Project B-3189 **Haywood County**

Project Special Provisions
Structures

Table of Contents

SP #			Page #
1	Thermal Sprayed Coatings (Metallization)	(6-7-05)	1
2	Evazote Joint Seals	(8-13-04)	5
3	Elastomeric Concrete	(10-12-01)	10
4	Falsework and Formwork	(7-18-06)	11
5	Submittal of Working Drawings	(11-17-06)	16
6	Crane Safety	(8-15-05)	23
7	Shipping Steel Structural Members	(7-18-06)	23
8	High Strength Bolts	(11-17-06)	25
9	Control of Vibration	(SPECIAL)	25
10	Cast in Place Concrete Faced MSE Retaining Wall	(SPECIAL)	26
11	Temporary Tieback Retaining Walls	(SPECIAL)	31
12	Temporary Shoring	(SPECIAL)	40
13	Classic Concrete Bridge Rails	(SPECIAL)	42
14	Railroad Provisions	(SPECIAL)	

NORTH CAROLINA PROFESSIONAL SEAL 13014 ENGINEER QUANG H. NGUYEN

Quang H Nguyen 4-9-07

excluding SP # 9, 10, 11 & 12

NORTH CAROLINA PROFESSIONAL SEAL 26962 ENGINEER ERIC N. WILLIAMS

4/11/07

For SP 9, 10, 11 and 12

PROJECT SPECIAL PROVISIONS
STRUCTURES

THERMAL SPRAYED COATINGS (METALLIZATION) (6-07-05)

1.0 DESCRIPTION

Apply a thermal sprayed coating (TSC) and sealer to metal surfaces as specified herein when called for on the plans or by other Special Provisions, or when otherwise approved by the Engineer in accordance with the SSPC-CS 23.00/AWS C2.23/NACE No. 12 Specification. Only Arc Sprayed application methods are used to apply TSC coatings, the Engineer must approve other methods of application.

2.0 QUALIFICATIONS

Only use NCDOT approved TSC Contractors meeting the following requirements:

1. Who have the capability of blast cleaning steel surfaces to SSPC SP-5 and SP-10 Finishes.

2. Who employ a Spray Operator(s) qualified in accordance with AWS C.16/C2.16M2002 and a Quality Control Inspector(s) who have documented training in the applicable test procedures of ASTM D-3276 and SSPC-CS 23.00.

A summary of the contractor's related work experience and the documents verifying each Spray Operator's and Quality Control Inspector's qualifications are submitted to the Engineer before any work is performed.

3.0 MATERIALS

Provide wire in accordance with the metallizing equipment manufacturer's recommendations. Use the wire alloy specified on the plans which meets the requirements in Annex **C** of the SSPC-CS 23.00 Specification. Have the contractor provide a certified analysis (NCDOT Type 2 Certification) for each lot of wire material.

Apply an approved sealer to all metallized surfaces in accordance with Section 9 of SSPC-CS 23. The sealer must either meet SSPC Paint 27 or is an alternate approved by the Engineer.

4.0 SURFACE PREPARATION AND TSC APPLICATION

Grind flame cut edges to remove the carbonized surface prior to blasting. Bevel all flame cut edges in accordance with Article 442-10(D) regardless of included angle. Blast clean surfaces to be metallized with grit or mineral abrasive in accordance with Steel Structures Painting Council SSPC SP-5/10(as specified) to impart an angular surface profile of 2.5 - 4.0 mils (0.063 – 0.100 mm). Surface preparation hold times are in accordance with Section 7.32 of SSPC-CS 23. If flash rusting occurs prior to metallizing, blast clean the metal surface again. Apply the thermal sprayed coating only when the surface temperature of the steel is at least 5°F (3°C) above the dew point.

At the beginning of each work period or shift, conduct bend tests in accordance with Section 6.5 of SSPC-CS 23.00. Any disbonding or delamination of the coating that exposes the substrate requires corrective action, additional testing, and the Engineer's approval before resuming the metallizing process.

Apply TSC with the alloy to the thickness specified on the plans or as provided in the table below. All spot results (the average of 3 to 5 readings) must meet the minimum requirement. No additional tolerance (as allowed by SSPC PA-2) is permitted. (For Steel Beams: For pieces with less than 200 ft^2 (18.6m^2) measure 2 spots/surface per piece and for pieces greater than 200 ft^2 (18.6m^2) add 1 additional spots/surface for each 500 ft^2 (46.5m^2)).

Application	Thickness	Alloy	Seal Coat
Pot Bearings	8 mil	85/15 Zinc (W-Zn-Al-2)	0.5 mil
Armored Joint Angles	8 mil	85/15 Zinc (W-Zn-Al-2)	0.5 mil
Modular Joints	8 mil	99.99% Zn (W-Zn-1)	0.5 mil
Expansion Joint Seals	8 mil	99.99% Zn (W-Zn-1)	0.5 mil
Optional Disc Bearings	8 mil	85/15 Zinc (W-Zn-Al-2)	0.5 mil

When noted on the plans or as specified in the above chart, apply the sealer to all metallized surfaces in accordance with the manufacturer's recommendations and these provisions. Apply the seal coat only when the air temperature is above 40°F (4°C) and the surface temperature of the steel is at least 5°F (3°C) above the dew point. If the sealer is not applied within eight hours after the final application of TSC, the applicator verifies acceptable TSC surfaces and obtains approval from the Engineer before applying the sealer.

5.0 INSPECTION FREQUENCY

The TSC Contractor must conduct the following tests at the specified frequency and the results documented in a format approved by the Engineer.

Test/Standard	Location	Frequency	Specification
Ambient Conditions	Site	Each Process	5°F (3°C) above the dew point
Abrasive Properties	Site	Each Day	Size, angularity, cleanliness
Surface Cleanliness SSPC Vis 1	All Surfaces	Visual All Surfaces	SSPC-SP-10 Atmospheric Service SSPC-SP - 5 Immersion Service
Surface Profile ASTM D-4417 Method C	Random Surfaces	3 per 500 ft^2	2.5 - 4.0 mils
Bend Test SSPC-CS 23.00	Site	5 per shift	Pass Visual
Thickness SSPC PA-2R SSPC-CS 23.00	Each Surface	Use the method in PA-2 Appendix 3 for Girders and Appendix 4 for frames and miscellaneous steel. See Note 1.	Zn - 8 mils minimum Al - 8 mils minimum Zn Al - 8 mils minimum Areas with more than twice the minimum thickness are inspected for compliance to the adhesion and cut testing requirements of this specification.
Adhesion ASTM 4541	Random Surfaces Splice Areas	1 set of 3 per 500 ft^2	Zn > 500 psi Al > 1000 psi Zn Al > 750 psi
Cut Test - SSPC-CS 23.00	Random Surfaces	3 sets of 3 per 500 ft^2	No peeling or delamination
Job Reference Std. SSPC-CS 23.00	Site	1 per job	Meets all the above requirements

6.0 REPAIRS

All Repairs are to be performed in accordance with the procedures below, depending on whether the repair surface is hidden or exposed. As an exception to the following, field welded splices on joint angles and field welding bearing plates to girders may be repaired in accordance with the procedures for hidden surfaces.

For hidden surfaces (including but not limited to interior girders, interior faces of exterior girders, and below-grade sections of piles):

1. Welding of metallized surfaces may be performed only if specifically permitted by the Engineer. Remove metallizing at the location of field welds by blast cleaning (SSPC SP-6 finish), or hand (SSPC SP-2 finish) or power tool cleaning (SSPC SP-3 finish) just prior to welding. Clean sufficiently to prevent contamination of the weld. All repairs to welded connections are metallized in accordance with SSPC CS 23.00.

2. Minor areas less than or equal to 0.1 ft^2 (9300mm^2) exposing the substrate are metallized in accordance with SSPC CS 23.00 or painted in accordance with ASTM A780, "Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings."

3. Large areas greater than 0.1 ft^2 (9300mm^2) exposing the substrate are metallized in accordance with SSPC CS 23.00.

4. Damaged (burnished) areas not exposing the substrate with less than the specified coating thickness are metallized in accordance with SSPC CS 23.00 or painted in accordance with ASTM A780, "Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings."

