

**Project Special Provisions
Culvert & Walls**

Table of Contents

	Page #
Precast Reinforced Concrete Box Culvert at Station 33+52.00 -L- (2-14-04)	1
Falsework and Formwork (10-12-01)	6
Submittal of Working Drawings (6-7-05)	12
Crane Safety (08-15-05)	18
Pile/Panel Retaining Wall (SPECIAL)	18
Control of Vibration (SPECIAL)	21
Modular Block Retaining Wall (SPECIAL)	22

A circular professional seal for Buck Charles Hunt, a Professional Engineer in North Carolina. The seal contains the text: "NORTH CAROLINA PROFESSIONAL SEAL 14091 ENGINEER BUCK CHARLES HUNT". A handwritten signature is written across the seal, and the date "3/30/06" is written below it.

PROJECT SPECIAL PROVISIONS
CULVERT AND WALLS

PROJECT U-3613B

PITT COUNTY

PRECAST REINFORCED CONCRETE
BOX CULVERT AT STATION 33+52.00 -L-

(2-14-04)

1.0 GENERAL

This Special Provision covers precast reinforced concrete box culverts intended for the construction of culverts and for the conveyance of storm water.

Where a precast reinforced box culvert is required on the plans, design the precast culvert sections in accordance with AASHTO M259 and provide the size and number of barrels as indicated on the plans. Precast wing walls will not be allowed. For culverts with less than 2 feet (0.6 m) of cover, design the precast culvert sections in accordance with AASHTO M273. Detail the culvert with cast in place wings. Provide a precast box culvert that meets the requirements of Section 1077 and any other applicable parts of the Standard Specifications.

The design of the precast members is the responsibility of the Contractor and is subject to review, comments and approval. Submit two sets of detailed plans for review. Include all details in the plans, including the size and spacing of the required reinforcement necessary to build the precast box culvert. Include checked design calculations for the precast members complying with the latest AASHTO Standard Specifications and requirements detailed herein. Have a North Carolina Registered Professional Engineer check and seal the plans and design calculations. After the plans are reviewed and, if necessary, the corrections made, submit one set of reproducible tracings on 22" x 34" sheets to become the revised contract plans.

A pre-installation meeting is required prior to installation. Representatives from the Contractor, the precast box manufacturer, and the Department should attend this meeting. The precast box manufacturer representative shall be on site during installation.

2.0 PRECAST REINFORCED CONCRETE BOX SECTIONS**A. Types**

Precast reinforced concrete box sections manufactured in accordance with this Special Provision are designated by span, rise, and design earth cover.

B. Design

1. Design – The box section dimensions and reinforcement details are subject to the provisions of Section F.

2. Placement of Reinforcement – Provide a 1 inch (25 mm) concrete cover over the circumferential reinforcement subject to the provisions of Section F. Extend the inside circumferential reinforcement into the male portion of the joint and the outside circumferential reinforcement into the female portion of the joint. Detail the clear distance of the end circumferential wires so it is not less than 1/2 inch (13 mm) nor more than 2 inches (51 mm) from the ends of the box section. Assemble reinforcement per the requirements of AASHTO M259, Section 7.3. The exposure of the ends of the wires used to position the reinforcement is not a cause for rejection.
3. Laps and Spacing – Use lap splices for the circumferential reinforcement. Detail the circumferential wires so that the center to center spacing is not less than 2 inches (50 mm) nor more than 4 inches (100 mm). Do not detail the longitudinal wires with a center to center spacing of more than 8 inches (200 mm).
4. The design earth cover is reported on the plans as the elevation difference between the point of maximum fill and the top of the top slab.

C. Joints

1. Produce the precast reinforced concrete box section with male and female ends. Design and form these ends of the box section so, when the sections are laid together, they make a continuous line of box sections with a smooth interior free of appreciable irregularities in the flowline, all compatible with the permissible variations given in Section F. The internal joint formed at the male and female ends of the precast units shall be sealed with either bitumen/butyl sealant or closed-cell neoprene material. The internal joint material shall be installed in accordance with the manufacturer's recommendations. The material shall be shown on the shop drawings when they are submitted for review.
2. Seal the external joint with an outside sealer wrap that is at least 12 inches (300 mm) wide and covers the joint on both the sides and the top of the box section. Use ConWrap CS-212 from Concrete Sealants, Inc., EZ-Wrap from Press-Seal Gasket Corporation, Seal Wrap from Mar-Mac Manufacturing Co., Inc., Cadilloc External Pipe Joint from Cadilloc, or an approved equal for the outside sealer wrap. If the outside sealer wrap is not applied in a continuous strip along the entire joint, a 12 inch (300 mm) minimum lap of the outside sealer wrap is permitted. Before placing the outside sealer wrap, clean and prime the area receiving the outside sealer wrap in accordance with the sealer wrap manufacturer recommendations. The joint wrap
3. manufacturer installation recommendations shall be included with shop drawings submitted for review. The external joint wrap shall be installed in three pieces, as indicated on Figure 1 below:

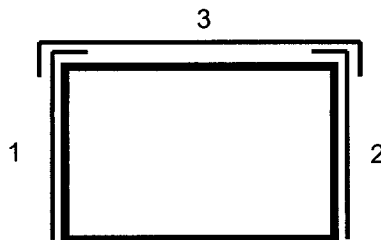


Figure 1

Cover the external joint sealer with a 3 foot (900 mm) strip of filter fabric conforming to Type 4 requirements in Section 1056 of the Standard Specifications. Place multiple lines of a precast reinforced concrete box culvert such that the longitudinal joint between the sections has a minimum width of 3 inches (75 mm). Fill the joint between multiple lines of precast box sections with Class A concrete. Use Class A concrete that meets the requirements listed in the Standard Specifications except that Field Compressive Strength Specimens are not required.

D. Manufacture

Precast box culverts may be manufactured by either the wet cast method or dry cast method.

1. Mixture – In addition to the requirements of Section 1077 of the Standard Specifications, do not proportion the mix with less than 564 lb/yd³ (335 kg/m³) of portland cement.
2. Strength – Make sure that all concrete develops a minimum 28-day compressive strength of 5000 psi (34.5 MPa). Movement of the precast sections should be minimized during the initial curing period. Any damage caused by moving or handling during the initial curing phase will be grounds for rejection of that precast section.
3. Air Entrainment – Air entrain the concrete in accordance with Section 1077 - 5(A) of the Standard Specifications. For dry cast manufacturing, air entrainment is not required.
4. Testing – Test the concrete in accordance with the requirements of Section 1077 - 5(B).
5. Handling – Handling devices or holes are permitted in each box section for the purpose of handling and laying. Submit details of handling devices or holes for approval and do not cast any concrete until approval is granted. Remove all handling devices flush with concrete surfaces as directed. Fill holes in a neat and workmanlike manner with an approved non-metallic non-shrink grout, concrete, or hole plug.

E. Physical Requirements

Acceptability of precast culvert sections is based on concrete cylinders made and tested in accordance with AASHTO T22 and AASHTO T23.

F. Permissible Variations

1. Flatness – All external surfaces shall be flat, true, and plumb. Irregularities, depressions, or high spots on all external surfaces shall not exceed 1/2 inch (12 mm) in 8 feet (2.5 meters).
2. Internal Dimensions – Produce sections so that the internal and haunch dimensions do not vary more than 1/4 inch (6 mm) from the plan dimensions.
3. Adjacent Sections - Internal, external, and haunch dimensions for connecting sections shall not vary more than 1/2 inch (12 mm).
4. Length of Tongue and Groove – The minimum length of the tongue shall be 4 inches (100 mm). The minimum length of the groove shall be 4 inches (100 mm). The dimensions of the tongue and groove shall not vary more than 1/4 inch (6 mm) from the plan dimensions.
5. Slab and Wall Thickness – Produce sections so that the slab and wall thickness are not less than that shown on the plans by more than 5% or 3/16 inch (5 mm), whichever is greater. A thickness more than that required on the plans is not a cause for rejection.
6. Length of Opposite Surfaces – Produce sections so that variations in laying lengths of two opposite surfaces of the box section meet the requirements of AASHTO M259, Section 11.3.
7. Length of Section – Produce sections so that the underrun in length of a section is not more than 1/2 inch (13 mm) in any box section.
8. Position of Reinforcement – Produce sections so that the maximum variation in the position of the reinforcement is $\pm 3/8$ " (± 10 mm) for slab and wall thicknesses of 5 inches (125 mm) or less and $\pm 1/2$ " (± 13 mm) for slab and wall thicknesses greater than 5 inches (125 mm). Produce sections so that the concrete cover is never less than 5/8 inch (16 mm) as measured to the internal surface or the external surface. The preceding minimum cover limitations do not apply at the mating surfaces of the joint.
9. Area of Reinforcement – Use the design steel shown on the plans for the steel reinforcement. Steel areas greater than those required are not cause for rejection. The permissible variation in diameter of any wire in finished fabric is prescribed for the wire before fabrication by either AASHTO M32 or M225.

