE SYSTEM (SPECIAL)

A. Materials: Ductile iron pipe collector system shall be as detailed and specified on the plans. French drain material behind abutments shall be No. 467M crushed stone or gravel conforming to Standard Specifications Table 1005-1, Aggregate Gradation.

B. Installation: Deck drains shall be located as shown on the plans. The ductile iron pipe collector system shall be installed as detailed and specified on the plans. Perforated pipe drains behind the abutments shall be laid with perforations turned down and bedded on a layer of compacted impervious clay. The perforations shall be kept open and free from the clay bedding course, asphalt coating, or other materials. The French drain material shall be placed concurrently with the backfill and shall be kept separate with a thin timber slide or burlap bag. Perforated pipe behind abutments and outfall pipes shall be laid on a grade of at least one percent (1%) and shall be as shown on the plans. Grades ofpipe drains shall be set by the Engineer. Copies of shop drawing details of the drainage system shall be submitted by the Contractor to the Department of Transportation for approval. The drainage system must be approved before fabrication.

C. Basis of Payment: Payment for the "Structure Drainage System at Sta. 10640+78.96-M1-" will be made at the contract lump sum price bid, which price and payment shall be full compensation for furnishing all materials and labor to install the drainage system complete, including corrugated metal and ductile iron pipe, deck drains, fittings, excavation, French drain material, pipe sleeves inserts, other backfill and outfall pipes.

CONDUIT IN PARAPETS (SPECIAL)

Conduit in the parapets shall be 4" diameter PVC conduit conforming to applicable Underwriters Laboratory specifications and shall be located as shown on the Plans. Provisions shall be made for expansion between the deck slab and abutment backwalls and between deck slabs at expansion joints. Couplings shall be provided behind backwalls for connection to the 4" diameter rigid pipe. If non-PVC fittings, couplings, or other incidental items are required, they must be fully compatible with PVC conduit. Details and material data shall be submitted by the Contractor to the Engineer for approval by the Railroad Company of all materials required for this work. The entire cost of furnishing and installing all conduit, expansion fittings, couplings and incidental items required for this work shall be included in the bid price for "Conduit in Parapet", Lump Sum.

REINFORCED CONCRETE DECK SLAB (SPECIAL)

General

This provision shall govern materials, forming and all other related work in the construction of a reinforced concrete deck slab in accordance with applicable parts of the Standard Specifications, the details shown on the plans, and as outlined in these special provisions. For structural steel spans, plans for the concrete deck slab are detailed for a cast-in-place slab using removable forms.

Materials

Unless otherwise noted on the plans, all cast-in-place concrete shall be Class AA conforming to the requirements of Section 1000 of the Standard Specifications as modified by the general notes in the plans.

Construction Methods

Design and construction requirements of the standard details and Sections 420 and 1070 of the Standard Specifications shall govern.

No profile grade line adjustment will be allowed unless permitted by the Engineer.

Curing methods for the concrete will conform to Section 420 of the Standard Specifications.

Measurement

Reinforced concrete deck slab constructed under this item will be measured by the square feet of horizontal surface area using the nominal dimensions and configuration shown in the "Layout for Computing Area of

Reinforced Concrete Deck Slab" detail as shown on Superstructure Bill of Material plan sheet. When required by the plans expansion joint material, waterstops, etc. will be considered a part of this item.

No measurement will be made for concrete or reinforcing steel due to a variation in camber of the girders from the plan camber or for additional quantities required by optional methods of forming.

Payment

The quantity for which payment is made will be that quantity shown in square feet on the plans. Where the plans have been revised, the quantity to be paid for will be the quantity shown on the revised plans.

The unit price bid per square foot will be full compensation for all work covered by this special provision and applicable parts of the Standard Specifications, but not limited to, furnishing and placing concrete, reinforcing steel, joint filler and sealer, curing, waterstops, expansion anchors and any other material; erecting and removing all falsework and forms; protecting concrete in wind, rain, low humidity, high temperatures or other unfavorable weather; and constructing joints and finishing and curing concrete.

Payment will be made under:

Reinforced Concrete Deck Slab.....Square Feet

BACKFILLING AROUND STRUCTURES (SPECIAL)

Backfill material behind abutments (except No. 467M crushed stone or gravel for French drains over perforated drain pipes) shall be Type A Aggregate Base Course (ABC) in accordance with the Standard Specifications. Placing and compacting shall be as provided for in Section 410-9 of the Standard Specifications. Backfill around structures, except as specified above, shall be suitable material available from the excavations. In the event material excavated is not approved for use as backfill by the Engineer, the Contractor will be required to furnish and haul to the structure site necessary suitable backfill material. Placing and compacting shall be as provided in Section 410-9 of the Standard Specifications. Disposal of surplus excavated material shall be as specified in Section 410-1 of the Standard Specifications.

Payment for furnishing ABC backfill material and any suitable material to replace excavated material and for placing and compacting all backfill material shall be included in the contract unit price for other pay items.

SELF-LUBRICATING EXPANSION BEARING ASSEMBLIES (SPECIAL)

Description:

The self-lubricating expansion bearing assemblies shall each consist of an oilless self-lubricating copper alloy plate, a sole plate, a sliding plate with keeper bars, a masonry plate, any necessary fill plates, bearing pad, anchor bolt assembly which includes anchor bolts, nuts, washers, pipe,

and any other necessary material as detailed on the plans. These bearing assemblies are located at the expansion ends ofapplicable spans as shown on the plans.

Requirements:
The self-lubricating copper alloy bearing plates shall be an approved article of standard production by an established manufacturer ofsuch equipment installed in accordance with the manufacturer of such equipment installed in accordance with the manufacturer's recommendations and shall conform to the following requirements:

(A) The copper alloy shall conform to AASHTO M107 Alloy 911 or AASHTO M108 Alloy 510.

(B) The lubricant shall be of the solid type and shall consist of graphite, metallic substances having lubricating properties and a lubricating binder. Materials which do not have lubricating qualities or which promote chemical or electrolytic reactions, will not be acceptable. The lubricant shall be integrally molded and compressed into the lubrication recesses to form a dense, non-plastic lubricant.

(C) The recesses shall be arranged in a geometric pattem such that successive rows shall overlap in the direction of motion and the distance between extremities of recesses shall be closer in the direction of motion than that perpendicular to motion. The entire bearing area of all surfaces which have provisions for motion shall be lubricated by means of these lubricant filled recesses. The total area of these recesses shall comprise not less than 25 % nor more than 35 % ofthe total bearing area of the plate.

(D) The bearing plates shall be furnished to the sizes specified on the drawings. Bearing surfaces shall be machine finished and the surface roughness shall not exceed 125 micro inches (3.18 microns) when measured in accordance with ASA Standard B46.1-1955. Also, the bearing surfaces of the opposing steel plates shall also be finished as above. Align the tool marks shall be in the direction of motion. Finish the bearing surfaces so that all machine surfaces shall be flat within 0.0005 inch per inch of length and width.

(E) For mating curved surfaces of steel and copper alloy, the maximum positive tolerance for the concave surface is 0.010 inch and the maximum negative tolerance for the convex surface is 0.010 inch.

(F) The coefficient of friction between the copper alloy self-lubricating plates and the steel plates in contact with them shall not exceed 0.10 when subjected to the designed unit loading and also at twice the designed unit loading.

Payment for the bearing assemblies shall be at the contract lump sum price bid for "Self-lubricating Expansion Bearing Assemblies". This price shall be full compensation for all materials, tools, equipment, labor and incidentals necessary to furnish and install the self-lubricating bearing assemblies. Payment for the Fixed Bearing Assemblies as shown on plans shall be included in the Lump Sum price bid for structural steel.

Project Number: P-5208G Mecklenburg County

METAL HANDRAIL (SPECIAL)

The Metal Handrail shall be constructed as shown on the plans. The quantity of Handrail to be paid for will be the actual number of linear feet of handrail, measured along the top bar ofthe rail, on the abutment wing walls and on the bridge superstructure, which has been completed and accepted. The quantities of Handrail, measured as provided herein, will be paid for at the contract unit price per linear feet for "Metal Handrail".

The above prices and payments will be full compensation for all work covered by this provision including but not limited to fiimishing posts, rail bars, base plates, anchor cords, hardware and all other materials; fabrication and erection ofthe handrail; and incidentals necessary to complete the work as shown on the plans.

