

1 **1060-12 MATERIALS FOR STAKING OR GUYING**

2 **(A) Stakes**

3 Use stakes made of cypress, cedar, oak, locust or other acceptable wood free from defects  
4 that would compromise the strength of the stake. Stakes shall be at least  
5 2 inches x 2 inches (nominal). Use stakes of the size and length as shown in the plans.

6 **(B) Wire**

7 Wire shall be new soft No. 14 gauge steel wire or as shown in the plans.

8 **(C) Hose**

9 Hose to be used with wire shall have a minimum inside diameter of 1/2 inch. All hose  
10 shall be garden type hose composed of rubber and fabric, or as shown in the plans.

11 **(D) Other**

12 Other staking and guying materials may be used if a sample is submitted and approved by  
13 the Engineer before use.

14 **1060-13 HERBICIDES**

15 The herbicide to be used for a particular application shall be as specified or approved by the  
16 Engineer prior to their application.

17 Herbicides shall be properly labeled and registered with the United States Department of  
18 Agriculture and the North Carolina Department of Agriculture and Consumer Services. A  
19 container shall contain only the herbicide that meets the analysis guaranteed on the label.  
20 Keep all herbicides in such original labeled containers until used.

21 Herbicide application shall only be conducted by individuals who possess a pesticide license  
22 from the NC Department of Agriculture and Consumer Services or individuals under their  
23 direction and who has read, understands, and follows the herbicide labeling before applying  
24 the product.

25 **1060-14 COIR FIBER MAT**

26 Coir fiber mat shall consist of 100% coconut fiber (coir) twine woven into high strength  
27 matrix. The coir fiber mat shall have a thickness of at least 0.30 inch and weigh at least 20  
28 ounces per square yard. The coir fiber mat shall have a tensile strength of at least 1,348 x 626  
29 lbs/ft and elongation of no more than 34% x 38%. The coir fiber mat shall have a flexibility  
30 of 65,030 x 29,590 mg-cm. The coir fiber mat shall have an observed flow velocity of 11 feet  
31 per second. The coir fiber mat shall have a C-Factor of 0.002. The size of the coir fiber mat  
32 shall be 6.6 feet x 164 feet and the measured open area shall be 50%.

33 **1060-15 SPECIAL STILLING BASIN**

34 The special stilling basin shall be a bag constructed to a minimum size of 10 feet x 15 feet  
35 made from a nonwoven fabric. It shall have a sewn-in 8 inches (maximum) spout for  
36 receiving pump discharge. The bag seams shall be sewn with a double needle machine using  
37 a high strength thread. The seams shall have a minimum wide width strength of 60 lbs. per  
38 inch tested in accordance with ASTM D4884.

39 **SECTION 1070**  
40 **REINFORCING STEEL**

41 **1070-1 GENERAL**

42 All reinforcing steel and welded wire reinforcement shall come from a NTPEP certified  
43 facility for Reinforcing Steel and Welded Wire Reinforcement (REBAR/WWR). Standard  
44 drawing details for reinforcement products are found in the *Roadway Standard Drawings*.

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1 Steel reinforcement shall be stored above the surface of the ground on platforms, skids, or  
2 other supports and shall be protected from mechanical injury and surface deterioration caused  
3 by exposure to conditions producing rust. When placed in the work, reinforcement shall be  
4 free from dirt, loose rust or scale, mortar, paint, grease, oil, or other nonmetallic coatings  
5 which could reduce bond as determined by the Engineer. Reinforcing steel placement and  
6 fastening shall conform to the requirements of AASHTO LRFD Bridge Construction  
7 Specifications, Section 9 and these Specifications of which the more stringent shall apply.

8 When approved by the Engineer, field welding of reinforcing steel materials shall be  
9 performed in accordance with Section 1072 and at a minimum, comply with the current  
10 edition of AWS D1.4.

### 11 **1070-2 REINFORCEMENT STEEL BAR FOR ROADS AND STRUCTURES**

12 All reinforcing steel must be provided by a NCDOT approved facility. Supply deformed steel  
13 bar reinforcement conforming to ASTM A615 for Grade 60. For un-coated deformed and/or  
14 plan reinforcing, furnish the Engineer a Type 1 certification in accordance with Article 106-3  
15 and attach it an M&T Form 913 for each shipment of reinforcing material. Bend and cut  
16 during fabrication with tolerances in accordance with the *Manual of Standard Practice*  
17 published by the Concrete Reinforcing Steel Institute and/or AASHTO LRFD Bridge  
18 Construction Specifications, Section 9. Bend the bars cold to the details shown in the plans.

19 Weld steel bar reinforcement only where shown in the plans or approved by the Engineer.  
20 When welding steel bar reinforcement use bars conforming to ASTM A706.

