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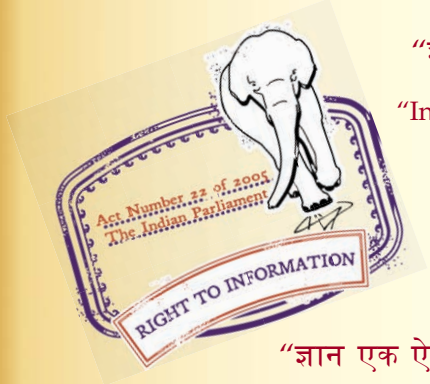
IS 802-2 (1978): Code of Practice for Use of Structural Steel in Overhead Transmission Line Towers, Part 2: Fabrication, Galvanizing, Inspection and Packing [CED 7: Structural Engineering and structural sections]



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Indian Standard

CODE OF PRACTICE FOR USE OF STRUCTURAL STEEL IN OVERHEAD TRANSMISSION LINE TOWERS

PART II FABRICATION, GALVANIZING, INSPECTION AND PACKING

(Fourth Reprint APRIL 2000)

UDC 621.315.668.2:006.76

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 3 *February* 1979

Indian Standard

CODE OF PRACTICE FOR USE OF STRUCTURAL STEEL IN OVERHEAD TRANSMISSION LINE TOWERS

PART II FABRICATION, GALVANIZING, INSPECTION AND PACKING

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(*Continued on page* 10)

AMENDMENT NO. 1 AUGUST 1992
TO
IS 802 (Part 2) : 1978 CODE OF PRACTICE FOR USE OF STRUCTURAL STEEL IN OVERHEAD TRANSMISSION LINE TOWERS

PART 2 FABRICATION, GALVANIZING, INSPECTION AND PACKING

(*Page* 7, *clause* 5.9, *line* 3) — Substitute 'SP 6 (Part 1) : 1964 ' *for* ' SP 6 (1) : 1969'.

(*Page* 8, *clause* 6.3, *line* 2) — Substitute '± 2 mm and ± 1 mm respectively' *for* '± 0.5 mm'.

(*Page* 8, *clause* 6.4, *line* 1) — Substitute '± 2 mm' *for* '± 1.6 mm'.

(*Page* 8, *clause* 6.5, *line* 2) — Substitute '± 1 mm' *for* '± 0.5 mm'.

(CED 7)

Reprography Unit, BIS, New Delhi, India

Indian Standard

CODE OF PRACTICE FOR USE OF STRUCTURAL STEEL IN OVERHEAD TRANSMISSION LINE TOWERS

PART II FABRICATION, GALVANIZING, INSPECTION AND PACKING

0. FOREWORD

0.1 This Indian Standard (Part II) was adopted by the Indian Standards Institution on 25 October 1978, after the draft finalized by the Structural Engineering Sectional Committee had been approved by the Structural and Metals Division Council and the Civil Engineering Division Council.

0.2 With the publication of IS : 802 (Part I)-1977*, provisions regarding loads, material, permissible stresses and design aspect have been covered. In this part requirements regarding fabrication, galvanizing, inspection and packing of overhead transmission line towers have been covered.

0.3 This standard keeps in view the practices being followed in the country in this field. Assistance has been derived from the 'Guide for design of steel transmission line towers' issued by the American Society of Civil Engineers.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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1. SCOPE

1.1 This standard (Part II) covers the provisions relating to the fabrication, galvanizing, inspection and packing requirements of self-supporting steel lattice towers for overhead transmission lines.

1.1.1 Provisions regarding loads, permissible stresses and design considerations have been covered in Part I of this standard.

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*Code of practice for use of structural steel in overhead transmission line towers: Part I Loads and permissible stresses (*second revision*).

†Rules for rounding off numerical values (*revised*).

1.1.2 Provisions regarding testing of towers have been covered in Part III of this standard.

1.1.3 For provisions regarding erection of towers, reference shall be made to IS : 5613 (Part II/Sec 2)-1976*.

1.2 This code does not cover guyed towers and special towers for river crossing or other long spans. These will be covered by separate codes.

2. PLAN AND DRAWING

2.1 Plans and drawings shall be prepared according to IS : 696-1972† and IS : 962-1967‡.

2.2 Structural Assembly Drawings

2.2.1 The drawings shall show the complete design dimensions, member length, slope factors or triangles, section sizes, bend lines, gauge lines, diameter, length and number of bolts, spacers, washers, sizes of gusset plates, position of holes, etc, and relative location of various members.

2.2.1.1 Sufficient number of elevation, cross section and plan views shall be presented to clearly indicate the details of joints and arrangement of members.

2.2.2 All members shall be clearly shown and the respective identification mark allotted to each member.

2.2.3 The drawings shall be drawn to a scale large enough to convey the information adequately.

2.2.4 All connections shall be detailed to minimize eccentricity of the connection.

NOTE — Due consideration shall be given to the additional stresses introduced in the members on account of eccentricity of the connection.

