PARTICULAR SPECIFICATIONS

REINFORCEMENT WORK

1.0 INDIAN STANDARDS

Work shall be carried out to Indian Standards and Code of Practices. In absence International Standards shall be followed. These shall be latest issue. List given hereunder is not to be considered as conclusive and is for reference and guidance only. Any discrepancies / conflict noticed shall be directed to the Engineer for his direction/approval. However as a general rule more stringent specification shall take precedence.

(1) IS 226 Specification for steel standard quality
(2) IS 228 Methods for chemical analysis of steels
(3) IS 280 Specification for mild steel wire for general Engineering purpose.
(4) IS 303 Specification for plywood for general purpose.
(5) IS 432 Specification for mild steel and medium tensile steel burn and hard drawn steel wires for concrete requirement.
   Part 1 Mild steel and Medium tensile steel bars.
   Part 2 Hard drawn steel wire.
(7) IS 723 Specification for steel counter sunk head wire nails.
(8) IS 961 Specification for structural steel : high tensile steel bars.
(9) IS 1730 Dimensions for steel plates, sheets and strip for structural and general Engineering purpose.
2.0 REINFORCEMENT (M.S. & TMT BARS)

2.1 Reinforcement bars used in construction shall be mild steel or medium tensile steel round bars and high strength deformed bars manufactured with TMT process conforming to IS or Tor. These shall be ISI or Tor mark only.

2.1.1 M S Plain

Rolled mild steel and medium tensile steel plain round bars used in concrete shall conform to IS 432 Part I. Steel received shall conform
to the following IS with regard to manufacturing and chemical composition.

1. M.S. bar Grade I Steel designation Fe 410-S of IS 226
2. M.S. bar Grade II Steel designation Fe 410-O of IS 1977
3. Medium Tensile Steel designation Fe 540 Steel bars W-HT IS 961

2.1.2 Nominal sizes and tolerances shall be as specified in IS 432 Part I. Physical requirements shall be determined in accordance with IS 1608, read in conjunction with IS 226.

2.2.1 TMT Steel
TMT bars for use as reinforcement in concrete shall be of grade Fe 415, Fe 500 and Fe 550 conforming to IS 1786.

2.2.2 Chemical composition shall conform to IS 1786 when made as a relevant part of IS 228. Permissible limits shall be as per IS.

2.2.3 Welding of cold work steel bars in reinforcement shall be permitted as per IS 9417. (recommendation for welding cold worked steel bars for RCC).

2.2.4 Nominal sizes, cross sectional areas and their mass shall be as specified in IS 1786, allowing due consideration for tolerances specified therein.

2.2.5 Physical properties
a) It shall satisfy IS 1599 test for bend and rebend test in conjunction with IS 226.

b) Bond requirements shall be deemed to have been satisfied if it meets clause 4.0 of IS 1786.

c) Tensile, proof stress and percent elongation shall be as per table 3 of IS 1786.
2.3.1 Material received at site shall have ISI certification mark. Each bundle or coil containing the bars shall bear ISI certification mark. Also bars shall be marked to identify categories. This shall be done as per IS-1387.

2.3.2 All reinforcement material shall be free from loose mill scale, excessive rust, loose rust, pitting, oil, grease, paint, mud or any foreign deleterious material present on the surface. Cleaning shall be done to the satisfaction of the Engineer.

2.3.3 Each batch brought at site shall be tested prior to use for respective specification / physical properties. Cost of all such tests shall be borne by the contractor. Material acceptable as per IS shall be allowed into the works. All rejected material shall be removed from site by the contractor within 3 days of rejection. If the same is not done, the Engineer shall impose a penalty of Rs.500/- per metric ton per day. This will be without any appeal and shall not be subjected to arbitration.

2.3.4 Reinforcement bars received at site shall be stored on hard concrete platform and clear of the ground with the use of timber sleeper, concrete sleeper or any other means. Reinforcement material shall be kept covered by tarpaulins or plastic to avoid excessive corrosion and other contamination. It is advised to follow storage methods as described in IS 4082.

2.4 Miscellaneous

2.4.1 Cover blocks shall be of non-corrosive material such as plastic but not wooden or broken bricks or stone. Specially PVC made cover spacers shall be used in the Works. Concrete cover spacers may be permitted by the Engineer. Such concrete spacers shall be cast from concrete and not cement-mortar. Strength of these blocks shall be more than or equal to the strength of concrete in use. These should be fully cured prior to use in works.

2.4.2 Binding wire shall be 16 or 18 gauge annealed wire conforming to IS 280. It shall be free from rust, oil, paint, grease, loose mill scale or any
other deleterious material undesirable for the reinforcement and concrete or which may prevent adhesion of concrete with reinforcement.

