



TITLE:

**STANDARD TECHNICAL
SPECIFICATION FOR
MISCELLANEOUS METAL**

SPECIFICATION NO. PE-TS-385-600-C001

VOLUME - II B

SECTION - D | SUB-SECTION - D8

REV.NO. 0

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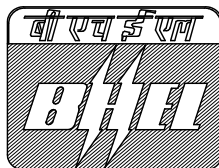
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Bharat Heavy Electricals Limited

Project Engineering Management

Power Sector, PPEI Building

Noida – 201 301



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MISCELLANEOUS METAL**1.00.00 SCOPE**

This section covers supply, fabrication and erection of miscellaneous metal items of light nature in gates, balcony and stair hand rails, structural works, ladders, hangers, masonry anchors, anchor bolts, fasteners, chain link fencing, barbed wire fencing etc. as specified or shown on drawing or as instructed by the Engineer. The above items shall be of fabricated or cast of mild steel, aluminium, brass, cast iron, M.S.& galvanized M.S. sheets, aluminium sheets, expanded metal, wire mesh as shown on drawings or specified.

2.00.00 INSTALLATION**2.01.00 Fabrication/casting****2.01.01 General**

All work shall be done according to approved shop drawings. All workmanship shall be equal to the best practice in modern structural or foundry shop.

2.01.02 Shop Connections

- a) All shop connections shall be riveted or welded except when noted otherwise on drawings.
- b) Welding of steel shall be done in accordance with IS: 816.
- c) Welding of aluminium shall be done accordance with IS: 2812, "Arc welding of Aluminium and Alloys." Special care shall be taken to grind smooth all welded surface that shall remain exposed to view. Welds shall be electrically continuous if so required by the Engineer.

2.01.03 Shop Coat

Before leaving the shop, all metal work shall be thoroughly cleaned by effective means of all loose mill seals, rust and foreign matter. Except where encased in concrete, all steelwork shall be given one coat of approved metal protective paint, applied by brush thoroughly and evenly, well worked into joints and other open spaces. All paint shall be applied to dry surfaces. When specified steel work shall be galvanised or painted with a coat of zinc chromate primer. Aluminium surfaces, which shall come in contact with masonry, shall be given one coat of bituminous paint.



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2.02.00 Erection**2.02.01 Bracing**

The Contractor shall provide all necessary temporary guys and braces to ensure alignment and stability of the members and to take care of all loads to which the structure may be subjected, including erection of equipment and operation of the same.

2.02.02 Temporary Bolting-Up

As erection proceeds the Contractor shall plum up and level all members and shall securely bolt up to take care of all dead load, wind load and erection stresses. Wherever erection equipment or other loads are carried by members during erection, proper provision shall be made to take care of the stresses resulting from the same.

2.02.03 Turned Bolt

For field connections where bolting is specified, holes for the turned bolts may be reamed in the field, if required. All drilling or reaming for turned bolts shall be done after the parts to be connected are assembled.

2.02.04 Welding

Where specified on drawings, welding shall be done in accordance with IS: 816 for steel and IS: 2812 for Aluminium & Alloys.

2.02.05 Cutting and Fitting

No cutting of sections, flanges, webs of angles shall be done without the approval of the Engineer. Where indicated on the drawings, holes, cuttings, etc. shall be provided as required for installation, to the work by the other Contractors. No additional holes or cuttings, than those shown on drawings, shall be made without the approval of the Engineer.

2.02.06 Drifting

Correction minor misfits and a reasonable amount of reaming and cutting of excess stock from rivets may be permitted. For this, light drifting may be allowed to draw holes together. Twist drills shall be used to enlarge as necessary to make connections, reaming that weakens the members or make it impossible to fill the holes properly or to adjust accurately after reaming shall not be allowed.

Any error in shop work which prevents the proper assembling and fitting of parts by moderate use of drift pins or a moderate amount of reaming and slight



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chipping and cutting shall immediately be called to the attention of the Engineer-and approval of the method of correction obtained. The use of cutting torches to enlarge or alter rivet holes shall not be permitted.

2.02.07 Spot Painting

All field rivets and bolts and also any serious abrasion to shop paint shall be spot painted with the same materials and used for the shop paint or equivalent.

2.02.08 Good

All cutting to concrete or masonry shall be made good to the satisfaction of the Engineer.

2.02.09 Grouting

All bearing plates, lintels and beams, etc. shall be set to proper grade and level by the Contractor and the Engineer's approval obtained before proceeding with the grouting. Grouting shall be done in 1:1:2 concrete with 6 mm down stone chips or as specified in schedule of items.

