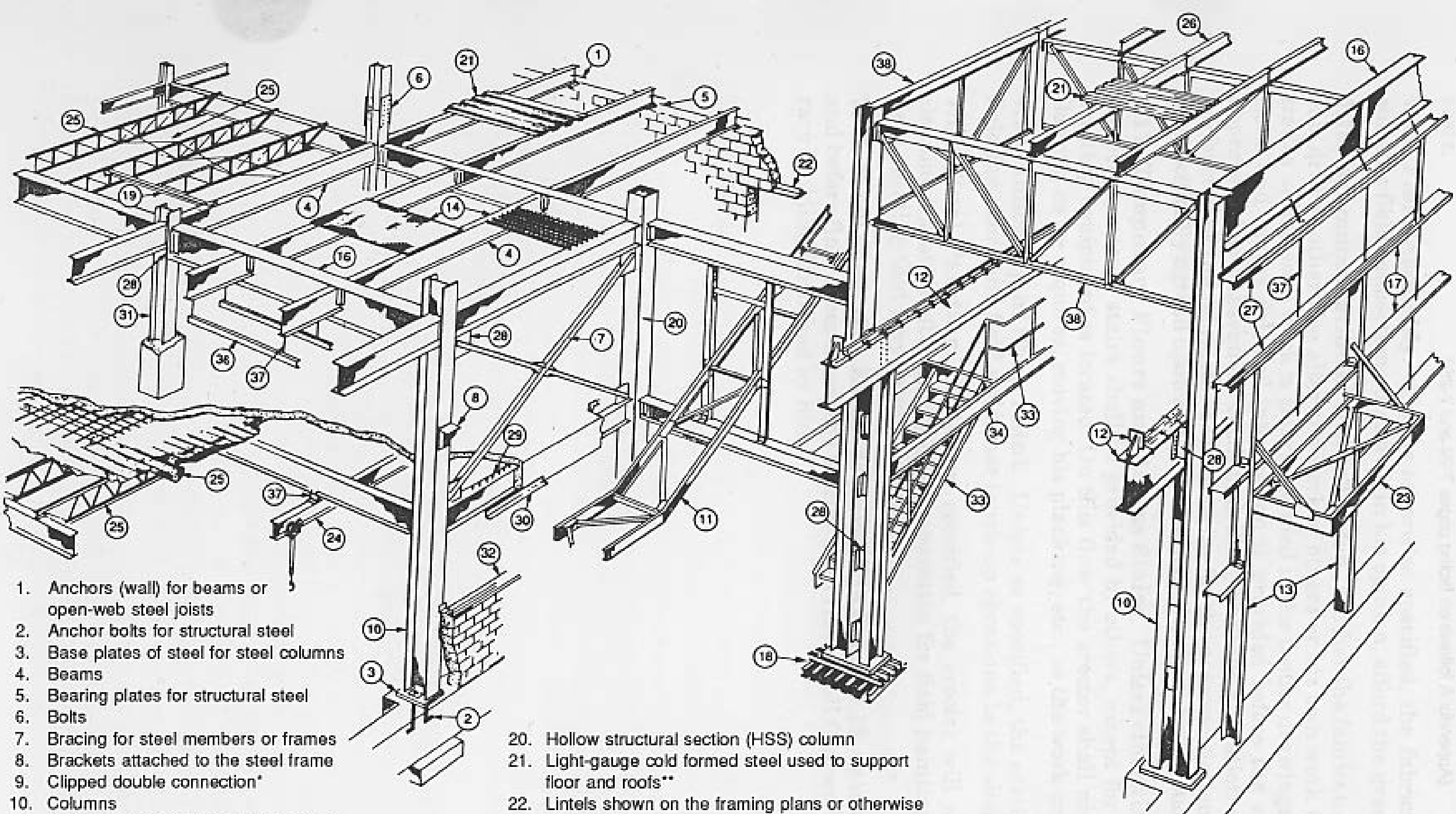
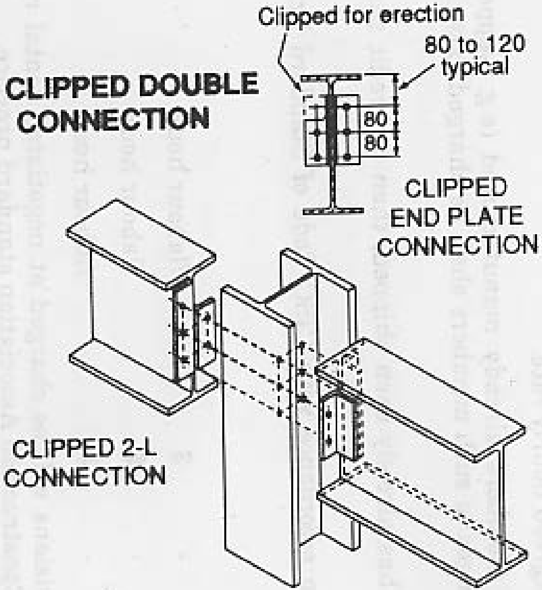


