5.1 Reinforcement Steel - General

Concrete is a material, which is relatively strong in compressive strength but is weak in tension. Reinforcing steel is used to provide the tensile capacity required in the tensile action.

- The required reinforcing steel is detailed on the drawings.

- It is essential that the reinforcing steel be thoroughly checked and approved by the Bridge Inspector before the Contractor is allowed to begin placing concrete. Once the concrete has been cast around the reinforcing steel, it will be virtually impossible to check or confirm that the correct size and number of bars have been placed in the required locations.

- The Contractor must handle and store the steel in a manner, which does not damage it and keeps it clean and accessible. Reinforcing steel anticipated to be stored at the site for lengthy periods must be protected from the elements.

- All loose rust, mill scale, paint, oil, grease, mud and weak dried mortar must be removed to ensure a good bond.

- Reinforcing steel should be checked promptly when requested by the Contractor. No concrete placement will be allowed while reinforcing steel is still being placed.

5.2 Placement and Support

Reinforcing steel must be installed accurately in the position shown on the plans and securely held in place until the concrete has been placed around it. The means of securing the steel must withstand all forces caused by placement of the concrete and being walked on by workers.

- Bars are required to be tied at all intersections, except if the spacing is less than 250 mm in each direction, then it needs to be tied at alternate intersections only.

- The Contractor must take all measures necessary to ensure that the required clearances are obtained and maintained during placing of the concrete.

- Spacers used to maintain clearance are to be precast concrete, plastic or galvanized steel chairs whose shape and dimension have been approved by the Bridge Project Engineer.

- Inspection must be done thoroughly and diligently and the checking process should commence as soon as the Contractor starts placing the steel. Check quantities, sizes, spacing and clearance to the forms and to the top of the unformed surface as detailed.

- Unless the drawings indicate otherwise, the minimum clear distance between parallel bars is 40 mm. This allows concrete to flow around the bars during placement.

5.3 Epoxy Coated Reinforcing

Reinforcing steel in some portions of bridges, particularly in the deck, curbs and/or parapets, and top portions of abutments is subjected to corrosion from high levels of chloride from road de-icing chemicals. Reinforcing steel in such areas is often provided with a protective epoxy coating to prevent corrosion.

- The epoxy coating is fusion bonded to the steel bar in a process that applies an epoxy powder in an electrostatic spray to a cleaned and preheated bar. The coating has sufficient flexibility to withstand bending during fabrication, but the bar must be handled with care to avoid chips, nicks, etc. in the surface.

- All handling and hoisting must be done carefully. Nylon lifting slings must be used, or wire rope slings must be padded, bundles of bars must be lifted in a manner that prevents bar-to-bar abrasion.

- Spreader bars must be used for lifting bundles, or the bundles must be lifted at third points with nylon or padded slings.

- Epoxy-coated bars must be stored on padded or wooden cribbing. Bars or bundles of bars must not be dragged over the ground or over other bars.

- After the epoxy-coated reinforcements are placed, walking on the bars by workmen must be held to a minimum. Supports and chairs for epoxy coated reinforcing are to be non-metallic. Tie wire for securing epoxy-coated bars must be epoxy coated.

- Where field cutting of epoxy-coated reinforcing steel is necessary, and is approved by the inspector, it shall be cut by means other than torch cutting. The cut ends must be completely patched with epoxy material. If damaged areas are rusting before being repaired the rust must be completely removed before the areas are repaired. Ensure that no damaged or scratched areas are in contact with a non-coated area.

5.4 Splicing

Where possible, splices are to be staggered to avoid congestion and to distribute stresses over a larger zone.

- Where bars are to be lapped, unless shown otherwise on the drawings, the lap is to be at least 30 bar diameters for horizontal bars at the bottom of slabs, beams and girders, and bars in walls, columns and haunches.

- When bars are lapped they are to be wired together in contact and oriented such that the minimum clearance of 40 mm to other bars is maintained.

- Sheets of mesh and bar mats are to be lapped and securely fastened at edges and ends. Lap for wire mesh is to be at least one mesh space in width.

5.5 Checklist

5.5.1 Bridge Inspector's Responsibilities

- Read specifications and study drawings.

- Spot check delivered reinforcement for correct bar sizes and grade.

- Check that all bar surfaces are free from objectionable material.

- Epoxy bars must be correctly handled to prevent chips, nicks, etc.

- Check that reinforcement has been accurately placed and securely held with sufficient chairs of suitable design (coated or masonry for epoxy).

- Any field bending must approve by the Bridge Project Engineer.

- Check that all nicks in the epoxy bars are repaired.

- Check that epoxy coating has not deteriorated due to UV, daylight exposure.

- Check that lap lengths are adequate.

- Check form clearances of reinforcement, size and quantity of reinforcement.

- No concrete is to be placed until the reinforcement has been checked and approved.

- Record mass of reinforcement acceptably placed for unit price payment.

