IS 802 (Part 1/Sec 2) : 1992
(Reaffirmed 1998)
Edition 4.1
(1998-01)

भारतीय मानक

शिरोपरि प्रेषण लाईन टावरों में संरचना इस्पात उपयोग की रीति संहिता

भाग 1 सामग्री, भार और अनुमत प्रतिबल

खंड 2 अनुमत प्रतिबल

(तीसरा पुनरीक्षण)

Indian Standard

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

PART 1 MATERIAL, LOADS AND PERMISSIBLE STRESSES

Section 2 Permissible Stresses

(Third Revision)

(Incorporating Amendment No. 1)

UDC 621.315.668.2

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Structural Engineering Sectional Committee, CED 7

FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Structural Engineering Sectional Committee had been approved by the Civil Engineering Division Council.

This standard has been prepared with a view to establish uniform practices for design, fabrication, testing and inspection of overhead transmission line towers. Part 1 of the standard covers requirements in regard to material, types of towers, loading and permissible stresses apart from other relevant design provisions. Provisions for fabrication, galvanizing, inspection and packing have been covered in Part 2 whereas provisions for testing of these towers have been covered in Part 3 of the standard.

This standard (Part 1) was first published in 1967 and subsequently revised in 1973 and 1977. In this revision, the code has been split in two sections namely Section 1 Materials and loads, and Section 2 Permissible stresses. Other major modifications effected in this revision (Section 2) are as under:

a) Permissible stresses in structural members have been given in terms of the yield strength of the material. With the inclusion of bolts of property class 5.6 of IS 12427 : 1988, permissible stresses for these bolts have also been included.

b) Critical stress in compression F_{cr} has been modified for width/thickness ratio of the angles exceeding the limiting value for calculating the allowable unit compressive stresses.

c) Effective slenderness ratios (KL/r) for redundant members have been included and provisions further elaborated.

d) Examples for the determination of slenderness ratios have been extended to include '*K*' and '*X*' bracings with and without secondary members.

Designs provisions or other items not covered in this standard shall generally be in accordance with IS 800 : 1984 'Code of practice for general construction in steel (*second revision*)'.

While preparing this standard, practices prevailing in the country in this field have been kept in view. Assistance has also been derived from the 'Guide for design of steel transmission line towers' (second edition) — ASCE Manual No. 52, issued by American Society of Civil Engineers (ASCE) New York, 1988.

This edition 4.1 incorporates Amendment No. 1 (January 1998). Side bar indicates modification of the text as the result of incorporation of the amendments.

For the purpose of deciding whether a particular requirement of this Code 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 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

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

PART 1 MATERIAL, LOADS AND PERMISSIBLE STRESSES

Section 2 Permissible Stresses

(Third Revision)

1 SCOPE

1.1 This standard (Part 1/Sec 2) stipulates the permissible stresses and other design parameters to be adopted in the design of self-supporting steel lattice towers for overhead transmission lines.

1.1.1 Materials, type of towers, loading and broken wire conditions are covered in Section 1 of this standard.

1.1.2 Provisions on fabrication and testing of transmission line towers have been covered in Part 2 and Part 3 respectively of the standard.

NOTE — While formulating the provisions of this standard it has been assumed that the structural connections are through bolts.

1.2 This standard does not cover guyed towers. These will be covered in a separate standard.

2 REFERENCES

The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 STATUTORY REQUIREMENTS

3.1 Statutory requirement as laid down in the '*Indian Electricity Rules, 1956*' or by any other statutory body applicable to such structures as covered in this standard shall be satisfied.

3.2 Compliance with this code does not relieve any one from the responsibility of observing local and state byelaws, fire and safety laws and other civil aviation requirements applicable to such structures.

4 CONDUCTOR TENSION

4.1 The conductor tension at everyday temperature and without external load should not exceed the following percentage of the ultimate strength of the conductor:

Initial unloaded tension	35 percent
Final unloaded tension	25 percent

provided that the ultimate tension under everyday temperature and full wind or minimum temperature and two-thirds wind pressure does not exceed 70 percent of the ultimate tensile strength of the cable.

5 PERMISSIBLE STRESSES

5.1 Axial Stresses in Tension

The estimated tensile stresses on the net effective sectional areas (*see* **9**) in various members, shall not exceed minimum guaranteed yield stress of the material. However in case the angle section is connected by one leg only, the estimated tensile stress on the net effective sectional area shall not exceed F_y, where F_y, is the minimum guaranteed yield stress of the material.