G. Marking

1. Each section shall be match-marked in order of intended installation as indicated on the approved shop drawings. Ensure that pieces fit together neatly and in a workmanlike manner. In order to ensure a good, neat field fit, assemble adjacent sections at the producer's facility and match-mark the pieces. This will require that a minimum of three adjacent sections of the culvert be fitted at the production yard at a time and then match-marked. Once three sections have been match-marked, the first section may be removed for shipment and a fourth section set for marking. Continue in a progressive manner until all sections have been properly match-marked.
2. Clearly mark each section of the box culvert in accordance with AASHTO M259, Section 15.

H. Construction

1. Foundation – Foundation for precast box culvert shall meet the requirements of Section 414 of the Standard Specifications. In addition, Type VI foundation material shall be encapsulated in filter fabric conforming to Type 4 requirements in Section 1056 of the Standard Specifications. The filter fabric shall be placed perpendicular to the culvert barrel. Provide sufficient overhang beyond the excavation to allow a minimum lap of 3 feet (900 mm) when the foundation material is placed and fabric wrapped on top. Perpendicular sections of fabric shall be continuous. A minimum lap of 2 feet (600 mm) shall be provided between sections of fabric.
2. Installation – Sections shall be placed at the beginning of the outlet end of the culvert with the groove end being laid upgrade. Tongue sections shall be laid into the groove sections. Positive means shall be provided to pull each section firmly into the previously placed section so that the joints are tightly homed. Use a "come-along", box pullers or other approved methods to create a positive means of joining box sections. Construction equipment shall not have direct contact with the box section. The load of the box shall be suspended by lifting device during joining procedure.
3. Backfill – Complete backfill in accordance with Section 414 of the Standard Specifications.

3.0 BASIS OF PAYMENT

The Precast Reinforced Concrete Box Culvert as described on the plans and in this Special Provision will be paid for at the contract lump sum price for "Precast Reinforced Concrete Box Culvert at Station _____". Such price and payment will be full compensation for all work covered by this Special Provision, the plans and applicable parts of the Standard Specifications and will include, but not be limited to, furnishing all labor,

materials (including all filter fabric), equipment and other incidentals necessary to complete this work. Such price and payment will also be full compensation for concrete, reinforcing steel, labor, equipment and all other related materials necessary for the completion of the barrel section, and the construction of the headwalls, end curtain walls, wings and wing footings. Culvert Excavation and Foundation Conditioning Material will be paid for in accordance with the Standard Specifications and will not be a part of this pay item.

Payment will be made under:

Precast Reinforced Concrete Box Culvert at Station _____ Lump Sum

FALSEWORK AND FORMWORK

(10-12-01)

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 420-17 of the Standard Specifications and these Special Provisions.

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

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

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

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

B. Review and Approval

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

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

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

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

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

If requested by the Engineer, submit with the working drawings manufacturer's catalog data listing the weight of all construction equipment that will be supported on the temporary work. Show anticipated total settlements and/or deflections of falsework and forms on the working drawings. Include falsework footing settlements, joint take-up, and deflection of beams or girders. 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**6-7-05****1.0 GENERAL**

Submit working drawings in accordance with Article 105-2 of the Standard Specifications and the requirements of this Special 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.

If submittals contain variations from plan details or specifications, significantly affect project cost, or significantly affect field construction or operations, discuss them with, and submit them through, the Resident Engineer. State the reason for the proposed variation in the submittals. To minimize overall review time, make sure all working drawing submittals are complete when first submitted. Provide a contact name and phone number with each submittal. Direct any questions regarding working drawing 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, the Contractor shall 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 WORKING DRAWINGS SUBMITTAL CONTACTS

All submittals noted herein are reviewed by the Structure Design Unit and/or the Geotechnical Engineering Unit.

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

The quantities provided in this Special Provision act as a guide in the submittal process.

Unless otherwise required by the contract, submit two sets of supporting calculations to the Structure Design Unit.

