



Uhde India Limited

**PART – II  
SECTION-4  
TECHNICAL SPECIFICATIONS  
REINFORCEMENT**

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Page :1

<b>Contents</b>	<b>Page</b>
LIST OF I.S. CODES	2
PROTECTION AGAINST CORROSION	4
TESTING	7
MODE OF MEASUREMENT	7

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**4.1 REINFORCEMENT****LIST OF IS CODES**

1. IS:432 - Mild steel & medium tensile steel bars and hard drawn steel wires for concrete reinforcement : Part-II - Hard drawn steel wire.
2. IS:1786 - Specification for High strength deformed steel bars and wires for concrete reinforcement.
3. IS:2502 - Code of practice for bending & fixing of bars for concrete reinforcement.
4. IS:2751 - Recommended practice for welding of mild steel plain & deformed bars for reinforced construction.
5. IS:5525 - Recommendation for detailing of reinforcement in reinforced concrete works.
6. IS:9077 - Code of practice for corrosion protection of steel reinforcement in RB & RCC construction.
7. SP:34 - Handbook on concrete reinforcement detailing.

**4.1.1 Material**

The reinforcement shall normally be Fe 415 conforming to IS:1786 unless noted otherwise. Mild steel rounds shall conform to IS:2062 Grade A or IS:432 and hard drawn steel wire fabric to IS:1566.

**4.1.2 Storage**

The steel reinforcement shall be stored in such a way as to avoid distortion and to prevent deterioration and corrosion.

**4.1.3**      Method of Installation.

Before cutting, bending and placing, all reinforcement shall be clean and free from pitting, loose millscalls, dust, loose rust and coats of paints, oil or other coatings which may destroy or reduce the bond. Any defective or damaged reinforcement shall be brought to the notice of the Engineer and replaced with good quality bars.

General construction details and workmanship related to reinforcement including bar bends, lap splices and installation shall be in accordance with IS:2502 and IS:456.

All bars shall be cut and bent as per the bending schedules indicated in the drawing or supplied separately relevant to the particular drawing. The contractor shall in all cases verify for himself the correctness of the schedule giving the numbers, length and the bending details of the bars.

No reinforcement shall be bent when already in position in the work, without approval of the Engineer, whether or not it is partially embedded in concrete. Bars shall not be straightened in a manner that will injure the material. Rebending can be done only if approved by the Engineer. Reinforcing bars shall be bent by machine or other approved means producing a gradual and even motion. All the bars shall be cold bent unless otherwise approved. Bending hot at a cherry-red heat(not exceeding 845 °C) may be allowed under very exceptional circumstances except for bars whose strength depends on cold working. Bars bent hot shall not be cooled by quenching. However, such bending will be allowable only with the approval of the Engineer.

The number, sizes, shape and position of all the reinforcement shall unless otherwise directed or authorised by the Engineer, be strictly in accordance with the drgs. The reinforcement shall be adequately secured and held in position by metal wires, chairs and spacers. Tees at inter-sections shall be made with 16 SWG soft black annealed binding wire (IS:10632, part II). Whenever conduit, piping inserts, sleeves etc. Interface with placing of reinforcement, proper adjustment in the spacing of bars shall be made as approved by the Engineer. No bars shall be made rest on or against forms nor on or against the earth in excavation.

Splices in reinforcement shall be made and located only as called for in the drawings or as otherwise approved by the Engineer and shall be lapped to the extent indicated in drawings at the splices. Not more than 25% to 50% bars shall be lapped at one section.

The contractor must obtain the approval of the Engineer for the reinforcement laid, before any concrete is placed in the forms. The reinforcement at this time shall be free from loose rust or scale or other coatings that may destroy or reduce bond.

Concrete / PVC spacer blocks of same strength as of parent concrete shall be used to ensure correct cover to the reinforcement. The clear cover shall be as shown on the drawings or as per instructions of the Engineer.

All the reinforcing bars shall be so tied as to form a rigid cage to prevent displacement before or during concreting. Necessary wooden planks supported independently of the reinforcement shall be provided for the labourers to move.

The vertical distance required between successive layers of bars in beams or similar members shall be maintained by the provision of mild steel spacer bars inserted at such interval that the main bars do not perceptibly sag between adjacent spacer bars.

Tack welding may be permitted by the Engineer under certain conditions for fixing reinforcement. Welding shall be done by skilled and qualified welders only. Suitable safeguards shall be taken by the contractor for welding.

#### **4.2 Protection of Reinforcement Rods against corrosion**

The protective measures against corrosion of reinforcement rods may be any of the following:

- a) Anticorrosive treatment using acid / alkali / other agents based on CECRI technology (as per IS:9077).
- b) Fusion bonded Epoxy coating (as per IS:13620).
- c) Corrosion resistant reinforcement rods as rolled in the factory and commercially available.