2.3 Shop Drawing — Shop drawings, containing complete information necessary for fabrication of the component parts of the structures shall be prepared. These drawings shall clearly show the member sizes, length and marks, hole positions, gauge lines, bend lines, edge distances, amount of clipping, notching, etc.

2.3.1 In the case of members to be bent, the shop drawings shall indicate provision for the variation in length to be made.

2.4 Bill of Material — Bill of material for each type of tower shall be prepared separately. This shall indicate grade of steel, mark numbers,

*Code of practice for design, installation and maintenance of overhead power lines: Part II Lines above 11 kV up to and including 220 kV, Section 2 Installation and maintenance.

†Code of practice for general engineering drawings (*second revision*).

‡Code of practice for architectural and building drawing (*first revision*).

section sizes, member lengths, their calculated weights, number of bolts, nuts and washers and their sizes, total quantities required and structural drawing numbers.

2.4.1 No reduction in weight due to drilling, punching of bolt holes, screw cuts, clipping, notching, chamfering, etc, shall be made while computing the calculated weight of the members.

3. FABRICATION

3.1 General — The fabrication of transmission line towers shall be done in accordance with this code A reference may, however, be made to IS : 800-1962* in case of non-stipulation of some particular provision in this standard.

3.2 Material Quality Control — In cases where more than one grade of steel is used in the structural members, proper identification marks of the various grades of steel being used shall be made on the material to ensure their ultimate use in the proper location in the towers before taking up the fabrication.

4. OPERATIONS IN FABRICATION

4.1 Straightening — All material shall be reasonably straight and, if necessary, before being worked shall be straightened and/or flattened by pressure, unless required to be of curvilinear form and shall be free from twists. Straightening shall not damage the material. The adjacent surfaces of the parts when assembled, shall be in close contact throughout keeping in view the tolerances specified. Hammering shall not be permitted for straightening and/or flattening of members. Sharp bends shall be cause for rejection.

4.2 Cutting — Cutting may be effected by shearing, cropping, flame cutting or sawing. The surfaces so cut shall be clean, smooth, reasonably square and free from any distortion.

4.3 Bending

4.3.1 Mild steel angle sections up to 75 × 75 mm (up to 6 mm thick) shall be bent cold up to and including bend angle of 10°; angles above 75 × 75 mm (thickness up to 6 mm) and up to and including 100 × 100 mm (thickness up to 8 mm) may also be bent cold up to the bend angle of 5°. All other angle sections and bend angles not covered above shall be bent hot.

4.3.2 All plates up to 12 mm thickness shall be bent cold up to a maximum bend angle of 15°. Greater bends and other thicknesses shall be bent hot.

4.3.3 Bends on all high tensile steel sections shall be done hot.

*Code of practice for use of structural steel in general building construction (*revised*).

4.3.4 All hot bent material shall be air cooled.

4.3.5 The bends shall be of even profile and free from any surface damages.

4.4 Holing

4.4.1 Holes in the members shall either be drilled or punched to jig and shall not be formed by flame cutting process. All burrs left by punching or drilling shall be completely removed.

4.4.2 Punching may be adopted for sections up to 12 mm thick. For thicker sections, drilling shall be done.

4.4.3 The holes near the bend line of a bent member, on both sides of bend line, shall be punched/drilled after bending and relative position of these holes shall be maintained with the use of proper template/jigs and fixtures.

5. FASTENERS AND JOINTS

5.1 General — It shall be ensured that the fasteners provide positive attachment at all times and under the conditions when the tower structures are subjected to vibratory loads.

5.2 Bolts — Bolts used for erection of transmission line tower shall preferably be of 12, 16 and 20 mm diameter and in no case bolt diameter shall be less than 12 mm.

5.2.1 Only one diameter of bolts shall preferably be used in one tower type.

5.2.2 The length of the bolt shall be such that the threaded portion does not lie in the plane of contact of members.

5.2.3 It shall also be ensured that the threaded portion of the bolt protrudes not less than 3 mm and not more than 8 mm over the nut after it is fully tightened.

5.3 Holes for Bolting — Holes shall be cylindrical. Oval or lobed forms of holes shall not be permitted. The diameter of the hole shall be equal to the diameter of the bolt plus 1·5 mm.

5.3.1 Holes shall be perpendicular to the plates or angles.

5.3.2 The accuracy of the location of holes shall be such that for any group of members when assembled the holes shall admit the bolt at right angle to the plane of connection.

5.4 Spacing of Bolts and Edge Distance — The minimum spacing of bolts and edge distance shall be as given in Table 1.

TABLE 1 SPACING OF BOLTS AND EDGE DISTANCE

(*Clause* 5.4)

Bolt Diameter	Hole Diameter	Bolt Spacing, *Min*	Edge Distance, *Min*	
			Hole Centre to Rolled or Sawn Edge	Hole Centre to Sheared or Flame Cut Edge
(1)	(2)	(3)	(4)	(5)
mm	mm	mm	mm	mm
12	13·5	32	16	20
16	17·5	40	20	23
20	21·5	48	25	28

5.5 In dimensioning gauge lines, allowance shall be made for the mill tolerance in width of flange in accordance with IS : 1852-1973* so as to ensure minimum edge distance specified in **5.4**.