Furnish one complete copy of the submittal, including all attachments, to the Resident Engineer. If requested, provide additional copies of any submittal. At the same time, submit the following number of copies directly to the Structure Design Unit and/or the Geotechnical Engineering Unit:

Working Drawing Submittal	Copies Required by Structure Design Unit	Copies Required by Geotechnical Engineering Unit	Contract Reference Requiring Submittal¹
Arch Culvert Falsework	5	0	Plan Note & SN Sheet
Box Culvert Falsework ²	5	0	Plan Note & SN Sheet
Cofferdams ⁴	6	1	Articles 410-5 and 420-8
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 (superstructure)	8	0	Article 420-3
Falsework & Forms ² (substructure)	8	0	Article 420-3
Mechanically Stabilized Earth Retaining Walls ⁴	7	1	“MSE Retaining Walls”
Metal Bridge Railing	8	0	Plan Note
Metal Stay-in-Place Forms	8	0	Article 420-3
Metalwork for Elastomeric Bearings ^{5,6}	7	0	Article 1072-10
Miscellaneous Metalwork ^{5,6}	7	0	Article 1072-10
Overhead Sign Assemblies	13	0	Article 903-3(C)
Pile Points	7	1	Article 450-8(D) & “Steel Pile Points”
Placement of Equipment on Structures (cranes, etc.)	7	0	Article 420-20

Precast Concrete Box Culverts	2, then 1 reproducible	0	“(Optional) Precast Reinforced Concrete Box Culvert at Station ____”
Precast Retaining Wall Panels	10	0	Article 1077-2
Pot bearings ⁵	8	0	“Pot Bearings”
Prestressed Concrete Deck Panels	6 and 1 reproducible	0	Article 420-3
Proprietary retaining walls ⁴	9	0	Applicable Project Special Provision
Prestressed Concrete Girder (strand elongation and detensioning sequences)	6	0	Articles 1078-8 and 1078- 11
Prestressed Concrete Cored Slab (detensioning sequences) ³	6	0	Article 1078-11
Revised Bridge Deck Plans (adaptation to metal stay-in-place forms)	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”
Soil Nail Retaining Walls ⁴	4	1	Applicable Project Special Provision
Sound Barrier Wall Steel Fabrication Plans ⁶	7	0	Article 1072-10 & “Sound Barrier Wall”
Sound Barrier Wall Casting Plans	10	0	Article 1077-2 & “Sound Barrier Wall”
Structural Steel ⁵	2, then 7	0	Article 1072-10
TFE Expansion Bearings ⁵	8	0	Article 1072-10
Temporary Detour Structures ⁴	10	1	Article 400-3 & “Construction, Maintenance and Removal of Temporary Structure at Station ____”
Temporary Shoring ⁴	6	1	Article 410-4 & “Temporary Shoring for Maintenance of Traffic”

Temporary Fabric or Wire Walls ⁸	0	2	Applicable Project Special Provision
Permanent Anchored Tieback Retaining Walls ⁴	4	1	Applicable Project Special Provision
Evazote Joint Seals ⁷	9	0	Applicable Project Special Provision
Optional Disc Bearings ⁵	8	0	“Optional Disc Bearings”
Removal of Existing Structure over Railroad	5	0	Railroad Special Provisions
Drilled Pier Construction Sequence Plans ⁸	0	1	“Drilled Piers”
Pile Hammers ⁸	0	1	Article 450-6
Crosshole Sonic Logging (CSL) Reports ⁸	0	1	“Crosshole Sonic Logging”
Pile Driving Analyzer (PDA) Reports ⁸	0	1	“Pile Driving Analyzer”

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. Submittals for these items are necessary only when plan notes require them.
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. These submittals are reviewed by the Structure Design Unit and the Geotechnical Engineering Unit. If NCDOT Shoring Standards are used, working drawings need not be submitted, but the Shoring Selection Form should be forwarded to the Geotechnical Engineering Unit.
5. The fabricator may submit these items directly to the Structure Design Unit.
6. The two sets of preliminary submittals required by Article 1072-10 of the Standard Specifications are not required for these items.
7. Submittals for Fabrication Drawings are not required. Submission of Catalogue Cuts of Proposed Material is required. See Section 5.A of the Project Special Provision.
8. Submittals for these items are reviewed by the Geotechnical Engineering Unit only and correspondence regarding these items should be directed to and will come from the Geotechnical Engineering Unit.

CRANE SAFETY

08-15-05

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

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

CRANE SAFETY SUBMITTAL LIST

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

PILE/PANEL RETAINING WALL**(SPECIAL)**

The Contractor shall construct a pile and precast concrete panel retaining wall at the location indicated in the plans and in accordance with the details in plans, the following provision, and as directed by the Engineer.