5.2 Axial Stresses in Compression

5.2.1 The estimated compressive stresses in various members shall not exceed the values given by the formulae in **5.2.2**.

5.2.2 The allowable unit stress F_a, in MPa on the gross cross sectional area of the axially loaded compression members shall be:

a) $$F_a = \left[1 - \frac{1}{2} \left(\frac{KL/r}{C_c} \right)^2 \right] \times F_y \quad \text{when } KL/r \leqslant C_c$$

and,

b) $$F_a = \frac{\pi^2 \times E}{(KL/r)^2} \quad \text{when } KL/r > C_c$$

where

$C_e = \pi\sqrt{2E/F_y}$

F_y = minimum guaranteed yield stress of the material, MPa

E = modulus, of elasticity of steel that is 2×10^5 MPa,

KL/r = largest effective slenderness ratio of any unbraced segment of the member,

L = unbraced length of the compression member (*see* **6.1.1**) in cm, and

r = appropriate radius of gyration in cm.

5.2.2.1 The formulae given in **5.2.2** are applicable provided the largest width thickness ratio b/t is not more than the limiting value given by:

$$(b/t)_{lim} = 210/\sqrt{F_y}$$

where

b = distance from edge of fillet to the extreme fibre in mm, and

t = thickness of flange in mm.

5.2.2.2 Where the width thickness ratio exceeds the limits given in **5.2.2.1**, the formulae given in **5.2.2** shall be used substituting for F_y the value F_{cr} given by:

a) $$F_{cr} = \left[1{\cdot}677 - \frac{0{\cdot}677\,(b/t)}{(b/t)_{lim}} \right] \times F_y$$
when $(b/t)_{lim} \leqslant b/t \leqslant 378/\sqrt{F_y}$

and

b) $$F_{cr} = \frac{65\,550}{(b/t)^2} \text{ when } \frac{b}{E} > \frac{378}{\sqrt{Fy}}$$

NOTE — The maximum permissible value of b/t for any type of steel shall not exceed 25.

5.3 The redundant members shall be checked individually for 2.5 percent of axial load carried by the member to which it supports.

5.4 Stresses in Bolts

Ultimate stresses in bolts conforming to property class 4.6 of IS 6639 : 1972 and to property class 5.6 of IS 12427 : 1988 shall not exceed the value given in Table 1. For bolts conforming to IS 3757 : 1985, permissible stresses and other provisions governing the use of high strength bolts reference shall be made to IS 4000 : 1992.

5.4.1 Where the material of bolt and the structural member are of different grades, the bearing strength of the joint shall be governed by the lower of the two.

Table 1 Ultimate Stresses in Bolts, MPa

(*Clause* 5.4)

Nature of Stress	Permissible Stress for Bolts of Property Class		Remarks
	4.6	5.6	
(1)	(2)	(3)	(4)
Shear			
Shear stress on gross area of bolts	218	310	For gross area of bolts (*see* **10.4**). For bolts in double shear the area to be assumed shall be twice the area defined
Bearing			
Bearing stress on gross diameter of bolts	436	620	For the bolt area in bearing (*see* **10.5**)
Tension			
Axial tensile stress	194	250	—

6 SLENDERNESS RATIOS

6.1 The slenderness ratios of compression and redundant members shall be determined as follows:

Type of Members	*Value of KL*/r
a) *Compression Members*	
i) Leg sections or joint members bolted in both faces at connections for $0 < L/r \leq 120$	L/r
ii) Members with concentric loading at both ends of the unsupported panel for $0 < L/r \leq 120$	L/r
iii) Member with concentric loading at one end and normal framing eccentricity at the other end of the unsupported panel for $0 < L/r \leq 120$	$30 + 0.75\,L/r$
iv) Member with normal framing eccentricities at both ends of the unsupported panel for $0 < L/r \leq 120$	$60 + 0.50\,L/r$
v) Member unrestrained against rotation at both ends of the unsupported panel for $120 \leq L/r \leq 200$	L/r

vi) Member partially restrained against rotation at one end of the unsupported panel for 120 < L/r < 225	28.6 + 0.762 L/r
vii) Member partially restrained against rotation at both ends of the unsupported panel for 120 < L/r < 250	46.2 + 0.615 L/r

b) *Redundant Members*

i) For 0 < L/r < 250	L/r

NOTE — The values of KL/r corresponding to (a) (vi) and (a) (vii), the following evaluation is suggested:

1 The restrained member must be connected to the restraining member with at least two bolts.

2 The restraining member must have a stiffness factor I/L in the stress plane (I = Moment of inertia and L = Length) that equals or exceeds the sum of the stiffness factors in the stress plane of the restrained members that are connected to it.