FALSEWORK AND FORMWORK (4-5-12)

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

Project Number: P-5208G Mecklenburg County

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.

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

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 ofcopies 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.

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.

As an option for the Contractor, overhang falsework hangers may be uniformly spaced, at a maximum of 36 inches, provided the following conditions are met:

Member Type (PCG)	Member Depth, (inches)	Max. Overhang Width, (inches)	Max. Slab Edge Thickness, (inches)	Max. Screed Wheel Weight, (lbs.)	Bracket Min. Vertical Leg Extension, (inches)
II	36	39	14	2000	26
III	45	42	14	2000	35
IV	54	45	14	2000	44
MBT	63	51	12	2000	50
MBT	72	55	12	1700	48

Overhang width is measured from the centerline ofthe girder to the edge ofthe deck slab.

For Type II, III & IV prestressed concrete girders (PCG), 45-degree cast-in-place half hangers and rods must have a minimum safe working load of 6,000 lbs.

For MBT prestressed concrete girders, 45-degree angle holes for falsework hanger rods shall be cast through the girder top flange and located, measuring along the top of the member, 1'-2 ½ " from the edge ofthe top flange. Hanger hardware and rods must have a minimum safe working load of 6,000 lbs.

The overhang bracket provided for the diagonal leg shall have a minimum safe working

load of 3,750 lbs. The vertical leg ofthe bracket shall extend to the point that the heel bears on the girder bottom flange, no closer than 4 inches from the bottom of the member. However, for 72-inch members, the heel of the bracket shall bear on the web, near the bottom flange transition.

Provide adequate overhang falsework and determine the appropriate adjustments for deck geometry, equipment, casting procedures and casting conditions.

If the optional overhang falsework spacing is used, indicate this on the falsework submittal and advise the girder producer ofthe proposed details. Failure to notify the Engineer of hanger type and hanger spacing on prestressed concrete girder casting drawings may delay the approval of those drawings.

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 on concrete girders with thin top flanges. 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.

When staged construction ofthe bridge deck is required, detail falsework and forms for screed and fluid concrete loads to be independent of any previous deck pour components when the mid-span girder deflection due to deck weight is greater than ¾ ".

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 or metalize these devices. Electroplating will not be allowed. Any coating required by the Engineer will be considered incidental to the various pay items requiring temporary works.

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. 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	Pressure, lb/ft2 for indicated Wind Velocity, mph				
feet above ground	70	80	90	100	110
0 to 30	15	20	25	30	35
30 to 50	20	25	30	35	40
50 to 100	25	30	35	40	45
over 100	30	35	40	45	50

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

Duplin	90	New Hanover	100	Yadkin	70
Durham	70	Northampton	80	Yancey	70
Edgecombe	80	Onslow	100		
Forsyth	70	Orange	70		

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. 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.

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.

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. 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 ofthe permanent structure is permitted ifthe 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.

Project Number: P-5208G Mecklenburg County

SUBMITTAL OF WORKING DRAWINGS (2-10-12)

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 ofthe 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.

ADDRESSES AND CONTACTS

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

Via US mail:
Mr. G. R. Perfetti, P. E.
State Structures Engineer
North Carolina Department
Of Transportation
Structures Management 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 Structures Engineer
North Carolina Department
of Transportation
Structures Management 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 (Paul Lambert)
Send an additional e-copy ofthe submittal to the following address:
jgaither@ncdot.gov (James Gaither)

jlbo1den@ncdot.gov (James Bolden)

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

For projects in Divisions 1-7, use the following Eastem 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

The status ofthe review ofstructure-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 conceming submittal review status, review comments or drawing markups to the following contacts:

Primary Structures Contact: Paul Lambert (919) 707 — 6407
(919) 250 — 4082 facsimile
plambert@ncdot.gov

Secondary Structures Contacts: James Gaither (919) 707 — 6409
James Bolden (919) 707 — 6408

Eastern Regional Geotechnical Contact (Divisions 1-7):
K. J. Kim (919)662-4710
(919) 662 — 3095 facsimile
kkim@ncdot.gov

Project Special Provisions: Structures

Project Number: P-5208G

Mecklenburg County

Western Regional Geotechnical Contact (Divisions 8-14):

John Pilipchuk (704) 455 —8902
(704) 455 — 8912 facsimile
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

Submittal	Copies Required by Structure Design Unit	Copies Required by Geotechnical Engineering Unit	Contract Reference Requiring Submittal [1]
Arch Culvert Falsework	5	0	Plan Note, SN Sheet & "Falsework and Formwork"
Box Culvert Falsework [7]	5	0	Plan Note, SN Sheet & 'Falsework and Formwork"
Cofferdams	6	2	Article 4 10-4
Foam Joint Seals [6]	9	0	"Foam 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"

Project Special Provisions: Structures 228 Revised 7-11-13

Project Number: P-5208G Mecklenburg County

Expansion Joint Seals (strip seals)	9	0	"Strip Seals"
Falsework & Forms[2] (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
Metalwork for Elastomeric Bearings [4, 5]	7	0	Article 1072-8
Miscellaneous Metalwork [4, 5]	7	0	Article 1072-8
Optional Disc Bearings 4	8	0	"Optional Disc Bearings"
Overhead and Digital Message Signs (DMS) (metalwork and foundations)	13	0	Applicable Provisions
Placement of Equipment on Structures (cranes, etc.)	7	0	Article 420-20
Pot Bearings [4]	8	0	"Pot Bearings"
Precast Concrete Box Culverts	2, then 1 reproducible	0	"Optional Precast Reinforced Concrete Box Culvert at Station ____"
Prestressed Concrete Cored Slab (detensioning sequences) [3]	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 (precast items)	10	0	Article 1077-2 & "Sound Barrier Wall"
Sound Barrier Wall Steel Fabrication Plans [5]	7	0	Article 1072-8 & "Sound Barrier Wall"
Structural Steel [4]	2, then 7	0	Article 1072-8
Temporary Detour Structures	10	2	Article 400-3 & "Construction, Maintenance and Removal of Temporary Structure at Station _____"
TFE Expansion Bearings[4]	8	0	Article 1072-8

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. 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 1072-8 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 ofthe referenced provision.
7. Submittals are necessary only when the top slab thickness is 18" or greater.

Project Special Provisions: Structures 230

Project Number: P-5208G Mecklenburg County

GEOTECHNICAL SUBMITTALS

Submittal	Copies Required by Geotechnical Engineering Unit	Copies Required by Structure Design Unit	Contract Reference Requiring Submittal [1]
Drilled Pier Construction Plans [2]	1	0	Subarticle 411-3(A)
Crosshole Sonic Logging (CSL) Reports [2]	1	0	Subarticle 411 -5(A)(2)
Pile Driving Equipment Data Forms [2,3]	1	0	Subarticle 450-3(D)(2)
Pile Driving Analyzer (PDA) Reports [2]	1	0	Subarticle 450-3(F)(3)
Retaining Walls [4]	8 drawings, 2 calculations	2 drawings	Applicable Provisions
Temporary Shoring [4]	5 drawings, 2 calculations	2 drawings	"Temporary Shoring" & "Temporary Soil Nail Walls"

FOOTNOTES

1. References are provided to help locate the part ofthe contract where the submittals are required. References in quotes refer to the provision by that name. Subarticles refer to the Standard Specifications.
2. Submit one hard copy ofsubmittal 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. The Pile Driving Equipment Data Form is available from: www.ncdot.org/doh/preconstruct/highway/geotech/formdet/See second page of form for submittal instructions.
4. Electronic copy of submittal is required. See referenced provision.

Project Number: P-5208G Mecklenburg County

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 ofthe 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 concems.

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 Inspection: 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 NCCCO (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.

Project Number: P-5208G Mecklenburg County

GROUT FOR STRUCTURE (9-30-11)

DESCRIPTION

This special provision addresses grout for use in pile blockouts, grout pockets, shear keys, dowel holes and recesses for structures. This provision does not apply to grout placed in post-tensioning ducts for bridge beams, girders, or decks. Mix and place grout in accordance with the manufacturer's recommendations, the applicable sections of the Standard Specifications and this provision.