2.02.10 Anchor Fasteners

The anchor fasteners shall be of two type viz. for masonry works and for concrete works. The expansion sleeves are different for masonry type anchor fastener and concrete type anchor fastener. Depending upon the safe tensile load capacity of each fastener, size of anchor fastener varies. The Contractor shall submit the Manufacturer's literature showing the average pull out and average shear value for anchor of various sizes. Anchors shall be fixed in position strictly as per the manufacturer's instructions and as approved by the Engineer.

Anchor fastener is considered as light duty for carrying safe tensile load up to 0.5MT per fastener and as heavy duty for carrying safe tensile load above 0.50MT per fastener.

Heavy Duty Anchor Fasteners

The safe tensile load carrying capacity of the anchors shall be arrived by providing the minimum factor of capacity of 2.5 for the characteristic load of the anchor. Minimum size of anchor shall be M8 (8mm). All anchors shall be from the approved manufacturers like HILTI or equivalent.

- a) Anchor fasteners shall be supplied and fixed in position by the contractor. Anchor fasteners can be of mechanical bonding or chemical bonding.
- b) Capacity of the anchor shall be established after considering the effect of concrete grade, embedment depth, concrete thickness, anchor spacing and edge distance from the concrete edge.



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- c) The selection for the particular type of bonding for the anchors shall be made after considering the concrete grade, available embedment depth, load to be transferred, space available for installing anchors.
- d) The mechanical bonding anchor are torque controlled anchors made from carbon steel of grade 8.8 as per IS:1367 part 3. Anchors in bolt as well as nut version are acceptable. The bolt version anchors consist of bolt washer, sleeves, plastic section, expansion sleeves and a cone. Nuts version anchor consists of nuts, threaded rod, washer, sleeves, plastic section, expansion sleeves and a cone. All steel component of anchor shall be electro galvanised to minimum 5 micron coating thickness. The plastic section shall be of polyacetal Derlin 100 or equivalent.
- e) Chemical bonding anchor shall consist of foil capsule and threaded rod. The foil capsule shall contain the resin and hardener. The threaded rod shall have chiselled tip. The behaviour of anchors under fire shall conform the heating curves as per ISO:834. Anchors of size M8 to M24 shall conform to grade 5.8 and anchors of size M27 to M39 shall conform to grade 8.8 as per IS:1367 part 3. All steel components of the anchors shall be electro-galvanised to minimum 5 micron thickness.

Light Duty Anchors

This anchor shall comprise of stud, nut, washers, and expansion sleeve. The one end of the stud shall have thread and the other end shall have cold formed conical head. All steel components of the anchors shall be electro-galvanised to minimum 5 micron thickness. The expansion sleeve shall preferably be of stainless steel of SS316. The anchors shall conform to minimum grade 5.8 as per IS:1367 part 3.

2.02.11 Pipe Joints

MS pipes or GI pipes shall be joined by threaded sockets or by welding. Cast iron pipes shall be socket and spigot joined and caulked with hemp and molten head.

2.03.0 FENCING**2.03.01 Galvanised Chain Link Fencing**

The material requirement shall conform to IS: 2721 latest edition. The galvanised chain link fencing shall be woven from 3.15mm dia. wire with mesh size of 50mm unless otherwise specified. The mesh wire shall not vary from specified dia. by more than ± 0.05 mm. All steel wire shall be hot dipped galvanised wire. The dia shall be measured over the galvanised coating. The line wire shall be 4.0mm dia. GI wire. The stirrup wire for securing the line wire to the intermediate post (RCC/structural steel) shall be GI wire 2.5 mm diameter. The tying wire for securing the chain link fencing to the line wire shall be 1.6mm diameter GI wire. Hair pin chain staples for fastening down



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the bottom of galvanised chain line fencing to the concrete sill shall be 3.15mm wire. The ends shall be bent outwards for securing anchorage.

Cleat for eye bolts shall be of uniform size and shall consist of mild steel angle of 75 x 50 x 8 mm. The eye bolts strainer shall consist of bolt with welded eye sufficiently threaded and fitted with a nut and washer. Two-way eye bolt strainer shall have suitable ring nuts fitted after the wires have been strained on one side. Stretcher bar shall consist of GI flats 25 x 4.75 mm. They shall be secured to the cleats by steel bolts.

The chain link fencing shall be strained between each pair of straining posts and secured to each straining posts by means of a stretcher bar. One of top line wire shall be threaded through appropriate adjacent row of mesh, care being taken that no meshes in the row are bypassed by the line wire except where deviation is necessary at the straining posts. The second top line wire shall be strained in front of the fencing. The fencing shall be attached to the top and bottom line wire by wire ties spaced at 150mm apart and to the other middle line wire by wire ties spaced at 450mm apart.

