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202

Project R-4430

Henderson County

**Project Special Provisions
Structures and Culvert**

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Quang H. Nguyen 2-26-10

PROJECT SPECIAL PROVISIONS
STRUCTURES AND CULVERT

PROJECT R-4430

HENDERSON COUNTY

MAINTENANCE AND PROTECTION OF TRAFFIC BENEATH
PROPOSED STRUCTURE AT STATION 93+31.40 -L-

(8-13-04)

1.0 GENERAL

Maintain traffic on I-26 as shown in Traffic Control Plans and as directed by the Engineer.

Provide a minimum temporary vertical clearance of 16'-6" at all times during construction.

Submit plans and calculations for review and approval for protecting traffic and bracing girders, as described herein, at the above station before beginning work at this location. Have the drawings and design calculations prepared, signed, and sealed by a North Carolina Registered Professional Engineer. The approval of the Engineer will not relieve the Contractor of the responsibility for the safety of the method or equipment.

2.0 PROTECTION OF TRAFFIC

Protect traffic from any operation that affords the opportunity for construction materials, equipment, tools, etc. to be dropped into the path of traffic beneath the structure. Based on Contractor means and methods determine and clearly define all dead and live loads for this system, which, at a minimum, shall be installed between beams or girders over any travelway or shoulder area where traffic is maintained. Install the protective system before beginning any construction operations over traffic. In addition, for these same areas, keep the overhang falsework in place until after the rails have been poured.

3.0 BRACING GIRDERS

Brace girders to resist wind forces, weight of forms and other temporary loads, especially those eccentric to the vertical axis of the member during all stages of erection and construction. Before casting of intermediate diaphragms, decks, or connecting steel diaphragms do not allow the horizontal movement of girders to exceed ½ inch (13mm).

4.0 BASIS OF PAYMENT

Payment at the contract unit prices for the various pay items will be full compensation for the above work.

CONSTRUCTION, MAINTENANCE AND REMOVAL
OF TEMPORARY STRUCTURE AT STATION 93.31+40 -L-

(SPECIAL)

Construct, maintain and afterwards remove a temporary structure in accordance with the applicable parts of the Standard Specifications and this Special Provision, (structure only; the approaches are not a part of this pay item). Provide a temporary structure with a minimum overall length of 240 feet. Center the length of the structure about Station 15+67 -DET-. Detour with the alignment, grade, and skew as indicated on the Roadway plans. If the skew is not 90°, then lengthening of the structure to accommodate a 90° skew is permitted. Provide a temporary structure with a minimum clear roadway width of 42 feet and a minimum vertical clearance 16'-6".

Design the temporary structure for HL-93 live load in accordance with the current edition of the AASHTO LRFD Bridge Design Specifications. The design of the temporary structure need not satisfy the Extreme Event I Load Combination of the AASHTO LRFD Bridge Design Specifications. Due to the expected issuance of overweight permits by the NCDOT for certain loads above legal limits, design the temporary structure to satisfy the requirements of AASHTO's Manual for Bridge Evaluation for the following five vehicle configurations:

| Truck #1 | | | Truck #2 | | | Truck #3 | | |
|----------|-------|---------------|----------|-------|---------------|----------|-------|---------------|
| Axle | P (k) | Distance (ft) | Axle | P (k) | Distance (ft) | Axle | P (k) | Distance (ft) |
| 1 | 12.00 | 0.00 | 1 | 12.00 | 0.00 | 1 | 4.50 | 0.00 |
| 2 | 20.00 | 8.08 | 2 | 20.00 | 8.08 | 2 | 25.00 | 8.08 |
| 3 | 20.00 | 4.00 | 3 | 20.00 | 4.00 | 3 | 25.00 | 4.00 |
| 4 | 20.00 | 4.00 | 4 | 20.00 | 4.00 | 4 | 20.00 | 18.00 |
| 5 | 16.67 | 20.00 | 5 | 18.00 | 18.00 | 5 | 20.00 | 4.00 |
| 6 | 16.67 | 4.00 | 6 | 18.00 | 4.00 | | | |
| 7 | 16.66 | 4.00 | | | | | | |