MATERIAL REQUIREMENTS

Use a Department approved pre-packaged, non-shrink, non-metallic grout. Contact the Materials and Tests Unit for a list of approved pre-packaged grouts and consult the manufacturer to determine if the pre-packaged grout selected is suitable for the required application.

When using an approved pre-packaged grout, a grout mix design submittal is not required.

The grout shall be free of soluble chlorides and contain less than one percent soluble sulfate.
Supply water in compliance with Article 1024-4 of the Standard Specifications.

Aggregate may be added to the mix only where recommended or permitted by the manufacturer and Engineer. The quantity and gradation of the aggregate shall be in accordance with the manufacturer's recommendations.

Admixtures, if approved by the Department, shall be used in accordance with the manufacturer's recommendations. The manufacture date shall be clearly stamped on each container. Admixtures with an expired shelf life shall not be used.

The Engineer reserves the right to reject material based on unsatisfactory performance.
Initial setting time shall not be less than 10 minutes when tested in accordance with ASTM C266.

Test the expansion and shrinkage of the grout in accordance with ASTM C1090. The grout shall expand no more than 0.2% and shall exhibit no shrinkage. Furnish a Type 4 material certification showing results of tests conducted to determine the properties listed in the Standard Specifications and to assure the material is non-shrink.

Unless required elsewhere in the contract the compressive strength at 3 days shall be at least 5000 psi. Compressive strength in the laboratory shall be determined in accordance with ASTM C109 except the test mix shall contain only water and the dry manufactured material.
Compressive strength in the field will be determined by molding and testing 4" x 8" cylinders in accordance with AASHTO T22. Construction loading and traffic loading shall not be allowed until the 3 day compressive strength is achieved.

When tested in accordance with ASTM C666, Procedure A, the durability factor of the grout shall not be less than 80.

SAMPLING AND PLACEMENT

Place and maintain components in final position until grout placement is complete and accepted. Concrete surfaces to receive grout shall be free of defective concrete, laitance, oil, grease and other foreign matter. Saturate concrete surfaces with clean water and remove excess water prior to placing grout.

Do not place grout if the grout temperature is less than 50°F or more than 90°F or if the air temperature measured at the location of the grouting operation in the shade away from artificial heat is below 45°F.

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. Use grout free of any lumps and undispersed cement. Agitate grout continuously before placement.

Control grout delivery so the interval between placing batches in the same component does not exceed 20 minutes.

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 3 cube or 2 cylinder specimens at 28 days.

BASIS OF PAYMENT

No separate payment will be made for "Grout for Structures". The cost of the material, equipment, labor, placement, and any incidentals necessary to complete the work shall be considered incidental to the structure item requiring grout.

FABRICATION OF STRUCTURAL STEEL (SPECIAL)

A. These specifications cover the furnishing, fabricating, preparing, assembling, welding, testing, painting and delivering of all structural steel and bridge bearings as shown on the plans.

B The following specifications are referred to in this document. The term current shall indicate the edition listed below:

1. American Railway Engineering and Maintenance of Way Association (AREMA) Manual for Railway Engineering (Manual)
2. American Society for Testing and Materials, Annual Book of Standards - dated 1990 (A.S.T.M.)

3. American Institute of Steel Construction, Manual of Steel Construction - Ninth Edition (A.I.S.C.)
4. American Welding Society - Bridge Welding Code, D1.5, dated 1995 (A.W.S.)

C. Fabricator shall be certified for "Major Steel Bridges" Category Cbr (Old III), under the AISC Quality Certification Program.

D. Except as otherwise specified hereinafter, the current American Railway Engineering and Maintenance of Way Association (AREMA) Manual for Railway Engineering (Manual), Chapter 15 - Steel Structures, apply to all work.

E. Materials

1. Structural steel shall meet the current requirements of the Specifications of the American Society for Testing and Materials, for Structural Steel, Designation A-709, Grade 50, S84-F2 (Fracture Critical - Charpy Test Zone 2), S91 (Fine Austentic Grain Size), S93 (Limitation on Weld Repairs), except as noted on the plans or in these specifications.
2. High strength bolts shall meet the current requirements of the Specifications of the American Society for Testing and Materials for High Strength Bolts for Structural Steel Joints, Designation A-325, unless otherwise indicated.
3. Welding electrodes for arc welding shall meet the current requirements of the Specifications for mild steel arc-welding electrodes Series E70, AWS 5.1, Low Hydrogen Classification for SMAW and AWS 5.17 for SAW.

F. Shop Drawings

1. The Fabricator's attention is called to the requirements for shop drawings, Chapter 15, Article 1.1.3 Shop Drawings, AREMA Specifications.
2. The Fabricator shall furnish eight (8) complete sets of detailed shop drawings to the Department for approval prior to starting fabrication. Unchecked drawings shall not be submitted for approval.
3. The rejection of shop drawings or the procedure for the correction of shop drawings will not be considered as cause for delay.
4. Approval by the Engineer of shop drawings shall not relieve the Fabricator from furnishing material of proper dimensions, quantities and quality, nor will such approval relieve the Fabricator from responsibility for errors of any sort in the shop drawings.
5. Copies of approved shop drawings shall be furnished to the Department for distribution.

G. Welding Inspection by Company:

1. The Company may arrange for additional inspection by an independent inspection firm under a separate contract. This will be in addition to the Fabricator's Quality Assurance Program.

2. The Fabricator shall notify the Company and the Company's inspector of the scheduled date for beginning fabrication and shall not begin fabrication until the Company's inspector is present.
3. The Contractor shall retain and pay for an Independent Testing Agency to perform the following weld inspection:
   a. Inspection shall verify that welds meet the quality requirements of American Welding Society (A.W.S.) Structural Welding Code, D1.1, dated 1985.
   b. Welds shall be inspected visually and by use of nondestructive testing.
   c. All nondestructive testing shall be performed by the Independent Testing Agency.
   d. The Independent Testing Agency shall furnish copies of all nondestructive weld testing reports.
   e. Nondestructive Testing:
      All welds shall be visually inspected.
      100 percent of all flange to web fillet welds shall be magnetic particle tested and ultrasonically tested.
      100 percent of all transverse stiffener welds (bearing and intermediate) shall be magnetic particle tested.
      25 percent of other fillet welds shall be magnetic particle tested.
   f. The Contractor shall submit the name and address of the Independent Testing Agency and evidence of AWS certification of welding inspectors to the Company for approval prior to the weld inspection. The Contractor shall submit test reports.

H. Welding Inspection by the Department

The Fabricator shall notify the Department and the Department's inspector ofthe schedule date for beginning fabrication and shall not begin fabrication until the Department's inspector is present.

Welding Inspection shall be in accordance with the above-mentioned AREM`A specifications. In addition to the weld inspection required by the AREMA specifications, the following weld inspection shall be made:

The top and bottom flange-to-web welds shall be tested on both sides by the ultrasonic and magnetic particle method as follows:

(a) Along top flange within 15 feet length end of girder: 1 foot of every 3 feet of weld length.

(b) Along the top flange for remainder length of girder: 1 foot of every 8 feet of weld.

(c) The bottom flange-to-web welds: full length of each girder.

Groove welds in top and bottom flanges shall be 100% radiographic tested and 100% ultrasonic tested. Twenty-five percent (25%) of all other groove welds shall be tested by radiographic or ultrasonic testing. Ten percent (10%) of all fillet welds shall be tested by ultrasonic or magnetic particle testing. Any single weld having unacceptable deficiencies shall be 100% tested. If more than 10% of the tested groove or fillet welds have unacceptable deficiencies, then all groove or fillet welds, whichever is deficient, shall be 100% tested.

Magnetic particle, radiographic, and ultrasonic procedure, technique, and standard of acceptance shall be in accordance with Section 6 of the current AWS Structural Welding Code.

The Contractor shall require the Fabricator to make provision for convenient access to the joints to be inspected and cooperate with the Inspector in doing the required work. The inspection equipment and supplies will be furnished by the Inspector and payment for the work will be handled between the Department of Transportation and the Inspector except in the event corrections are necessary as the result of such inspection, the cost of any additional inspection of the joints must be borne by the Contractor, and he will be required to pay the Inspector directly for this portion of the work. Except for the cost of the first inspection as specified above, the entire cost of the first inspection as specified above, the entire cost of any nature resulting from the required magnetic particle, radiographic or ultrasonic inspection shall be included in the lump sum contract price for structural steel.