5. Damaged (burnished) areas not exposing the substrate with more than the specified coating thickness are not repaired.

6. Defective coating is repaired by either method 2 or 3 depending on the area of the defect.

For Exposed Surfaces (including but not limited to exterior faces of exterior girders and above-grade sections of piles):

1. Welding of metallized surfaces may be performed only if specifically permitted by the Engineer. Remove metallization at the location of field welds by blast cleaning (SSPC SP-6 finish), or hand (SSPC SP-2 finish) or power tool cleaning (SSPC SP-3 finish) just prior to welding. Clean sufficiently to prevent contamination of the weld. All repairs to welded connections are metallized in accordance with SSPC CS 23.00.

2. All areas exposing the substrate are metallized in accordance with SSPC CS 23.00

3. Defective coating is repaired by either method 2 or 3 depending on the area of the defect.

7.0 TWELVE MONTH OBSERVATION PERIOD

The contractor maintains responsibility for the coating system for a twelve (12) month observation period beginning upon the satisfactory completion of all the work required in the plans or as directed by the engineer. The contractor must guarantee the coating system under the payment and performance bond (refer to article 109-10). To successfully complete the observation period, the coating system must meet the following requirements after twelve(12) months service:

- No visible rust, contamination or application defect is observed in any coated area.
- Painted surfaces have a uniform color and gloss.
- Surfaces have an adhesion of no less than 500 psi (3.45 MPa) when tested in accordance with ASTM D-4541.

8.0 BASIS OF PAYMENT

The contract price bid for the bridge component to which the coating is applied will be full compensation for the thermal sprayed coating.

EVAZOTE JOINT SEALS (8-13-04)

1.0 SEALS

Use preformed seals compatible with concrete and resistant to abrasion, oxidation, oils, gasoline, salt and other materials that are spilled on or applied to the surface. Use a low-density closed cell, cross-linked ethylene vinyl acetate polyethylene copolymer nitrogen blown material for the seal.

Use seals manufactured with grooves 1/8" (3 mm) ± wide by 1/8" (3 mm) ± deep and spaced between 1/4 (6 mm) and 1/2 inch (13 mm) apart along the bond surface running the length of the joint. Use seals sized so that the depth of the seal meets the manufacturer's recommendation, but is not less than 70% of the uncompressed width. Provide a seal designed so that, when compressed, the center portion of the top does not extend upward above the original height of the seal by more than 1/4 inch (6 mm). Splice the seal using the heat welding method by placing the joint material ends against a teflon heating iron of 350°F (177°C) for 7 - 10 seconds, then pressing the ends together tightly. Do not test the welding until the material has completely cooled. Use material that resists weathering and ultraviolet rays. Provide a seal that has a working range of 30% tension and 60% compression and is watertight along its entire length including the ends.

Provide seals that meet the requirements given below.

TEST	TEST METHOD	REQUIREMENT
Elongation at break	ASTM D3575	210 ± 15%
Tensile strength, psi (kPa)	ASTM D3575	110 ± 15 (755 ± 100)
Compression Recovery (% of original width)	AASHTO T42 50% compr. for 22 hr. @ 73°F (23°C) 1/2 hr. recovery	87 ± 3
Weather/Deterioration	AASHTO T42 Accelerated Weathering	No deterioration for 10 years min.
Compression/Deflection	@ 50% deflection of original width @ 50% deflection of original width	10 psi (69 kPa) min. 60 psi (414 kPa) max.
Tear Strength, psi (kPa)	ASTM D624	16 ± 3 (110 ± 20)
Density	ASTM D545	2.8 to 3.4
Water Absorption (% vol/vol)	ASTM D3575 Total immersion for 3 months	3

Have the top of the evazote seal clearly shop marked. Inspect the evazote seals upon receipt to ensure that the marks are clearly visible upon installation.

2.0 ADHESIVES

Use a two component, 100% solid, modified epoxy adhesive with the seal that meets the requirements of ASTM C881, Type 1, Grade 3, Class B & C and has the following physical properties:

Tensile strength ..... 3500 psi (24.1 MPa) min.
Compressive strength ..... 7000 psi (48.3 MPa) min.
Shore D Hardness ..... 75 psi (0.5 MPa) min.
Water Absorption ..... 0.25% by weight

Use an adhesive that is workable to 40°F (4°C). When installing in temperatures below 40°F (4°C) or for application on moist, difficult to dry concrete surfaces, use an adhesive specified by the manufacturer of the joint material.

3.0 SAWING THE JOINTS

When the plans call for sawing the joints, the joints shall be initially formed to a width as shown on the plans including the blockout for the elastomeric concrete. Complete placement of the elastomeric concrete after the reinforced concrete deck slab has cured for seven full days and reached a minimum strength of 3000 psi (20.7 Mpa).

Cure the elastomeric concrete for a minimum of 2 days prior to sawing the elastomeric concrete to the final width and depth as specified in the plans.

When sawing the joint to receive the evazote seal, always use a rigid guide to control the saw in the desired direction. To control the saw and to produce a straight line as indicated on the plans, anchor and positively connect a template or a track to the bridge deck. Do not saw the joint by visual means such as a chalk line. Fill the holes used for holding the template or track to the deck with an approved, flowable non-shrink, non-metallic grout.

Saw cut to the desired width and depth in one or two passes of the saw by placing and spacing two metal blades on the saw shaft to the desired width for compression seals.

The desired depth is the depth of the seal plus 1/4 inch (6 mm) above the top of the seal plus approximately 1 inch (25 mm) below the bottom of the seal. An irregular bottom of sawed joint is permitted as indicated on the plans. Grind exposed corners on saw cut edges to a 1/4" (6 mm) chamfer.

Remove any staining or deposited material resulting from sawing with a wet blade to the satisfaction of the Engineer.

Use extreme care to saw the joint straight to the desired width and to prevent any chipping or damage to sawed edges of the joint.

4.0 PREPARATIONS FOR SAWED JOINTS

When the plans call for sawing the joint, the Engineer thoroughly inspects the sawed joint opening for spalls, popouts, cracks, etc. Make all necessary repairs prior to blast cleaning and installing the seal.

Immediately before sealing, clean the joints by sandblasting with clean dry sand. Sandblast to provide a firm, clean joint surface free of curing compound, loose material and any foreign matter. Sandblast without causing pitting or uneven surfaces. The aggregate in the elastomeric concrete may be exposed after sandblasting.

After blasting, either brush the surface with clean brushes made of hair, bristle or fiber, blow the surface with compressed air, or vacuum the surface until all traces of blast products and abrasives are removed from the surface, pockets, and corners.

If nozzle blasting, use compressed air that does not contain detrimental amounts of water or oil.

Examine the blast cleaned surface and remove any traces of oil, grease or smudge deposited in the cleaning operations.

Bond the seal to the blast cleaned surface on the same day the surface is blast cleaned.

5.0 PREPARATIONS FOR ARMORED JOINTS

When the plans call for armored joints, form the joint and blockout openings in accordance with the plans. If preferred, wrap the temporary form with polyethylene sheets to allow for easier removal. Do not use form release agents.

Submittals

Submitting detailed working drawings is not required; however, submitting catalog cuts of the proposed material is required. In addition, direct the joint supplier to provide an angle segment placing plan.

Surface Preparation

Prepare the surface within the 48 hours prior to placing the elastomeric concrete. Do not place the elastomeric concrete until the surface preparation is completed and approved.

1. Angle Assembly

   Clean and free metallized steel of all foreign contaminants and blast the non-metallized steel surfaces to SSPC SP-10. Blast-cleaning anchor studs is not required.

2. Concrete

   Prior to placing the elastomeric concrete, thoroughly clean and dry all concrete surfaces. Sandblast the concrete surface in the blockout and clear the surface of all loose debris.

Elastomeric Concrete Placement

Make sure that a manufacturer's representative is present when placing elastomeric concrete. Do not place elastomeric concrete if the ambient air temperature is below 45°F (7°C).

Prepare and apply a primer, as per manufacturer's recommendations, to all vertical concrete faces, all steel components to be in contact with elastomeric concrete, and to areas specified by the manufacturer. Align the angles with the joint opening.

Prepare, batch, and place the elastomeric concrete in accordance with the manufacturer's instructions. Place the elastomeric concrete in the areas specified on the plans while the primer is still tacky and within 2 hours after applying the primer. Pay careful attention to properly consolidate the concrete around the steel and anchors. Trowel the elastomeric concrete to a smooth finish.

