Project U-3401 **Randolph County**

Project Special Provisions
Culverts & Walls

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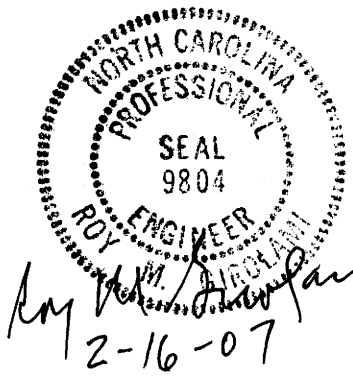

PROJECT SPECIAL PROVISIONS
CULVERT AND WALLS

PROJECT U-3401 **RANDOLPH COUNTY**

MSE RETAINING WALLS (7-18-06)

1.0 DESCRIPTION

Design, prepare plans, and construct 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, concrete face panel, concrete coping, retaining wall backfill, the fabric above the crushed aggregate backfill, and all other materials, labor, tools, equipment and incidentals necessary to complete the work.

Furnish any one of following retaining wall systems or approved equal in accordance with this Special Provision. Declare the choice of retaining wall system at the first Project Preconstruction Conference for the project. The wall system chosen at this Preconstruction Conference becomes the required wall system for the contract.

The Reinforced Earth Wall as manufactured by:

The Reinforced Earth Company
8614 Westwood Center Drive, Suite 1100
Vienna, VA 22182
Telephone (703) 821-1175

The Retained Earth Wall as manufactured by:

Foster Geotechnical
1372 Old Bridge Road, Suite 101
Woodbridge, VA 22192
Telephone (703) 499-9818

The Reinforced Soil Embankment Wall as manufactured by:

T and B Structural Systems
637 W. Hurst Boulevard, Suite 2A
Hurst, TX 76053
Telephone (817) 280-9858

The MSE Plus Wall as manufactured by:

SSL, Inc.
4740 Scotts Valley Drive, Suite E
Scotts Valley, CA 95066
Telephone (831) 430-9300

The Tricon Retained Soil Wall as manufactured by:

Tricon Precast Ltd.
15055 Henry Road
Houston, TX 77060
Telephone (281) 931-9832

The approved equal must meet the following criteria:

1. The MSE Retaining Wall System must utilize precast concrete face panels, and utilize steel soil reinforcements with a positive connection to the panels. Full-height panels are not allowed.

2. The company marketing the system must have successfully completed at least three projects in the last three years involving construction of permanent MSE walls totaling at least 100,000 square feet (10,000 square meters) of wall face area. Submit experience qualifications and details for these projects including owner contact information.

3. All other aspects of this special provision apply to the design, manufacture and construction of this MSE wall system.

Allow 15 calendar days review for approved equal.

Value engineering proposals for other wall systems are not considered.

Design the retaining walls to meet the criteria of the current AASHTO Standard Specifications for Highway Bridges and the requirements specified in the plans.

Submit eleven 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. Allow 40 days for review and approval from the date they are received by the Engineer until they are returned to the Contractor.

Provide the option chosen to meet the requirements of the plans, this Special Provision and the Standard Specifications.

2.0 GENERAL

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

Provide all necessary material from the Supplier chosen.

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.

3.0 MATERIALS

A. Concrete Panels

Provide the concrete mix designed by the Supplier to the State Materials Engineer prior to use. Design the mix to meet the strength requirements included in this Special Provision under the heading "Casting of Precast Concrete Face Panels".

B. Concrete Leveling Pad

Provide Class A concrete conforming to the applicable requirements in Sections 420 and 1000 of the Standard Specifications for the leveling pad.

C. Concrete Coping

Use Class A Concrete for coping and apply the requirements in Sections 420, 1000, and 1077 of the Standard Specifications. The requirements in Sections 425 and 1070 of the Standard Specifications apply to the reinforcing steel in coping. If preferred, precast coping is permitted unless otherwise stated in the plans.

D. Wall Facing Panel Reinforcing Steel, Soil Reinforcing Mesh, Mats, or Strips

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

Shop fabricate the soil reinforcing mesh or mats of cold drawn steel wire conforming to the minimum requirements of AASHTO M32 (M32M) and weld into the finished mesh fabric in accordance with AASHTO M55 (M55M). Hot roll reinforcing strips from bars to the required shape and dimensions with their physical and mechanical properties conforming to AASHTO M223 (M223M), Grade 65 (Grade 450). Cut to lengths and tolerances shown on the plans and punch holes for bolts in the locations shown on plan details. 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.