I. Paint

All steel preparation and shop painting shall be in accordance with the Special Provision for PAINTING OF STRUCTURAL STEEL.

J. Measurement and Payment

Payment will be made at the contract lump sum price for the bid item for "Approx. 901,110 lbs. of Structural Steel" and shall constitute full payment for all costs of plant, superintendence, labor, material, and equipment necessary to furnish, fabricate, shop paint, shop assemble and deliver, all the structural steel required for the project in accordance with the Plans and Specifications, including furnishing the fixed bearing assemblies and anchor bolts.

PROTECTION OF PAINTED STEEL (SPECIAL)

The painted structural steel shall be protected during concreting operations. Any concrete that gets on the painted steel is to be removed as soon as possible by a method approved by the Engineer to restore the surface to the specified condition.

Project Special Provisions: Structures 237

Project Number: P-5208G Mecklenburg County

Norfolk Southern Specification for PAINTING OF STRUCTURAL STEEL (Special)

Dated : February 8, 2002

I. General

A. Plans and Specifications

1. This work consists of furnishing all labor, material, plant and equipment, and performing all operations in connection with Shop Painting (prime coat, wash coat, and Finish coat applied in the fabricators plant or unless otherwise specified by the Railway). All painting shall be in accordance with AREMA Specifications, Chapter 15 - Section 3.4, and recommendations of the Society of Protective Coatings Specifications with the following specific requirements.
2. The paint thickness will be measured according to "SSPC-PA2" Method for Measurement of Dry Paint Thickness with Magnetic Gages.

B. Surface Preparation

1 The surface preparation shall be in accordance with Steel Structures Painting Council Specifications SP 10 (NEAR WHITE BLAST) latest revision and Visual Standard NACE No. 2 average surface profile to be 2 mils.
2. Application - The paint shall be applied in accordance with SSPC Specifications for Paint Application - PA1.
3. The Prime Coat shall be applied in the shop promptly after blast cleaning, but in no case shall the prime coat be applied more than 8 hours after blast cleaning or after visible or detrimental rusting occurs.
4. Steel shall be cleaned by washing, or other mechanical means to remove all residue (loose zinc dust and foreign matter) prior to applying Wash and Finish Coat.
5. Surfaces damaged during shipment and handling shall be repaired using the same paint system as applied in the shop except that the Prime coat shall be repaired using an Organic Zinc Primer when the Primer Coat is repaired in the field.

C. Welded Areas and Faying (Contact) Surfaces

1. No paint shall be applied to areas to be welded in the field. No Vinyl paint (wash or Finish coat) shall be applied to any Faying surfaces.

II. Painting Requirements

A. Paint System

1. The fabricator will be given the option of using one of the following paint systems (Prime Coat, Intermediate and Finish Coats shall be applied in the fabricator's plant unless otherwise specified by the Railway). If the Intermediate Coat and Top Coat are applied in the field, the steel shall be solvent wiped to removed all grease and oil and a "High Pressure Power

Washing" with clean water (3500p.s.i. minimum) shall be used to clean all mud and dirt off prior to applying the touch-up

Primer or Intermediate and Finish Coats. The fabricator shall supply sufficient quantities of touch-up Organic Zinc-Rich Primer, Intermediate Coat, Finish Coat and Thinner. The Chief Engineer Bridges and Structures is to be notified of the fabricator's choice. Priming ofthe contact surfaces with Inorganic Zinc-Rich primer is required.

2. If approved, or further specified by the Railway, the Wash Coat and Finish Coat shall be applied in the shop.
3. DFT denotes Dry Film Thickness in all system information listings hereinafter.
4. Provide a STRIPE COAT in accordance with NCDOT Standards Section 442-7, system 3.

B. System #1 (Elite)

Prime Coat: Elite 1312 Inorganic Zinc Rich Primer applied at 4.0 - 5.0 mils DFT.
Intermediate Coat - Elite 156 Exterior Acrylic Latex (White) applied at 3.0 - 4.0 mils DFT.
Finish Coat - Elite 156 Exterior Acrylic Latex (gray) applied at 3.0 - 4.0 mils DFT.
Touch Up Primer - Elite 305 Organic Zinc-Rich Primer applied at 4.0 - 5.0 mils DFT.
Suggested Supplier: Elite Coatings Company, Inc.
P. O. Box 130
Gordon, GA 3103 1
Telephone: 912/628-21 1 1

C. System #2 (Devoe)

Prime Coat: Catha-Coat 301 Inorganic Zinc-Rich Primer applied at 4.0 - 5 .0 mils DFT.
Intermediate Coat: DEVRAN 646 Water Based Epoxy primer (White) applied at 3.0 - 4.0 mils DFT.
Prime Coat: DEVFLEX 604-S-9903 Water Based Gloss Enamel (Gray) applied at 3.0 - 4.0 mils DFT.
Touch Up Primer - Cata-Coat 303H Organic Zinc-Rich Epoxy applied at 4.0 - 5.0 mils DFT.
Suggested Supplier: Devoe Coatings Company
320 Westbrook Drive
Butler, PA 16001
Telephone: 724/283-1471
Attn. : Gary M. Mato

D. System #3 (Sherwin-Williams)

Prime Coat: ZINC CLAD II HS - (B69VZl B69VZ3 B69D1l) Inorganic Zinc-Rich Primer applied at 4.0 - 5.0 mils DFT.
Intermediate Coat - B66 Series DTM ACRYLIC GLOSS (White) applied at 3.0 - 4.0 mils DFT.
Finish Coat - B66 Series DTM ACRYLIC GLOSS (Gray) applied at 3.0 - 4.0 mils

DFT.
Touch Up Primer - ZINC-CLAD IV - (B69 A8/B69 V8) applied at 4.0 - 5.0 mils DFT.
Suggested Suplier: The Sherwin-Williams Company
765 North Avenue NE
Atlanta, GA 30306
Telephone: 404/873-6723

E. System #4 (Ameron)
Prime Coat: Amercoat 21-5 Inorganic Zinc-Rich primer applied at 4.0 - 5.0 mils DFT.
Intermediate Coat - Amercoat 148 Waterbome Acrylic primer applied at 3.0 - 4.0 mils DFT.
Finish Coat - Amercoat 220 Waterbome Acrylic (Gray) applied at 3.0 - 4.0 mils DFT.
Touch Up Primer - Amercoat 68HS Zinc-Rich Primer applied at 4.0 - 5.0 mils DFT
Suggested Supplier: Ameron Protective Coatings Division
11605 Vimy Ridge Road
Little Rock, AR 72209
Telephone: 800/283-6627

F. Post-Painting Requirements
1. Steel shall be cleaned by washing, or other mechanical means to remove all residue (loose zinc dust and foreign matter) prior to applying Wash and Top Coat. An "M. E. K. Rub Test" shall be used to assure proper cure of the inorganic zinc primer prior to applying the next coat.
2. The Intermediate Coat may have to be thinned to prevent gassing.

III. Painting Materials Requirements

A. Packaging and Shipping
1. All paint shall be received at the point of use in original containers and carefully stored. All paint to be used shall be freshly mixed and shall be ordered only a sufficient length oftime in advance ofits use to insure an adequate supply being on hand at all times so as not to delay the work.
2. Paint shipped to the job shall arrive in sealed containers clearly marked with the type ofpaint and specifications controlling its manufacture.
3. There shall be no modification of the paint except upon, and in accordance with, express written stipulation by an authorized representative ofthe paint manufacturer and with specific approval ofthe Engineer.

B. Storage
Paint in storage at the shop or in the field shall have the position of the containers reversed at least once a week to prevent settlement and separation of the pigment from the vehicle. There shall be suitable devices maintained at the point of storage and used for agitation and thorough mixing ofthe paint prior to its use on this work.

C. Sample Panel

If directed by the Engineer, a sample panel shall be made up. The panel shall be used as a basis of comparison of the work on this contract. The panel shall be of size designated by the Engineer and shall be prepared and painted in all respects in the same manner as the work will be done.