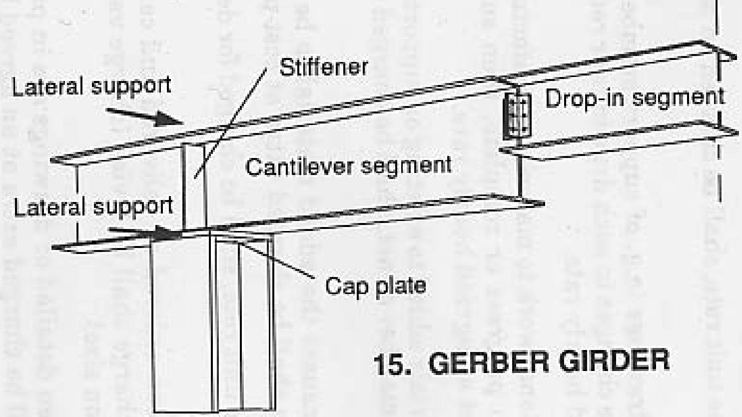
1. Anchors (wall) for beams or open-web steel joists
2. Anchor bolts for structural steel
3. Base plates of steel for steel columns
4. Beams
5. Bearing plates for structural steel
6. Bolts
7. Bracing for steel members or frames
8. Brackets attached to the steel frame
9. Clipped double connection*
10. Columns
11. Conveyor structural steel frame work
12. Crane, girders, rails and stops
13. Door frames constituting part of and connected to the steel frame
14. Floor and roof plates (raised pattern or plain), grating, connected to steel frame
15. Gerber girder*
16. Girders
17. Girts
18. Grillage beams of steel
19. Headers or trimmers for support of open-web steel joists where such headers or trimmers frame into structural steel members
20. Hollow structural section (HSS) column
21. Light-gauge cold formed steel used to support floor and roofs**
22. Lintels shown on the framing plans or otherwise scheduled
23. Marquee or canopy (structural frame only) when forming an integral part of the steel frame
24. Monorail beams of standard structural shapes, attached to the steel frame
25. Open-web steel joists, bridging, and accessories when supplied with steel joists
26. Purlins
27. Sash angles connected to the steel frame
28. Separators, angles, tees, clips, and other detail fitting essential to the structural steel frame
29. Shear connectors
30. Shelf angles attached to the steel frame
31. Steel cores for composite columns
32. Steel window sills attached to the steel frame
33. Steel stairs and handrails
34. Struts
35. Stub girder*
36. Suspended ceiling supports of structural steel shapes 75 mm or greater in depth
37. Ties, hangers and sag rods forming part of the structural frame
38. Trusses and brace frames