| Truck #1 | | | Truck #2 | | | Truck #3 | | |
|----------|--------|--------------|----------|--------|--------------|----------|--------|--------------|
| Axle | P (kN) | Distance (m) | Axle | P (kN) | Distance (m) | Axle | P (kN) | Distance (m) |
| 1 | 53.38 | 0.00 | 1 | 53.38 | 0.00 | 1 | 20.02 | 0.00 |
| 2 | 88.96 | 2.46 | 2 | 88.96 | 2.46 | 2 | 111.21 | 2.46 |
| 3 | 88.96 | 1.22 | 3 | 88.96 | 1.22 | 3 | 111.21 | 1.22 |
| 4 | 88.96 | 1.22 | 4 | 88.96 | 1.22 | 4 | 88.96 | 5.49 |
| 5 | 74.15 | 6.10 | 5 | 80.07 | 5.49 | 5 | 88.96 | 1.22 |
| 6 | 74.15 | 1.22 | 6 | 80.07 | 1.22 | | | |
| 7 | 74.11 | 1.22 | | | | | | |

| Truck #4 | | | Truck #5 | | |
|----------|-------|---------------|----------|-------|---------------|
| Axle | P (k) | Distance (ft) | Axle | P (k) | Distance (ft) |
| 1 | 12.00 | 0.00 | 1 | 14.00 | 0.00 |
| 2 | 20.00 | 15.00 | 2 | 25.00 | 15.00 |
| 3 | 20.00 | 4.00 | 3 | 25.00 | 4.00 |
| 4 | 20.00 | 4.00 | 4 | 17.00 | 20.00 |
| 5 | 20.00 | 20.00 | 5 | 17.00 | 4.00 |
| 6 | 20.00 | 4.00 | 6 | 17.00 | 4.00 |
| 7 | 20.00 | 4.00 | 7 | 17.00 | 4.00 |

| Truck #4 | | | Truck #5 | | |
|----------|--------|--------------|----------|--------|--------------|
| Axle | P (kN) | Distance (m) | Axle | P (kN) | Distance (m) |
| 1 | 53.38 | 0.00 | 1 | 62.28 | 0.00 |
| 2 | 88.96 | 4.57 | 2 | 111.21 | 4.57 |
| 3 | 88.96 | 1.22 | 3 | 111.21 | 1.22 |
| 4 | 88.96 | 1.22 | 4 | 75.62 | 6.10 |
| 5 | 88.96 | 6.10 | 5 | 75.62 | 1.22 |
| 6 | 88.96 | 1.22 | 6 | 75.62 | 1.22 |
| 7 | 88.96 | 1.22 | 7 | 75.62 | 1.22 |

As a minimum, design the bridge rails for the AASHTO LRFD Test Level 2 (TL-2) crash test criteria, except when the plans state that a Test Level 3 (TL-3) bridge rail is required. The bridge rail design criteria are defined in the current edition of the AASHTO LRFD Bridge Design Specifications. In addition, design structural elements to which the bridge rail is attached, or elements which may receive loads transmitted through the rail, to distribute and/or withstand these loads.

Attach the bridge rails in a way that permits the bridge approach railing system to transition from the guardrail system and attach to the rigid railing system on the temporary bridge.

Using timber floors or timber mat floors is not permitted due to anticipated high truck traffic. If timber piles are used, use piles that are new and conform to ASTM D25. Rough-peeled or clean-peeled untreated timber piles are permitted.

All wood and timber products shall be inspected in accordance with Article 1082-1 of the Standard Specifications.

Submit design calculations to the Engineer that, as a minimum, include stress calculations for the following structural components: railings, rail post, rail post connections, flooring, main girders or floor beam system, bent cap, pile bearing, pile as a structural member and longitudinal and lateral stability of pile bents if necessary. Design calculations and detailed drawings of the structural components shall be signed and sealed by a North Carolina Registered Professional Engineer. For stream crossings, determine the pile stability assuming a scour depth equal to 250% of the pile diameter or width below the existing bed elevation. The Engineer may require a more detailed analysis of scour depth for pile bents containing more than a single row of piles.

Include material specifications for all new and used materials in the detail drawings of the structure. In addition, show the location and a detailed sketch of the used materials indicating condition of the material, the location and geometry of existing but unused holes, attachments left over from previous use and any other irregularities in the material.

Indicate the condition of any used materials in the design calculations. Provide access to any used materials for inspection prior to assembly.