5.6 Locking Devices —Spring washers of positive lock type of the following thicknesses shall be provided for insertion under all nuts.

Bolt Dia mm	*Thickness of Spring Washer* mm
12	2·5
16	3·5
20	4·0

5.7 To obviate bending stress in bolts or to reduce the same to a minimum, no bolt shall connect aggregate thickness of more than three times the bolt diameter and also the number of members carrying stress to be connected by a single bolt shall not generally exceed three (excluding gussets and packing).

5.8 The gap between the ends of two connected members in a butt joint shall not be more than 6 mm and less than 4 mm.

5.9 Bolt Gauge Distances in Flanges of Angles — The bolt gauge distances in flanges of angle sections shall generally be in accordance with Table XXXI of SP : 6(1)-1969†.

*Specification for rolling and cutting tolerances for hot rolled steel products (*second revision*).

†ISI Handbook for structural engineers — Structural steel sections (*revised*).

6. TOLERANCES

6.1 Fabrication tolerances shall conform to those specified in **6.2** to **6.5**. Tolerances not specified in this code shall in general conform to IS : 7215-1974*.

6.2 The maximum allowable difference in diameter of the holes on the two sides of plate or angle shall be 0·8 mm, that is, the allowable taper in a punched hole shall not exceed 0·8 mm on diameter.

6.3 Tolerance cumulative and between consecutive holes shall be within ± 0·5 mm.

6.4 Tolerance on the overall length of a member shall be within ±1·6 mm.

6.5 Tolerance on gauge distance shall be within ± 0·5 mm.

7. MARKING

7.1 The identification mark allotted to each member shall be distinctly stamped before galvanizing with marking dies of 16 mm size.

8. SHOP ERECTION

8.1 The steel work shall be temporarily shop erected complete in horizontal or vertical position (one tower of each type including every combination of leg extensions) so that accuracy of the members may be checked before commencing mass fabrication.

9. PAINTING AND GALVANIZING

9.1 Painting — Preparation of surface for painting (pretreatment) and application of primer and finishing coats shall be done in accordance with the relevant clauses of IS : 1477 (Part I)-1971† and IS : 1477 (Part II)-1971‡ respectively.

9.1.1 The pretreatment to the members and application of primer coat shall be done immediately after fabrication. Another primer coat followed by two coats of finishing paint shall be given at site after the fabricated steel work is erected. In case the primer coat is scraped during transportation, the member surface shall be cleaned before applying the primer coat in the field.

9.2 Galvanizing — Bolts and other fasteners shall be galvanized in accordance with IS : 5358-1969§ galvanizing of members of the tower shall conform to IS : 4759-1968‖ and spring washers shall be galvanized in accordance with IS : 1573-1970¶.

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*Tolerances for fabrication of steel structures.

†Code of practice for painting of ferrous metals in buildings: Part I Pretreatment (*first revision*).

‡Code of practice for painting of ferrous metals in buildings: Part II Painting (*first revision*).

§Specification for hot-dip galvanized coatings on fasteners.

‖Specification for hot-dip zinc coating on structural steel and other allied products.

¶Specification for electroplated coatings for zinc on iron and steel.

10. INSPECTION

10.1 The inspector shall have free access at all reasonable times to those parts of the manufacturer's works which are concerned with the fabrication of the steel work and shall be afforded all reasonable facilities for satisfying himself that the fabrication is being done in accordance with the provisions of this standard.

10.2 Unless specified otherwise, inspection shall be made at the place of manufacture prior to despatch and shall be conducted so as not to interfere unnecessarily with the operation of the work.

10.3 The manufacturer shall guarantee compliance with the provisions of this standard, if required to do so by the purchaser.

10.4 Should any member of the structure be found not to comply with any of the provisions of this standard, it shall be liable to rejection. No member once rejected shall be resubmitted for inspection, except in cases where the purchaser or his authorized representative considers the defect as rectifiable.

10.5 Defects which may appear during fabrication shall be made good with the consent of and according to the procedure laid down by the inspector.

10.6 All gauges and templates necessary to satisfy the inspector shall be supplied by the manufacturer.

10.7 The correct grade and quality of steel shall be used by the manufacturer. To ascertain the quality of steel used, the inspector at his discretion may get the material tested at a suitable or approved laboratory.

11. PACKING

11.1 Angle sections shall be wire bundled or despatched loose as may be mutually agreed upon.

11.2 Cleat angles, gusset plates, brackets, fillet plate, hanger and similar loose pieces shall be nested and bolted together in mutiples or securely wired together through holes.

11.3 Bolts, nuts, washers and other attachments shall be packed in double gunny bags accurately tagged in accordance with the contents.

11.4 The packings shall avoid losses/damages during transit. Each bundle or package shall be appropriately marked.

(*Continued from page 2*)

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