A pile/panel retaining wall preconstruction conference shall be scheduled with the Contractor including the Resident Engineer, the inspector, the Area Bridge Construction Engineer and a member from the Geotechnical Engineering Unit to discuss construction and inspection of the

pile/panel retaining wall. This conference shall be scheduled after the sample panels have been formed and before the sample panels are approved.

Steel Piles

HP steel piles shall conform to the applicable parts of the Standard Specifications and these provisions. Steel piles shall be ASTM A572 Grade 50 with the addition of 0.2% minimum copper. The size of piles shall be as shown in the plans.

See provisions contained herein for painting of steel piles.

The piles shall be installed to grade and location using the lengths and cut off elevations shown in the plans by a pile hammer. Vibrations due to pile driving shall be monitored and limited according to the control of vibration special provision.

Where the alignment of the wall is curved, the piles shall be laid out on chords and aligned such that their flanges are tangent to the curve at the web.

Piles shall be installed to within 2 inches of their plan location and the center to center distance between piles shall not differ from the plans by more than 3 inches after installation.

The plumbness of the piles shall not vary from the vertical by more than 1/8 inch per foot. In general, installed piles will be acceptable if the precast concrete panels, when installed, have an acceptable appearance without significant gaps between the face of the panels and the pile flanges. The precast concrete panels shall have a minimum 2 inch bearing on the pile flanges.

Splicing of piles is not allowed.

Precast Concrete Panels

Concrete materials for precast panels shall conform to the applicable parts of the Standard Specifications and these provisions.

Concrete for the precast panels shall have a minimum 28-day compressive strength of 4,000 psi. The panels shall not be removed from the forms until the concrete has attained sufficient strength to prevent damage. Cracked, spalled or discolored panels shall be rejected.

Panels shall have an exposed aggregate face. The depth of exposure shall range from 0" to ¼". The aggregate shall be from an approved source. The coarse aggregate and fine aggregate shall be manufactured from dark gray granite. All fine and course aggregate, retarder and cement shall come from the same source as used in the approved sample panels.

The side of the panel shall be plumb and have a minimum bearing distance of 2 inches. ½" thick expansion joint material shall be placed between the panels and pile flanges for the width of the bearing surface. The panel shall be seated firmly on the cushioning material and shall be held securely against the pile flange until the backfill is placed sufficiently to hold it in place.

C.I.P. Coping

The work covered by this provision consists of the construction of portland cement concrete coping in accordance with the details in the plans and the following provisions.

- (1) Concrete shall be Class A conforming to the applicable requirements of Sections 420 and 1000 of the Specifications.
- (2) Reinforcing steel in the coping shall conform to the applicable requirements of Sections 425 and 1070 of the Specifications.
- (3) Concrete for C.I.P. coping shall be colored to match the precast panels.

Expansion joints are not permitted, but construction joints may be used where the coping changes slopes and at 90 foot centers.

Excavation and Backfill

Where necessary for safety, the excavation shall be sloped or shored in accordance with local and state safety standards. It is suggested to use timber lagging in conjunction with the permanent retaining wall piles as excavation shoring. However, the Contractor may elect to use alternate methods of providing a safe excavation provided the methods are submitted to the Engineer for review and acceptance.

The Contractor shall take care to minimize the excavation necessary to place the cushioning material and panels. The excavation for cushioning material and panels shall be backfilled immediately after panels are placed with No. 57 stone. Excavation to install panels and timber lagging shall be limited 6 inches behind the panels. Any overexcavation shall be backfilled with No. 57 stone.

No. 57 stone shall conform to the applicable requirements of Section 1005 of the Standard Specifications and these provisions.

Compaction of the No. 57 stone backfill shall be to the satisfaction of the Engineer. The stone shall be rodded and spread in order to fill all voids and insure maximum density. Larger areas shall be compacted with hand operated equipment. Flushing the stone with water will not be allowed. Heavy compaction equipment will not be allowed behind the wall.

The No. 57 stone cushioning material shall be compacted with at least two (2) passes of lightweight compaction equipment.

Painting of Piles

Steel piles shall be painted in accordance with Section 442 of the Standard Specifications and these provisions.

Painting is required only from the top of the pile down to 12 inches below grade. The finish coat of the steel piles will be painted black.

In addition to surface preparation requirements of Section 442, all free edges to be painted shall be planed in accordance with Section 1072-14.

Measurement and Payment

The quantity of pile/panel retaining walls to be paid for will be the actual number of square feet of precast concrete panels which have been incorporated into the completed and accepted retaining wall. Measurement shall be made horizontally and vertically from outside edge to outside edge.