* see separate diagram

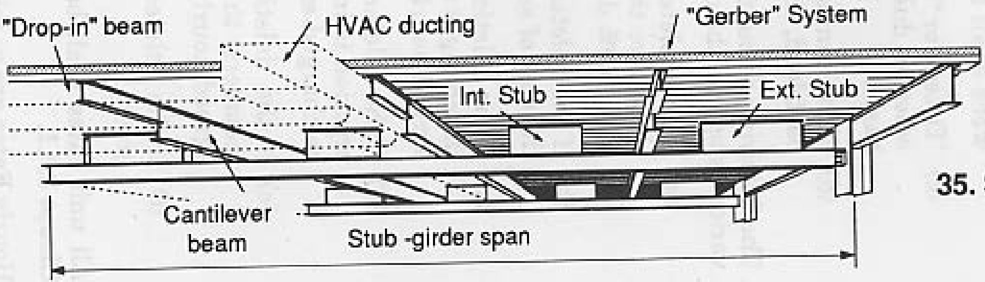
** supplied by others

9. CLIPPED DOUBLE CONNECTION





15. GERBER GIRDER



35. STUB-GIRDER

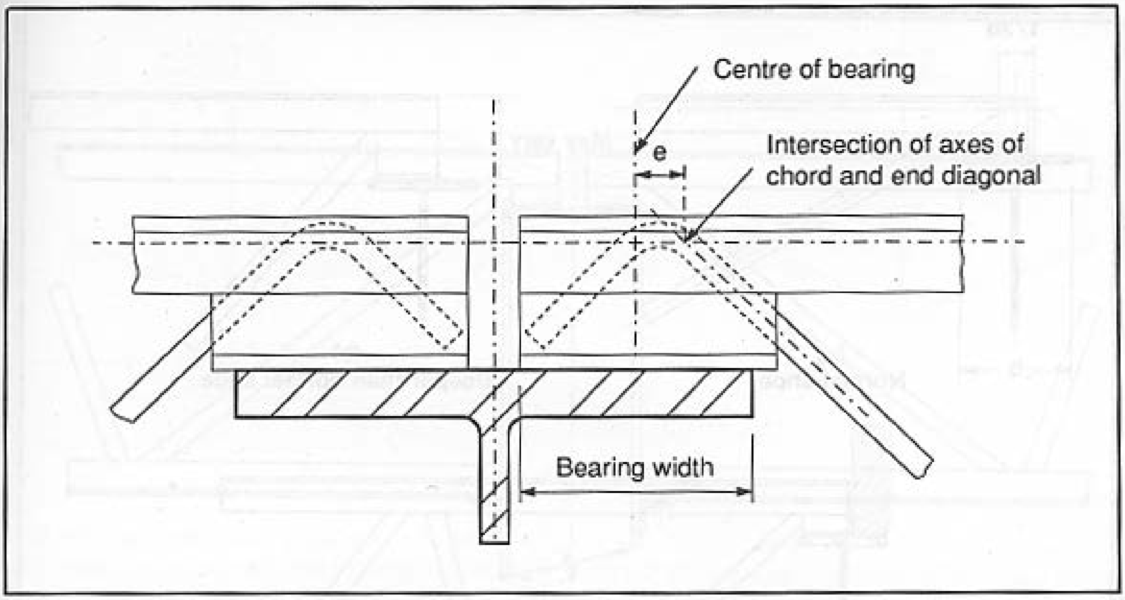


FIGURE 2-32
JOIST END BEARING ECCENTRICITY

tolerances, it may be wise to assume a maximum eccentricity when designing the bearing detail. In lieu of specific information, a reasonable assumption might be an eccentricity of 32 mm because the minimum bearing on a steel support is 65 mm. When detailing joists, care must be taken to provide clearance between the end diagonal and the supporting member or wall (Figure 2-33). A maximum 25 mm is suggested to minimize eccentricities. One solution, to obtain proper bearing, is to increase the depth of the bearing shoe.

For spandrel beams and other beams on which joists frame from one side only, good practice suggests that the centre of the bearing shoe be located within the middle third of the flange of the supporting beam (Figure 2-34(a)). As the depth of bearing shoes vary, the building designer should check with the manufacturer in setting top of steel elevations. By using a deep shoe, interference between the support and the end diagonal will be avoided (Figure 2-34(b)).