### 21 **1070-3 COLD DRAWN STEEL WIRE AND WIRE REINFORCEMENT**

22 Provide cold drawn steel wire for use as spirals or in fabricated form for the reinforcement of  
23 concrete meeting AASHTO M 32. When required by the plans, apply epoxy coating by a  
24 NCDOT approved facility.

25 Use smooth welded wire reinforcement conforming to AASHTO M 55.

26 Use deformed welded wire reinforcement conforming to AASHTO M 221.

### 27 **1070-4 REINFORCING STEEL BAR SUPPORTS**

28 Provide all wire bar supports of smooth cold drawn industrial quality basic wire having  
29 a minimum tensile strength of 65,000 psi. When the legs of the bar supports are in contact  
30 with the forms, ensure that the entire leg of the bar support is stainless steel wire or  
31 a minimum thickness of 1/4 inch stainless steel at points of contact with the forms. Use  
32 stainless steel wire meeting ASTM A493 except having a minimum chromium content of  
33 16% and a minimum tensile strength of 95,000 psi. Ensure that wire sizes, height tolerance,  
34 and leg spacing for wire bar supports are in accordance with the *Manual of Standard Practice*  
35 published by the Concrete Reinforcing Steel Institute.

36 As an option to the stainless steel wire for the legs of bar supports at points of contact with the  
37 forms, provide legs of cold drawn steel wire plastic protected in accordance with the *Manual*  
38 *of Standard Practice* published by the Concrete Reinforcing Steel Institute, except provide  
39 plastic protection by dipping or by premolded plastic tips. Do not use plastic legs molded to  
40 the top wire.

41 Use plastic bar supports meeting the requirements listed in the *Manual of Standard Practice*  
42 published by the Concrete Reinforcing Steel Institute only when approved by the Engineer.

### 43 **1070-5 PRESTRESSING STRAND**

44 Use prestressing strands for use in prestressed concrete consisting of seven wire strands, stress  
45 relieved after manufacture to remove internal stresses. Use the size and the grade of the  
46 strand as shown in the plans. Use strands conforming to AASHTO M 203 except provide  
47 a specimen for test purposes, if required, from each reel of cable instead of each 20 ton  
48 production lot.

1 For precast prestressed deck panels, use 3/8 inch round seven-wire stress-relieved Grades 250  
2 or 270 prestressing strands meeting AASHTO M 203.

3 Mark the outer layer of each reel pack of strand with a wide color band as follows: white for  
4 Grade 270 stress relieved strand, green for low relaxation strand, and a double marking of  
5 green and red for special low relaxation strand. In addition, attach a metal tag to each reel  
6 pack labeled in accordance with AASHTO M 203.

#### 7 **1070-6 DOWELS AND TIE BARS FOR PORTLAND CEMENT CONCRETE** 8 **PAVEMENT**

9 Use smooth plain round steel dowel bars conforming to AASHTO M 31 Grade 60. Do not  
10 use dowel bars with burred ends. A tolerance of  $\pm 1/4$  inch is permitted from the dowel length  
11 required by the plans. A straightness tolerance of 0.075 inch from a straight line is permitted.

12 When required by the plans, epoxy coat and fabricate all dowel bars/baskets by a NCDOT  
13 approved facility.

14 Use dowel assemblies for supporting dowel bars of rigid construction capable of holding the  
15 dowel bars in proper position during placing of concrete, and of such design to permit  
16 unrestricted movement of the pavement slab. Use wire for dowel assemblies meeting  
17 AASHTO M 32. Use a dowel assembly that holds the dowels in the required position within  
18 a tolerance of  $\pm 1/4$  inch in vertical and horizontal planes. Obtain written approval from the  
19 Engineer for the dowel assembly before use.

20 Coat dowel bars and the entire dowel assembly with an approved wax base coating. Apply  
21 the coating by dipping or spraying such that the wax coating on the dowel bars is of uniform  
22 thickness sufficient to allow pulling of the dowel from the concrete as provided in  
23 AASHTO T 253 Type B coated dowel.

24 When required by the Department's Minimum Sampling Guide, furnish for testing one dowel  
25 basket assembly for each 200 assemblies incorporated into the project. Each Department  
26 approved producer/supplier, coater and fabricator shall provide the Department a Type 1  
27 material certification in accordance with Article 106-3, M&T DB-06 Dowel Basket  
28 Fabrication Report and when required by the Engineer the M&T Form 913 for all coated  
29 dowel baskets and loose dowels with each shipment.

30 Use deformed tie bars conforming to AASHTO M 31 for Grade 40 or Grade 60.

31 Storage, handling and transportation of epoxy coated dowel and/or tie bars shall be in  
32 accordance with Section 1070-7(D).