The quantity of pile/panel retaining wall, measured as provided above, will be paid for at the contract unit price per square foot for "Pile/Panel Retaining Wall".

Such price and payment shall be full compensation for all work covered by this provision including but not limited to furnishing, installing and painting the piles, furnishing and placing precast concrete panels, furnishing and placing No. 57 stone, temporary shoring, construction of C.I.P. coping, and all other incidental work and materials necessary to construct the pile/panel retaining wall.

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 Administration Office. Schedule a preconstruction conference before beginning any work, and include personnel from the Contractor, the vibration monitoring firm, the Resident Engineer, and representatives from the NCDOT Construction Unit and the Geotechnical Engineering Unit. Submit a vibration monitoring plan to the Engineer for approval before at least 30 days before beginning construction work.

Prepare and furnish three (3) copies of a preconstruction inspection report to the Engineer before beginning the construction. Utilize construction methods and equipment to prevent damage to adjacent structures/properties. Use of vibratory compaction equipment is only allowed for placement and/or compaction of earth material, stone or asphalt pavement to the limit that does not cause damage to the adjacent structures.

Furnish and operate vibration monitoring devices (engineering seismographs) for the duration of the construction work in which vibrations may cause damage at locations along the project including the following seven homes located behind Pile/Panel Wall (Wall 1) beginning at station 110+43.00 –L- to station 115+50.00 –L-. 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 pile installation for the pile/panel wall at adjacent structures/properties. Once safe levels have been confirmed, instruments only need to be checked on a daily basis.

Inspect the conditions of adjacent structures frequently during the construction to assess any damage to the structures. If the vibrations recorded show any potential to damage adjacent structures, cease all work immediately and furnish the Engineer with an alternative method of construction.

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 adjacent structures 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 structures, vibration monitoring, and submission of reports.

Pay Item: Vibration Monitoring Lump Sum

MODULAR BLOCK RETAINING WALL: (SPECIAL)

1.0 DESCRIPTION

Design, prepare plans, and construct modular block 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 block, cap block coping, retaining wall backfill, the fabric above the #57 stone, handrail materials and installation, temporary shoring for wall construction, and all other materials, labor, tools, equipment and incidentals necessary to complete the work.

The Contractor has the option of providing the Keysystem Retaining Wall, the Reinforced Earth Pyramid Wall, or the Tensar Mesa Retaining Wall, or approved equal that must be approved by the NCDOT before beginning the wall design.

For further information concerning the Keysystem Retaining Wall, contact:

Keystone 4444 Minneapolis, Telephone www.keystonewalls.com	West	Retaining 78 MN (800)	Wall TH	Systems Street 55435 747-8971
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For further information concerning the Reinforced Earth Pyramid Wall, contact:

The 8614 Vienna, Telephone www.recousa.com	Westwood	Reinforced Center VA (703)	Earth Drive, Suite	Company 1100 22182 821-1175
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For further information concerning the Tensar Mesa Retaining Wall, contact:

Tensar 5883 Atlanta, Telephone www.tensarcorp.com	Glenridge	Earth Drive, GA (404)	Technologies, Suite	Inc. 200 30328 250-1290
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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 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. 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 Section 1000, Section 1077 and all other applicable articles of the Standard Specifications with the additions and exceptions specified in this Special Provision.

2.0 GENERAL

The Resident Engineer will schedule a Preconstruction Conference with representatives from the Contractor, Supplier, and Geotechnical Engineering 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 by the Engineer.

3.0 MATERIALS:

A. Concrete Modular Block:

Provide the concrete mix designed by the Supplier and approved by the State Materials Engineer prior to use. Furnish a copy of the Supplier's approval to the Resident Engineer and to the Materials and Tests Unit in Raleigh. Manufacture the concrete facing blocks in accordance with ASTM C 1372 and ASTM C 140.

Physical Properties - Supply concrete for blocks that attains a minimum 28-day compressive strength of 4,000 psi and has a maximum moisture absorption of 5% after 24 hours.

Add Mixtures and Color - Add mixtures, i.e., color, silica, air entraining reducers, etc., that have been previously established as suitable and conform to applicable ASTM Specifications or have been demonstrated to be suitable to the concrete blocks are allowed. Color of block should closely match the adjacent church building.

Finish and Appearance - Provide blocks free of defects that indicate imperfect molding, block weakening or lessened durability. Provide blocks free of chips and cracks.

Face Finish - Provide a natural rock face finish on the front face of the blocks, unless otherwise shown on the plans.

