

5 STEEL REINFORCEMENT

5.1 Material

- 5.1.1 Reinforcing steel shall be of the dimensions given in the Drawings.
- 5.1.2 Reinforcing bars shall comply with the requirement of B.S.4449 and welded wire fabric, square bar fabric and expanded metal shall comply with appropriate part of B.S.4483.
- 5.1.3 Diameter 6 mm reinforcing steel shall be round mild steel bars, and 12mm, 16mm, 20mm and 25mm shall be deformed high strength bars.
- 5.1.4 Any other non-specified reinforcing steel shall be used only with the approval of the Consultant.
- 5.1.5 All reinforcing steel and binding wire shall be stored under cover and shall be at least 250 mm above the ground.

5.2 Cleaning

- 5.2.1 Reinforcing bars shall be cleaned before use so that it is free from rust, oil, dirt or other coatings that reduce bond.

5.3 Bending and Laps

- 5.3.1 The reinforcement shall be bent cold in an approved bar bending machine.
- 5.3.2 Preferably bars of full length shall be used. Lapping of bars where necessary shall conform to BS1487 'Bending Dimensions of Bars of Concrete reinforcement.'

5.4 Reinforcement Cover

- 5.4.1 Concrete cover for reinforcement shall be as follows:
- 5.4.2 FOR ANY STEEL IN UNDER GROUND CONCRETE 50 mm
- 5.4.3 CLEAR COVER IN SLABS 25-30 mm
- 5.4.4 CLEAR COVER IN BEAMS SOFFIT 30-35 mm
- 5.4.5 CLEAR COVER IN SIDES OF BEAMS 30 mm
- 5.4.6 CLEAR COVER IN COLUMNS 40 mm

5.5 Placing

- 5.5.1 Reinforcement intended for contact when passing each other shall be securely tied together with binding wire.
- 5.5.2 Binders and stirrups shall tightly embrace the longitudinal reinforcement to which they shall be security bound or spot welded.
- 5.5.3 Binding wire shall be turned in from the formwork and shall not project beyond reinforcing bars.
- 5.5.4 All reinforcement shall be inspected by the Consultant and approved before concrete is placed in the forms.

STRUCTURAL STEEL

5.6 Scope

- 5.6.1 This section shall apply to the work involved with structural steels. All incidental items of structural steel shall be stated in the particular specification.

5.7 Materials

5.7.1 Steel

- 5.7.1.1 Shape of steel shall be precise and straight and free of injurious scratches and rust.
- 5.7.1.2 All steel sections shall be galvanized sections of strength class 43 A.
- 5.7.1.3 Dimensions of steel section and tolerance of dimension shall conform to standard dimension of steel regulated in ASTM or BS standard.

5.7.2 Bolt

- 5.7.2.1 Shape of bolt, nut, and washer shall be in accordance with requirement of BS 4190 & BS 3692.
- 5.7.2.2 Quality of bolt shall be SC 43 A.

5.7.3 Welding Rod

- 5.7.3.1 Arc welding rod shall conform to materials to be welded, and position.

5.8 Fabrication

- 5.8.1 Main fabrication shall be done in workshop unless otherwise specified or approved by the Consultant.
- 5.8.2 Full scale drawing of each section shall be drawn prior to fabrication and checked by the Consultant.
- 5.8.3 Section of each material shall be cut perpendicular to axis unless otherwise specified in the drawing.
- 5.8.4 Saw and angle cutter shall be used for cutting, and cut section shall be free of any noticeable defect.
- 5.8.5 Deformation caused by cutting shall be corrected.

Diameter of Bolt	Standard Pitch	Minimum Pitch	End Distance	Edge Distance
12	50	30	30	25
16	50	40	40	30

- 5.8.6 Normal temperature or hot drawn process shall do bending process. Steel shall be red heat in hot drawn process.
- 5.8.7 Those directed in the drawing shall be chiseled finish and completely attached.
- 5.8.8 Materials shall be checked for bend, distortion, warp, etc. before fabrication.

5.9 Bolt

5.9.1 Bolt Hole

- 5.9.1.1 Spacing of bolt holes shall be as directed in the following table.
- 5.9.1.2 Minimum pitch and end distance for lightweight steel shape shall be more than 3 times and 2.5 times a Bolt diameter respectively.
- 5.9.1.3 Diameter of hole shall not be over 0.5 mm larger than bolt diameter. However, for anchor bolt 5mm clearance shall be allowed between bolt diameter and diameter of hole unless otherwise specified.
- 5.9.1.4 Bolt hole shall either be drilled open or reamed after sub-punching. Punching can only be permitted for a material thickness less than 13 mm.
- 5.9.1.5 Rolled edge around a hole shall be removed.
- 5.9.1.6 Position of a bolt hole shall be precise so that the center of all holes aligns.