Joint Preparation

Prior to installing the seal, the Engineer thoroughly inspects the armored joint opening for proper alignment and full consolidation of elastomeric concrete under the angle assemblies. Make all necessary repairs prior to cleaning the joint opening and installing the seal.

Clean the armored joint opening with a pressure washer rated at 3000 psi (20.7 MPa) minimum at least 24 hours after placing the elastomeric concrete. Dry the cleaned surface prior to installing the seal.

Examine the cleaned surface and remove traces of oil, grease or smudge deposited during the cleaning operations.

Bond the seal to the cleaned surface on the same day the surface is cleaned.

6.0 SEAL INSTALLATION

Install the joint seal according to the manufacturer's procedures and recommendations and as recommended below. Do not install the joint seal if the ambient air temperature is below 45°F (7°C). Have a manufacturer's representative present during the installation of the first seal of the project.

Begin installation at the low end of the joint after applying the mixed epoxy to the sides of both the joint material and both sides of the joint, making certain to completely fill the grooves with epoxy. With gloved hands, compress the material and with the help of a blunt probe, push it down into the joint until it is recessed approximately 1/4 inch (6 mm) below the surface. Do not push the seal at an angle that would stretch the material. Once work on a joint begins, do not stop until it is completed. Clean the excess epoxy off the surface of the joint material *quickly* and *thoroughly*. Do not use solvents to remove excess epoxy. Remove excess epoxy in accordance with the joint manufacturer's recommendations.

Install the seal so that it is watertight. Testing of the joint seal is not required, but it is observed until final inspection.

7.0 BASIS OF PAYMENT

Payment for all evazote joint seals will be at the lump sum contract price bid for "Evazote Joint Seals" which prices and payment will be full compensation for furnishing all material, including elastomeric concrete when required, labor, tools and equipment necessary for installing these units in place and accepted.

ELASTOMERIC CONCRETE (10-12-01)

1.0 DESCRIPTION

Elastomeric concrete is a mixture of a two-part polymer consisting of polyurethane and/or epoxy, and kiln-dried aggregate. Have the manufacturer supply it as a unit. Use the concrete in the blocked out areas on both sides of the bridge deck joints as indicated on the plans.

2.0 MATERIALS

Provide materials that comply with the following minimum requirements at 14 days.

CONCRETE PROPERTIES	TEST METHOD	MINIMUM REQUIREMENT
Bond Strength to Concrete, psi (MPa)	ASTM D638 (D638M)	450 (3.1)
Brittleness by Impact, ft-lb (kg-m)	Ball Drop	7 (0.97)
Compressive Strength, psi (MPa)	ASTM D695 (D695M)	2800 (19.3)

BINDER PROPERTIES (without aggregate)	TEST METHOD	MINIMUM REQUIREMENT
Tensile Strength, psi (MPa)	ASTM D638 (D638M)	800 (5.5)
Ultimate Elongation	ASTM D638 (D638M)	150%
Tear Resistance, lb/in (kN/m)	ASTM D624	90 (15.7)

In addition to the requirements above, use elastomeric concrete that also resists water, chemical, UV, and ozone exposure and withstands extreme temperature (freeze-thaw) changes.

Furnish a manufacturer's certification verifying that the materials satisfy the above requirements. Provide samples of elastomeric concrete to the Engineer, if requested, to independently verify conformance with the above requirements.

Require a manufacturer's representative to be present on site during the installation of the elastomeric concrete.

3.0 BASIS OF PAYMENT

No separate payment will be made for elastomeric concrete. The lump sum contract price bid for "Evazote Joint Seals" will be full compensation for furnishing and placing the Elastomeric Concrete.

FALSEWORK AND FORMWORK (7-18-06)

1.0 DESCRIPTION

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

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

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

2.0 MATERIALS

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

3.0 DESIGN REQUIREMENTS

Working Drawings

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

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

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

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

1. Wind Loads

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

Table 2.2 - Wind Pressure Values

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

2. Time of Removal

   The following requirements replace those of Article 3.4.8.2.

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

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

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

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

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

Review and Approval

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

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

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

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

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

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

4.0 CONSTRUCTION REQUIREMENTS

All requirements of Section 420 of the Standard Specifications apply.

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

permanent structure unless approved. Show any welding to the permanent structure on the approved construction drawings.

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

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.

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 (11-17-06)

1.0 GENERAL

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

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

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

2.0 ADDRESSES AND CONTACTS

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

Via US mail:

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

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

Via other delivery service:

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

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

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

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

Via US mail:

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

Via other delivery service:

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

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

Via US mail:

Mr. John Pilipchuk, L. G., P. E.
Western Regional Geotechnical
Manager
North Carolina Department
of Transportation
Geotechnical Engineering Unit
Western Regional Office
5253 Z Max Boulevard
Harrisburg, NC 28075

Via other delivery service:

Mr. John Pilipchuk, L. G., P. E.
Western Region Geotechnical
Manager
North Carolina Department
of Transportation
Geotechnical Engineering Unit
Western Regional Office
5253 Z Max Boulevard
Harrisburg, NC 28075

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

Primary Structures Contact:
Paul Lambert
(919) 250 – 4041
(919) 250 – 4082 facsimile
plambert@dot.state.nc.us

Secondary Structures Contacts:
James Gaither (919) 250 – 4042
Man-Pan Hui (919) 250 – 4044

Eastern Regional Geotechnical Contact (Divisions 1-7):
K. J. Kim
(919) 662 – 4710
(919) 662 – 3095 facsimile
kkim@dot.state.nc.us

Western Regional Geotechnical Contact (Divisions 8-14):
John Pilipchuk
(704) 455 – 8902
(704) 455 – 8912 facsimile
jpilipchuk@dot.state.nc.us

3.0 SUBMITTAL COPIES

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

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

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

STRUCTURE SUBMITTALS

Submittal	Copies Required by Structure Design Unit	Copies Required by Geotechnical Engineering Unit	Contract Reference Requiring Submittal [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
Evazote Joint Seals [6]	9	0	"Evazote Joint Seals"
Expansion Joint Seals (hold down plate type with base angle)	9	0	"Expansion Joint Seals"
Expansion Joint Seals (modular)	2, then 9	0	"Modular Expansion Joint Seals"
Expansion Joint Seals (strip seals)	9	0	"Strip Seals"
Falsework & Forms [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 Special Provisions
Maintenance and Protection of Traffic Beneath Proposed Structure	8	0	"Maintenance and Protection of Traffic Beneath Proposed Structure at Station ___"
Metal Bridge Railing	8	0	Plan Note
Metal Stay-in-Place Forms	8	0	Article 420-3
Metalwork for Elastomeric Bearings [4,5]	7	0	Article 1072-10
Miscellaneous Metalwork [4,5]	7	0	Article 1072-10
Optional Disc Bearings [4]	8	0	"Optional Disc Bearings"
Overhead Signs	13	0	Article 903-3(C) &

			Applicable Project Special Provisions
Pile Splicer	7	2	Subarticle 450-7(C)
Placement of Equipment on Structures (cranes, etc.)	7	0	Article 420-20
Pot Bearings [4]	8	0	"Pot Bearings"
Precast Concrete Box Culverts	2, then 1 reproducible	0	"Optional Precast Reinforced Concrete Box Culvert at Station ___"
Precast Retaining Wall Panels	10	1	Article 1077-2
Prestressed Concrete Cored Slab (detensioning sequences) [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 Special Provisions
Revised Bridge Deck Plans (adaptation to prestressed deck panels)	2, then 1 reproducible	0	Article 420-3
Revised Bridge Deck Plans (adaptation to modular expansion joint seals)	2, then 1 reproducible	0	"Modular Expansion Joint Seals"
Sound Barrier Wall Casting Plans	10	0	Article 1077-2 & "Sound Barrier Wall"
Sound Barrier Wall Steel Fabrication Plans [5]	7	0	Article 1072-10 & "Sound Barrier Wall"
Structural Steel [4]	2, then 7	0	Article 1072-10
Temporary Detour Structures	10	2	Article 400-3 & "Construction, Maintenance and Removal of Temporary Structure at Station ____"
Temporary Shoring [8]	7	2	"Temporary Shoring"
TFE Expansion Bearings [4]	8	0	Article 1072-10