3 Angle members connected by one leg should have the holes located as close to the outstanding leg as feasible. Normal framing eccentricities at load transfer connection imply that connection holes are located between the heel of the angle end the centreline of the framing leg.

6.1.1 In calculating the slenderness ratio of the members, the length L should be the distance between the intersections of the centre of gravity lines at each end of the member.

6.2 Examples showing the application of the procedure given in **6.1** and **6.1.1** and method of determining the slenderness ratio of legs and bracings with or without secondary members are given in Annex B.

NOTE — Where test and/or analysis demonstrate that any other type of bracing pattern if found technically suitable, the same can be adopted.

6.3 The limiting values KL/r shall be as follows:

Leg members, ground wire peak member and lower members of the cross arms in compression	120
Other members carrying computed stresses	200
Redundant members and those carrying nominal stresses	250

6.4 Slenderness ratio L/r of a member carrying axial tension only, shall not exceed 400.

7 MINIMUM THICKNESS

7.1 Minimum thickness of galvanized and painted tower members shall be as follows:

	Minimum Thickness, mm	
	Galvanized	Painted
Leg members, ground wire peak member and lower members of cross arms in compression	5	6
Other members	4	5

7.2 Gusset plates shall be designed to resist the shear, direct and flexural stresses acting on the weakest or critical section. Re-entrant cuts shall be avoided as far as practical. Minimum thickness of gusset shall be 2 mm more than lattice it connects only in case when the lattice is directly connected on the gusset outside the leg member. In no case the gusset shall be less than 5 mm in thickness.

8 NET SECTIONAL AREA FOR TENSION MEMBER

8.1 The net sectional area shall be the least area which is to be obtained by deducting from the gross sectional area, the area of all holes cut by any straight, diagonal or zigzag line across the member. In determining the total area of the holes to be deducted from gross sectional area, the full area of the first hole shall be counted, plus a fraction part X, of each succeeding hole cut by the line of holes under consideration. The value of X shall be determined from the formula:

$$X = 1 - \frac{P^2}{4gd}$$

where

P = longitudinal spacing (stagger), that is the distance between two successive holes in the line of holes under consideration;

g = transverse spacing (gauge), that is the distance between the same two consecutive holes as for P; and

d = diameter of holes.

For holes in opposite legs of angles, the value of g should be the sum of the gauges from the back of the angle less the thickness of the angle.

9 NET EFFECTIVE AREA FOR ANGLE SECTION IN TENSION

9.1 In the case of single angle connected through one leg, the net effective section of the angle shall be taken as:

$$A_1 + A_2 k$$

where

A_1 = effective sectional area of the connected leg.

A_2 = the gross cross-sectional area of the unconnected leg, and

$$k = \frac{3A_1}{(3A_1 + A_2)}$$

where lug angles are used, the effective sectional area of the whole of the angle member shall be considered.

9.2 In the case of pair of angles back to back in tension connected by one leg of each angle to the same side of gusset, the net effective area shall be taken as:

$$A_1 + A_2 k$$

where

A_1 and A_2 are as defined in **9.1**, and

$$k = \frac{5A_1}{5A_1 + A_2}$$

9.3 The angles connected together back-to-back (in contact) or separated back-to-back by a distance not exceeding the aggregate thickness of the connected parts shall be provided with stich bolt at a a pitch not exceeding 1 000 mm. The slenderness ratio of individual component between adjacent stich bolts shall not be more than that of the two members together.

9.4 Where the angles are back to back but not connected as per **9.3**, each angle shall be designed as a single angle connected through one leg only in accordance with **9.1**.

9.5 When two tees are placed back to back but are not connected as per **9.3**, each tee shall be designed as a single tee connected to one side of a gusset only in accordance with **9.2**.

NOTE — The area of the leg of an angle shall be taken as the product of the thickness and the length from the outer corner minus half the thickness, and the area of the leg of a tee as the product of the thickness and the depth minus the thickness of the table.

