



Design Note No. D5

300PLUS® S0 – A Seismic Grade Steel

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Structural Engineers should specify 300PLUS® S0 steel sections where there is a requirement for steel members to sustain high levels of plastic strain without suffering brittle fracture. The lateral load resisting systems in buildings subjected to earthquake loads can absorb and dissipate the kinetic energy through plastic deformation of designated hinge zones to avoid sudden catastrophic collapse of the structure.

However, it is important for the steel specified for use in these zones to be sufficiently ductile to perform in the manner in which it was designed. Changes to the New Zealand Steel Structures Design Standard NZS 3404.1: 2009 reflect this requirement. Clause 2.2.4 of NZS 3404.1: 2009 covering steel for seismic applications requires that category 1 and 2 members in seismic-resisting systems must comply with the criteria set out in Figure 1.

Table 3 – Category 1 and 2 seismic member material requirements (extracted from NZS 3404.1 2009)

| | Item | Category 1 and 2 Members |
|---|---|---|
| 1 | Maximum specified yield stress ⁽¹⁾ | 360 MPa |
| 2 | Minimum % total actual elongation ^(2,3) | 25 |
| 3 | Maximum actual yield ratio (fy/fu) ⁽²⁾ | 0.80 |
| 4 | Maximum actual ⁽²⁾ yield stress | ≤ 1.33fy(3,4) |
| 5 | Minimum Charpy V-Notch impact energy ^(2,4, 5, 6) | 70J @ 0°C - Average of three tests 50J @ 0°C - Individual test |

NOTE –

- (1) The limits in item 1 and 4 are based on a grade reference steel thickness of 12 < t ≤ 20 mm from the appropriate materials supply Standard from Clause 2.2.1 of NZS 3404.1: 2009
- (2) For items 2, 3 and 4, the mechanical properties are those recorded on the certified mill test report or test certificate.
- (3) Elongation after fracture shall be determined from proportional test pieces in accordance with AS 1391
- (4) Tensile and Charpy V-Notch testing shall be completed and assessed for compliance in accordance with the provisions for selection, position and orientation, preparation for testing and testing procedures found in AS/NZS 3679.1 for hot rolled steel sections, AS/NZ 3678 for plate used in welded steel sections and AS 1163 for structural steel hollow sections.
- (5) Charpy V-Notch testing is only required for sections greater than 12 mm thick.
- (6) Steel conforming to Table 3 may be considered to be equivalent to steel type 2S or 5S for permissible service temperatures and welding requirements.

Figure 1 - Extract from NZS 3404.1: 2009 - Requirements for S0 Grade Steels

After an exhaustive testing program a new grade, 300PLUS® S0 which meets the requirements of NZS 3404.1: 2009 for 300 grade steels in seismic-resisting systems has been developed. 300PLUS® S0 certified steels are available in the sizes listed in Table 1.

| Universal Beams | Universal Columns |
|-----------------|-------------------|
| 610UB125 | 310UC158 |
| 610UB113 | 310UC137 |
| 610UB101 | 310UC118 |
| 530UB92.4 | 310UC96.8 |
| 530UB82.0 | 250UC89.5 |
| 460UB82.1 | 250UC72.9 |
| 460UB74.6 | 200UC59.5 |
| 460UB67.1 | 200UC52.2 |
| 410UB59.7 | 200UC46.2 |
| 410UB53.7 | 150UC37.2 |
| 360UB56.7 | 150UC30.0 |
| 360UB50.7 | 150UC23.4 |
| 360UB44.7 | 100UC14.8 |
| 310UB46.2 | |
| 310UB40.4 | |
| 310UB32.0 | |
| 250UB37.3 | |
| 250UB31.4 | |
| 250UB25.7 | |
| 200UB29.8 | |
| 200UB25.4 | |
| 200UB22.3 | |
| 200UB18.2 | |
| 180UB22.2 | |
| 180UB18.1 | |
| 180UB16.1 | |
| 150UB18.0 | |
| 150UB14.0 | |

Table 1: Sections available in 300PLUS® S0 grade

Channel sections are not doubly symmetric and therefore should not be used as category 1 or 2 members in seismic moment resisting frames. Therefore standard grade of parallel flange channels stocked by our distributors in New Zealand is 300PLUS®.

Engineering drawings should clearly indicate the members that are part of the seismic moment resisting frame and specifications should clearly note the requirements of NZS 3404.1: 2009 Table 3. Alternatively, simply specify 300PLUS® S0 sections to ensure you get the ductility that is required in the design.

InfraBuild **only** supply Universal Beams and Columns to New Zealand that meet the requirements of S0 Grade Steels.

In 2010 AS/NZS 3679.1 recognised that this new grade of steel meets the requirements of Table 3 in NZS 3404.1:2009 for Category 1 and 2 seismic members, giving it the designation AS/NZS 3679.1 300S0. Mill certificates for 300PLUS® S0 provide documentary evidence that it meets these requirements. Certificates are available from the distributor at the time of delivery in paper or electronic format or can be accessed via the EzyCommerce website at: <https://ezycommerce.libertygfg.com>.

300PLUS® S0 sections are also marked as shown below in Figure 2 with a painted stencil at one end to facilitate easy identification from the mill.



Figure 2: Typical 300PLUS® S0 Grade Mark

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