70

FOOTNOTES

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

GEOTECHNICAL SUBMITTALS

Submittal	Copies Required by Geotechnical Engineering Unit	Copies Required by Structure Design Unit	Contract Reference Requiring Submittal [1]
Crosshole Sonic Logging (CSL) Reports [2]	1	0	"Crosshole Sonic Logging"
Drilled Pier Construction Sequence Plans [2]	1	0	"Drilled Piers"
Mechanically Stabilized Earth (MSE) Retaining Walls	8	2	"MSE Retaining Walls"
Pile Driving Analyzer (PDA) Reports [2]	2	0	"Pile Driving Analyzer"
Pile Driving Equipment Data [3]	1	0	Article 450-5
Proprietary Retaining Walls	8	2	Applicable Project Special Provision
Anchored Retaining Walls	8	2	Applicable Project Special Provision
Soil Nail Retaining Walls	8	2	Applicable Project Special Provision
Temporary Mechanically Stabilized (MSE) Earth Wall [2]	9	0	"Temporary Shoring"

FOOTNOTES

1. References are provided to help locate the part of the contract where the working drawing submittals are required. References in quotes refer to the Project Special Provision by that name. Articles refer to the Standard Specifications.
2. Electronic copies of submittals are required. See referenced Project Special Provision.
3. Download Pile Driving Equipment Data Form from following link:
   http://www.ncdot.org/doh/preconstruct/highway/geotech/formprovdet/
   Submit one hard copy of the completed form to the Resident Engineer. Submit a second copy of the completed form electronically, by facsimile or via US Mail or other delivery service to the Geotechnical Engineering Unit. Electronic submission is preferred. See second page of form for submittal instructions.

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

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.

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.

Crane Inspections: Inspection records for all cranes shall be current and readily accessible for review upon request.

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.

SHIPPING STEEL STRUCTURAL MEMBERS (7-18-06)

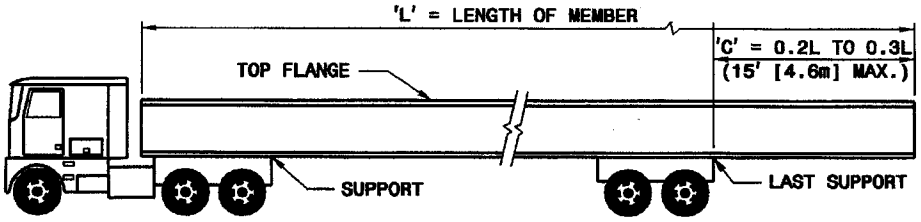
Section 1072-23 Marking and Shipping

Add the following paragraphs after the third paragraph of the Section.

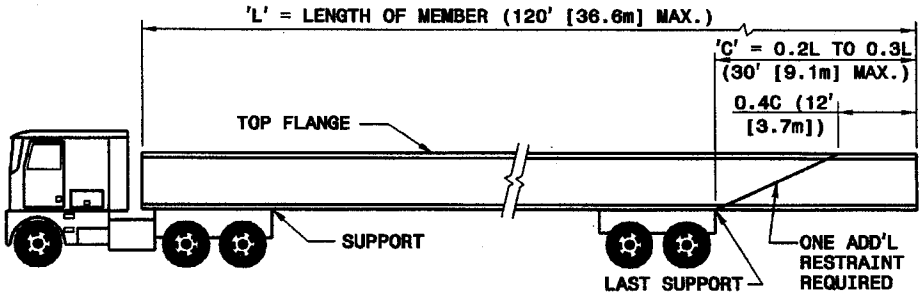
Load and ship steel beams and girders in accordance with the Figure below for all types of transportation.

Below is the sketches provided to Materials and Tests Unit on May 8, 1991. When the contractor wishes to place members on trucks not in accordance with these limits, to ship by rail, to attach shipping restraints to the members, to ship horizontally curved steel members, or to invert members, he shall submit a shipping plan prior to shipping. See also Article 1072-11.

LIMITS FOR PLACEMENT OF BEAMS AND GIRDERS DURING SHIPMENT



WHEN 'C' = 15' (4.6m) OR LESS



WHEN 'C' = OVER 15' (4.6m) THRU 30' (9.1m)

L		MIN. 'C'		MAX 'C'
75 (22.9m)		15 (4.6m)		22½(6.9m)
80 (24.4m)		16 (4.9m)		24 (7.3m)
85 (25.9m)		17 (5.2m)	0.3L	25½(7.8m)
90 (27.4m)		18 (5.5m)		27 (8.2m)
95 (29.0m)	0.2L	19 (5.8m)		28½(8.7m)
100 (30.5m)		20 (6.1m)		30 (9.1m)
105 (32.0m)		21 (6.4m)		30 (9.1m)
110 (33.5m)		22 (6.7m)		30 (9.1m)
115 (35.1m)		23 (7.0m)		30 (9.1m)
120 (36.6m)		24 (7.3m)		30 (9.1m)

NOTES: ALL DIMENSIONS ARE IN FEET (METERS).
TRUCK LOADING SHOWN FOR SIMPLICITY
DIMENSIONS APPLY TO ALL TYPES OF SHIPMENTS.

HIGH STRENGTH BOLTS (11-17-06)

In Section 440-8(A) of the Standard Specifications, revise the third paragraph and insert a new paragraph four, respectively, as follows:

"Make sure that plain bolts and washers have a thin coat of lubricant at the time of installation."

"Use nuts that are pre-waxed by the producer/supplier prior to shipping to the project."

CONTROL OF VIBRATION (SPECIAL)

Attention is directed to Articles 107-12 and 107-15 of the Standard Specifications and to the Subsurface Plans. Employ an engineering firm from the list of the contract holding firms for vibration monitoring from the Geotechnical Engineering Unit Contract Administrator located at 1020 Birch Ridge Road (Century Center Building B), Raleigh, NC 27610, phone (919) 250-4088. The firm shall perform a Pre-Construction Structure Condition Inspection for the buildings at the listed parcels and submit three (3) copies at least 5 business days before the preconstruction conference.

PIN 8657-81-6379, Arrow Wood Products, Inc.
PIN 8357-81-8315, Kenneth and Barbara Gann
PIN 8657-81-8207, Coast Lamp Mfg. Inc.

Schedule a preconstruction conference to include personnel from the Contractor, the vibration monitoring firm, the Resident Engineer, and representatives from the NCDOT Construction Unit and the Geotechnical Engineering Unit before beginning any construction work. Submit a vibration monitoring plan for the buildings on the following parcels to the Engineer for approval at least 10 business days before beginning construction work.

PIN 8657-81-6379, Arrow Wood Products, Inc.
PIN 8357-81-8315, Kenneth and Barbara Gann

Furnish and operate vibration monitoring devices (engineering seismographs) for the duration of the construction work in which vibrations may affect the buildings included in the vibration monitoring plan. Calibrate the devices within twelve months before their use on this project. Record vibrations in the three perpendicular axes: vertical, transverse, and longitudinal, and record the full vibration waveform. Use geophones exhibiting linear response in the frequency range of 4-100 Hertz. Install crack gauges where applicable.

Continuous monitoring will be required during the initial stages of each particular phase of work that could generate detectable vibrations at the buildings. Once safe levels have been confirmed, instruments only need to be checked on a daily basis.

Inspect the condition of the buildings frequently during construction to assess any potential damage. If the vibration records or visual inspections show any potential for damage to the buildings, the Contractor shall cease work and shall furnish the Engineer with an alternative method of accomplishing the work that was affected.

Throughout the duration of the vibration monitoring on the project, the Department reserves the right to request information associated with this work for review. At the completion of the project, submit to the Engineer three (3) copies of the final report which should include all vibration monitoring records, preconstruction, construction and postconstruction condition assessments of the subject buildings with both photographic and written documentation.

Payment will be made by the Lump Sum bid price for "Vibration Monitoring." Such payment will be full compensation for all work described in this provision including, but not limited to, control of vibration, inspection of the buildings, vibration monitoring, and submission of reports.

Pay Item: Vibration Monitoring ..... Lump Sum

CAST-IN-PLACE CONCRETE FACED MSE RETAINING WALL (SPECIAL)

1.0 DESCRIPTION

Design, prepare plans, and construct cast-in-place concrete faced MSE retaining walls to the lines, grades and locations shown in the plans and in accordance with this specification and the details shown in the plans. Work includes all excavation, leveling pad, cast-in-place concrete facing, wire facing, retaining wall backfill and all other materials, labor, tools, equipment and incidentals necessary to complete the work.

