



Design Note No. D4

300PLUS® – Australian Made Steel

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InfraBuild Steel has a great history of manufacturing structural steel long products in Australia, and pride is taken in the strength, consistency and quality of these products. Over the years, the Australian Standards used for structural steel design have developed, reflecting improved understanding of material performance, structural behaviour and design processes. A significant change in the early 1990s was the move from a working stress to a limit state methodology. The quality and character of InfraBuild's Australian made steels contributed significantly to the standards, particularly those currently in use.

At the heart of the currently limit state Steel Structures Standard AS 4100, are the capacity factors ϕ which were derived by a process called "code calibration" through the use of a "safety index". (Refer AS 4100 Supp1 C3.4.) The ϕ values were thus selected to provide a sufficiently high degree of structural reliability, following consideration of various factors including past successful steel designs (ie steel typically designed to AS 1250 and supplied from Australian mills) and the variability of "real" structural capacities. This capacity variation in large part depends on the mean and coefficient of variation of properties such as yield stress and section dimensions. These statistical details were usually obtained for products sourced from InfraBuild mills, hence the reliability and characteristics of InfraBuild products have significantly influenced the ϕ factor values in AS 4100.

Also, for many years, InfraBuild Steel has manufactured steels in accordance with the relevant material standards such as AS/NZS 3679.1. In addition, aspects of InfraBuild's production, such as quality controls, testing procedures and material properties have contributed to the development of these standards.

Therefore, InfraBuild produced material is inextricably linked to the structural and materials standards used in steel design. This connection is illustrated in various areas of the standards, as follows:

AS 4100 1998 2.2.1 Australian Standards - Except as otherwise permitted in CI 2.2.3 (which relates to unidentified steel), all structural steel coming within the scope of this Standard shall, before fabrication, comply with the requirements of the following Standards, as appropriate. The Standard listed for hot rolled steel is AS/NZS 3679.1 Hot-rolled bars and sections, which as discussed above, was to a significant degree based on steel manufactured in Australia by InfraBuild Steel.

AS 4100 Supp1 1999 C2.2 "The Standard has been written around the range of structural steels manufactured in Australia to the Australian Standards quoted in Clause 2.2.1."

In relation to Brittle Fracture: AS 4100 1998 Table 10.4.1 Note 1 "Table 10.4.1 is based on available statistical data on notch toughness characteristics of steels currently made in Australia. Care should be taken in applying Table 10.4.1 to imported steels as verification tests may be required. For further explanation, see AS 4100 Supplement 1."

AS 4100 Supp1 1999 C10.3 "... In the current edition (1998), use is made of the statistical data from the current generation of Australian made steels which are produced via slabcaster route and are made to a fully killed fine grain steel-making practice."

There is also the question of weldability to consider. Since AS 4100 CI 2.3.3 calls up AS/NZS1554.1 as the welding standard to be met, evaluation of the steel must consider the chemical properties to assign the correct Steel Type and Weldability Group Number for use with AS/NZS 1554.1. Given the listed or compliant steels are mostly based on the Australian Standards, Australian steel made by InfraBuild Steel has again featured significantly in the development of these categories, which relate to prequalified materials, consumables and welding temperatures.

For steels not manufactured in Australia, Clause 1.5.1 of AS 4100 provides a method whereby they may be used as a “new material”. However, seeking approval from an appropriate building authority to use this new material would be a torturous process.

Another alternative is to obtain sufficient statistical data on the chemical and mechanical properties to demonstrate that it is equivalent to InfraBuild’s product cited in Clause 2.2 of AS 4100, then use the capacity factors in Clause 3.4. The volume of data and the need to verify it mitigates against the practical use of this method.

Where the Designer intends to utilise a test certificate from the manufacturer, it is recommended that at least the following be included in the certificate, to demonstrate compliance with the relevant Australian Standards listed in AS 4100 Clause 2.2:

- Product chemistry
- Mechanical properties
- Methods of manufacture
- Tolerances
- Dimensions of rolled sections

The manufacturer should be able to supply this information with verification from an appropriate independent laboratory. It should be noted that the quality and reliability of the original documentation will vary according to source and country of origin and the structural engineer needs to be satisfied as to the veracity of the information received. If no independent verification is available, serious consideration should be given to independent testing.

The final alternative which again has practical limitations, is to have sufficient tests done by an independent laboratory, obtain certification from the laboratory and fit the steel into a grade in the relevant Standard based on yield stress and tensile strength.

For imported steels, the alternative which presents the least risk to the Designer, is to treat the steel as unidentified steel and invoke clause

2.2.3 of AS 4100. This will require redesigning the steelwork using a yield stress f_y of 170MPa.

The best alternative, which provides structural economy and the least risk for the Designer, is to insist on InfraBuild’s premier range of Australian made steels – 300PLUS®.

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