If the support is found to be improperly located, such that the span of the joist is increased, the resulting eccentricity may be greater than that assumed. Increasing the

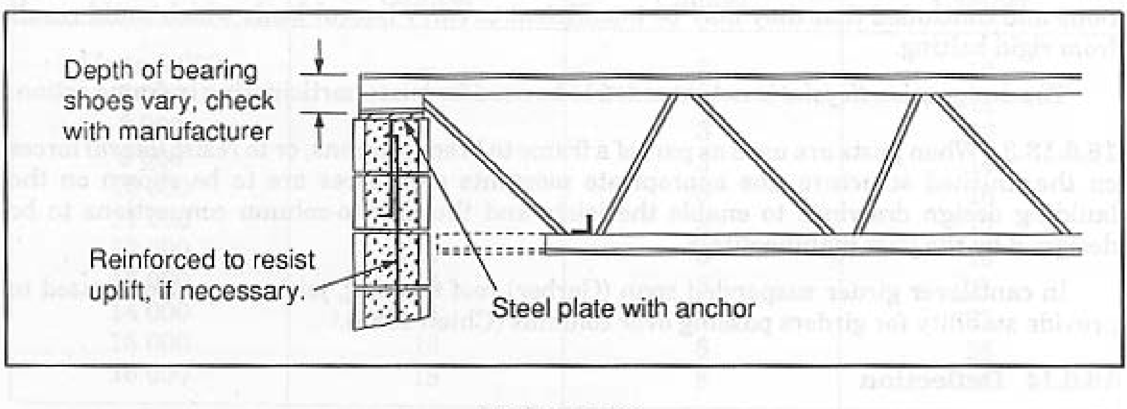


FIGURE 2-33
JOISTS BEARING ON STEEL PLATE ANCHORED TO CONCRETE AND MASONRY

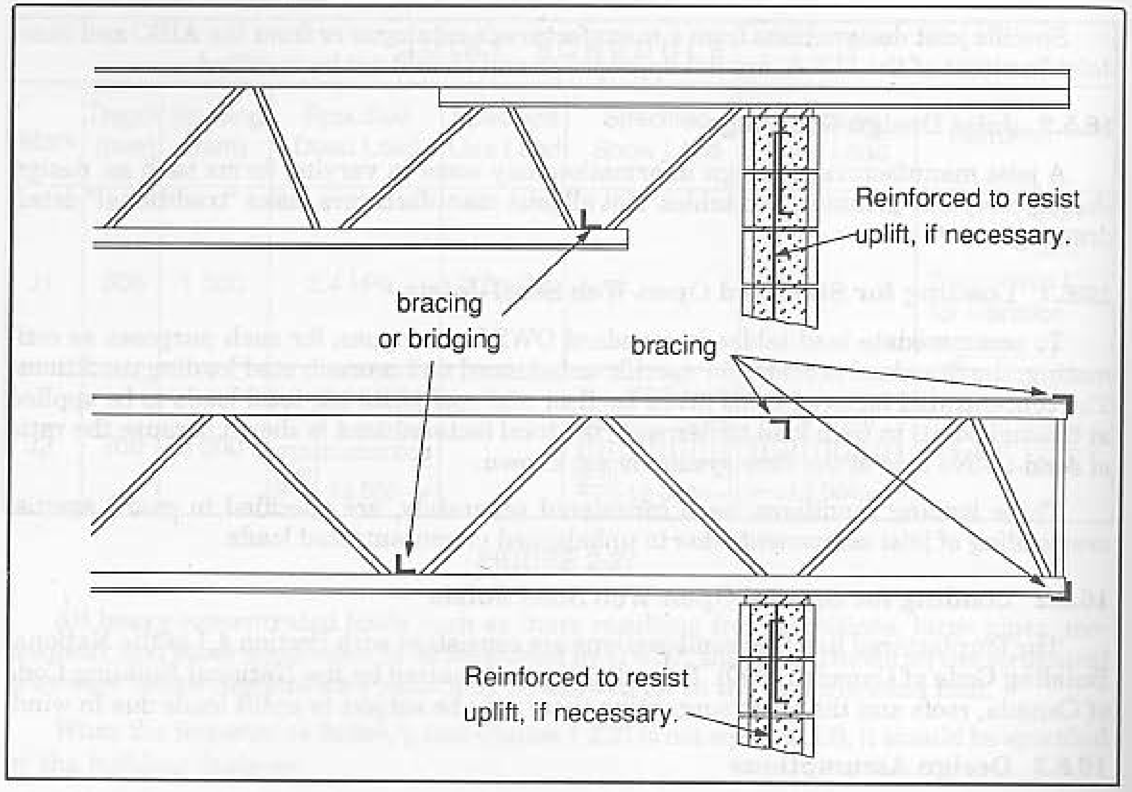


FIGURE 2-29
BRACING AND BRIDGING OF CANTILEVER JOISTS

required for cantilever joists. However, it is generally considered good practice to install a line of bridging at the first bottom chord panel point as shown in Figure 2-29.

16.6.8 Compression Chord

When the conditions set out in Clause 16.6.8.1 are fulfilled, only axial force need be considered when the panel length is less than 610 mm (Kennedy and Rowan 1964). In these cases, the stiffness of the floor or roof structure tends to help transfer loads to the panel points of the joist, thus offsetting the reduction in chord capacity due to local bending. When the panel length exceeds 610 mm, a simplified form of the beam–column interaction formula is used, based on the larger shape factor common