10 BOLTING

10.1 Minimum Diameter of Bolts

The diameter of bolts shall not be less than 12 mm

10.2 Preferred Sizes of Bolts

Bolts used for erection of transmission line towers shall be of diameter 12, 16 and 20 mm.

10.3 The length of bolts shall be such that the threaded portion does not lie in the plane of contact of members. The projected portion of the bolt beyond the nut shall be between 3 to 8 mm.

10.4 Gross Area of Bolt

For the purpose of calculating the shear stress, the gross area of bolts shall be taken as the nominal area of the bolt.

10.5 The bolt area for bearing shall be taken as $d \times t$ where d is the nominal diameter of the bolt, and t the thickness of the thinner of the parts jointed.

10.6 The net area of a bolt in tension shall be taken as the area at the root of the thread.

10.7 Holes for Bolting

The diameter of the hole drilled/punched shall not be more than the nominal diameter of the bolt plus 1.5 mm.

11 FRAMING

11.1 The angle between any two members common to a joint of a trussed frame shall preferably be greater than 20° and never less than 15° due to uncertainty of stress distribution between two closely spaced members.

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
800 : 1984	Code of practice for use of structural steel in general building construction (*revised*)
3757 : 1985	High strength structural bolts (*second revision*)
4000 : 1992	Code of practice for high strength bolts in steel structures
6639 : 1972	Hexagonal bolt for steel structures
12427 : 1988	Transmission tower bolts

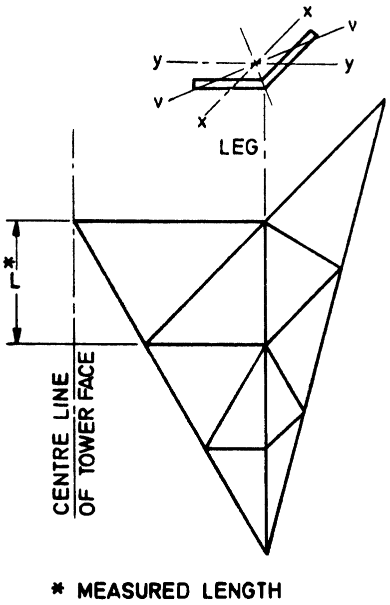
ANNEX B

(*Clause* 6.2)

EXAMPLES OF DETERMINATION OF SLENDERNESS RATIOS

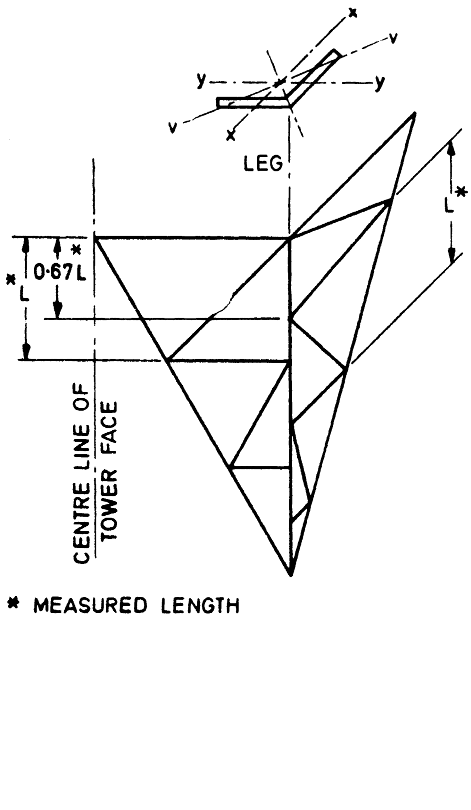
B-0 Example of determining the effective length of compression members of towers based on the provision given in **6.1** are given below.