IV. Workmanship

A. Weather Conditions

Paint shall not be applied when the temperature of the air is less than 40 degrees F., when the surface of the metal is not dry, the relative humidity is above 85%, or when, in the opinion ofthe Engineer, conditions are otherwise unsatisfactory for such work. Paint shall not be applied upon damp, or frosted surfaces. Material painted under cover in damp or cold weather shall remain under cover until dry or until weather conditions permit its exposure in the open. Painting shall not be done when the metal is hot enough to cause the paint to blister and produce a porous paint film.

B. Application

1. Paint shall be applied in accordance with SSPC Specifications for Paint Application - PA1 and in accordance with manufacturer's recommendation.
2. All blast cleaned steel surfaces shall be primed before completion of the work day.
3. Steel shall be cleaned by washing, brushing or other mechanical means of all residue (loose foreign matter) prior to applying the finish coat.

C. Removal Of Unsatisfactory Paint

If the Prime Coat "mud- cracks," the Finish Coat wrinkles or shows evidence of having been applied under unfavorable conditions or if the workmanship is poor, the Engineer may order it removed and the metal thoroughly cleaned and repainted. Any "Blushing" of the Finish Coat shall be corrected by solvent wiping and/or re-coating before final acceptance by the Company.

D. Thinning

No thinner shall be used ifthe paint can be applied in a neat workmanlike manner without thinning. If the paint is too thick to spray, only the manufacturer's specified thinner (in hot weather vinyl paint shall be thinned with M.I.B.K. to reduce the chances of "Blushing" occurring) may be added to the paint up to 25% by volume or as otherwise specified by the manufacturer. Thinning shall not relieve the contractor from applying the specified coating D.F.T.

E. Paint Touch-Up

Alter erection, all damaged areas shall be cleaned of mud and dirt by High Pressure Power Washing with clean water (3500 p.s.i. minimum); grease, and oil by solvent wiping; and rusted areas shall be cleaned by sand blasting orpower tool cleaning with non-woven abrasives prior to touch-up or Finish coating. The paint used for touch-up shall be the same system used in the shop. The Contractor and/or Fabricator shall be

responsible for cleaning all damaged surfaces and applying all field touch-up coatings in accordance with all manufacturer's recommendations. The Zinc Primer shall be touched up with only Organic Zinc Primer when applied in the field.

F. Warranty
The Fabricator and or Contractor will be required to guarantee his work against defective workmanship or the use of defective materials for a period of one (1) year from the completion ofthe contract.

G. Handling Shop Primed Steel
Only Nylon web slings or padded lifting points shall be used to move shop primed steel to prevent damage to the coating.

V. Enviromnental Protection Requirements

A. Air Quality Requirements
Abrasive blasting operations shall be conducted in full compliance with all current National primary and secondary ambient air quality standards 40 CFR 50, (for Particulate matter - 40 CFR 50.6; Lead - 40 CFR 50.12; and nuisance dust). Abrasive blasting operations shall also be compliant with any and all local and state air quality requirements.

VI. Environmental Protection Statement
"All collection, containment, disposal and transportation for disposal must be compliant with all applicable State, Federal and Local air pollution, water pollution, solid waste and hazardous waste regulations, ordinances or statutes."

VII. Measurement and Payment
All work covered by this provision, except for shop painting, will be paid for at the contract lump sum price for "Painting Structural Steel".
Payment at the contract lump sum price for "Approx. 901,110 lbs. of Structural Steel" will be full compensation for the work of shop painting.
The above prices and payments will be full compensation for all work including but not limited to furnishing all paint, cleaning abrasives, cleaning solvents, and all other materials; protecting the work; protecting traffic and property; preparing and cleaning surfaces to be painted; applying paint in the shop and field; and furnishing blast cleaning equipment, paint spraying equipment, brushes, rollers, and any other hand or power tools, and any other equipment.

Project Special Provisions: Structures 242

Project Number: P-5208G Mecklenburg County

Norfolk Southern Specification for STRUCTURAL STEEL (Special)

I. STRUCTURAL STEEL

A. Scope

These specifications shall cover the furnishing, fabrication, preparation, assembly, welding, painting, and erection of all structural steel shown on the plans.

B. General Specifications

Except as otherwise specified hereinafter, the current AREMA Specification, Chapter 15, Steel Structures, apply to all work.

C. Structural Steel

1. Fracture Critical Members

   a. All fracture critical members are identified on the plans.

   b. All fracture critical members will be fabricated in accordance with the Fracture Control Plan stated in the AREMA Specifications, Chapter 15, Section 1.14.

   c. Fabricator shall be certified under the AISC Quality Certification

   Program as follows:

   Welded Plate Girders, Category III
   Rolled Beam Bridges, Category I.

   d. Structural Steel shall meet the current requirements of the A.S.T.M. Specifications for Structural Steel, Designation A-709, Grade 50, (345) S84-F2, 891, S93.

S84-F2	(Fracture Critical - Charpy Test Zone 2)
S91	(Fine Austenitic Grain Size)
S93	(Limitation on Weld Repairs)

   Except as noted in the AREMA Fracture Control Plans.

2. Non-Fracture Critical Members

   a. All primary members or components requiring improved notch toughness are identified on the plans.

   b. Fabricator shall be certified under the AISC Quality Certification

Program as follows:

Welded Plate Girders	Category III
Rolled Beam Bridges	Category I

c. Structural steel shapes and plates used as primary members or components shall meet the current requirements of the A.S.T.M. Specifications for Structural Steel, Designation A-709, Grade 50, (345) S83-T2, S91.

S83-T2 (Non-Fracture Critical - Charpy Test Zone 2)

S91 (Fine Austenitic Grain Size)

3. Other Structural Steel

a. It is preferred that the Fabricator be certified under the AISC Quality Certification Program, Category I.

b. All structural steel shall meet the current requirements of the Specification for A.S.T.M. A-709, Grade 50, unless specified otherwise in these specifications or on the plans.

D. Other Materials

1. High strength bolts shall meet the current requirements of the A.S.T.M. Specifications for High Strength Bolts for Structural Steel Joints, Designation A 325-97.

2. Anchor bolts shall be threaded rods with heavy hex nut meeting the current requirements of ASTM specification for fasteners, Designation A-307-97.

3. Welding electrodes for arc welding shall meet the current requirements of the Specifications for mild steel arc-welding electrodes Series E70, AWS 5.1, Low Hydrogen Classification for SMAW and AWS 5.17 for SAW.

4. Preformed fabric bearing pads shall be Shock Pad Style No. 15175 as manufactured by Alert Manufacturing and Supply Company, Chicago, Illinois, or FABREEKA Pads as manufactured by Fabreeka Products Company, 1190 Adams Street, Boston, Massachusetts, or SORBTEX Pads as manufactured by Voss Engineering, Inc., Chicago, Illinois, or approved equal.

E. Welding Processes

Only submerged arc welding (SAW) or shielded metal arc welding (SMAW) may be used. No other process will be allowed.

F. Bolted Connections

Permanent bolted connections using High Strength Bolts shall be installed and tightened using the Turn-of-the-Nut Method.

G. Paint

All steel preparation and painting shall be in accordance with Norfolk Southern

Corporation Paint Specifications.

H. Shop Drawings

1. The Contractor's attention is called to the requirements for shop drawings, Chapter 15, Article 1.1.2 Shop Drawings, AREMA Specifications.

2. The Contractor shall furnish three (3) complete sets of detailed shop drawings to the Company for approval prior to starting fabrication. Unchecked drawings shall not be submitted for approval. After approval of shop drawings, the Contractor shall supply the Company with one set of reproducibles of the approved drawings.

3. The rejection of or the procedure for the correction of shop drawings will not be considered as cause for delay.

4. Approval by the Engineer of the shop drawings shall not relieve the Contractor from furnishing material of proper dimensions, quantity, and quality, nor will such approval relieve the Contractor from the responsibility for errors of any sort in the shop drawings.

5. Original drawings or photographic reproducibles on mylar, or equivalent film, shall be furnished at the completion of the Contract in accordance with Chapter 15, Article 1.1.3, AREMA specifications. Reproducibles made by the diazo process are not acceptable.