All critical bolted connections in the temporary structure require new high strength bolts. Indicate the location of the critical connections and recommended bolt size with tightening procedures in the detail drawings of the structure. The use of used high strength bolts is limited to non-critical connections and is subject to approval. For new high strength bolts, furnish the Engineer a copy of the manufacturer's test report for each component. Have the report indicate the testing date, the location where the components were manufactured, the lot number of the material represented, the rotational capacity tests lot number and the source identification marking used by the manufacturer of each component.

Before the temporary structure is loaded, the contractor shall inspect the structure and submit a written statement certifying that the erected structure complies with the approved detailed drawings. Temporary structures utilizing modular panels shall be inspected and certified by a manufacturer's representative. Any condition that does not comply with the accepted drawings, or any other condition deemed unsatisfactory by the Engineer, is cause for rejection until corrections are made.

The lump sum price bid for "Construction, Maintenance and Removal of Temporary Structure at Station 93+31.40 -L-" will be full compensation for the above work including all materials, equipment, tools, labor and incidentals necessary to complete the work.

EVAZOTE JOINT SEALS

(8-13-04)

1.0 SEALS

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

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

Provide seals that meet the requirements given below.

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

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

2.0 ADHESIVES

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

- Tensile strength..... 3500 psi (24.1 MPa) min.
- Compressive strength..... 7000 psi (48.3 MPa) min.

| | |
|------------------------|-----------------------|
| Shore D Hardness | 75 psi (0.5 MPa) min. |
| Water Absorption..... | 0.25% by weight |

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

3.0 SAWING THE JOINTS

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

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

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

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

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

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

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

4.0 PREPARATIONS FOR SAWED JOINTS

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

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

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

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

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

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

5.0 PREPARATIONS FOR ARMORED JOINTS

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

A. Submittals

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

B. Surface Preparation

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

1. Angle Assembly

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

2. Concrete

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

C. Elastomeric Concrete Placement

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

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

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

D. Joint Preparation

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

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

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

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

6.0 SEAL INSTALLATION

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

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

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

7.0 BASIS OF PAYMENT

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

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ELASTOMERIC CONCRETE

(10-12-01)

1.0 DESCRIPTION

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

2.0 MATERIALS

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

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

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

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

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

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

3.0 BASIS OF PAYMENT

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

FALSEWORK AND FORMWORK

(8-4-09)

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

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

(9-16-08)

1.0 GENERAL

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

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

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

2.0 ADDRESSES AND CONTACTS

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

Via US mail:

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

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

Via other delivery service:

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

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

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@ncdot.gov

Secondary Structures Contacts:

James Gaither (919) 250 – 4042
David Stark (919) 250 – 4044

Eastern Regional Geotechnical Contact (Divisions 1-7):

K. J. Kim
(919) 662 – 4710
(919) 662 – 3095 facsimile
kkim@ncdot.gov

Western Regional Geotechnical Contact (Divisions 8-14):

John Pilipchuk
(704) 455 – 8902
(704) 455 – 8912 facsimile
jpilipchuk@ncdot.gov

3.0 SUBMITTAL COPIES

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

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

Unless otherwise required, submit one set of supporting calculations to either the Structure Design Unit or the Geotechnical Engineering Unit unless both units require submittal copies in which case submit a set of supporting calculations to each unit. Provide additional copies of any submittal as directed 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 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 Provisions |
| Pile Splicers | 7 | 2 | Subarticle 450-7(C) & "Piles" |
| Pile Points | 7 | 2 | Subarticle 450-7(D) & "Piles" |
| 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 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 ____" |
| 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 provision by that name. Articles and 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 & 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 provision.
7. Submittals are necessary only when the top slab thickness is 18" or greater.

GEOTECHNICAL SUBMITTALS

| Submittal ¹ | Copies Required by Geotechnical Engineering Unit | Copies Required by Structure Design Unit | Contract Reference Requiring Submittal ² |
|---|--|---|---|
| Crosshole Sonic Logging (CSL) Reports | 1 | 0 | “Crosshole Sonic Logging” |
| Drilled Pier Construction Sequence Plans | 1 | 0 | “Drilled Piers” |
| Pile Driving Analyzer (PDA) Reports | 2 | 0 | “Pile Driving Analyzer” |
| Pile Driving Equipment Data ³ | 1 | 0 | Article 450-5 & “Piles” |
| Retaining Walls | 8 | 2 | Applicable Provisions “Temporary Shoring”, “Anchored Temporary Shoring” & “Temporary Soil Nail Walls” |
| Contractor Designed Shoring | 7 | 2 | |

FOOTNOTES

1. With the exception of “Pile Driving Equipment Data”, electronic copies of geotechnical submittals are required. See referenced provision.
2. References are provided to help locate the part of the contract where the submittals are required. References in quotes refer to the provision by that name. Articles refer to the *Standard Specifications*.
3. Download Pile Driving Equipment Data Form from following link:
<http://www.ncdot.org/doh/preconstruct/highway/geotech/formdet/>
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.