Furnish a cast-in-place concrete faced MSE retaining wall as supplied below or by approved equal:

The Reinforced Earth Company
8614 Westwood Center Drive, Suite 1100
Vienna, VA 22182
Telephone (703) 749-4325

2.0 DESIGN CRITERIA

Design the retaining walls to meet the criteria of the current AASHTO Standard Specifications for Highway Bridges, FHWA Mechanically Stabilized Earth Walls and Reinforced Soil Slopes Design and Construction Guidelines, and the requirements specified in the plans. Design all metallic components including wire facing, connection devices to the cast-in-place facing, reinforcing strips, fasteners, etc. for a design life of 100 years. Design the cast-in-place concrete faced MSE wall to support the bridge loads as shown on the contract plans. Design the cast-in-place concrete face as the permanent wall facing.

The bottom of wall elevation for design for all walls is located at the bottom of the required embedment as shown of the plans. The top of wall for design is located 1 foot above the bottom of footing elevation for the front wall and wing walls below the footing. The top of wall for design of wing walls not below the footing is where the asphalt pad behind the wall extends to the back of the cast-in-place face.

Include calculations and details of the cast-in-place concrete facing in the design package. Construct facing a minimum 12 inches in thickness for left and right wing walls and for front wall above Elev. 2609.00 feet. Construct front wall facing below Elev 2609.00 feet as a crash wall with a minimum thickness of 30 inches with a minimum reinforcement as shown on the NCDOT Structure Design Unit Standard Crash Wall. The NCDOT Standard Crash Wall may be found on the Structure Design Unit website at the following address:

http://ncdot.org/doh/preconstruct/highway/structur/designmanual/english/fig7-33.pdf

Construct wing wall facings on a 6 inch thick by 18 inch wide unreinforced concrete leveling pad. Construct front wall facing on a 12 inch thick by 42 inch wide reinforced concrete leveling pad.

Embed the front, right and left wing walls a minimum of 3 feet below proposed finished grade except at locations where deeper embedment is required as shown on the contract plans.

Submit eight sets of complete working drawings/shop plans, erection plans and design calculations, sealed by a North Carolina Registered Professional Engineer, for review and approval prior to beginning wall work. Wall plans must be reviewed and approved by the railroad prior to beginning work. Allow 40 days for review and approval from the date they are received by the Engineer until they are returned to the Contractor. The Contractor is cautioned that the railroad review may take longer than 40 days.

3.0 GENERAL

The Resident Engineer schedules a Preconstruction Conference with representatives from the Contractor, the retaining wall system Supplier, Railroad, and the Geotechnical Engineering Unit to discuss construction details and inspection of the retaining wall.

Provide all necessary material from the Supplier.

Obtain from the Supplier technical instruction and guidance in preconstruction activities, including the Preconstruction Conference, and on-site technical assistance during construction. Follow any instructions from the Supplier closely unless otherwise directed.

4.0 MATERIALS

All materials shall be as specified or better and approved by the Engineer.

Concrete

Concrete for cast-in-place facing, coping, and leveling pad shall be Class A and shall conform to the applicable requirements in section 420 and 1000 of the Standard Specifications. Reinforcing steel in coping and facing shall conform to the applicable requirements in Sections 425 and 1070 of the Standard Specifications. The leveling pad shall cure a minimum of twenty-four hours before setting any forms for the facing.

Wire Facing, Reinforcing Steel, Reinforcing Mesh, Mats, or Strips, Tie Strips, Fasteners and/or Connector Hardware to Cast-in-Place Facing

Use reinforcing Steel conforming to the applicable requirements in Sections 425 and 1070 of the Standard Specifications.

Shop fabricate tie strips and connector hardware of hot rolled steel conforming to the minimum requirements of ASTM A570-85, Grade 50 or equivalent. Shop fabricate the wire facing, reinforcing mesh or mats and connector hardware of cold drawn steel wire conforming to the minimum requirements of AASHTO M32 and weld into the finished mesh fabric in accordance with AASHTO M55. Hot roll reinforcing strips from bars to the required shape and dimensions with their physical and mechanical properties conforming to AASHTO M223, Grade 65. Cut to lengths and tolerances shown on the plans and punch holes for bolts in the locations shown on plan details. The minimum bending radius of tie strips is 1 inch. Inspect all reinforcing and tie strips carefully to ensure they are true to size and free from defects that may impair their strength or durability. Galvanize in accordance with the minimum requirements of AASHTO M111.

Use 1/2" diameter bolts, nuts and washers conforming to AASHTO M164. Provide Bolt and thread lengths in accordance with Supplier's recommendations. Hot-dip galvanize bolts and nuts in accordance with the requirements of AASHTO M232.

Miscellaneous Facing Components

Provide miscellaneous wire and cast-in-place concrete face components, including polyvinylchloride pipe, stirrups, etc., in accordance with the Supplier's recommendations.

Stone Retention Material

Use stone retention material in the wire facing as recommended by the wall Supplier.

#57 Washed Crushed Stone Backfill (Retaining Wall)

Use only washed, crushed stone backfill material conforming to the applicable requirements for #57 Stone of Section 1005 and Section 1014-2 of the Standard Specifications and meeting the following criteria:

- Free of organic or otherwise deleterious substances.

- Contains a maximum organic content of 0.1%.
- Electrochemical: Resistivity > 5000 ohm-cm ASTM D1125
  4.5 < pH < 9.5 ASTM D1293

Before placing any backfill, furnish a Type IV certification in accordance with Article 106-3 of the Standard Specifications. Include a copy of all test results conducted in accordance with the above requirements in the certification. The Engineer determines how often NCDOT samples backfill material to assure compliance with gradation and electrochemical requirements.

1. Sample Preparation

Obtain approximately 2,000 grams of representative material and transfer it into a 1 gallon (3.8 liters) wide mouth plastic jug. Then add an equal weight of deionized or distilled water to the sample, and let this mixture set for approximately 30 minutes. At the end of this period, place a lid on the container and vigorously agitate the mixture for 3 minutes. Repeat this agitation at the 2 hour and 4 hour intervals. Allow the sample to set for approximately 20 hours after the 4 hour agitation so the solids will settle out. At this time remove a sufficient amount of the solution and filter through a coarse paper (Fisher Q8) to obtain the supernate to be analyzed in accordance with the above procedures.

5.0 CONSTRUCTION METHODS

A. Site Preparation

Perform surface excavation operations and random fill construction in the vicinity of the structure in accordance with the applicable portions of this Special Provision, and in reasonably close conformity to the lines, grades, dimensions, and cross-sections shown on the plans.

B. Retaining Wall Excavation

Excavate all material necessary for the construction of the retaining walls in accordance with the plans and this provision. Excavation includes the construction of all necessary bracing, shoring, and all pumping, bailing, and draining. Perform random backfilling in accordance with the details in the plans and dispose of or stockpile surplus or unsuitable excavated material as directed by the Engineer.

Perform all necessary clearing and grubbing at the site in accordance with Section 200 of the Standard Specifications.

Notify the Engineer a sufficient time before beginning the excavation so that measurements may be taken of the undisturbed ground.

Shore or brace the excavation in accordance with temporary shoring and temporary tieback retaining wall special provisions and local and state safety standards. Perform excavation and related work in such sequence that no portion of the retaining wall will be endangered by subsequent operations.

When the retaining wall is adjacent to a traveled way, obtain approval before beginning the excavation. Submit drawings and design calculations in accordance with the provisions of Subarticle 410-5(D) of the Standard Specifications.

Notify the Engineer after excavating each location of the wall. Do not place the concrete leveling pad until the depth of the excavation and the character of the foundation material have been approved.

Obtain approval for all random backfill material. Large or frozen lumps, wood or other undesirable material is not allowed in the backfill. Compact all backfill in accordance with Subarticle 235-4(C) of the Standard Specifications.

C. Wall Erection

1. Foundation Preparation

   Prior to wall construction, grade the foundation for the structure level for a width equal to or exceeding the length of soil reinforcing or as shown on the plans. Compact the foundation to a minimum of 95% of the maximum dry density as determined by AASHTO T99.