E. Miscellaneous Panel Components and Attachment Devices

Provide miscellaneous concrete face panel components, including dowels, polyvinylchloride pipe, stirrups, etc., in accordance with the Supplier's recommendations.

Shop-fabricate tie strips of hot rolled steel conforming to the minimum requirements of ASTM A1011, Grade 50 (Grade 345) or equivalent. The minimum bending radius of tie strips is 1 inch (25 mm).

Use 1/2" (12.70 mm) diameter bolts, nuts and washers conforming to AASHTO M164 (M164M). Provide Bolt and thread lengths in accordance with the Supplier's recommendations. Hot-dip galvanize bolts and nuts in accordance with the requirements of AASHTO M232 (M232M).

Fabricate clevis connector and connector bar from cold drawn steel wire conforming to the requirements of AASHTO M32 (M32M) and weld in accordance with AASHTO M55 (M55M). Galvanize loops in accordance with AASHTO M111.

F. Joints and Joint Materials

Provide the type and grade bearing pads approved by the chosen Supplier.

Where shown on the plans, provide a polyester filter fabric cover, approved by the Supplier, for horizontal and vertical joints between panels. Use adhesive approved by the manufacturer to attach the fabric material to the rear of the facing panels.

G. Alignment Pins

Use 5/8" (16 mm) diameter, smooth mild steel bars galvanized in accordance with AASHTO M111 for pins to align the face panels during construction.

H. Coarse Aggregate Backfill (Retaining Wall)

Use only washed, crushed stone backfill material conforming to the applicable requirements for #57, #67, or #78M 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.

2. Backfill Separation Fabric

   Place a layer of fabric on top of the completed coarse aggregate wall backfill to prevent migration of fines from common backfill placed above from contaminating the wall backfill.

   Use fabric meeting the applicable requirements for Type 2 fabric as described in Section 1056 of the Standard Specifications.

   Overlap the fabric a minimum of 18 inches (460 mm).

4.0 CASTING OF PRECAST CONCRETE FACE PANELS

A. General

Cast concrete face panels and apply the requirements of Sections 1000 and 1077 of the Standard Specifications.

B. Acceptance

Supply concrete for precast panels that attains a 28 day compressive strength of 4000 psi (27.6 MPa) unless otherwise shown on plans.

Acceptance of the concrete face panels with respect to compressive strength is determined on the basis of production lots. A production lot is a group of panels that is represented by a single compressive strength sample and consists of either 40 panels or a single day's production, whichever is less. Make compression tests on standard 6" x 12" (152 mm by 305 mm) or 4" x 8" (102 mm by 203 mm) test specimens

prepared in accordance with AASHTO T23. Conduct compressive strength testing in accordance with AASHTO T22.

Cast a minimum of four cylinders for each production lot sampled. Cure all specimens in the same manner as the panels. An acceptance test result is the average compressive strength of two cylinders.

The lot is acceptable if the test results are equal to or greater than 4000 psi (27.6 MPa).

If a production lot fails to meet the specified compressive strength requirements, the production lot is rejected unless the Supplier, at his own expense, obtains and submits evidence of a type acceptable to the Engineer that the strength and quality of the concrete placed within the panels of the production lot is acceptable. If such evidence consists of tests made on cores taken from the panels within the production lot, obtain and test the cores in accordance with the requirements of AASHTO T24.

C. Miscellaneous

1. Casting

Set all panel components in place in the forms to conform to the details on the plans and accepted shop plans prior to casting. Cast the panels on a flat area with the front face of the form at the bottom and the rear face at the top. Set tie strip guides or clevis connectors on the rear face.

Give special care to the clevis connectors: Place all clevis connectors normal to the panel and attach them to the alignment templates using the bars provided with the forms. Tolerance for the vertical and horizontal alignment of the clevis connectors is ±1/8" (3 mm). Clean the holes inside the loops so that they are free of all concrete and debris.

Place the concrete in each unit without interruption and consolidate using an approved vibrator, supplemented by hand tamping to force the concrete into corners of the forms and prevent the formation of stone pockets or cleavage planes. Use clear form oil of the same manufacture throughout the casting operation.

2. Concrete Finish

Provide an ordinary surface finish as defined by Subarticle 420-17(B) of the Standard Specifications for the front face (exposed face of wall) unless otherwise shown on the plans. Screed the rear face of the panel to a uniform surface finish to eliminate open pockets of aggregate and surface distortions in excess of 1/4 inch (6 mm).