#### 33 **1070-7 EPOXY COATED REINFORCING STEEL**

##### 34 **(A) General**

35 Coating and fabrication of epoxy coated reinforcing steel shall establish proof of their  
36 competency and responsibility in accordance with the Concrete Reinforcing Steel  
37 Institute's Fusion Bonded Epoxy Coating Applicator Plant Certification Program.  
38 Registration and certification of the plant or shop under the CRSI Program and  
39 submission of the valid annual certificate to the State Materials Engineer is required  
40 before beginning any coating. The same requirement applies to coaters subcontracting  
41 work from the coater directly employed by the contractor.

42 Obtain approval of each coater and/or fabricator of epoxy coated reinforcing steel before  
43 coating or fabrication of bars. The coating applicator and/or fabricator is responsible for  
44 establishing and maintaining an effective quality control program, and employ equipment  
45 for cleaning, coating and/or fabricating that produces coated material conforming to the  
46 *Standard Specifications*.

47 Include in requests for approval a well-defined quality control program and direct the  
48 requests to the State Materials Engineer. Before Department approval is issued, the

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1 condition of equipment for blast cleaning, coating and/or fabricating material is evaluated  
2 by the Engineer for determining the equipment capability of producing a coated product  
3 conforming to the *Standard Specifications*. Lists of Department approved epoxy coating  
4 and fabricating companies are available from the State Materials Engineer.

### 5 (B) Coating Materials

6 Obtain approval for the epoxy resin powder before use. A list of prequalified powder  
7 sources is available from the State Materials Engineer.

### 8 (C) Coated Reinforcing Steel

9 Use coated steel reinforcing bars meeting AASHTO M 31, Grade 60 and free of  
10 contaminants such as oil, grease and paint. Use bars free of surface irregularities as  
11 defined in ASTM A775 and/or that produce holidays in the coating.

### 12 (D) Handling, Storage and Transportation

13 When handling, storing and transporting coated steel reinforcing bars, all contact areas  
14 shall be padded.

15 All bundling bands shall be padded or suitable banding shall be used to prevent damage  
16 to the coating. All bundles of coated steel reinforcing bars shall be lifted with a strong  
17 back, spreader bar, multiple supports, or a platform bridge to prevent bar-to-bar abrasion  
18 from sags in the bundles of coated steel reinforcing bars. Packaging of uncoated and  
19 coated bars is strictly prohibited. When loading/unloading coated bars; pallets, bags or  
20 bundles shall not be dropped or dragged.

21 During storage, protect steel reinforcement at all times from damage and make sure it is  
22 free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign materials until  
23 the time of placement. For storage outside at the fabrication shop and project site, store  
24 epoxy coated reinforcing steel bars at least 1 foot above the ground on wooden or padded  
25 supports placed 10 feet apart, and completely cover with an opaque cloth, canvas or  
26 woven fiber reinforced polyethylene white tarp. Storage of uncoated and coated material  
27 shall not be mixed or in direct contact. Do not use solid plastic sheeting. Cover the bars  
28 such that adequate ventilation is provided to prevent condensation from forming on the  
29 material during storage, and completely protect the bars from direct sunlight. Do not  
30 allow water to pond under the epoxy coated reinforcing steel. Do not expose epoxy  
31 coated reinforcing steel to outdoor weather for more than 30 days. If the coated steel  
32 reinforcing bars are stored outdoors without cover, the date on which the coated bars are  
33 placed outdoors shall be recorded on the identification tag for the bundled steel.

34 Transport the bundled bars from the producer/supplier to the project site with padding,  
35 such as carpet padding, placed over each bundle of steel upon which another bundle of  
36 steel is placed unless wooden spacers are placed between each bundle to prevent contact.  
37 Load all bundles of bars horizontally for transporting. Transport the bars on a flatbed  
38 trailer. Do not allow the length of bars to exceed 8 feet beyond the trailer bed. Repair  
39 coating damage associated with handling and transporting or other causes in accordance  
40 to Section 1070-7 (E). Coated steel reinforcing bars should be off-loaded as close as  
41 possible to their points of placement or under the crane so that the bars can be hoisted to  
42 the area of placement to minimize re-handling. If the material is being transported in  
43 adverse weather conditions the producer/supplier, coater, fabricator and/or Contractor  
44 shall co-coordinate a material protection plan, test for the presence of chlorides, and, if  
45 necessary, clean the material as directed by the Engineer.

**(E) Field Coating Repair**

The maximum amount of repaired damaged coating shall not exceed 1% of the total surface area in each 0.3 m [1 foot] of the bar. This limit on repaired damaged coating shall not include sheared or cut ends that are coated with patching material. When degraded coating is observed additional inspection or non-destructive testing may be required by the Engineer at no additional cost to the Department.