2. Leveling Pad Construction

   Construct concrete leveling pad of Class A concrete having the dimensions and at the locations and elevations shown on the plans. Cure the leveling pad a minimum of 24 hours before placement of wire facing.

3. Placing Wire Facing
   Place wire facing with equipment that does not damage the wire facing and in accordance with the wall Supplier's recommendations and construction manual. Place wire facing in successive horizontal lifts in accordance with the details and at the locations shown on the plans. Proceed with backfill placement as hereinafter specified. As wire facing and backfill lifts progress, maintain the wire facing within the maximum tolerance for vertical (plumbness) and horizontal alignment of 3/4 inch when measured along a 10 foot straightedge. The overall vertical tolerance of the wall (plumbness from top to bottom) is 1/2 inch per 10 feet of wall height.

4. Placing Stone Retention Fabric, Retaining Wall Backfill and Soil Reinforcing

   Place stone retention fabric along the back of the wire facing as indicated on the plans and in accordance with the wall Supplier's recommendations. Place backfill within the structure closely following the erection of each lift of wire facing. Place

the backfill material in layers for the full width shown on the plans. Place backfill layers such that the compacted layer is not more than 5 inches in depth. Compact the #57 stone backfill to the satisfaction of the Engineer. At each tie strip level, reinforcing mesh level, or reinforcing mat level of the wall, level and compact the backfill material before placing and attaching tie strip, mat or mesh. Place the reinforcing strips, mat or mesh normal to the face of the wall or as shown on the plans. Place connector rods, handle bars and hairpins as shown on the plans and in accordance with the Supplier's recommendations. Compact backfill layers in a direction parallel to the wall and without disturbance or distortion of reinforcing strips, mats, mesh, or wire facing. Use only a hand-operated mechanical compactor within three feet of the face of the wall as a precaution against pushing wire facing outward and distorting the vertical face of the wall. Exercise extreme care to prevent bending tie strips, mats, or mesh during compaction. Compact as required with a minimum of three passes of the compactor.

At the end of each day's operation, slope the areas adjacent to the stone backfill such that in the event of rain, surface runoff will be diverted away from the backfill area. Contamination of the stone backfill by soil fines from runoff is grounds for rejection of the backfill.

6.0 BASIS OF PAYMENT

Cast-In-Place Concrete Faced MSE retaining walls will be measured and paid for as the actual number of square feet of exposed face area incorporated into the completed and accepted wall. Portions of the MSE wall below finished grade or without cast-in-place concrete facing as shown on plans are considered incidental to the cost of the MSE walls. The wall height is measured as the difference between the top and bottom of the wall. The bottom of wall for payment purposes is defined as the point where the finished grade intersects the front of the wall. The top of the wall is defined as the top elevation of the completed wall not including and coping.

The price and payment will be full compensation for all items required, including cast-in-place concrete face, cast-in-place concrete coping, wire facing, Class VI select backfill, and any miscellaneous items needed to provide the Cast-In-Place Concrete Faced MSE retaining walls including but not limited to those items contained in this special provision.

Payment will be made under:

Cast-In-Place Concrete Faced MSE Retaining Walls ..... Square Foot

TEMPORARY TIEBACK RETAINING WALLS (SPECIAL)

1.0 GENERAL

The work under this section consists of design, plan preparation, furnishing materials, and construction of temporary tieback retaining walls as shown in the plans and in accordance with these specifications.

A tieback retaining wall consists of soldier piles and timber lagging or shotcrete supported by post-tensioned ground anchors.

The Contractor is advised to review all available subsurface information and conduct additional investigations, as needed, to determine subsurface conditions such as high groundwater, unstable soil, hard rock, etc. that would adversely affect the cost of construction. Further, the Contractor is cautioned that cobbles or boulders or general debris may be present within the fill in the general vicinity of the existing stone retaining wall and concrete block present at the site and should plan the design and construction of the temporary tieback retaining wall accordingly. No additional payment will be made for obstructions encountered during construction of the temporary tieback retaining wall.

Submit 5 copies of plans and calculations to the Engineer for review and approval and allow 40 calendar days from the date they are received until the Engineer returns them.

A pre-construction meeting is required prior to the start of the work and will be attended by representatives of the Contractor, Tieback Retaining Wall Subcontractor, Resident Engineer and the Geotechnical Engineering Unit. Tieback wall construction requires organized coordination of each of these parties. Conduct the pre-construction meeting to clarify the construction requirements, provide appropriate scheduling of the construction activities and identify contractual relationships and responsibilities. Review of all submittals should be completed prior to scheduling the pre-construction meeting.

2.0 PREQUALIFICATION REQUIREMENTS

The Temporary Tieback Retaining Wall Subcontractor is responsible for the installation, monitoring, and testing of the temporary tieback retaining walls. Use a Tieback Retaining Wall Subsontractor prequalified by the Contractual Services Unit of the Department for Retaining Walls (Anchored) [work code 3020]

The Temporary Tieback Retaining Wall Subcontractor's Project Engineer and Superintendent must have successfully constructed at least 3 projects in the last 3 years involving construction of tieback retaining walls totaling at least 10,000 square feet (1,000 square meters) of wall face area and at least 150 tiebacks.

The temporary tieback retaining wall must be constructed under the responsible charge of a professional engineer employed by the tieback wall Contractor, registered in the state of North Carolina, and have experience in the construction of at least 3 completed tieback retaining wall projects over the past 3 years. Any manufacturers' representatives cannot be used to satisfy the supervising Engineer requirements of this section.

Work cannot be started nor materials ordered until the Contractor's personnel qualifications have been approved by the Engineer. The Engineer may suspend the work if the Contractor substitutes non-approved personnel for approved personnel. The Contractor will be fully liable for costs resulting from the suspension of work and no adjustments in the contract time resulting from the work suspension will be allowed.

3.0 DESIGN CRITERIA AND PLAN REQUIREMENTS

Design and construct temporary tieback retaining walls in accordance with the criteria set forth in the latest version of AASHTO Allowable Strength Design Standard Specifications for Highway Bridges (including interims) and the FHWA Manual for "Ground Anchors and Anchored Systems", Report No. FHWA-IF-99-015.

Use the soil parameters shown on the plans for design of the wall.

Size all tieback tendons so that the design load does not exceed 60% of the minimum ultimate tensile strength of the tendon and the maximum test load does not exceed 80% of the minimum ultimate tensile strength of the tendon. Do not extend tieback tendons beyond the Right of Way or easement line. Helical type ground anchors are not permitted.

Do not use impact or vibratory methods to install sheet piling or soldier piles for the temporary shoring.

The submitted plans should include but will not be limited to the following:

- Elevation views showing all proposed and existing ground lines and stations, soldier piles, and anchor locations.

- Plan views showing all horizontal layout information.

- Section views showing in detail all wall components, the proximity of other structures, proposed and existing utilities, etc.

- Ground anchor schedule including anchor number, design load, type and size of tendon, minimum total anchor length, minimum bond length, minimum tendon bond length and unbonded length.

- Drawing of the ground anchor tendon, details of spacers, centralizers, anchorage, and trumpet.

- Construction sequence and installation procedure for installing soldier piles and anchors.

A professional engineer registered in the state of North Carolina must seal all plans and calculations.

4.0 MATERIALS

All materials must conform to the requirements of the applicable sections of the Standard Specifications for Roads and Bridges of the North Carolina Department of Transportation and the following provisions:

A. Fabricate tieback tendons from a single or multiple elements of the following:

1. Steel bars conforming to ASTM Designation A722, "Uncoated High-Strength Steel Bars for Prestressed Concrete."

2. Seven-wire strand conforming to ASTM Designation A416/416M, "Uncoated Seven-Wire Stress-Relieved Strand for Prestressed Concrete."

3. Compact seven-wire strands conforming to ASTM Designation A779, "Uncoated Seven-Wire Compacted, Stress-Relieved Steel Strand for Prestressed Concrete."

Submit mill test reports for each heat or lot of prestressing material used to fabricate tendons to the Engineer.