3. Tolerances

   Manufacture all units within the following tolerances:

   - All dimensions within 3/16 inch (5 mm), except the lateral position of the tie strips to within 1 inch (25 mm).
   - Surface defects on formed surfaces are not to exceed 1/8 inch in 5 feet (3mm in 1.5 m).

4. Marking

   Clearly scribe the date of manufacture, the production lot number, and the piece-mark on the rear face of each panel.

5. Handling, Storage and Shipping

   Handle, store and ship all units in such manner as to eliminate the danger of discoloration, chipping, cracks, fractures and excessive bending stresses. Support panels in storage on firm blocking located immediately adjacent to tie strips to avoid bending the tie strips. Store panels in a horizontal position and stack no more than six high. Do not ship panels prior to 5 days after production.

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 and subsequent removal of all necessary bracing, shoring, sheeting and cribbing 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 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.

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.

Remove all sheeting and bracing as the random backfilling progresses.

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 an unreinforced 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 wall panels.

3. Placing Concrete Face Panels

   Place precast concrete panels vertically with equipment that does not damage the panels. For erection, handle panels by means of eyes set into the upper edge of the panels. Use other placement methods when approved by the Supplier and Engineer. Place panels in successive horizontal lifts in accordance with the details and at the locations shown on the plans. Externally brace the first lift of panels. Proceed with backfill placement as hereinafter specified. As panel and backfill lifts progress, maintain the panels in vertical position by means of temporary wooden wedges placed in the joint at the junction of the two adjacent panels on the external side of the wall. The maximum tolerance for vertical (plumbness) and horizontal alignment is 3/4 inch (19 mm) when measured along a 10 foot (3 m) straightedge. The maximum allowable offset in any panel joint is 3/4 inch (19 mm). The overall vertical tolerance of the wall (plumbness from top to bottom) is 1/2 inch (13 mm) per 10 feet (3 m) of wall height. As wall erection progresses, install horizontal and vertical joint filler in accordance with the Supplier's instructions.

4. Placing Retaining Wall Backfill and Soil Reinforcing

   Place backfill within the structure closely following the erection of each lift of panels. Place the backfill material in layers for the full width shown on the plans. Place layers not more than 7½ inches (190 mm) in depth loose thickness and compact. Compact coarse aggregate backfill with at least four passes of an 8 – 10 ton (7.3 - 9.1 metric ton) vibratory roller in the vibratory mode, or as directed by the Engineer. At each soil reinforcement location, level and compact the backfill material before placing and attaching tie strip, mat or mesh. Place the soil reinforcement normal to the face of the wall or as shown on the plans. Compact backfill layers in a direction parallel to the wall and without disturbance or distortion of soil reinforcement or wall panels. Use only a hand-operated mechanical compactor within 3 feet (1 m) of the face of the wall as a precaution against pushing panels outward and distorting the vertical face of the wall. Exercise extreme care to prevent bending soil reinforcement or panel attachments during compaction. Compact as required with a minimum of three passes of the hand-operated 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.

5. Placing Concrete Coping

   When cast-in-place coping is used, place a 1/2 inch deep vertical contraction joint in all exposed faces at a spacing equal to two panel widths and in accordance with Article 825-10(B) of the Standard Specifications. Place the contraction joints in the coping so that it aligns with the vertical joints between the panels.

6.0 MEASUREMENT AND PAYMENT

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. The wall height is measured as the difference between the top and bottom of the wall. The bottom of wall 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 including any height from the concrete coping.

The price and payment will be full compensation for all items required to provide the MSE retaining walls including but not limited to those items contained in this special provision.

Payment will be made under:

MSE Retaining Walls ..... Square Foot

FALSEWORK AND FORMWORK (7-18-06)

1.0 DESCRIPTION

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

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

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

2.0 MATERIALS

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

3.0 DESIGN REQUIREMENTS

A. Working Drawings

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

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

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

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

1. Wind Loads

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

Table 2.2 - Wind Pressure Values

Height Zone feet (m) above ground	Pressure, lb/ft^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.

B. Review and Approval

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

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

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

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

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

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

4.0 CONSTRUCTION REQUIREMENTS

All requirements of Section 420 of the Standard Specifications apply.

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

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

A. Maintenance and Inspection

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

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

B. Foundations

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

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

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

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

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

5.0 REMOVAL

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

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

6.0 METHOD OF MEASUREMENT

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

7.0 BASIS OF PAYMENT

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

SUBMITTAL OF WORKING DRAWINGS (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

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

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.