2.4.3 Deformed bars for concrete reinforcement and rolled mild steel and medium tensile steel conforming to IS 1786 shall be allowed in construction provided they are approved by the Engineer.

2.4.4 Unit weights payable per metre shall be as follows-

1. 6 mm 0.22 kg/Rmt
2. 8 mm 0.40 kg/Rmt
3. 10 mm 0.62 kg/Rmt
4. 12 mm 0.89 kg/Rmt
5. 16 mm 1.58 kg/Rmt
6. 20 mm 2.47 kg/Rmt
7. 25 mm 3.85 kg/Rmt
8. 28 mm 4.83 kg/Rmt
9. 32 mm 6.31 kg/Rmt

2.5 Fabrication of reinforcement

Reinforcement shall be fabricated as per the drawing. Bending shall be done mechanically or with hand but to the correct radius, with proper tools and platform and shall conform to IS 2502. Bending of material shall be cold bending only. Material shall be inspected for visible defects such as cracks, brittle, excessive rust, loose mill scale, etc. Cracked ends of bars shall not be used in Works. Also the bars should be free from any deleterious material and hence the best practice shall be to hose down reinforcement just prior to concreting.

It is important that bending, straightening, cutting, etc. shall be carried out in a manner not injurious to the material and the safety of the persons working should be ensured.

2.5.1 Anchoring of bars and stirrup shall be provided exactly as detailed in the structural drawing or as directed by the Engineer.
2.5.2 Lapping of bar
Laps shall be strictly as per the drawing or as directed by the Engineer. For general guidance, the principles shall be followed as given in IS 456-2000.

2.5.3 Spacing of bars
Bars shall be placed in position as shown in the drawing. Guidelines as given in IS 456-2000 shall be followed in case of difficulties or shall be carried out as directed by the Engineer.

2.6 Cover to reinforcement
Reinforcement shall have nominal concrete cover and the thickness of such cover (exclusive of plaster or other decorative finish) shall be provided to meet the durability requirements as per exposure condition stated in table 16 clause No. 26.4.2 of IS 456-2000. However, nominal cover to reinforcement shall not be than as specified in drawing or as directed by the Engineer.

2.7 Fixing in position
Correctly cut and bent bars shall be accurately placed in position as detailed in the drawing. Unless otherwise specified by the Engineer, reinforcement shall be positioned within the tolerance as under:
   a) for effective depth 200 mm or less, ± 10 mm
   b) for effective depth more than 200 mm, ± 15 mm
But in no case shall the cover be reduced by more than 5 mm of that specified. There shall be no compromise on cover for foundation work. Reinforcing bars shall be held in position during the placing of concrete by use of PVC or concrete cover blocks (made of equal strength of well-cured concrete in use), steel chair spacers, steel hangers, supporting wires, etc. and secured by tying with an annealed binding wire of 16 to 18 gauge as approved by the Engineer.
Layer of bars shall be separated by precast concrete spacer blocks or spacer bars. Reinforcement shall be in correct position prior to start of concreting. No reinforcing bar shall be placed on freshly laid concrete for adjusting bar spacing. Care shall be taken to maintain reinforcement in position and keep it clean, throughout the period till it is embedded in the concrete. For maintaining cover, pieces of broken stone or brick or wooden blocks shall not be used at any stage.

Binding wire used shall conform to IS 280.

2.7.1 Welded joints or mechanical connections

Welded joints or mechanical connections in reinforcement may be used but in all cases of important connections, tests shall be made to prove that the joints are of the full strength of the connected bars. Welding of reinforcement shall be done in accordance with IS recommendation.

2.7.2 Where reinforcement bars are bent aside at construction joints and afterwards bent back into their original position, care should be taken to ensure that at no time is the radius of the bend less than 4 bar diameters in case of plain mild steel or 6 bar diameters for deformed bars. Care shall be taken when bending back bars to ensure that the concrete around is not damaged/disturbed.

2.7.3 Welding rods used shall conform to IS 814: covered electrodes for metal arc welding of structural steel. Work shall be carried out by a competent welder. Samples from Work site shall be taken at regular intervals and tested. Frequency and number of samples shall be as directed by the Engineer.

2.8 Item includes

1. The item shall include the cost of materials, if wastage and labour for various operations involved such as:
   a) Cover blocks of PVC or concrete.
   b) Spacer bars, chairs and unauthorised overlaps (Allowed for convenience).
c) Cutting, bending, placing and fixing in position.

d) Binding wire as approved.

e) Wastage.

f) Cleaning of bars.

2. In case the material is supplied by the owner free-of-cost, it shall include the following in addition to 1a to 1f above. Transportation from owner's store to work site and returning surplus material back to store.