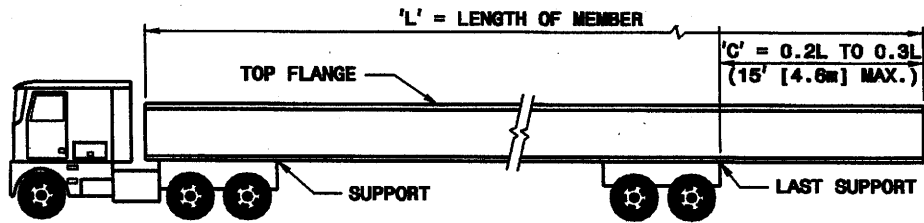
SHIPPING STEEL STRUCTURAL MEMBERS**(7-18-06)****Section 1072-23 Marking and Shipping**

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

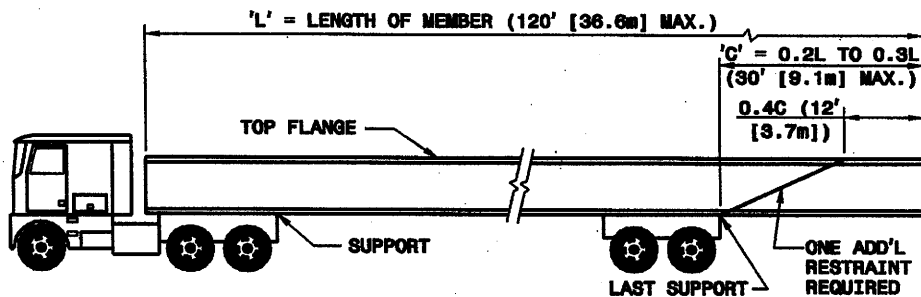
Load and ship steel beams and girders in accordance with the Figure below for all types of transportation.

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

LIMITS FOR PLACEMENT OF BEAMS AND GIRDERS DURING SHIPMENT



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



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

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

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

GROUT FOR STRUCTURES

(7-12-07)

1.0 DESCRIPTION

This special provision addresses grout for use in structures, including continuous flight auger (CFA) piles, micropiles, soil nail and anchored retaining walls and backfilling crosshole sonic logging (CSL) tubes or grout pockets, shear keys, dowel holes and recesses for cored slabs and box beams. This provision does not apply to grout placed in post-tensioning ducts for bridge beams, girders, or decks. Provide grout composed of portland cement, water and at the Contractor's option, fine aggregate and/or pozzolan. If necessary, use set controlling admixtures. Proportion, mix and place grout in accordance with the plans, the applicable section of the *Standard Specifications* or special provision for the application and this provision.

2.0 MATERIALS

Refer to Division 10 of the *Standard Specifications*:

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

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

3.0 REQUIREMENTS

Unless required elsewhere in the Contract, provide non-metallic grout with minimum compressive strengths as follows:

| Property | Requirement |
|--------------------------------|---------------------|
| Compressive Strength @ 3 days | 2500 psi (17.2 MPa) |
| Compressive Strength @ 28 days | 4500 psi (31.0 MPa) |

For applications other than micropiles, soil nails and ground anchors, use non-shrink grout with shrinkage of less than 0.15%.

When using approved packaged grout, a grout mix design submittal is not required. Submit grout mix designs in terms of saturated surface dry weights on M&T Form 312U in accordance with the applicable section of the *Standard Specifications* or special provision for the structure. Use an approved testing laboratory to determine the grout mix proportions. Adjust proportions to compensate for surface moisture contained in the aggregates at the time of mixing. Changes in the saturated surface dry mix proportions will not be permitted unless a revised grout mix design submittal is accepted.

