PART 7 MEMBERS SUBJECT TO AXIAL TENSION

7.1 General

Tables 7-1 to 7-22 give values of design section capacity in axial tension. Section 7 of AS 4100 has been used to determine these values.

The tables list the design section capacity in tension for selected bolted and welded connections. In the case of bolted connections, tables are provided for certain nominated hole sizes only.

7.2 Design Section Capacity in Axial Tension

The design section capacity in axial tension (ϕN_t) listed in the tables has been determined using Clause 7.2 of AS 4100 and is taken as the lesser of:

$\phi N_t = \phi A_g f_y$ (yielding of the gross section)

$\phi N_t = \phi(0.85)k_t A_n f_u$ (fracture of the net section)

where ϕ = 0.9 (Table 3.4 of AS 4100)

f_y = yield stress used in design *(for sections where the flange and web yield stresses (f_{yf} & f_{yw}) differ, the **lower** of the two is applied to the entire cross-section)*

f_u = ultimate tensile strength used in design

A_g = gross area of the cross-section

A_n = net area of the cross-section (accounting for any fastener holes in the section using Clause 9.1.10 of AS 4100)

= A_g (for full perimeter welded connections to uniformly stiff supports)

k_t = a correction factor to account for any non-uniform distribution of forces at a connection (shown in Table T7.1)

Note: For staggered bolt holes (which are not considered in these Tables) designers should consult Clause 9.1.10.3 of AS 4100 to determine the deduction to the gross area due to the holes.

Each of the tables in this Part considers one or more plate or gusset/cleat components to be either welded or bolted to some or all components of the steel section. The column headed "Welded No Holes" in these tables refers to ϕN_t for the plate component(s) being welded to the section. The other values of ϕN_t refer to the bolted connection situation where there may be a reduction in design section capacity due to the presence of bolt holes.

7.3 Example

Select an appropriate Equal Angle section for a design axial tension force of 1300 kN, assuming an eccentrically bolted connection through one leg of the angle.

Design Data:

N^* = 1300 kN

Solution:

Select a suitable member from Tables 7-20(1) and 7-20(2). The alternatives are:

150x150x19EA – Grade 300 (42.1 kg/m) ϕN_t = 1350 kN > N^*

200x200x13EA – Grade 300 (40.0 kg/m) ϕN_t = 1360 kN > N^*

In each case there is a single line of 26 mm holes (M24 bolts) in one leg of the angle.

Choose the 200x200x13EA – Grade 300 section because it is more economical having slightly less mass per metre. The 150x150x19EA might be chosen if there is a space limitation.