Marking - Clearly scribe the date of manufacture and the production lot number on a tag affixed to each pallet of blocks shipped.

Handling, Storage and Shipment - Support blocks in storage until the concrete reaches a minimum compressive strength of 1,000 psi. Do not ship blocks until a minimum compressive strength of 3,000 psi is reached. Handle, store and ship all blocks in such a manner as to eliminate the dangers of chipping, discoloration, cracks, fractures, and excessive bending stresses.

Block Dimensions - Dimension variances must be in accordance with ASTM C 1372. Make adjustments for the specified patterns on the facing surface.

Testing, Inspection and Acceptance - Acceptance of concrete blocks with respect to compressive strength and absorption will be determined on the basis of ASTM Method C 140. Full blocks may be used in place of coupons.

Acceptance - If any of the tests indicates non-compliance, then the Engineer will perform a second testing of the same production lot. The results of the second tests will determine the acceptability of the lot. Failure to meet any of the requirements specified in Section 3A will be grounds for rejection of the blocks. Minor cracks and chips incidental to the usual method of manufacture and shipments are not grounds for rejection. (A "production lot" is defined as a maximum of 10,000 blocks).

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. Cap Block Coping:

Use Cap Block coping as supplied by the wall manufacturer. The Cap Blocks must meet all the requirements of Section 3.0, Part A, of this Provision.

D. Soil Reinforcement:

Soil Reinforcement may be either Steel or Extensible Reinforcement.

Steel Reinforcement:

Reinforcing steel must conform to the applicable requirements in Sections 425 and 1070 of the Standard Specifications.

Shop fabricate the reinforcing strips of cold drawn steel wire conforming to the minimum requirements of ASTM A 82 and weld into the finished strips in accordance with ASTM A 185. Galvanize after the mesh is fabricated in accordance with the minimum requirements of ASTM A 123.

Extensible Reinforcement:

The geogrid must be a regular network of integrally connected polymer tensile elements with aperture geometry sufficient to permit significant mechanical interlock with the surrounding soil or rock. The geogrid structure shall be dimensionally stable and able to retain its geometry under manufacture, transport, and installation.

E. Attachment Devices:

Steel Connectors:

Connector pins - Fabricate from cold drawn steel wire conforming to the requirements of ASTM A 82. Galvanize in accordance with ASTM A 123.

Steel Alignment/Shear Pins:

Alignment/Shear pins - Utilize Alignment/Shear pins where only block to block connections are required. Pins must be a minimum of 0.5-in diameter and sufficient flexural and shear strengths for the actual loading requirements. Provide material strength testing data to verify the pin's strengths. Provide methods for the alignment and positive connection of the block units for the Engineer's approval prior to beginning of the wall construction.

Geogrid Connectors:

Geogrid Connectors- To evaluate the long-term geogrid strength at the connection with the wall facing, reduce T_{ult} using the connection/seam strength determined in accordance with ASTM D4884 for structural connections. A positive mechanical connection is required between the geogrid reinforcements and the wall facing elements. Reinforcements connected to the facing through embedment between the facing elements using a partial or full friction connection will not be allowed.

F. Backfill/Corefill (Retaining Wall)

Walls with Steel Reinforcements:

For the walls with steel reinforcements, use #57 stone backfill material conforming to the applicable requirements of Section 1005 of the Standard Specifications and meeting the following criteria:

Be free of organic or otherwise deleterious substances.

Contain a maximum organic content of 0.1 %.

Soundness (AASHTO T-1 04) - Have a maximum weighted average loss of 15% when subjected to 5 cycles of the soundness test.

Resistance to Abrasion (AASHTO T-96) - Have a maximum percentage of wear of 55 percent.

Electrochemical: Resistivity > 5000 OHM-CM ASTM D-1125
 $4.5 < \text{pH} < 9.5$ ASTM D-1293

Furnish a Type IV certification in accordance with Article 106-3 of the Standard Specifications to the Engineer before placement of any backfill. Include a copy of all test results conducted in accordance with the above requirements in the certification. The Engineer determines the frequency of sampling backfill material by NCDOT necessary to assure compliance with gradation and electrochemical requirements.

Sample Preparation:

Obtain approximately 4.5 lb. of representative material and transfer it into a 1-gallon 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 three minutes. Repeat this agitation at the two hour and four hour intervals. Allow the sample to set for approximately 20 hours after the four 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.