5.5.2 Bridge Project Engineer's Responsibilities

- Discuss with the Contractor, the Bridge Inspector and the Design Engineer possible additional splice locations, especially in high columns or pier shafts.

- Discuss with the Contractor and the Bridge Inspector the procedure for unloading epoxy coated reinforcing steel.

- Discuss with the Contractor and the Bridge Inspector acceptable deck chairs especially for epoxy coated bars.

- Discuss with the Contractor and the Bridge Inspector acceptable methods for cutting and repairing epoxy coated rebars.

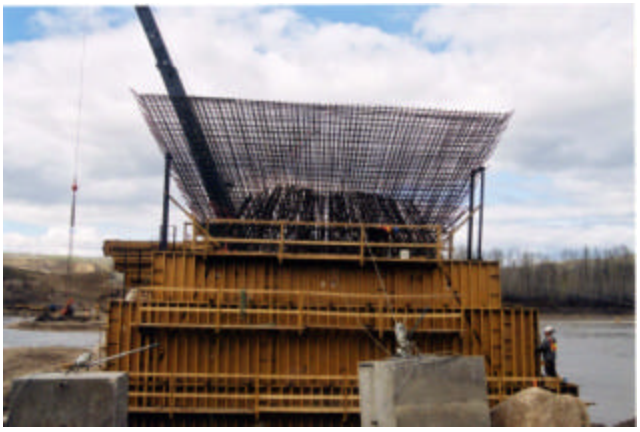
SECTION 5

REINFORCEMENT STEEL

5-1 Top portion of abutment is epoxy-coated reinforcement

5-4 Lower pier shaft - Plain steel reinforcement

5-2 Pier footing plain steel reinforcement



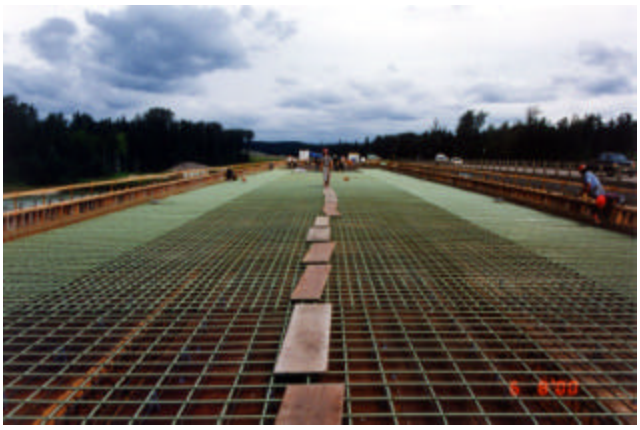
5-5 Upper pier shaft plain steel reinforcement

5-3 Pre-tying lower pier shaft steel reinforcement on EFCO form

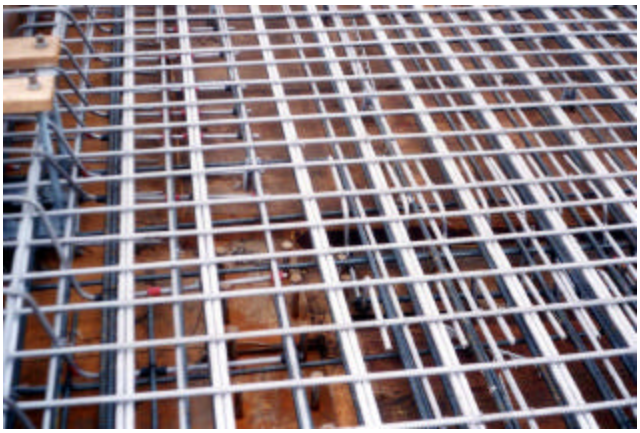
5-6 Bottom deck plain steel reinforcement

SECTION 5

REINFORCEMENT STEEL

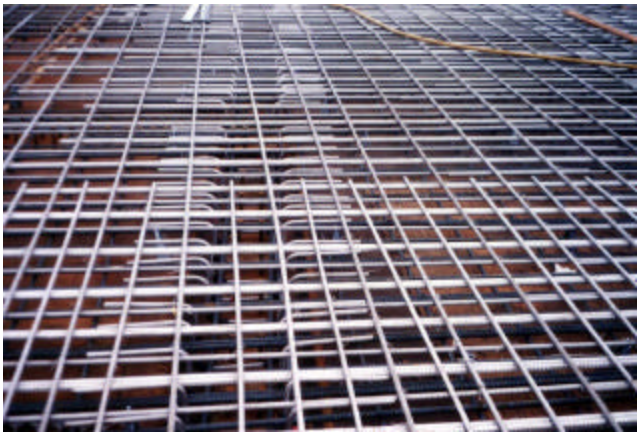


5-7 Epoxy coated reinforcement for top layer of deck slab



5-10 Stainless steel reinforcement detail over pier

5-8 Bars tied at all intersections for spacing more than 250mm in each direction



5-11 Stainless steel reinforcement detail over girder haunch

5-9 Epoxy coated reinforcing for curb

5-12 Curb and deck Stainless steel reinforcement details