Ensure the Contractor uses a Department approved patching or repair material that is compatible with the coating and inert in concrete. When repair is required, clean the areas in accordance to SSPC SP-1 prior to performing additional surface preparation. Surface preparation shall be in accordance with SSPC SP-11 (Power Tool Cleaning to Bare Metal) and/or in accordance with the manufacturers recommendations. The more stringent of the two shall apply. Ensure that the material is suitable for making repairs with a minimum dry film thickness of 7 mils. Ensure that the Contractor has a copy of the manufacturer's written instructions for application of the patching material and the instructions are closely followed during any coating damage repair. Do not apply any patch material when the surface temperature of the steel or the air temperature is below 40°F. Do not ship or place steel until the patch material is dry to the touch.

**1070-8 SPIRAL COLUMN REINFORCING STEEL**

Furnish spiral column reinforcing steel with the following areas and weights as required in Table 1070-1 and in the plans.

<b>Material</b>	<b>Size</b>	<b>Area, sq.in.</b>	<b>Weight, lb/ft</b>
Plain Cold Drawn Wire	W 20	0.20	0.668
	W 31	0.31	1.043
Deformed Cold Drawn Wire	D-20	0.20	0.680
	D-31	0.31	1.054
Plain or Deformed Bar	#4	0.20	0.668
	#5	0.31	1.043

Use cold drawn wire conforming to AASHTO M 32. Use plain or deformed bars conforming to AASHTO M 31 for Grade 60. Use deformed cold drawn wire conforming to AASHTO M 225.

The diameter of the spiral reinforcing steel is the outside to outside measurement of the bars or wire, with an allowance of 1/2 inch more or 1/2 inch less than the specified diameter as shown in the plans.

Furnish spirals with 1.5 extra turns at top and at bottom of the completed spiral cage. Where splicing of the spirals is necessary other than those shown in the plans, provide a minimum lap splice of 3 feet.

Do not weld on the spiral reinforcing steel.

When required by the plans, use epoxy coated spiral column reinforcing steel and spacers provided by a NCDOT approved facility.

Use the minimum number of spiral spacers as shown in the plans. Ensure a minimum section modulus per spiral spacer of 0.030 cu. in.

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### 1 1070-9 MECHANICAL BUTT SPLICES

2 When called for by the contract or when directed by the Engineer, use a mechanical butt  
3 reinforcing steel splice from an approved source. Use a standard metal filled sleeve, cement  
4 mortar filled sleeve, threaded steel couplings, forged steel sleeve or cold-forged sleeve.  
5 An exothermic process whereby molten filler metal, contained by a high strength steel sleeve  
6 of larger inside diameter than the bars, is introduced into the annular space between the bars  
7 and the sleeve and between the ends of the bars may be used. Provide a splice that is capable  
8 of transferring at least 125% of the yield strength of the bars from one bar to the other by the  
9 mechanical strength of the splice components.

10 For splices not on the approved list, before use and as a condition of approval, assemble three  
11 test splices in the presence of the Engineer for each size of bar which is proposed for use on  
12 the project. Forward the test splices to the Materials and Tests Unit in Raleigh, NC for testing  
13 and approval.

### 14 1070-10 REJECTION

15 Reinforcing material that does not meet the *Standard Specifications* is rejected. When  
16 required by the Engineer, replace reinforcing material that is bent, deformed, exhibits cracked  
17 material or welds, contaminated and when the maximum amount of coating damage exceeds  
18 the limits herein or degraded coating is observed and as determined by the Engineer.

## 19 SECTION 1072 20 STRUCTURAL STEEL

### 21 1072-1 GENERAL

22 Furnish and fabricate all structural steel and related incidental materials including sign  
23 supports and high mount lighting standards and use materials in accordance with this section.

#### 24 (A) Department Steel Bridge Qualification Program

25 Fabricators furnishing structural steel bridge members for Department projects shall  
26 comply with this program. Qualifications shall be submitted prior to project letting.

#### 27 (B) Fabricator Qualification

28 Use steel fabricators on the Department's Approved Structural Steel Fabricators List that  
29 have undergone and successfully completed the Department's audit process for the type  
30 work being performed as outlined below. The list is available from the Materials and  
31 Tests Unit or on the Department's website.

32 Employ fabricators that possess an AISC Bridge Component Quality Management  
33 Systems (QMS) Certified Component Manufacturer Certification (CPT) for the  
34 following:

- 35 (1) High mount lighting standards in excess of 80 feet in length
- 36 (2) Structural steel components of fender systems,
- 37 (3) Solar array platforms
- 38 (4) Retaining walls and noise walls
- 39 (5) Sign supports and sign structures
- 40 (6) Expansion joints (except modular joints)

41 Employ fabricators that possess an AISC certification category of Simple Bridge  
42 Requirement (SBR) for the following:

- 43 (1) Pot and expansion bearings