For each grout mix design, provide laboratory test results for compressive strength, density, flow and if applicable, aggregate gradation and shrinkage. Submit compressive strength for at least 3 cube and 2 cylinder specimens at the age of 3, 7, 14 and 28 days for a total of at least 20 specimens tested. Perform laboratory tests in accordance with the following:

| Property | Test Method |
|---|---|
| Compressive Strength | AASHTO T106 and T22 |
| Density | AASHTO T133 |
| Flow for Sand Cement Grout | ASTM C939 (as modified below) |
| Flow for Neat Cement Grout (no fine aggregate) | Marsh Funnel and Cup API RP 13B-1, Section 2.2 |
| Aggregate Gradation for Sand Cement Grout | AASHTO T27 |
| Shrinkage for Non-shrink Grout | ASTM C1090 |

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

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

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

4.0 SAMPLING AND PLACEMENT

The Engineer will determine the locations to sample grout and the number and type of samples collected for field and laboratory testing. Use API RP 13B-1 for field testing grout flow and density of neat cement grout. The compressive strength of the grout will be considered the average compressive strength test results of 3 cube or 2 cylinder specimens at 28 days.

Do not place grout if the grout temperature is less than 50°F (10°C) or more than 90°F (32°C) or if the air temperature measured at the location of the grouting operation in the shade away from artificial heat is below 40°F (4°C).

Provide grout at a rate that permits proper handling, placing and finishing in accordance with the manufacturer’s recommendations unless directed otherwise by the Engineer. Use grout free of any lumps and undispersed cement. Agitate grout continuously before placement.

Control grout delivery so the interval between placing batches in the same component does not exceed 20 minutes. Place grout before the time between adding the mixing water and placing the grout exceeds that in the table below.

| ELAPSED TIME FOR PLACING GROUT (with continuous agitation) | | |
|---|--|---|
| Air or Grout Temperature Whichever is Higher | Maximum Elapsed Time | |
| | No Set Retarding Admixture Used | Set Retarding Admixture Used |
| 90°F (32°C) or above | 30 min. | 1 hr. 15 min. |
| 80°F (27°C) through 89°F (31°C) | 45 min. | 1 hr. 30 min. |
| 79°F (26°C) or below | 60 min. | 1 hr. 45 min. |

5.0 MISCELLANEOUS

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

HIGH STRENGTH BOLTS

(11-17-06)

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

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

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

ADHESIVELY ANCHORED ANCHOR BOLTS OR DOWELS

(6-11-07)

1.0 GENERAL

Installation and Testing of Adhesively anchored anchor bolts and dowels shall be in accordance with Section 420-13, 420-21 and 1081-1 of the *Standard Specifications* except as modified in this provision.

2.0 INSTALLATION

Installation of the adhesive anchors shall be in accordance with manufacturer's recommendations and shall occur when the concrete is above 40 degrees Fahrenheit and has reached its 28 day strength.

The anchors shall be installed before the adhesive's initial set ('gel time').

3.0 FIELD TESTING

Replace the third paragraph of Section 420-13 (C) with the following:

"In the presence of the Engineer, field test the anchor bolt or dowel in accordance with the test level shown on the plans and the following:

Level One Field testing: Test a minimum of 1 anchor but not less than 10% of all anchors to 50% of the yield load shown on the plans. If less than 60 anchors are to be installed, install and test the required number of anchors prior to installing the remaining anchors. If more than 60 anchors are to be installed, test the first 6 anchors prior to installing the remaining anchors, then test 10% of the number in excess of 60 anchors.

Level Two Field testing: Test a minimum of 2 anchors but not less than 10% of the all anchors to 80% of the yield load shown on the plans. If less than 60 anchors are to be installed, install and test the required number of anchors prior to installing the remaining anchors. If more than 60 anchors are to be installed, test the first 6 anchors prior to installing the remaining anchors, then test 10% of the number in excess of 60 anchors.

Testing should begin only after the Manufacturer's recommended cure time has been reached. For testing, apply and hold the test load for three minutes. If the jack experiences any drop in gage reading, the test must be restarted. For the anchor to be deemed satisfactory, the test load must be held for three minutes with no movement or drop in gage reading."

4.0 REMOVAL AND REPLACEMENT OF FAILED TEST SPECIMENS:

Remove all anchors and dowels that fail the field test without damage to the surrounding concrete. Redrill holes to remove adhesive bonding material residue and clean the hole in accordance with specifications. For reinstalling replacement anchors or dowels, follow the same procedures as new installations. Do not reuse failed anchors or dowels unless approved by the Engineer.