B-1 LEG MEMBER USING SYMMETRICAL BRACING



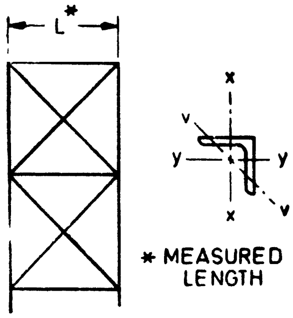
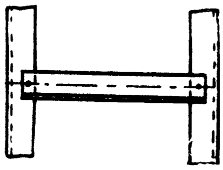
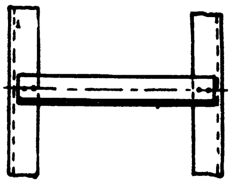
Method of Loading/ Rigidity of Joints	*Slenderness Ratio*
Concentric loading	$\frac{L}{r_{vv}}$ from 0 to 120 $\left(\frac{KL}{r} = \frac{L}{r_{vv}}\right)$
No restraint at ends	$\frac{L}{r_{vv}}$ from 120 to 200 $\left(\frac{KL}{r} = \frac{L}{r_{vv}}\right)$

B-2 LEG MEMBER USING STAGGERED BRACING

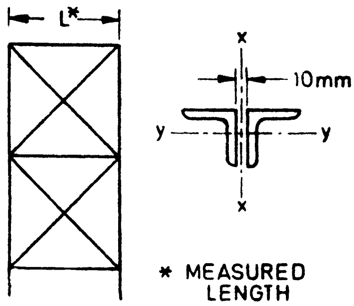
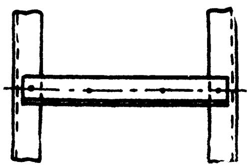
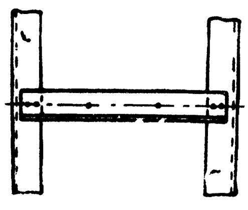


Method of Loading/ Rigidity of Joints	*Slenderness Ratio*
Concentric loading	$\frac{L}{r_{xx}}$ or $\frac{L}{r_{yy}}$ or 0.67 $\frac{L}{r_{vv}}$ from 0 to 120 $\left(\frac{KL}{r} = \frac{L}{r}\right)$
No restraint at ends	$\frac{L}{r_{xx}}$ or $\frac{L}{r_{yy}}$ or 0.67 $\frac{L}{r_{vv}}$ from 120 to 200 $\left(\frac{KL}{r} = \frac{L}{r}\right)$

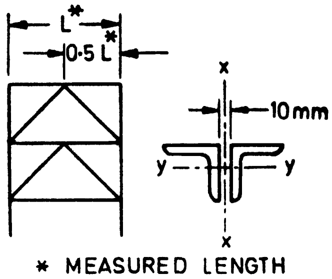
B-3 EFFECT OF END CONNECTIONS ON MEMBER CAPACITY

	Method of Loading/Rigidity of Joints	*Slenderness Ratio*
	Tension system with compression strut (eccentricity in critical axis)	$\frac{L}{r_{vv}}$ from 0 to 120 $\left(\frac{KL}{r} = 60 + 0.5\,\frac{L}{r}\right)$
	*Bracing Requirements* (*Single Angle Members*): Single bolt connection, no restraint at ends	$\frac{L}{r_{vv}}$ from 120 to 200 $\left(\frac{KL}{r} = \frac{L}{r}\right)$
	Multiple bolt connection partial restraint at both ends	$\frac{L}{r_{vv}}$ from 120 to 250 $\left(\frac{KL}{r} = 46.2 + 0.615\,\frac{L}{r}\right)$

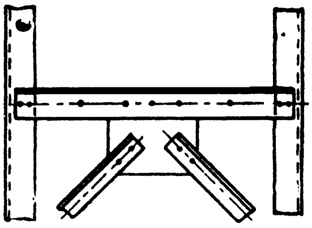
B-4 CONCENTRIC LOADING TWO ANGLE MEMBER

	Method of Loading/Rigidity of Joints	*Slenderness Ratio*
	Tension system strut compression concentric loading	$\frac{L}{r_{xx}}$ or $\frac{L}{r_{yy}}$ from 0 to 120 $\left(\frac{KL}{r} = \frac{L}{r}\right)$
	*Bracing Requirements* (*Two Angle Member*): Single bolt connection, no restraint at ends	$\frac{L}{r_{xx}}$ or $\frac{L}{r_{yy}}$ from 120 to 200 $\left(\frac{KL}{r} = \frac{L}{r}\right)$
	Multiple bolt connection, partial restraint at ends	$\frac{L}{r_{xx}}$ or $\frac{L}{r_{yy}}$ from 120 to 250 $\left(\frac{KL}{r} = 46.2 + 0.615\,\frac{L}{r}\right)$