   The plans shall be sent to:
   Chief Engineer - Bridges & Structures
   Norfolk Southern Corporation
   99 Spring Street, SW
   Atlanta, GA 30303

I. SHOP INSPECTION & TESTING

1. The Company may arrange for inspection by an independent inspection firm under a separate contract. This inspection will be in addition to the Fabricator's Quality Control Program.

2. The Fabricator shall notify the Company and it's inspector of the scheduled date for beginning fabrication and shall not begin fabrication until the Company's Inspector is present.

3. The Fabricator shall furnish copies of certified mill inspection reports to the Company for all structural steel requiring improved notch toughness.

4. The Fabricator shall meet the requirements of the AREMA Fracture Control Plan described in Chapter 15, Section 1.14 for all members and components designated as fracture critical.

5. Welding inspection shall verify that all welds and welding procedures meet the requirements of the American Welding Society (A.W.S.) Bridge Welding Code, D1.5, dated 2002.

6. All welds shall be inspected visually and by use of nondestructive testing. All nondestructive testing shall be performed by the Fabricator and witnessed by the Company's Inspector.

7. Witnessing of weld inspection shall be done in a timely manner without disruption of normal shop operations. Copies of all weld inspections and nondestructive testing reports shall be furnished to the Company.

8. The Fabricator shall perform the following weld inspection and testing:

   a. All transverse tension groove welds in FCM members, when allowed by the Engineer, shall be RT and UT tested 100%. In non- FCM components of FCM's all transverse groove welds shall be RT or UT tested 100%.

   b. All flange to web welds shall be tested on both sides as follows:

      1. Top flange to web welds will be UT tested 100% over 10% of the length from each end and the remaining length of weld will be UT tested 10%.

      2. Bottom flange to web welds will be UT tested 100%.

   c. All flange to web fillet welds, when allowed by the Engineer, are to be magnetic particle tested 100%.

   d. Ten percent (10%) of all welds not mentioned above shall be magnetic particle tested.

SOLDIER PILE RETAINING WALLS (Special)

1.1 General

Construct soldier pile retaining walls consisting of drilled-in steel H-piles with precast concrete panels in between piles. Timber lagging is to be used for temporary support of excavations during construction. Provide cast-in-place reinforced concrete coping as required. Construct soldier pile retaining walls based on actual elevations and wall dimensions in accordance with the contract plans and accepted submittals. Use a prequalified Cantilever Wall Contractor to construct soldier pile retaining walls. Define "soldier pile wall" as a soldier pile retaining wall. Define "panel" as a precast concrete panel. Define "pile" as a steel H-pile and "coping" as cast-in-place concrete coping.

1.2 Materials

Refer to the *Standard Specifications*.

Item	Section
Anchor Pins	1056-2
Curing Agents	1026
Flowable Fill, Excavatable	1000-6
Geosynthetics	1056
Joint Materials	1028
Masonry	1040
Neat Cement Grout, Nonshrink	1003
Portland Cement Concrete	1000
Reinforcing Steel	1070
Retaining Wall Panels	1077
Select Material, Class VI	1016
Shoulder Drain Materials	816-2
Steel H-Piles	1084-1
Untreated Timber	1082-2
Welded Stud Shear Connectors	1072-6
Wire Staples	1060-8(D)

Provide Type 2 geotextile for separation geotextiles and Class VI select material (standard size No. 57 stone) for leveling pads and backfilling. Use Class A concrete for concrete facing and coping and Class A concrete that meets Article 450-2 of the *Standard Specifications* for drilled-in piles. Use untreated timber with a thickness of at least 3" and a service bending stress of at least 1,200 psi for timber lagging.

Unless required otherwise in the contract, produce panels with a smooth flat final finish that meets Article 1077-11 of the *Standard Specifications*. When noted in the plans, produce panels with an exposed aggregate finish that meets Article 1077-12 of the *Standard Specifications*. Produce panels within 1/4" of the panel dimensions shown in the accepted submittals. Damaged panels with excessive discoloration, chips or cracks as determined by the Engineer will be rejected.

For soldier pile walls with panels, galvanize piles in accordance with Section 1076 of the *Standard Specifications*. When noted in the plans, paint galvanized piles in accordance with Article 442-12 of the *Standard Specifications*. Apply the following system to paint galvanized piles gray with waterborne paints that meet Article 1080-11 of the *Standard Specifications*. For painting galvanized piles other colors, contact the Materials and Tests (M&T) Unit for an appropriate paint system.

GRAY PAINT SYSTEM FOR GALVANIZED PILES			
Coat	**Color**	**Dry/Wet Film Thickness (Mils)**	
		Min.	**Max.**
Intermediate	Brown	3.0 DFT	5.0 DFT
Stripe	White	4.0 WFT	7.0 WFT
Topcoat	Gray	2.0 DFT	4.0 DFT
Total		5.0 DFT	9.0 DFT

Store steel materials on blocking at least 12" above the ground and protect it at all times from damage; and when placing in the work make sure it is free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign materials. Load, transport, unload and store soldier pile wall materials so materials are kept clean and free of damage.

1.3 Preconstruction Requirements

A. Soldier Pile Wall Surveys

The Retaining Wall Plans show a plan view, typical sections, details, notes and an elevation or profile view (wall envelope) for each soldier pile wall. Before beginning soldier pile wall design, survey existing ground elevations shown in the plans and other elevations in the vicinity of soldier pile wall locations as needed. Based on these elevations, finished grades and actual soldier pile wall dimensions and details, submit revised wall envelopes for acceptance. Use accepted wall envelopes for construction.

B. Alternate Soldier Pile Wall Designs

The Contractor has the option to submit an alternate soldier pile wall design. Submit 11 copies of working drawings and 3 copies of design calculations and a PDF copy of each for soldier pile wall designs at least 30 days before the preconstruction meeting. Do not begin soldier pile wall construction until a design submittal is accepted.

Use a prequalified Cantilever Wall Design Consultant to design soldier pile walls. Provide designs sealed by a Design Engineer approved as a Geotechnical Engineer (key person) for the Cantilever Wall Design Consultant.

Design soldier pile walls in accordance with the plans and Article 11.8 of the AASHTO LRFD Bridge Design Specifications unless otherwise required. Design soldier pile walls for seismic if walls are located in seismic zone 2 based on Figure 2-1 of the Structure Design Manual. Design soldier pile walls for a maximum deflection of 2" or 1.5% of H, whichever is less, with H as shown in the plans. Design soldier pile walls for a live load (traffic) surcharge of 250 lb/sf in accordance with Article 11.5.5 of the AASHTO LRFD specifications. For steel beam guardrail with 8 ft posts above soldier pile walls, analyze walls for a horizontal load (PH1) of 300 lb/ft of wall in accordance with Figure 3.11.6.3-2(a) of the AASHTO LRFD specifications. For concrete barrier rail above soldier pile walls, analyze walls for a PH1 of 500 lb/ft of wall in accordance with Figure 3.11.6.3-2(a).

Use a maximum H-pile spacing of 10 ft. At the Contractor's option, use driven or drilled-in piles for soldier pile walls with concrete facing unless otherwise required. For soldier pile walls with panels, use drilled-in piles unless noted otherwise in the plans. Use concrete or grout for embedded portions of drilled-in piles unless required otherwise in the plans. Install drilled-in piles by excavating holes with diameters that will result in at least 3" of clearance all around piles.

At the Contractor's option, use panels or concrete facing unless required otherwise in the plans. Design panels and concrete facing in accordance with the plans and Section 5 of the AASHTO LRFD Bridge Design Specifications. Provide reinforcing steel of sufficient density to satisfy Article 5.7.3.4 of the AASHTO LRFD specifications. Attach concrete facing to front of H-piles with welded stud shear connectors. Use panels or concrete facing at least 6" thick and extend facing at least 6" above where the grade intersects back of concrete facing unless required otherwise in the plans.

Submit working drawings and design calculations for acceptance in accordance with Article 105-2 of the Standard Specifications. Submit working drawings showing plan views, wall profiles with pile locations, typical sections and details of piles, drainage, temporary support, leveling pads, panels and concrete facing. If necessary, include details on working drawings for coping, concrete barrier rail with moment slab and obstructions extending through walls or interfering with piles, barriers or moment slabs. Submit design calculations including deflection calculations for each wall section with different surcharge loads, geometry or material parameters. Include analysis of temporary conditions in design calculations. When designing soldier pile walls with computer software, a hand calculation is required for the tallest wall section.

