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No.RW/NH-34041/18/93-S&R *Dated, the 15th March, 1994*

To

The Chief Engineers of State PWDs/UTs. (dealing with National Highways and other centrally sponsored projects); Director General(Works), Central Public Works Department; Director General Border Roads; Chairman, National Highway Authority

Subject: Use of Fusion Bonded Epxoy Coated Reinforcement in Bridges on National Highways and other centrally sponsored bridge projects to be constructed in marine environment susceptible to severe corrosion

A large number of R.C.C./Prestressed Concrete Bridges are located in marine environment on National Highways running parallel and close to the sea-shores in the country. Keeping in view the huge investment made in constructing these bridges as well as the difficulties and high cost involved in their rehabilitation due to corrosion related distresses, there is a need to adopt suitable measures to prevent or minimise corrosion of steel at the construction stage itself. Presently, four types of anti-corrosive treatments to reinforcement steel are available in the country viz. :-

a) Cement slurry/phosphate jelly technique (CECRI method);

b) Hot Dip Galvanisation;

c) Polymer Based Protective Coatings;

d) Fusion Bonded Epoxy Coated Reinforcement (FBECR).

2. The Ministry has recently taken up a Research Scheme on Critical Evaluation of Fusion Bonded Epoxy Coated Reinforcement and other protective coatings on reinforcements. Findings in the Preliminary Report on the Research done so far indicate that RCC structures by and large perform better with Fusion Bonded Epoxy Coated Reinforcement compared to other anti-corrosive coatings on rebars and countries like U.S.A. and Japan have been adopting such FBEC reinforcement since more than a decade. Accordingly, it is suggested that FBEC reinforcement may be adopted for major reinforced concrete bridges in the coastal regions subjected to severe corrosion keeping in consideration the production capacity and location of a Fusion Bonding Plant as well as the economics of transportation of coated rebars. The following guidelines are, however, suggested with regard to adoption of Fusion Bonded Epoxy Coated Reinforcement for major RCC bridges.

3. The reinforcements in major RCC bridges may be protected by Fusion Bonded Epoxy Coating in the following situations:-

a) In marine environment where the rate of corrosion is greater than 0.25 mm per year (corrosion map of the country enclosed). In locations where it is difficult to ascertain the rate of corrosion, coastal locations within 50 kms from the sea may be considered as areas subjected to severe corrosion.

b) In marine locations where the severity of corrosion is confirmed from the inspection of nearby structures (bridges/buildings).

4. The following pre-requisites shall be satisfied for adoption of Fusion Bonded Epoxy Coating to the reinforcement bars:-

a) A fusion bonded epoxy coating plant shall be available within a distance of 300 km from the bridge site.

b) Steel to be coated shall by HYSD bars conforming to IS:1786 produced by TISCO or SAIL.

c) The bridge shall be a R.C.C. bridge having a total length of 60m and above.

5. The fusion bonded epoxy coating shall be done conforming to IS:13620:1993. The following points may, however, also be kept in view:

5.1. Thickness of coating shall be 175±50 microns.

5.2. The coating shall be got done by an authorised firm approved by the Department.

5.3. PVC coated GI binding wires shall only be used for tying the reinforcement and the tender rates for fusion bonded epoxy coating shall include the cost of the same.

5.4. The Contractor shall produce certificate from the coating firm that the quality of powder epoxy material and other components of fusion bonded epoxy coating conform to the relevant IS Code. Such certificate shall accompany each consignment of delivery while leaving the plant.

5.5. The Coating firm shall furnish at the time of shipment, a certificate that the coated reinforcing bars meet the requirement of IS:13620:1993.

5.6. Inspite of the test certificates produced by the Coating Firm, the Department reserve the right to carry out independent tests at the plant site for sample cross- checking. The Contractor's agreement with the coating Firms shall include the provision for independent checking by the Department and that if the coating quality is not approved by the Department, the decision of the Department to reject or repair the coating shall be final and binding on all parties.

6. The following points need to be taken care in the field while using fusion bonded epoxy coated reinforcement:-

a) Bars shall be stacked on wooden battens separated from each other to protect them from rubbing;

b) Dragging the bars shall be avoided to prevent damage to the coating.

c) Cutting of bars shall be done by cutting machine or hacksaw.

d) While bending the bars, teflon covered pins shall be used at the bar bending bench. It is preferable to insist on the use of bar bending machine by incorporating suitable stipulation in the tender specifications.

e) While transporting the fusion bonded epoxy coated bars, there shall be wooden battens between the rows or bundles of bars. The number of bars in each bundle shall be such that 3 labourers could lift one such bundle from the trailor without opening it and stack the bundle intact at the yard over wooden battens.

f) The cut end of the bars shall be touched up with special touch up materials as prescribed by the coating firm satisfying IS:13620 specifications. There shall be a time gap of maximum 4 hours within which the repairs to the cut ends and damaged portions shall be carried out with touch up materials and failure to do so may cause complete rejection of the coated bars.

g) The coated steel shall not be directly exposed to sun and rains and shall be protected with opaque polyethylene sheets or such other approved materials.

7. It is requested that the contents of this letter may be given wide circulation and brought to the notice of all concerned. Further, while submitting the estimates for the bridges with fusion bonded epoxy coated reinforcement, necessary justifications for adopting it for a particular bridge shall be furnished along with appropriate rate analysis.

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1 This circular supersedes vide Ministry Circular No RW/NH-34041/44/91-S&R dated 14/21.03.2000