Walls with Geogrid Reinforcements:

For the walls with geogrid reinforcements, use Select Material, Class III backfill material conforming to the applicable requirements of Section 1016 of the Standard Specifications. Use #57 stone for corefill and for backfill within 2 feet behind the back of the block units conforming to the applicable requirements of Section 1005 of the Standard Specifications.

G. Backfill Separation Fabric:

Place a layer of fabric on top of the completed 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 1.5 ft.

H. Handrail:

Construct 1.5 inch diameter steel pipe handrail with schedule 40 plain end galvanized steel pipe meeting the requirements of ASTM A53 as shown on details in plans. Embed pipe rail a minimum of 8 inches into proposed wall with chemical or concrete grout anchoring system as directed by the Engineer. Galvanize according to Section 1076 of the Standard Roadway Specifications.

Weld in accordance with Article 1072-20 of the Standard Specifications.

Paint handrail black in accordance with Section 442 of the Roadway Specifications.

Pre-measure and center the rail location on top of the wall for post spacing. Use a rotary drill for drilling of postholes. Impact drills will not be allowed to minimize damage to the wall.

4.0 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 wall 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 on 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 wall will be endangered by subsequent operations.

Obtain approval of the Engineer before beginning the excavation when the wall is adjacent to a traveled way. Submit drawings and design calculations, designed and detailed by a North Carolina Registered Professional Engineer, in accordance with the provisions of Sub-Article 410-5(D) of the Standard Specifications.

Notify the Engineer after the excavation for each location of the wall is performed. Do not place concrete leveling pad until the Engineer has approved the depth of the excavation, the character of the foundation material, and has given permission to proceed.

Remove all sheeting and bracing as the random backfilling progresses.

Obtain approval of the Engineer for all random backfill. Large or frozen lumps, wood or other undesirable material is not allowed in the backfill. Compact all backfill in accordance with Sub-Article 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 reinforcing elements plus one foot. Compact the foundation to a minimum of 95% of the maximum dry density as determined by AASHTO T-99.

(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 blocks.

(3) Placing Concrete Face Blocks:

Place the first course of concrete wall blocks on the leveling pad and check for elevation and alignment. Check for full contact with the leveling pad.

Install the connecting pins at the reinforcement locations and the alignment pin, if required, at all other locations. Fill all voids with corefill and tamp.

Place the backfill behind this course and compact. Be sure that each course is completely corefilled and backfilled before placing the reinforcement or proceeding to the next course. Clean all excess material from the top of blocks and install the next course. Ensure that connecting pins protrude into the adjoining courses. Move each block forward, toward the exposed wall face, until it is restrained by the pins in the previous course.

Repeat this procedure to the extent of the wall height. Construct the wall vertical or as near vertical as the wall system will allow. The overall vertical tolerance of the wall and the horizontal alignment tolerance shall not exceed 0.5 in. per 10 ft.

(4) Placing Retaining Wall Backfill and Reinforcing Elements:

Place backfill within the structure, closely following the erection of each lift of blocks. Place the backfill material in layers for the full width shown on the plans. Place layers not more than 7 inches in depth loose thickness and compact.

Compact #57 stone backfill with at least four passes with a vibratory roller in the vibratory mode having a weight of 8-10 tons, or as directed by the Engineer.

Compact each layer of Select Material, Class III to a density equal to at least 95% of that obtained by compacting a sample of the material in accordance with AASHTO T99 as modified by the Department.

At each reinforcing element level of the wall, level and compact the backfill material before placing and attaching the reinforcing elements. Place the reinforcing elements horizontally, normal to the face of the wall or as shown on the plans. Compact the backfill layers in a direction parallel to the wall, without disturbance or distortion of reinforcing elements or wall blocks.

Within (3) feet of the face of the wall, use a hand-operated mechanical compactor as a precaution against pushing blocks outward and distorting the vertical face of the wall. Exercise extreme care to prevent bending of the reinforcing strips 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 directed away from the backfill area. Contamination of the stone backfill by soil fines from runoff will be grounds for rejection of the backfill.

D. Cap Block Coping:

Install Cap Block as shown on construction drawings.

5.0 MEASUREMENT AND PAYMENT

No measurement for payment will be made since the work covered under this provision will be paid at the lump sum price bid for Modular Block Retaining Wall. This payment will be for full compensation for all work described in this provision including, but not limited to, submittal of design plans and calculations, materials, labor, equipment, testing, excavation, backfilling, and all incidentals necessary to complete the work.

Modular Block Retaining Wall Lump Sum