to joist chords. When calculating bending moments in the end panel, it is customary to assume the end of the chord to be pinned, even though the joist bearing is welded to its support. The stiffening effect of supported deck or of the web is to be neglected when determining the appropriate width–thickness ratio (Clause 16.6.6.1) of the compression top chord.

The requirement in Clause 16.6.8.4, that the flat width of the chord component be at least 5 mm larger than the nominal dimension of the weld, should be considered an absolute minimum. Increasing the dimension may improve workmanship. See Clauses 16.9.5.1 and 16.9.5.2 regarding workmanship requirements when laying and attaching deck to joists.

16.6.9 Webs

The length of web members for design purposes are shown in Figure 2-30. With the

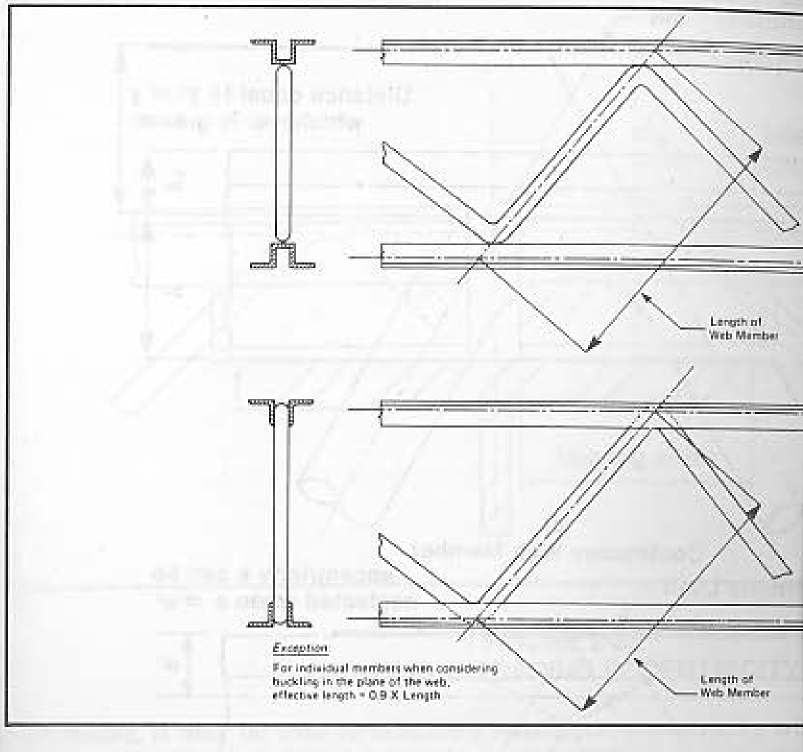


FIGURE 2-30
LENGTH OF JOIST WEB MEMBER

significant when flats are used as tension members; however, at
those loading cases where the possibility of shear reversal exis
stances, it is likely that diagonals (except for end diagonals) may h
forces.