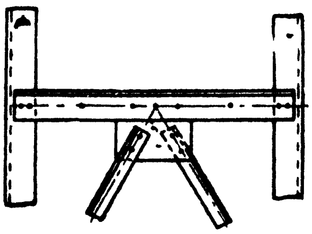
B-5 HORIZONTAL MEMBER OF *K*-BRACING-TWO ANGLE MEMBER



Method of Loading/Rigidity of Joints	*Slenderness Ratio*
Tension-compression system with compression strut:	
Multiple bolts connection partial restraint at ends and intermediate	$0.5 \frac{L}{r_{yy}}$ or $\frac{L}{r_{xx}}$ from 120 to 250 $\left(\frac{KL}{r} = 46.2 + 0.615 \frac{L}{r}\right)$

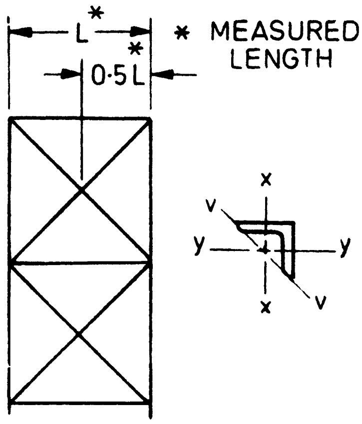


Bracing Requirements (*Two Angle Member*):	
Concentric load at ends, eccentric loading at intermediate in both directions	$0.5 \frac{L}{r_{yy}}$ or $\frac{L}{r_{xx}}$ from 0 to 120 $\left(\frac{KL}{r} = 30 + 0.75 \frac{L}{r}\right)$

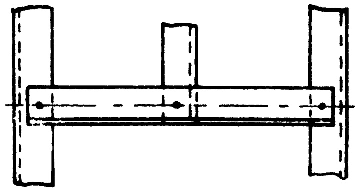


Concentric loading at ends and intermediate	$0.5 \frac{L}{r_{yy}}$ or $\frac{L}{r_{xx}}$ from 0 to 120 $\left(\frac{KL}{r} = \frac{L}{r}\right)$

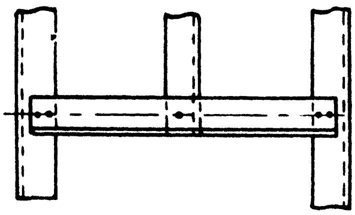
B-6 EFFECT OF SUBDIVIDED PANELS FOR THE HORIZONTAL MEMBER AND END CONNECTIONS ON MEMBER CAPACITY



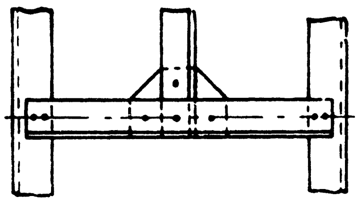
Method of Loading/Rigidity of Joints	*Slenderness Ratio*
Tension system with compression strut:	
Eccentricity in critical axis	$0.5 \frac{L}{r_{vv}}$ or $\frac{L}{r_{xx}}$ from 0 to 120 $\left(\frac{KL}{r} = 60 + 0.50 \frac{L}{r}\right)$



Bracing Requirements:	
Single bolt connection, no restraint at ends for intermediate	$0.5 \frac{L}{r_{vv}}$ or $\frac{L}{r_{xx}}$ from 120 to 200 $\left(\frac{KL}{r} = \frac{L}{r}\right)$

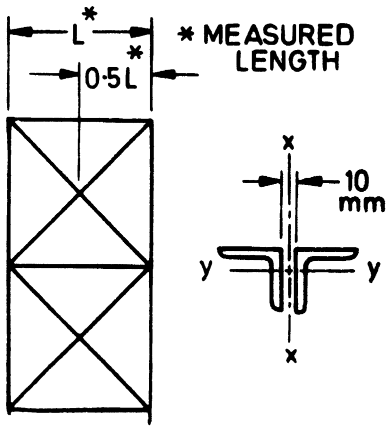


Multiple bolt connection at ends. Single bolt connection at intermediate point:	
Partial restraint at one end, on restraint at intermediate	$0.5 \frac{L}{r_{vv}}$ from 120 to 225 $\left(\frac{KL}{r} = 28.6 + 0.762 \frac{L}{r}\right)$
Partial restraint at both ends	$\frac{L}{r_{xx}}$ from 120 to 250 $\left(\frac{KL}{r} = 46.2 + 0.615 \frac{L}{r}\right)$