5.0 USAGE

The use of adhesive anchors for overhead installments is not permitted without written permission from the Engineer.

6.0 BASIS OF PAYMENT

No separate measurement or payment will be made for furnishing, installing, and testing anchor bolts/dowels. Payment at the contract unit prices for the various pay items will be full compensation for all materials, equipment, tools, labor, and incidentals necessary to complete the work.

PILES

(8-4-09)

Refer to Section 450 of the *Standard Specifications*.

DIRECT TENSION INDICATORS

(6-12-09)

The 2006 Standard Specifications shall be revised as follows:

Replace Section 440-8(C)(6) – **Direct Tension Indicators** with the following:

Supply direct tension indicators in accordance with the requirements of ASTM F959 and Article 1072-7.

Furnish the Engineer with at least one metal feeler gage for each container of direct tension indicators shipped before beginning installation.

Make sure that the lot number on the containers of direct tension indicators is for the same lot number tested as indicated on the test documents.

Furnish to the Engineer three samples of load indicating washers from each lot number, each size and type for tests and two each of the metal feeler gages required for performing the tests.

Install the direct tension indicator under the bolt head. If it is necessary to install the direct tension indicator under the nut, or if the bolt head shall be turned, install additional hardened washers between the nut or bolt head and the direct tension indicator.

Provide a tension indicating device on the project for determining the tension imposed on a fastener when the protrusions on direct tension indicator are properly compressed.

Test 3 samples from each lot of direct tension indicators in the presence of the Engineer. Achieve a minimum bolt tension of 5% greater than that required by Table 440-1 of Article 440-8.

Do not substitute direct tension indicators for hardened steel washers required with short slotted or oversized holes. If desired, use direct tension indicators in conjunction with hardened steel washers.

Install direct tension indicators initially to a snug tight condition as specified in Subarticle 440-8(C)(3). After initial tightening, fully tighten beginning at the most rigid part of the joint and continuing toward its free edges.

For tightening fasteners containing direct tension indicators, use a clean and lubricated wrench. Maintain air supply and hoses in good condition and provide air pressure of at least 100 psi at the wrench.

When tightening the fasteners, ensure that the part of the fastener being restrained from turning does not rotate during the tightening process. Ensure that no portion of the direct tension indicator protrusions is accidentally partially flattened before installing in the structural steel joints.

Do not reuse direct tension indicators. If it is necessary to loosen a bolt previously tensioned, discard and replace the direct tension indicator.

CURING CONCRETE

(6-12-09)

The 2006 Standard Specifications shall be revised as follows:

Replace the first paragraph of Section **420-15(A) – Curing Concrete – General** with the following:

Unless otherwise specified in the contract, use any of the following methods except for membrane curing compounds on bridge deck and approach slab, or on concrete which is to receive epoxy protective coating in accordance with 420-18. Advise the Engineer in advance of the proposed method. Have all material, equipment, and labor necessary to promptly apply the curing on the site before placing any concrete. Cure all patches in accordance with this article. Improperly cured concrete is considered defective.

Replace the third paragraph of Section **420-15(C) – Curing Concrete – Membrane Curing Compound Method** with the following:

Seal the surface with a single uniform coating of the specified type of curing compound applied at the rate of coverage recommended by the manufacturer or as directed, but not less than 1 gallon per 150 square feet of surface area.

PLACING LOAD ON STRUCTURE MEMBERS

(8-4-09)

The 2006 Standard Specifications shall be revised as follows:

Replace the fifth paragraph of Section **420-20 – Placing Load on Structure Members** with the following:

Do not place vehicles or construction equipment on a bridge deck until the deck concrete develops the minimum specified 28 day compressive strength and attains an age of at least 14 curing days. The screed may be rolled across a previously cast bridge deck if the entire pour

has not achieved initial set. If any portion of the deck concrete has achieved initial set, the screed can not be rolled across the bridge deck until the concrete develops a compressive strength of at least 1,500 psi. Construction equipment is allowed on bridge approach slabs after the slab concrete develops a compressive strength of at least 3,000 psi and attains an age of at least 7 curing days. A curing day is defined in Subarticle 420-15(A).