C. Other Preconstruction Requirements

Provide temporary support of excavations for excavations more than 4 ft deep and timber lagging in accordance with the AASHTO Guide Design Specifications for Bridge Temporary Works. At the Contractor's option and when noted in the plans, provide temporary slopes instead of temporary support of excavations. Do not extend temporary slopes outside right-of-way or easement limits. Except for fill sections or when using temporary slopes, backfill voids behind panels, lagging and piles with No. 57 stone. Place separation geotextile between No. 57 stone and overlying fill or pavement sections except when concrete pavement, full depth asphalt or cement treated base is placed directly on stone.

Use No. 57 stone for aggregate leveling pads. Use 6" thick leveling pads beneath panels and concrete facing. Unless required otherwise in the plans, embed top of leveling pads at least 12" below finished grade shown in the plans.

Provide wall drainage systems consisting of geocomposite drain strips, drains and outlet components. Place drain strips with a horizontal spacing of no more than 10 ft and center strips between adjacent piles. Attach drain strips to front of timber lagging or back of panels or concrete facing and connect strips to leveling pads. Locate a continuous aggregate shoulder drain along the base of panels or concrete facing in front of piles and leveling pads. Provide drains and outlet components in accordance with Standard Drawing No. 816.02 of the Roadway Standard Drawings.

Unless required otherwise in the plans, use cast-in-place reinforced concrete coping at top of soldier pile walls with panels. Extend coping at least 6" above where the grade intersects back of coping unless required otherwise in the plans. Use coping dimensions shown in the plans. At the Contractor's option, connect coping to panels with dowels or extend coping down back of panels. When concrete barrier rail is required above soldier pile walls, use concrete barrier rail with moment slab as shown in the plans.

D. Soldier Pile Wall Construction Plan

Submit 4 copies and a PDF copy of a soldier pile wall construction plan at least 30 days before the preconstruction meeting. Do not begin soldier pile wall construction until the construction plan submittal is accepted. Provide project specific information in the soldier pile wall construction plan including a detailed construction sequence. For driven piles, submit proposed pile driving methods and equipment in accordance with Subarticle 450-3(D)(2) of the Standard Specifications. For drilled-in piles, submit installation details including drilling equipment and methods for stabilizing and filling holes. Provide details in the construction plan of excavations including temporary support and any other information shown in the plans or requested by the Engineer.

If alternate construction procedures are proposed or necessary, a revised soldier pile wall construction plan submittal may be required. If the work deviates from the accepted submittal without prior approval, the Engineer may suspend soldier pile wall construction until a revised plan is accepted.

E. Preconstruction Meeting

Before starting soldier pile wall construction, hold a preconstruction meeting to discuss the construction and inspection of the soldier pile walls. Schedule this meeting after all soldier pile wall submittals have been accepted. The Resident or Bridge Maintenance Engineer, Bridge Construction Engineer, Geotechnical Operations Engineer, Contractor and Cantilever Wall Contractor Superintendent will attend this preconstruction meeting.

1.4 Construction Methods

Control drainage during construction in the vicinity of soldier pile walls. Direct run off away from soldier pile walls and areas above and behind walls. Contain and maintain No. 57 stone and backfill and protect material from erosion.

Notify the Engineer before blasting in the vicinity of soldier pile walls. Perform blasting in accordance with the contract. Unless required otherwise in the plans, install foundations located behind soldier pile walls before beginning wall construction if the horizontal distance to the closest foundation is less than the height of the tallest wall section.

Install soldier pile walls in accordance with the accepted submittals and as directed. Do not excavate behind soldier pile walls unless a temporary slope is shown in the accepted submittals. If overexcavation occurs and is not approved, repair walls with an approved method and a revised soldier pile wall design or construction plan may be required.

A. Piles

If a temporary slope is shown in the accepted submittals, excavate the slope before installing piles. Otherwise, install piles before excavating for soldier pile walls. Weld stud shear connectors to piles in accordance with Article 1072-6 of the Standard Specifications.

Install piles within 1" of horizontal and vertical alignment shown in the accepted submittals and with no negative batter (piles leaning forward). Minimize alignment variations between piles for soldier pile walls with concrete facing since variations can result in thicker concrete facing in some locations in order to provide the minimum required facing thickness elsewhere. Locate piles so the minimum required concrete facing thickness, if applicable, and roadway clearances are maintained for variable pile alignments.

Install piles with the minimum required embedment in accordance with Subarticles 450-3(D) and 450-3(E) of the Standard Specifications. Piles may be installed with a vibratory hammer as approved by the Engineer. Do not splice piles. If necessary, cut off piles at elevations shown in the accepted submittals along a plane normal to the pile axis.

Use pile excavation to install drilled-in piles. If overexcavation occurs, fill to required elevations with No. 57 stone before setting piles. After filling holes with concrete or grout to the elevations shown in the accepted submittals, remove any fluids and fill remaining portions of holes with flowable fill. Cure concrete or grout at least 7 days before excavating.
Notify the Engineer if refusal is reached before pile excavation or driven piles attain the minimum required embedment. When this occurs, a revised soldier pile wall design or construction plan submittal may be required.

B. Excavation
If a temporary slope is shown in the accepted submittals, excavate the slope as shown. Otherwise, excavate in front of piles from the top down in accordance with the accepted submittals. Excavate in staged horizontal lifts with a maximum height of 5 ft. Use timber lagging or an alternate approved method for temporary support of excavations in accordance with the accepted submittals.
Install temporary support within 24 hours of excavating each lift unless otherwise approved. The installation may be delayed if it can be demonstrated that delays will not adversely affect excavation stability. If excavation faces will be exposed for more than 24 hours, use polyethylene sheets anchored at top and bottom of lifts to protect excavation faces from changes in moisture content.
If an excavation becomes unstable at any time, suspend soldier pile wall construction and temporarily stabilize the excavation by immediately placing an earth berm up against the unstable excavation face. When this occurs, repair walls with an approved method and a revised soldier pile wall design or construction plan may be required.
Remove flowable fill and material in between piles as necessary to install timber lagging. Position lagging with at least 3" of contact in the horizontal direction between the lagging and pile flanges. Do not excavate the next lift until temporary support for the current lift is accepted.

C. Wall Drainage Systems
Install wall drainage systems as shown in the accepted submittals and in accordance with Section 816 of the Standard Specifications. Place geocomposite drain strips with the geotextile side facing away from wall faces. Secure drain strips so strips are in continuous contact with surfaces to which they are attached and allow for full flow the entire height of soldier pile walls. Discontinuous drain strips are not allowed. If splices are needed, overlap drain strips at least 12" so flow is not impeded. Connect drain strips to leveling pads by embedding strip ends at least 4" into No. 57 stone.

D. Leveling Pads, Panels, Coping and Concrete Facing
Construct aggregate leveling pads at elevations and with dimensions shown in the accepted submittals. Compact leveling pads with a vibratory compactor to the satisfaction of the Engineer.
Set panels against pile flanges as shown in the accepted submittals. Position panels with at least 2" of contact in the horizontal direction between the panels and pile flanges. If contact cannot be maintained, remove panels, fill gaps with joint filler and reset panels. Securely support panels until enough No. 57 stone or backfill is placed to hold panels in place.
Construct coping as shown in the accepted submittals and Subarticle 452-3(C) of the Standard Specifications. When single faced precast concrete barrier is required in front of and against soldier pile walls, stop coping just above barrier so coping does not interfere with placing barrier up against wall faces.
Construct concrete facing in accordance with the accepted submittals and Section 420 of the Standard Specifications. Do not remove forms until concrete attains a compressive strength of at least 2,400 psi. Unless required otherwise in the plans, provide a Class 2 surface finish for concrete facing that

meets Subarticle 420-17(F) of the Standard Specifications. Construct concrete facing joints at a maximum spacing of 30 ft unless required otherwise in the plans. Make 1/2" thick expansion joints that meet Article 420-10 of the Standard Specifications for every third joint and 1/2" deep grooved contraction joints that meet Subarticle 825-11(B) for the remaining joints. Stop reinforcing steel for concrete facing 2" on either side of expansion joints.
If a brick veneer is required, construct brick masonry in accordance with Section 830 of the Standard Specifications. Anchor brick veneers to soldier pile walls with approved brick to concrete type anchors in accordance with the manufacturer's instructions. Space anchors no more than 16" apart in the vertical direction and no more than 32" apart in the horizontal direction with each row of anchors staggered 16" from the row above and below.
Seal joints above and behind soldier pile walls between coping or concrete facing and ditches or concrete slope protection with silicone sealant.