The bottom of fencing shall be treated as follows:

Hair pin staples shall be threaded through the bottom row of mesh at 750mm c/c and set in the sill 25mm below the chain link fencing to a depth of 150mm.

2.03.02**PVC coated Galvanised Chain Link Fencing**

The PVC coated galvanized chain link fencing shall be woven from minimum 8 gauge PVC coated wire (including PVC coating) with mesh size of 75mmX75mm. The diameter of the hot dip galvanized steel wire for chain link fencing excluding PVC coating shall not be less than 12 gauge. The mesh wire shall not vary from specified dia. by more than +0.05mm. Other fixing details shall be as provided under sub head Galvanised **Chain Link Fencing** above.

2.03.03**Barbed Wire Fencing**

The barbed wire shall be conform to IS: 278 latest edition. The barbed wire shall be galvanised and galvanising shall conform to the requirement laid down for 'light-coated wire' of IS:4826 and it shall be smooth and relatively free of lumps etc. Wire with excessive roughness blisters, salammoniac spots shall be rejected. The barbed wire shall be made from two line wires and two point wires. The barbs shall have four points and shall be formed by twisting two point wires, each two turns, tightly around both or one line wire (Type A - around both line wire, Type B - around one line wire) making altogether four complete turns. The barbs shall be so finished that four points are set and located or locked as far as possible at right angle to each other.

Straining posts shall be provided at all ends and corners of fences or at changes in direction or acute variation in level and at intervals not exceeding



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66 M on straight lengths of fence. Intermediate posts shall be spaced at regular intervals not exceeding 3.0m. Struts shall be fitted to all straining posts behind the chain link fabric in the direction of line of fence. There shall be four evenly spaced row of line wire in all. The top line wire shall be doubled, making five line wire in all. The bottom wire shall be closed to the ground. Each line wire shall be strained tightly by means of eyebolts strainers or winders at each straining points. Each line wire shall be secured to each intermediate post by a wire stirrup passed through a hold in the post and secured to the line wire by three complete turns on each sides of the post. The barbed wire shall be fitted with one dropper at the centre of each bay, secured to the wire so that they could not be bunched together. Droppers for barbed wire shall be of mild steel of not less than 25 x 4.75 mm thick with 38 x 4.85 mm half round staples for fastening the barbed wire to them. Bracing for the rows of barbed wire shall be approved by the Engineer.

2.03.04 Concertina Fencing

Concertina shall be from high tensile serrated galvanized wire (HTSW) made with wire diameter of 2.5 mm which will be stretched to 6m and attached on two strands of galvanized HTSSW (high tensile spring steel wire) of 2.5mm dia by means of clips at 1m interval. These two HTSSW strands will be attached to the fence posts/ angles with 12mm security fasteners.

3.00.00 ACCEPTANCE CRITERIA

- a) All items shall be correct shape, size, weight etc. shown on drawings and schedule of items.
- b) For installed items, the tolerances shall be as follows
 - i) Permissible deviation from, straightness – 1 in 1000.
 - ii) Seats, stiffener connections etc. shall be as per approved drawings and shall not interfere with architectural clearances.
- c) All castings shall be free from blowholes, cracks, and other blemishes.
- d) All MS wire fencing shall be in true vertical plain, and shall not bulge.

4.00.00 IS CODES

- IS:278 Specification for Galvanised Steel Barbed wire for fencing.
- IS:816 Code of practice for use of Metal Arc welding for general construction in mild steel.



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IS:1367 Industrial Fasteners – Threaded steel fasteners - Technical supply condition.

IS:2721 Specification for Galvanised Steel Chain Link fence fabric.

IS:2812 Arc welding of Aluminum and Alloy

5.00.00 RATES AND MEASUREMENTS**5.01.0 Rates**

Rates shall include supply, fabrication and installation for misc. metals works as required for completion of works like gates, fencing, handrails, ladders, hangers, anchors etc., unless otherwise specified in Schedule of Items.

Rate for fencing shall also include excavation, concreting and supply, erection & fabrication of post (post made of either structural steel or reinforced cement concrete), unless any specific item is excluded in the schedule of items.

5.02.0 Measurements

Measurement for MS gates shall be in MT.

Measurement for fencing shall be in Sqm unless otherwise specified in schedule of item.

Measurement for Anchors shall be in nos. for the type as specified in schedule of items.

Measurement of other misc. metals shall be done in MT unless otherwise specified in schedule of items.