5.9.2 Protection against loosening of Nuts

- 5.9.2.1 Nuts shall be protected against loosening by concrete covering, double nuts or other proper means.

5.10 Welding

5.10.1 Welding

- 5.10.1.1 Welder shall have an authorized qualification in Maldives and approved by the Consultant.
- 5.10.1.2 Other tests shall be conducted to confirm welder's skill in accordance with type of work.
- 5.10.1.3 Tack welding shall be carried out by the welder approved by the Consultant.

5.10.2 Welding Machine

- 5.10.2.1 Arc welding machine shall be alternate or direct current type, which provides sufficient and adequate current.

5.10.3 Preparation

- 5.10.3.1 Welding shall be done as much downward as possible using a jig such as Rotary frame.
- 5.10.3.2 Welding rod shall be always kept in a dry area and if necessary, dried by drying equipment.
- 5.10.3.3 Welding surface shall be free of water, scale or others injurious to welding work. Slag appeared on the created surface in the middle of welding shall be cleaned before starting again.

5.10.4 Fabrication

- 5.10.4.1 Welding edge shall be smoothed by automatic gas cutting or other proper finishes.

5.10.5 Finishes

- 5.10.5.1 Surface of welds shall be as smooth as possible and size and length of welds shall not be less than designed dimensions.
- 5.10.5.2 Reinforcement of weld shall not exceed $0.1s + 1 \text{ mm}$ (s: Designated size) in fillet welds.
- 5.10.5.3 Welded parts shall be free of undercut, overlap, crack, blow hole, lack of welds, and lack of weld settlement, rolled up slag or other defects.
- 5.10.5.4 Crater at the end of bead shall be carefully heaped up and slag, sputter, etc. shall be completely removed after welds.

5.10.6 Safety

- 5.10.6.1 Safe scaffoldings shall be provided for the field welds work.
- 5.10.6.2 Welding facilities shall be such that there shall be no electric leakage of electric shock. There also shall be sufficient protection for fire.
- 5.10.6.3 Electric shock protection device shall be used and also care shall be taken not to get suffocated or intoxicated by gas when welding in small area.

5.10.7 Inspection

- 5.10.7.1 Welding parts shall be inspected before, during and after welding in accordance with work schedule.

5.11 Erection and Field Painting

5.11.1 Erection

- 5.11.1.1 Erection procedure shall be prepared by the contractor and be approved by the Consultant prior to the erection.
- 5.11.1.2 Material shall be stored on flat surface in order not to get distortion, twist or other defects. Correction shall be made to those distortions or twisted before erection.
- 5.11.1.3 Horizontal reinforcement and bracing shall be placed and bolts are temporary tightened as trusses are put up.
- 5.11.1.4 Connection of materials by bolts, etc. shall be made after distortion on plumb is thoroughly corrected.
- 5.11.1.5 Temporary bracing or other reinforcement shall be placed to resist wind pressure or other loads erection.
- 5.11.1.6 When heavy objects are placed on a horizontal element in the course of erection, they shall be reinforced with prior approval of the Consultant.
- 5.11.1.7 Care shall be taken on all facilities so that there is no accident.

5.11.2 Field Painting

- 5.11.2.1 All steel work shall be delivered to site unprimed shall be cleaned of impurities, scrapped and wire brushed to remove rust and painted with one coat of priming paint applied by brush.
- 5.11.2.2 Steelwork delivered to Site primed shall be cleaned of impurities and damage to the priming paint and made good with priming paint.
- 5.11.2.3 Galvanized steelwork to be painted shall be cleaned of impurities. Where rusting has occurred the rust shall be removed by wire brushing and made good with an approved rust inhibitor. The surfaces shall be coated with a mordant solution, washed with clean water and painted with two coats of priming paint applied by brush.

- 5.11.2.4 Steelwork, which is to be concealed shall be prepared and primed as above and shall be painted with two priming coats and one finishing coat of paint applied by brush.

5.12 Anchor Bolt

- 5.12.1 The other methods for movable burying shall be as directed by the Consultant.