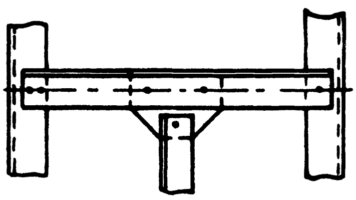
Multiple bolt connection	
Partial restraint at ends and intermediate	$0.5 \frac{L}{r_{vv}}$ or $\frac{L}{r_{xx}}$ from 120 to 250 $\left(\frac{KL}{r} = 46.2 + 0.615 \frac{L}{r}\right)$

B-7 CONCENTRIC LOADING TWO ANGLE MEMBER, SUBDIVIDED PANELS OF A HORIZONTAL MEMBER

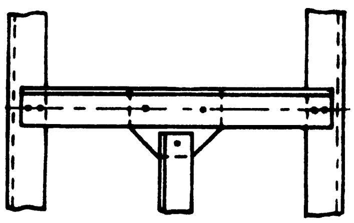


Method of Loading/Rigidity of Panel	*Slenderness Ratio*
Tension system with compression strut:	
Concentric loading	$0.5\ \frac{L}{r_{yy}}$ or $\frac{L}{r_{xx}}$ from 0 to 120 $\left(\frac{KL}{r} = \frac{L}{r}\right)$

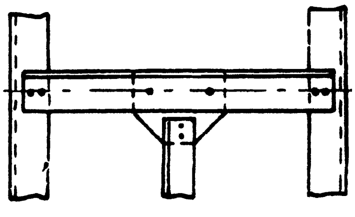
Bracing Requirements:



Method of Loading/Rigidity of Panel	*Slenderness Ratio*
Single bolt connection, no restraint at ends and intermediate	$0.5\ \frac{L}{r_{yy}}$ or $\frac{L}{r_{xx}}$ from 120 to 200 $\left(\frac{KL}{r} = \frac{L}{r}\right)$



Method of Loading/Rigidity of Panel	*Slenderness Ratio*
Multiple bolt connection at ends. Single bolt connection at intermediate joint	
Partial restraint at one end, no restraint at intermediate	$0.5\ \frac{L}{r_{yy}}$ from 120 to 200 $\left(\frac{KL}{r} = 28.6 + 0.762\ \frac{L}{r}\right)$
Partial restraint at both ends	$\frac{L}{r_{xx}}$ from 120 to 250 $\left(\frac{KL}{r} = 46.2 + 0.615\ \frac{L}{r}\right)$

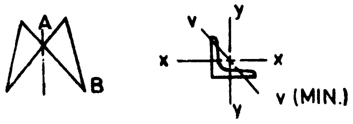


Method of Loading/Rigidity of Panel	*Slenderness Ratio*
Multiple bolt connection Partial restraint at ends and intermediate	$0.5\ \frac{L}{r_{yy}}$ or $\frac{L}{r_{xx}}$ from 120 to 250 $\left(\frac{KL}{r} = 46.2 + 0.615\ \frac{L}{r}\right)$

B-8 X-BRACINGS WITH AND WITHOUT SECONDARY MEMBERS

Slenderness Ratio Critical of:

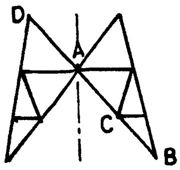
B-8.1



AB/r_{vv}

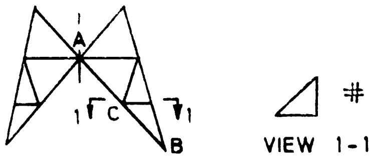
B-8.2

a)



AC/r_{vv} or CB/r_{vv} or
*AB/r_{xx} or *AB/r_{yy} or
*AD/r_{vv}

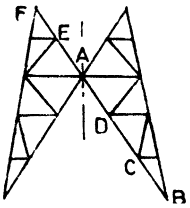
b)



AC/r_{vv} or CB/r_{vv} or
*AD/r_{vv}

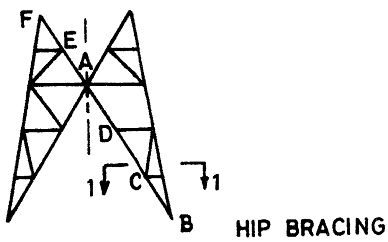
B-8.3

a)