16.6.10 Spacers and Battens

Spacers and battens must be an intregal part of the joist an
steel deck cannot be considered to act spacers or battens.

16.6.11 Connections and Splices

Although splices are permitted at any point in chord or web m
be capable of carrying the factored loads without exceeding the f
members. Butt-welded splices are permitted provided they dev
resistance of the member. As a general rule, it is preferable to
members meet at a common point within a joint. However, wh
eccentricities may be neglected if they do not exceed those describe
Figure 2-31. Kaliandasani, et al (1977) have shown that the effec
of minor consequence, except for eccentricities at the end bearing a
end diagonal and bottom chord. (See also Clause 16.6.12.4.)

16.6.12 Bearings

16.6.12.1 As required by Clause 16.5.1(c), the factored bearing re

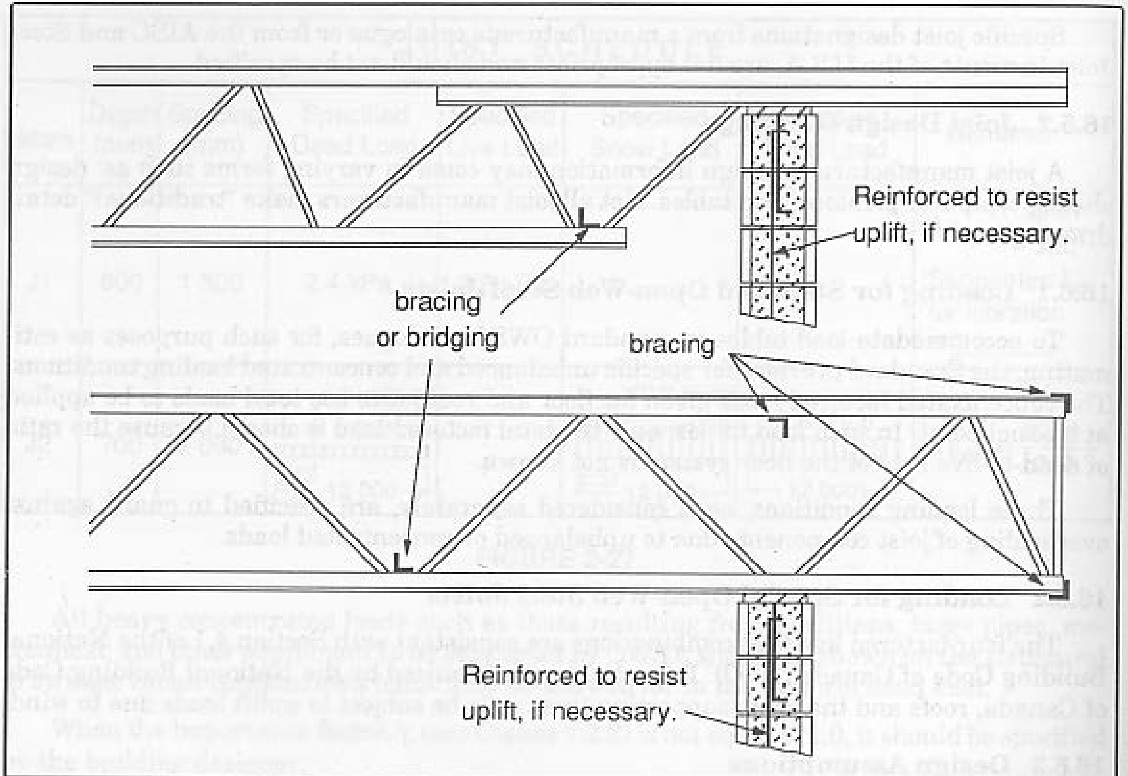


FIGURE 2-29
BRACING AND BRIDGING OF CANTILEVER JOISTS

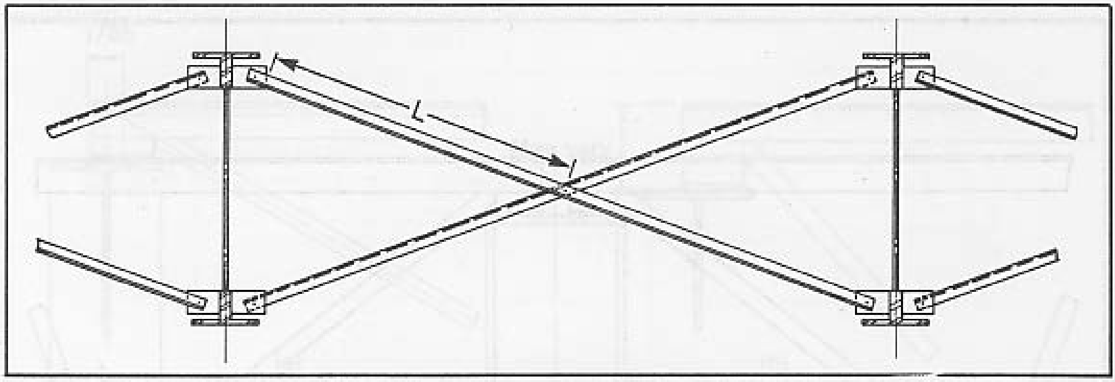


FIGURE 2-36
DIAGONAL BRIDGING OF JOISTS

16.6.16 Vibration

Appendix G of S16.1-M89, *Guide for Floor Vibrations*, contains recommendations for floors using steel joists. By increasing the floor thickness (mass), both the frequency and the peak acceleration are reduced, thus reducing the annoyance more efficiently than by increasing the moment of inertia (I_x) of the joists.

16.6.17 Welding

16.6.17.3 A fabricator or erector certified in Division 3 may meet the requirement of the Standard by having the work done under the supervision of a fabricator certified in Division 1 or 2.1. Many welded joints used in joists are not prequalified under CSA W59, therefore the certified fabricator must have all these welded joints qualified by the Canadian Welding Bureau.

16.6.17.6 Flux and slag are removed from all welds to assist in the inspection of the welds, as well as to increase the life of the protective coatings applied to the joists.

16.7 Stability During Construction

A distinction is made between bridging, put in to meet the slenderness ratio requirements for top and bottom chords, and the temporary support required by Clause 16.7 to hold joists against movement during construction. Permanent bridging, of course, can be used for both purposes.

16.8 Bridging

Figures 2-36 to 2-38 provide illustrations of bridging and details of bridging connections.