E. Backfill

For fill sections or if a temporary slope is shown in the accepted submittals, backfill behind piles, panels and concrete facing in accordance with Article 410-8 of the Standard Specifications. Otherwise, backfill voids behind panels, lagging and piles with No. 57 stone as shown in the accepted submittals. Ensure all voids between panels and lagging and between piles, lagging and excavation faces are filled with No. 57 stone. Compact stone to the satisfaction of the Engineer. When separation geotextiles are required, overlap adjacent geotextiles at least 18" and hold separation geotextiles in place with wire staples or anchor pins as needed.

F. Pile Coatings

For soldier pile walls with panels, clean exposed galvanized or painted surfaces of piles with a 2,500 psi pressure washer after wall construction is complete. Repair galvanized surfaces that are exposed and damaged in accordance with Article 1076-7 of the Standard Specifications. Repair painted surfaces that are exposed and damaged by applying 4.0 to 7.0 mils wet film thickness of a topcoat to damaged areas with brushes or rollers. Use the same paint for damaged areas that was used for the topcoat when painting piles initially. Feather or taper topcoats in damaged areas to be level with surrounding areas.

1.5 Measurement and Payment

Soldier Pile Retaining Walls will be measured and paid in square feet. Soldier pile walls will be measured as the square feet of exposed wall face area with the height equal to the difference between top and bottom of wall elevations. Define "top of wall" as top of coping or top of panels or concrete facing for soldier pile walls without coping. Define "bottom of wall" as shown in the plans and no measurement will be made for portions of soldier pile walls embedded below bottom of wall elevations. The contract unit price for Soldier Pile Retaining Walls will be full compensation for providing designs, submittals, labor, tools, equipment and soldier pile wall materials, installing piles, excavating, backfilling, hauling and removing excavated materials and supplying temporary support of excavations, wall drainage systems, leveling pads, panels, concrete facing, No. 57 stone, geotextiles and any incidentals necessary to construct soldier pile walls. The contract unit price for Soldier Pile Retaining Walls will also be full compensation for coping, pile coatings and brick veneers, if required. No additional payment will be made and no extension of completion date or time will be allowed for repairing overexcavations or unstable excavations or thicker concrete facing.
The contract unit price for Soldier Pile Retaining Walls does not include the cost for ditches, fences,

handrails, barrier or guardrail associated with soldier pile walls as these items will be paid for elsewhere in the contract.

Where it is necessary to provide backfill material behind soldier pile walls from sources other than excavated areas or borrow sources used in connection with other work in the contract, payment for furnishing and hauling such backfill material will be paid as extra work in accordance with Article 104-7 of the Standard Specifications. Placing and compacting such backfill material is not considered extra work but is incidental to the work being performed.

Payment will be made under:

Pay Item	Pay Unit
Soldier Pile Retaining Walls	Square Foot

0041DEL_P10A1
0001ADD_P10A1

253 New 7-11-13

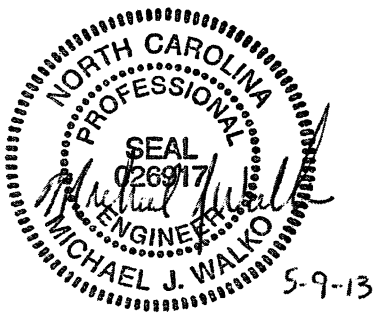
P-5208A, Haydock to Junker Railroad Roadbed

Roadbed

Project Special Provisions: Geotechnical

Prepared for:

NCDOT Rail Division



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254 New 7-11-13

REINFORCED BACKFILL: **(SPECIAL)**

Description

Construct Reinforced Backfill consisting of select material and geogrid reinforcements in the reinforced zone at locations indicated on the Structure Plans. Reinforced Backfill is required to stabilize slopes at locations shown in the plans and as directed.

Materials

Refer to Division 10 of the *Standard Specifications*.

Item	Section
Anchor Pins	1056-2
Select Material – Class IV, V, or VI	1016

Unless required otherwise in the plans, use Class IV, VI or VI select material in the reinforced zone as shown on the plans.

(A) Geogrid – Tencate Mirafi Miragrid 20XT (or approved equivalent)

Handle and store geogrid in accordance with Article 1056-2 of the *Standard Specifications*. Define "machine direction" (MD) and "cross-machine direction" (CD) for geogrids in accordance with ASTM D4439. Test geogrids in accordance with ASTM D6637. Provide a geogrid with design strengths that meet or exceed the following:

GEOGRID FOR REINFORCED BACKFILL REQUIREMENTS

Property	Requirement (MARV*)	Test Method
Tensile Strength @ 5% Strain	5,300 lbs/ft	ASTM D6637
Tensile Strength @ Ultimate	13,700 lbs/ft	ASTM D6637
Long Term Allowable Design Load	7,500 lbs/ft	GRI GG-4(b)

* Minimum Average Roll Value (MARV)

Construction Methods

Before starting End Bent construction, the Engineer may require a preconstruction meeting to discuss the construction and inspection of the Reinforced Backfill. If required, schedule this meeting after all material certifications have been submitted. The Designers, Resident or District Engineer, Geotechnical Operations Engineer, Contractor and Superintendent should attend this preconstruction meeting.

Excavate as necessary for the Reinforced Backfill in accordance with the contract. Maintain a horizontal clearance of at least 12" between the ends of the geogrid and the limits of the reinforced zone as shown in the plans. Notify the Engineer when the foundation excavation is complete. Do not place geogrid until excavation dimensions and backfill materials are approved. The first layer of geogrids should be installed at the Bottom of Footing (BOF) elevation of 547.9 feet. Subsequent layers should be installed at 18" vertical spaced intervals to elevation 561.4

feet. Select backfill should continue to the Top of Backwall elevation 564.4 feet. The geogrids should be fastened to the backwall via mechanical connections. The contractor should submit a detailed installation plan to the Engineer for review and approval.

Place geogrids within 3" of locations shown in the plans and in slight tension free of kinks, folds, wrinkles or creases. Install geogrids with the MD perpendicular to the end bent. The MD is the direction of the length or long dimension of the geogrid roll. The geogrid may not be spliced in the principal strength direction through overlap, sewing, or mechanical connection. Therefore, the geogrid should be installed in one continuous piece with the principal strength direction extending the full length of the reinforced area. Overlap adjacent geogrids at least 18" with seams oriented parallel to the roadbed centerline. Hold geogrids in place with wire staples or anchor pins as needed. Contact the Engineer when existing or future obstructions such as foundations, pavements, pipes, inlets or utilities will interfere with geogrids.

Place select material in the reinforced zone in 8" to 10" thick lifts. Compact Class IV, V, or VI select material with a vibratory compactor to the satisfaction of the Engineer. Do not displace or damage geogrids when placing and compacting select material. End dumping directly on geogrids is not permitted. Do not operate heavy equipment on geogrids until they are covered with at least 8" of select material. To prevent damaging geogrids, minimize turning and avoid sudden braking and sharp turns with compaction equipment. Replace any damaged geogrids to the satisfaction of the Engineer.

Measurement and Payment

Reinforced Backfill will be measured and paid in square yards. Reinforced Backfill will be measured along the faces of Reinforced Backfill geogrids as the square yards of Reinforced Backfill. No payment will be made for repairing damaged Reinforced Backfill geogrids.

The contract unit price for *Reinforced Backfill* will be full compensation for providing labor, tools, equipment and *Reinforced Backfill* materials, compacting select materials and supplying and placing geogrids, select material, and any incidentals necessary to construct *Reinforced Backfill*. The contract unit price for *Reinforced Backfill* will also be full compensation for excavating and transporting, placement, and compaction of select fill material and removing excavated materials to install *Reinforced Backfill*. 2,400 square yards shall be used for bidding purposes.

Payment will be made under:

Pay Item	**Pay Unit**
Reinforced Backfill	Square Yard