B. Submit cement anchor grout mix design to the Engineer for approval. Provide cement grout using Portland Cement conforming to ASTM Specification C-150, Type I, or III and potable water. The cement should be fresh, free from lumps or any indication of hydration. Admixtures that will impart low water content, flowability and minimum bleeding may be used in the cement grout with the consent of the Engineer. The admixtures may not contain any chemicals that may have a harmful effect on the prestressing steel or cement. If admixtures are to be used, submit to the Engineer prior to using the admixture the manufacturer's literature indicating the type of admixture and the manufacturer's recommendations for mixing the admixtures with grout. Expansive additives that cause air bubbles in the grout are not allowed. Provide grouting equipment that produces a uniformly mixed grout free of lumpy and undispersed cement. A positive displacement grout pump is required. Use a pump with a pressure gauge which can measure at least twice but no more than three times the intended grout pressure and a stroke counter (for piston-type grout pumps). Grout pumps without the specified pressure gauge and piston-type grout pumps without a stroke counter may not be used. Size the grouting equipment to enable the tieback to be grouted in one continuous operation. Mixing and storage times should not cause excessive temperature build in the grout and the mixer should be capable of continuously agitating the grout.

C. Use anchorage and hardware that is suitable for use with the type of anchor tendon used and capable of developing 95% of the guaranteed specified minimum ultimate tensile strength of the tendon, when tested in the unbonded state, without failure of the tendon. Anchorage devices should be capable of holding the prestressing steel at a load producing a stress of not less than 95% of the guaranteed specified minimum ultimate tensile strength of the prestressing steel without exceeding anticipated set and without failure of either the anchorage or the prestressing steel. Anchorages should also be capable of lift-off, detensioning or retensioning a tendon at any time prior to grouting.

Fabricate the bearing plates from steel plates conforming to AASHTO M270 Grade 250 Specifications. Size the plate so the bending stresses do not exceed 0.75 times the yield strength of the steel at the tieback design load or 1.00 times the yield strength of the steel at the maximum tieback test load.

Steel trumpets made from pipe or tube conforming to the requirements of ASTM A-53 for pipe and ASTM A-500 for tubing are also required. The inside diameter of the trumpet should be equal to or larger than the hole in the bearing plate furnished by the tendon supplier. The trumpet should also be long enough to accommodate movements of the structure during testing and stressing. For strand tendons, consult the tendon supplier to determine the minimum length trumpet required for making a transition from the diameter of the tendon in the unbonded length to the diameter of the tendon at the anchorhead.

The anchor nut and plate for bars should have complementary spherical shapes at the contact areas.

Use Anchorheads that are either steel meeting the requirements of AASHTO M-270 Grade 250 or cast ductile iron meeting the requirements of ASTM A-536 Grade 80-55-06.

D. Use Steel piles that conform to the applicable sections of the Standard Specifications.

E. Use timber lagging that conforms to the requirements of Section 1082 of the Standard Specifications and Table 16 entitled Recommended Thicknesses of Wood Lagging in Appendix C of the AASHTO "Construction Handbook for Bridge Temporary Works" is required but with a minimum thickness of 4 inches.

5.0 CONSTRUCTION

A. Excavation and Backfill:
Excavate only what is necessary to install the temporary support. If backfill behind the wall is required, backfill with granular material free of organics, cobbles and boulders as approved by the Engineer. Backfill should have a liquid limit (LL) of less than 50 and a plasticity index (PI) of less than 20. Compact the backfill to the satisfaction of the Engineer and to a density of at least 95 percent of that obtained by compacting a sample of the backfill material in accordance with AASHTO T99 as modified by the Department. Temporarily support soil and rock with timber lagging between the piles or other methods as approved by the Engineer. Materials used for support should be sound, free of defects and placed in a workmanlike manner.

B. Soldier Piles:
Place all soldier piles in pre-augered or drilled holes. Keep the holes open with casing if required, or other means as approved by the engineer. Use a lean sand grout mixture or excavatable flowable fill to fill the hole to the ground surface. This mixture will be removed as required to install the timber lagging. Set piles and place backfill in the holes as soon as practical after drilling. Do not leave more than 5 holes open at any time before setting piles and placing concrete unless the holes are cased.

Perform shaft excavation in accordance with the applicable provisions of Section 410 of the Standard Specifications. Remove and dispose of material resulting from shaft excavation off site. Placement of material from shaft excavation on the slope or behind the lagging is not allowed.

C. Anchor Installation:
Core drilling, rotary drilling, auger drilling or percussion drilling may be used to drill the holes for the anchors. If water is used in the drilling operation, dispose of the water in such a manner that erosion of the wall site is avoided. Repair any damage to the site by water erosion at no additional cost to the Department. If the hole will not stand open, install casing as required to maintain a clean and open hole. A 3 inch (75 mm) minimum hole diameter is required if no pressure grouting is used. Pressure grouting is defined as grouting with a pressure greater than 60 psi (415 kPa). The diameter of the drill bit should not be less than 0.12 inches (3 mm) smaller than the specified hole diameter. The hole should be within 3 inches (75 mm) of plan location and drilled to the inclination specified on the approved submittals within a three degree tolerance. Thoroughly clean holes in rock of all dust, rock chips, grease or other deleterious material prior to inserting the tendon.

Install the tendon in the casing or hole for the anchor. Drill holes to 1 foot (300 mm) minimum longer than tendons. Tendons should not be subjected to sharp bends. Use centralizers at a maximum of 10 foot (3 meter) on center spacing throughout the bond length to insure that the tendons do not contact the wall of the drill hole. The lowest centralizer should not be more than 5 feet (1.5 meters) from the bottom of the bond length.

The grouting operation should be performed after the tendon is inserted. Inject grout at the lowest point of the anchor. Place the grout over the entire anchor length. The top of the grout column may not contact the wall or the trumpet. After grouting, do not disturb the tendon until the grout has cured for at least 72 hours. Record the following data during the grouting operation:

1. Type of mixer
2. Water/cement ratio
3. Type of cement and additives
4. Grout pressure
6. Test sample strengths (prior to stressing)
7. Volume of grout placed in bond and free lengths

D. Anchor Testing and Stressing:
Test each anchor not to exceed 80% of the guaranteed ultimate tensile strength of the tendon. Performance testing is required on the first anchor installed of each specified design load capacity. Proof test all remaining anchors. Additional anchors may not be installed until the first anchor has been successfully performance tested.

1. Performance Tests:
   Incrementally load and unload the anchor in accordance with the following schedule. At each increment, record the movement of the tendon to the nearest 0.001 inch (0.025 mm) with respect to an independent fixed reference point. Calibrate the jack and pressure gauge as a unit. Provide a jack pressure gauge that is graduated in 100 psi (700 kPa) increments or less. Use a master gauge to verify the accuracy of the production gauge at the beginning of each shift.

Cycle	Load	Cycle	Load
1	0	5	0.50P
	0.25P		0.75P
	AL		1.00P
2	0.25P		1.20P
	0.50P		1.33P*
	0.25P		
	AL		
3	0.50P	When completed, adjust to	
	0.75P	lock-off load of 0.80P.	
	0.50P	AL (Alignment Load)	
	AL	P (Design Load)	
4	0.50P	* Hold 50 minutes for creep	
	0.75P	test.	
	1.00P		
	0.75P		
	0.50P		
	AL		

   To prevent misalignment of testing equipment, maintain a minimum Alignment Load (AL) at 0.05P. Hold each load increment until movement ceases or a minimum of 1 minute. Apply each load less than 30 seconds after the jack pump is started.

   Perform creep testing at the 1.33P load for 50 minutes. While the load is maintained, record the anchor movement (total movement) referenced to a fixed point at 0, ½, 1, 3, 5, 10, 20, 30, 40 and 50 minutes. The observation time begins when load begins being applied to the pump.

   The Engineer will review all performance tests to determine if the anchor is acceptable. An anchor will be acceptable if:

   a. The total elastic movement exceeds 80% of the theoretical elastic elongation of the free length.

   b. The creep movement does not exceed 0.08 inches (2 mm) during the 5 to 50 minute time increments regardless of tendon length and load.

2. Proof Tests:
   Incrementally load and unload the anchor in accordance with the following schedule. At each increment, record the movement of the tendon to the nearest 0.001 inches (0.025 mm) with respect to an independent fixed reference point. Monitor the jack load with a pressure gauge or load cell.