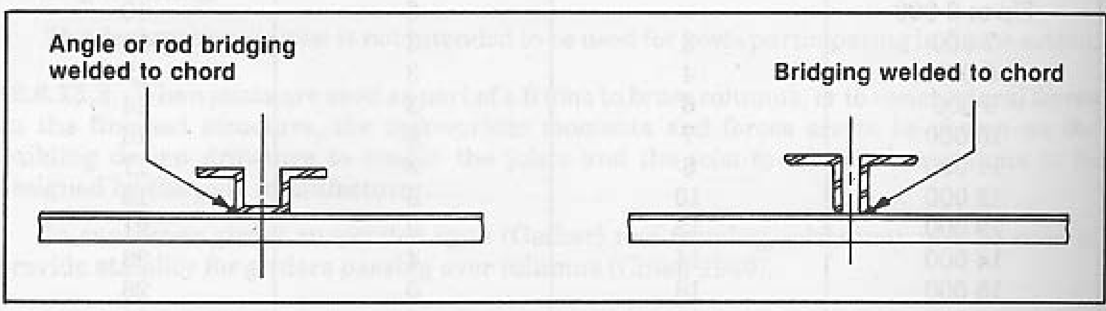


FIGURE 2-37
HORIZONTAL BRIDGING CONNECTIONS TO THE JOIST'S TOP CHORD

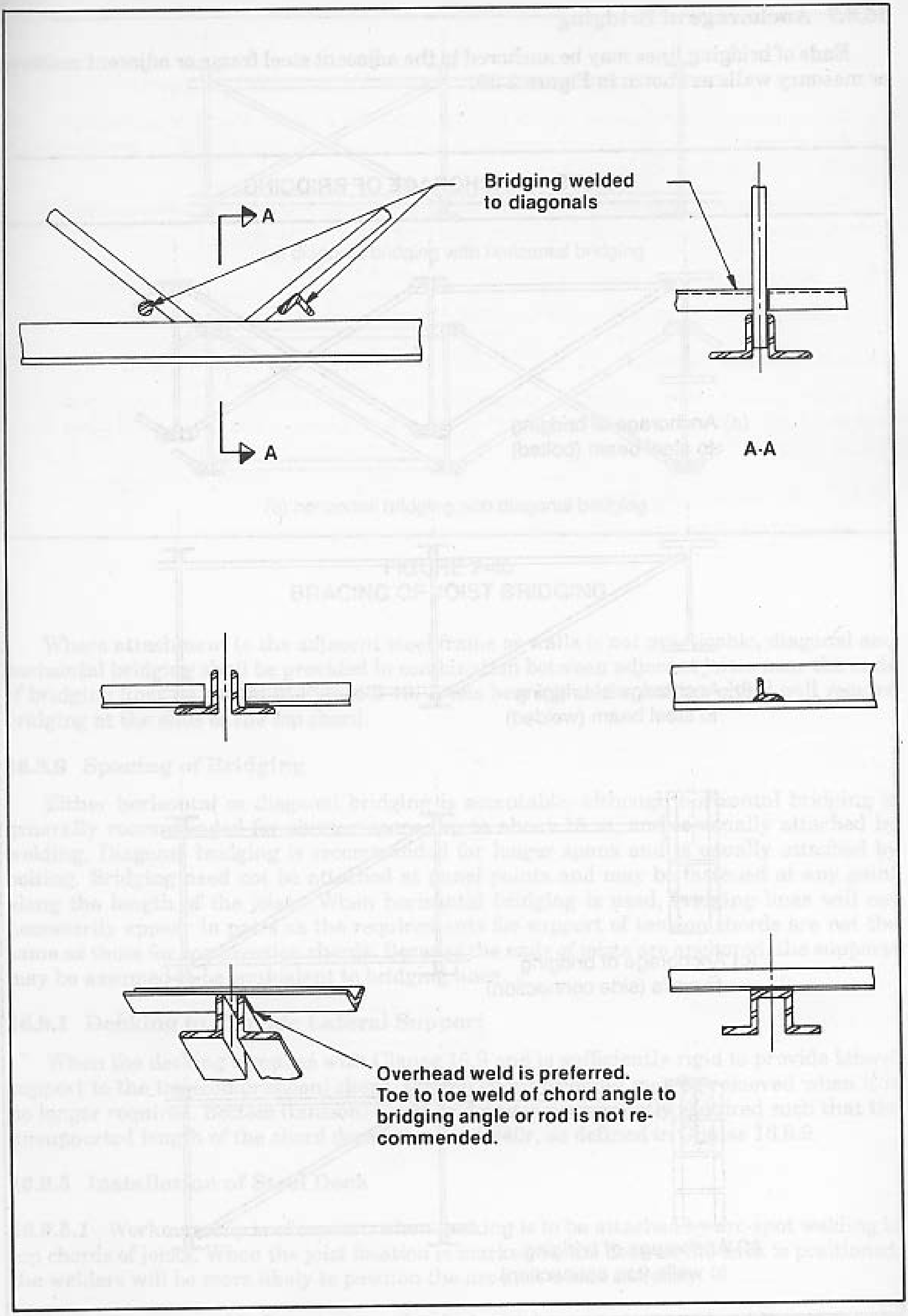


FIGURE 2-38
HORIZONTAL BRIDGING CONNECTIONS TO JOIST BOTTOM CHORD