

SPECIFICATIONS FOR BRIDGE CONSTRUCTION

SECTION 5

REINFORCING STEEL

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### 5.1 General

This specification is for the supply, fabrication, handling and placing of reinforcing steel. Reinforcement bars shall be supplied in the lengths and shapes, and installed as indicated on the drawings. The Bar Lists in the drawings are provided for estimating purposes only. No substitution of bars or changes to bar details will be allowed without the prior acceptance of the Consultant.

### 5.2 Certification

Epoxy-coated reinforcing steel shall be coated by a manufacturer certified under the Concrete Reinforcing Steel Institute (CRSI) Voluntary Certification program for Fusion-Bonded Epoxy Coating Applicator plants. Proof of certification shall be submitted to the Consultant.

### 5.3 Fabrication

Reinforcing steel shall conform to the requirements of the CSA Standard G30.18M Grade 400. All hooks and bends shall be bent using the pin diameters and dimensions as recommended in The Reinforcing Steel Institute of Canada, (RSIC), Manual of Standard Practice, 1 Sparks Avenue, Willowdale, Ontario M2H 2W1, Phone: 416-499-4000, unless specified otherwise. Reinforcing bars shall conform accurately to the dimensions shown on the drawings and within the fabricating tolerance as shown in the RSIC, Manual of Standard Practice.

Epoxy-coated reinforcing steel shall be prepared and coated according to the requirements of ASTM A775 and the Ontario Provincial Standard Specification OPSS 1442, Material Specification for Epoxy-coated Steel Reinforcement for Concrete with additions and exceptions as described in this specifications. Film thickness of the coating, after curing, shall be 175  $\mu\text{m}$  to 300  $\mu\text{m}$  (7 to 12 mils). The epoxy coating material shall conform to the requirements of OPSS 1443, Material Specification for Organic Coatings for Steel Reinforcement.

Mesh reinforcement shall be supplied in flat sheets only.

### 5.4 Handling and Storage

The Contractor shall store steel reinforcement above the surface of the ground, upon platforms, skids, or other supports, and protect it from mechanical injury and surface deterioration caused by exposure to conditions producing rust. Steel reinforcement incorporated in the work shall be free from loose rust, scale, dirt, paint, oil, and other foreign material.

Special care shall be taken when handling epoxy-coated reinforcing steel to prevent damage to the epoxy coating. Epoxy-coated reinforcing bars shall not be dropped or dragged, and shall be lifted with non-metallic slings. Bar-to-bar abrasion and excessive sagging of bundles must be prevented, and bundles shall be handled with spreaders and non-metallic slings.

On site storage of the epoxy-coated reinforcing steel shall not exceed 120 days, and exposure to daylight shall not exceed 30 days. If the exposure time is expected to exceed 30 days, the reinforcing steel shall be protected by covering with opaque polyethylene sheeting or equivalent protective material.

### 5.5 Field Repair of Epoxy Coating

The Contractor shall be responsible for the field repair of all damage to epoxy coating up to the time the reinforcing steel is acceptably incorporated into the concrete structure, whether the damage is due to field cutting or handling damage. Where field cutting of the epoxy-coated reinforcing steel is necessary and accepted by the Consultant, it shall be either sheared or saw cut.

Repair of damaged coating, sheared or sawed ends shall be done to the Consultants acceptance using the epoxy coating supplier's approved patching material and in accordance with the patching material manufacturer's written recommendations regarding surface preparation and patching material application. At a minimum the areas to be repaired shall be cleaned by removing all surface contaminants and damaged coating before applying patching material. Where rust is present, it shall be entirely removed immediately before applying the patching material. The patching material shall be overlapped onto the original coating for 25 mm or as recommended by the manufacturer. The dry film thickness of the patched areas shall be between 175  $\mu\text{m}$  to 300  $\mu\text{m}$ . When the field repairs result in a total bar surface area covered by patching material that exceeds 5% of the bar surface area, the bar shall be replaced.

### 5.6 Placing and Fastening

All steel reinforcement shall be accurately placed in the positions shown on the plans, and firmly tied and chaired before placing the concrete. When placed in the work it shall be free from dirt, detrimental rust, loose scale, paint, oil or other foreign material. Bars shall be tied at all intersections, except where spacing is less than 250 mm in each direction, when alternate intersections shall be tied. Tack welding of reinforcing steel shall not be allowed.

Distances from the forms shall be maintained by means of stays, spacers, or other approved supports. Reinforcing cover shall not be less than the minimum specified on the drawings. Spacers for securing reinforcement from contact with the forms or for separation between layers of bars shall be plastic chairs, precast concrete supports, galvanized metal or epoxy-coated metal; of acceptable shape and dimensions. Precast concrete supports shall be used for all exposed faces of curbs, medians and barriers. Precast concrete supports shall have compressive strengths equal to or exceeding the placed concrete. Tie-wire for epoxy coated reinforcing shall be plastic coated. Any metal chairs protruding through the surface of the hardened concrete shall be cut back at least 25 mm, and the holes filled in accordance with Section 4.24.2, unless otherwise reviewed and accepted by the Consultant. Metal chairs shall not be used to support reinforcement on surfaces which are to be exposed or are to be finished; where possible, this reinforcement is to be supported entirely from above.

### 5.7 Splicing

Splicing of bars, unless shown on the plans, is prohibited except with the written acceptance of the Consultant. Splices, where possible, shall be staggered.

For lapped splices, the bars shall be placed in contact and wired together in such a manner as to maintain a clearance of not less than the required minimum clear distance to other bars, and the required minimum distance to the surface of the concrete. In general, suitable lap lengths will be achieved by the placing of bars of the lengths as detailed. Where the lap length cannot be determined, a minimum of 35 bar diameters lap length shall be provided.

Sheets of mesh or bar mat reinforcement shall overlap each other sufficiently to maintain a uniform strength and shall be securely fastened at the ends and edges. The edge lap shall not be less than one mesh in width.

### 5.8 Measurement and Payment

Steel reinforcement incorporated in the concrete will be measured in kilograms, based on the total computed mass for the size and length of bars as shown on the drawings or authorized by the Consultant.

The mass of bars will be calculated as follows:

Bar Designation	10M	15M	20M	25M	30M	35M	45M	55M
Mass (kg/m)	0.785	1.570	2.355	3.925	5.495	7.850	11.775	19.625

No allowance will be made for tie wire, chairs, and other material used in fastening the reinforcing steel in place. If bars are substituted upon the Contractor's request, and as a result more steel is used than specified, only the amount specified shall be included.

Payment for the supply of **plain reinforcing steel** and the supply of **epoxy-coated reinforcing steel** will be made on the basis of the unit price bid per kilogram acceptably supplied and delivered to the site. When the materials are delivered to the site, payments for the supply of **plain reinforcing steel** or **epoxy-coated reinforcing steel** will be made to a maximum of 90% of the cost of the materials based upon the unit price bid. Payment for the remainder of the price bid for supply will be made as the materials are acceptably installed. Payment for the placing of reinforcing steel will be made on the basis of the unit price bid per kilogram acceptably placed and remaining in the work, which price shall include full compensation for the cost of furnishing all labour, equipment, tools and incidentals necessary to complete the work.

Mesh reinforcement shall be supplied and placed by the Contractor, and its cost included with the tendered unit price for the relevant portion of the Contract.