**4.2.1 Anticorrosive treatment (using CECRI technology)**

The materials and procedure shall be from approved agencies (Refer to Data Sheet 'B' for recommended vendor / data information).

**4.2.1.1 The procedure for treatment shall be as follows:**

The reinforcement rods shall be immersed in the pickling tank, containing DERUSTING SOLUTION of approved quality. The rods shall be left in the derusting solution until all the rust is satisfactorily removed and a bright surface is obtained. This may take about 15-30 minutes.

Typically, to prepare 100 litres of Derusting Solution mix 5 liters of Inhibitor – Derusting solution, 50 liters of Hydrochloric acid and 50 liters of water in the pickling tank (as per manufacturer's instruction).

4.2.1.2 The rods shall then be removed from the pickling tank cleaned with wet waste cloth and immersed in the ALKALINE CLEANING TANK. This tank shall contain Alkaline Powder in the ratio of 1.5 kg. of powder to 400 liters of water. The rods shall be left for about 5 minutes, cleaned and removed.

4.2.1.3 Phosphating Jelly shall be immediately applied on the surface of the rods by means of a fibre brush. The jelly shall be allowed to react with the rod surface for 45-60 minutes and the jelly removed by means of rinsing in water or wet cloth.

4.2.1.4 Corrosion inhibitor solution shall then be applied on the rod surface by brushing/dipping.

4.2.1.5 The corrosion inhibitor solution shall be mixed with ordinary portland cement in the ratio of 500 CC of inhibitor to 1 kg of OPC and a brushable slurry is prepared. This slurry shall then be applied on the rod surface by brushing.

Note: All above steps shall be applied in the same day and the steel allowed to air dry for 12 - 24 hours.

4.2.1.6 Corrosion sealing solution shall then be applied by brushing / dipping.

4.2.1.7 Inhibitor shall be mixed with ordinary portland cement in the ratio of 600 CC of inhibitor to 1 kg. of cement and a brushable slurry shall be prepared. This slurry

shall be immediately applied on the rod surface. The coating shall then be allowed to dry for 12 - 24 hours.

4.2.1.8 Corrosion sealing solution shall be applied on the rod surface. This coating is again repeated after 4 hours of air drying.

4.2.1.9 The above Anticorrosive treatment shall be given after the rods are cut and bent to shape. The treatment shall be done in a covered area. The treated rods shall be stored above ground in a covered area on wooden / masonry supports.

4.2.1.10 Typical Mechanical Properties are as under:

- a) Average thickness of coating =  $0.3 \pm 0.1$  mm
- b) Rockwell superficial hardness = 40 HR 15 N

4.2.1.11 Typical Corrosion Resistance properties are as under:

- a) Tolerable limit for Chloride  
In 0.04 N, NaOH as per Anodic  
Polarisation Technique  $\longrightarrow$  5000 ppm
- b) Corrosion resistance as per  
salt fog test  $\longrightarrow$  > 2000 hrs.
- c) Corrosion resistance as per  
alternative wetting and drying  
test  $\longrightarrow$  > 450 days

4.2.2 Fusion Bonded Epoxy Coating

This process shall be done as per IS:13620

This process shall be carried out by the approved agency in their Plant.

4.2.3 Commercially available corrosion resistant reinforcement rods:

The reinforcement rods shall be procured from approved supplier of tested and well-known brand of corrosion resistant rods. The supplier shall guarantee the special chemical composition (for corrosion resistance). The mechanical properties like tensile strength, elongation etc. shall conform to the requirements of the corresponding class of bars, like Fe 415, Fe 500 etc. as per IS-1786. The contractor shall submit all test certificates as required.

**4.3 TESTING**

Tests shall be carried out on reinforcement and the results should be approved by the Engineer before use of the same. Samples shall be taken immediately on receipt of reinforcement at site. The methods and procedure of sampling and testing shall be in accordance with IS:1786. The engineer may specify other forms of sampling and tests, if in his opinion the reinforcement is of doubtful quality. The costs of such additional tests shall be borne by the contractor, if supplied by him. Alternatively, the Engineer at his discretion may accept test certificates of the manufacturer.

**4.4 Mode of Measurement**

The payment of MS reinforcement or twisted bars shall be on the basis of weight. The weight shall be derived from the sizes and corresponding weights given in the relevant I.S. Handbook. Standard hook lengths, chairs, spacer, bars and authorised laps only will be included in the weight calculated. Binding wire will not be weighed nor otherwise measured. Measurements for weight shall not include cutting allowance wastage etc. Concrete cover blocks will not be measured and are deemed to be included in the reinforcement rates.

The rate quoted for reinforcement should include cost of receiving, storing, cleaning, cutting, bending, placing, binding, with contractor's own binding wire, including providing, cutting allowance, rolling margin and preparation of bar bending schedule (if specified in B.O.Q. item) etc. complete including transporting, handling, taxes and levies.

**END**