   0
   0.25P
   0.50P
   0.75P
   1.00P
   1.20P
   1.33P*
   When completed, adjust to lock-off load of 0.80P.
   *Hold for 5 minutes for creep test.
   P (Design Load)

   Perform creep testing at the 1.33P load for 5 minutes. While the load is maintained, record the anchor movement (total movement) at 0, ½, 1, 3 and 5 minutes. The observation time begins when load begins being applied to the pump. If the movement between the 30 second and the 5 minute reading is 0.08 inches (2 mm) or more, maintain the load for an additional 45 minutes and record the movement at 10, 20, 30, 40 and 50 minutes. Record all movements in relation to a fixed reference point. The acceptance criteria will be as in Section 1 for the performance tests above.

3. Lift-Off Tests:
   Make a lift-off reading for all anchors after transferring the load to the end anchorage and prior to removing the jack. Determine if the is load within 5% of lock-off load. If the lift-off load is not within this tolerance, reset the end anchorage and make another lift-off reading. Perform lift-off tests within 7 days of when the load was locked-off in the anchor.

   After five lift-off tests are performed, the Engineer will perform lift-off tests on a random basis such that the total number of lift-off tests performed will be no more than 10% of the remaining anchors.

E. Cutting of Tendon Protrusions:
   After an anchor has been accepted by the Engineer, the portion of the anchored tendon protruding over the anchor may be cut, if not otherwise required for use in retesting. Cut the tendon in accordance with the tendon manufacturers' recommendations as approved by the Engineer. Do not damage the tendon anchor when cutting.

F. Redesign:
If anchors fail during performance tests or proof tests, modify the design or construction procedures as approved by the Engineer. These modifications may include reducing the anchor design load by increasing the number of anchors, increasing the grout pressure and requiring post-grouting or increasing the bond length. Any modification of design or construction procedure will be at no cost to the Department. Install and test the redesigned anchors as directed by the Engineer at no additional cost to the Department. Acceptance of such anchors will be at the discretion of the Department. Anchors that fail the performance or proof tests may not be incorporated in the wall.

6.0 RECORDS

Record the following information:

A. As-built drawings showing the location of the tiebacks, total tieback length, anchor length and unbonded length one month after completion of the tieback installation.

B. Steel and grout certifications and mill reports prior to incorporating these materials in the work.

C. Grouting records indicating the cement type, quantity injected and the grout pressures once a week.

D. Tieback test results once a week.

Upon completion of the work, submit a complete record of the construction activities including the information listed above to the Engineer.

7.0 MEASUREMENT AND BASIS OF PAYMENT

Temporary Tieback Wall will be measured and paid for as the actual number of square feet of exposed face incorporated into the completed and accepted wall. The bottom of wall elevation is defined as the point where the finished grade intersects the front of the wall. The top of the wall is defined as the top elevation of the completed wall. The price and payment will be full compensation for grout, reinforcing steel, excavation, lagging, piles, anchors, labor, design and all other materials and equipment including grouting, drilling holes, post-tensioning, testing and all tools and any other miscellaneous items necessary to complete the work.

Payment will be made under:

Temporary Tieback Retaining Wall.....Square Feet

TEMPORARY SHORING **(SPECIAL)**

1.0 GENERAL

The work under this section consists of design, plan preparation, furnishing materials, and construction of temporary shoring walls as shown in the plans and in accordance with these specifications.

Submit shoring design for review and approval by the Engineer prior to beginning construction. Submit calculations and detail drawings in accordance with Article 400-3 of the Standard Specifications. Submit 5 copies of plans and calculations to the Engineer for review and approval and allow 40 calendar days from the date they are received until the Engineer returns them.

The temporary shoring must be constructed under the responsible charge of a professional engineer employed by the shoring Contractor and registered in the state of North Carolina. Any manufacturers' representatives cannot be used to satisfy the supervising Engineer requirements of this section.

The Contractor is advised to review all available subsurface information and conduct additional investigations, as needed, to determine subsurface conditions such as high groundwater, unstable soil, hard rock, etc. that would adversely affect the cost of construction. Further, the Contractor is cautioned that cobbles or boulders or general debris may be present within the fill in the general vicinity of the existing stone retaining wall and concrete block present at the site and should plan the design and construction of the temporary shoring accordingly. No additional payment will be made for obstructions encountered during construction of the temporary shoring.

A pre-construction meeting is required prior to the start of the work and will be attended by representatives of the Contractor, Resident Engineer and the Geotechnical Engineering Unit. Temporary shoring wall construction requires organized coordination of each of these parties. Conduct the pre-construction meeting to clarify the construction requirements, provide appropriate scheduling of the construction activities and identify contractual relationships and responsibilities. Review of all submittals should be completed prior to scheduling the pre-construction meeting.

2.0 DESIGN CRITERIA AND PLAN REQUIREMENTS

Design and construct temporary shoring walls in accordance with the criteria set forth in the latest version of AASHTO's "Guide Design Specifications for Bridge Temporary Works". If a temporary tieback wall is proposed for Temporary Shoring locations as shown on the plans, design and construct the walls in accordance with the "Temporary Tieback Retaining Wall" Special Provision. If a temporary soil nail wall is proposed, design and construct the wall in accordance with FHWA "Manual for Design and Construction Monitoring of Soil Nail Walls", Report No. FHWA-SA-96-069R and the Soil

Nailing Field Inspectors Manual, Publication No. FHWA-SA-93-068. Other wall types may be proposed with the Engineer's approval.

Use the soil parameters shown on the plans for design of the wall.

Do not extend any element of the temporary shoring beyond the Right of Way or easement line.

Do not use impact or vibratory methods to install sheet piling or soldier piles for the temporary shoring.

The submitted plans should include but will not be limited to the following:

- Elevation views showing all proposed and existing ground lines and stations.

- Plan views showing all horizontal layout information.

- Section views showing in detail all wall components, the proximity of other structures, proposed and existing utilities, etc.

- Construction sequence and installation procedure.

A professional engineer registered in the state of North Carolina must seal all plans and calculations.

3.0 MATERIALS

All materials must conform to the requirements of the applicable sections of the Standard Specifications for Roads and Bridges of the North Carolina Department of Transportation and the following provisions:

Steel piles if used must conform to the applicable sections of the Standard Specifications.

Timber lagging if used must conform to the requirements of Section 1082 of the Standard Specifications and Table 16 entitled Recommended Thicknesses of Wood Lagging in Appendix C of the AASHTO "Construction Handbook for Bridge Temporary Works" but with a minimum thickness of 4 inches.

4.0 MEASUREMENT AND BASIS OF PAYMENT

Temporary Shoring will be measured and paid for as the actual number of square feet of exposed face incorporated into the completed and accepted wall. The bottom of wall elevation is defined as the point where the finished grade intersects the front of the wall. If a temporary tieback wall, designed and constructed in accordance with the Temporary Tieback Retaining Wall Special Provision, is used for locations marked "Temporary Shoring" on the plans, Measurement and Payment will be in accordance with the Temporary Shoring Special Provision. The top of the wall is defined as the top elevation of

the completed wall. The price and payment will be full compensation for labor, design and all materials and equipment necessary to complete the work.

Payment will be made under:

Temporary Shoring.....Square Feet

CLASSIC CONCRETE BRIDGE RAILS: **(SPECIAL)**

1.0 General

The "Classic Concrete Bridge Rails" shall be in accordance with applicable parts of the Standard Specifications, the details shown on the plans and as outlined in these special provisions. Plans for the bridge rails are detailed for cast in place concrete and must be placed using conventional forms.

2.0 Construction

The bridge rails shall be placed to the established shape, line, grade and dimensions shown on the plans.

Joints in the rails shall be constructed at the locations and of the type specified on the plans.

3.0 Finishing

All exposed surfaces which are not satisfactory to the Engineer due to uniformity of color and texture or because of excessive patching shall be corrected as required by the Engineer. All surfaces of the bridge rails shall be given a Class I surface finish in accordance with the Standard Specifications unless directed otherwise by the Engineer.

4.0 Measurement

The quantity to be paid for under this item shall be the actual number of linear feet of "Classic Concrete Bridge Rail", complete in place and accepted, measured continuously along the top surface of completed rail from end to end without deductions for spaces between sections.

5.0 Payment

The quantity, measured as described above, will be paid for at the contract unit price per linear _foot bid for "Classic Concrete Bridge Rail", which price and payment shall be full compensation for all materials, admixtures, forms, falsework, curing, surface finish, tools, labor, equipment and incidentals necessary to complete the item.