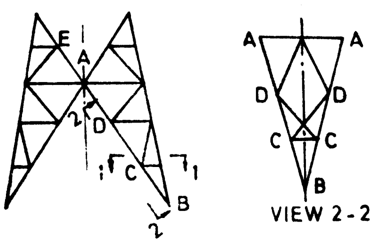
AD/r_{vv} or *AF/r_{xx} or
DC/r_{vv} or *AE/r_{vv} or
CB/r_{vv} or
*AB/r_{xx} or *AB/r_{yy} or
EF/r_{vv}

b)



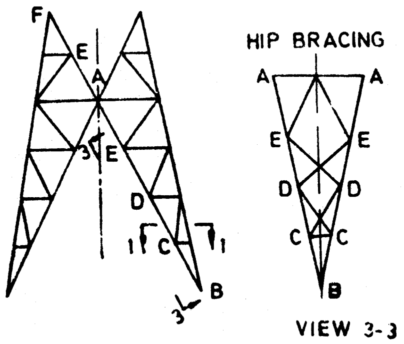
AD/r_{vv} or *AF/r_{xx} or
DC/r_{vv} or *AE/r_{vv} or
CB/r_{vv} or
AC/r_{xx} or *AC/r_{yy} or
EF/r_{vv}

c)



AD/r_{vv} or *AF/r_{xx} or
DC/r_{vv} or
CB/r_{vv} or *AE/r_{vv} or
EF/r_{vv}

B-8.4



AE/r_{vv} or *AF/r_{xx} or
ED/r_{vv} or *AE/r_{vv} or
DC/r_{vv} or CB/r_{vv}

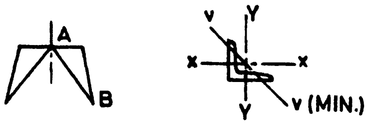
*Application for tension compression system only *i.e.* tensile stresses in one bracing must be at least equal to 75 percent of the compressive stress in the other bracing.

#The corner stay should be designed to provide lateral support adequately.

B-9 *K*-BRACINGS WITH AND WITHOUT SECONDARY MEMBERS

Slenderness Ratio Critical of:

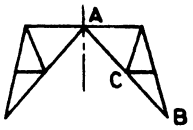
B-9.1



AB/r_{vv}

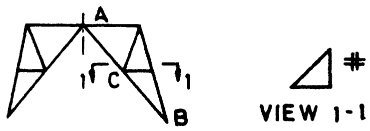
B-9.2

a)



AC/r_{vv} or
CB/r_{vv} or
AB/r_{xx} or AB/r_{yy}

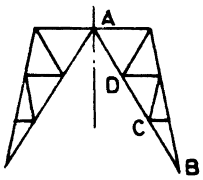
b)



AC/r_{vv} or
CB/r_{vv}

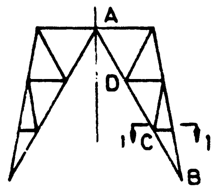
B-9.3

a)



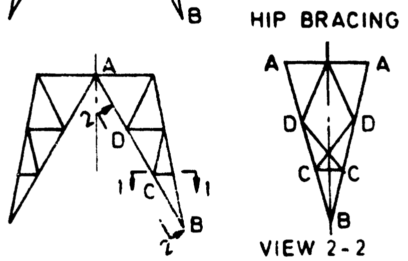
AD/r_{vv} or
DC/r_{vv} or
CB/r_{vv} or
AB/r_{xx} or AB/r_{yy}

b)



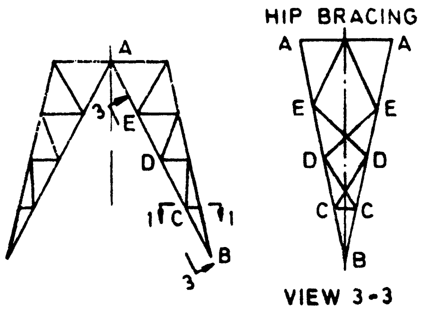
AD/r_{vv} or
DC/r_{vv} or
CB/r_{vv} or
AC/r_{xx} or AC/r_{yy}

c)



AD/r_{vv} or
DC/r_{vv} or
CB/r_{vv}

B-9.4



AE/r_{vv} or
ED/r_{vv} or
DC/r_{vv} or
CB/r_{vv}

#The corner stay should be designed to provide lateral support adequately.

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