

# ADVISORY NOTE

NAN 006

## Getting your steel right

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A number of different steel products are regularly used in steel framed housing and more generally in low-rise construction. It is critical that the steel properties meet the performance assumed in the design. The National Construction Code (NCC) Volumes One and Two reference the following standards as suitable for the design of these structures:

*NASH Standard – Residential and Low-rise Steel Framing Part 1: Design Criteria*

*NASH Standard – Residential and Low-rise Steel Framing Part 2: Design Solutions*

The NASH Standard in turn references the following design standards:

- AS 4100 Steel structures
- AS/NZS 4600 Cold-formed steel structures

The most common types of steel used in this form of construction are:

- Metallic coated steel to AS 1397
- Structural steel hollow sections to AS/NZS 1163
- Hot rolled channels (PFC) and universal beams (UB) to AS/NZS 3679.1

The remainder of this Advisory Note will concentrate on the requirements of AS 1397 as this is the most common steel used in the residential and low-rise steel framing industry. However the principles discussed apply for all steel products used in building structures.

### Ordering

The most important step in getting the specified steel for your fabricating operation or project is to buy your steel from a reputable supplier. You can have all the paper work for the steel but if it is not supplied from a company that has a history of responsible supply and a proven commitment to product quality and compliance, the paper work alone will not guarantee the supplied product properties.

The order should include the following information for each thickness and strip width:

- Steel to conform to AS 1397
- Type of product eg coil
- Grade of steel eg G550
- Coating specification eg AM150
- Dimensions eg width, thickness and length
- Dimensional tolerances to AS/NZS 1365
- Indicate whether test certificates are required.

For more information on purchasing procedures refer to AS 1397 Appendix A.

### Steel manufacturer

AS 1397 Appendix B sets out the minimum sampling and testing plan for product conformity required of the manufacturer or supplier. Whilst it not required by the Standard, it is recommended that the manufacturer has a quality system to ISO 9001. In addition, testing should be carried out by an accredited testing laboratory.

## Test certificates

Test procedures for all critical properties are fully described in the above Standards. Genuine test certificates issued by the manufacturer provide a way of reviewing the quality of steel being used. However, it is important that the steel has been tracked since leaving the steel works so it can be verified that the test certificate relates to the steel being delivered.

The test certificate must include the steel manufacturer so that the credentials of the manufacturer can be determined. Without this there can be no confidence that the steel supplied relates to the certificate.

Whilst there is no prescribed form of test certificate in any of the above Standards, the test certificate typically gives mechanical properties eg yield stress, tensile strength and elongation as well as the chemistry of the steel. However, it does not necessarily cover all the other requirements of AS 1397. Customers should specify the critical technical information they require on the certificate.

## Marking and packaging

To conform to AS 1397, each package of steel must have the following information marked on or tagged to the steel:

- Product designation
- Product dimensions
- Manufacturers name or trademark
- Unique identifier to facilitate product traceability

This information should be entered into the manufacturer's or fabricator's quality assurance system to ensure traceability.

Each strip of steel must also be marked with the relevant steel descriptors, ie AS 1397, base steel thickness (BMT) grade of steel and coating. BlueScope Steel spirally marks its steel at regular intervals. The marking provides assistance during manufacture of the framing ensuring the correct steel is used in the right place. Perhaps more importantly, it provides assurance on site to the building inspector that the correct steel has been used on the project. When the markings are detrimental to the end use eg painted steels, markings may be placed only on the packaging.

## Design from testing

When another manufacturer of steel is selected, the properties of steel need to be reviewed by the engineer to ensure that the coefficient of variation assumed in the derivation of design values is sufficient to cope with the new steel. If the properties fall outside the assumed range, the test data would need to be reanalysed. For more information refer to NASH Technical Note 4 Establishing Design Values by Testing.

## Thickness of steel

In Australia the reference thickness is the Base Metal Thickness (BMT) which is the thickness of steel only. Some suppliers refer to the Total Coated Thickness (TCT) which is the BMT plus the thickness of metallic coating. For instance, steel with a BMT of 0.75 mm with an AM150 coating will have a coating thickness of about 0.05 mm giving a TCT of 0.80 mm. BMT is the thickness used in the design and use of the wrong thickness results in a 7% error in this example. For thinner steels, the percentage error is larger as the coating thickness remains the same.

## **Consistency of steel affects roll forming**

Changing to different steel manufacturers can create issues when roll forming even if the steel conforms to AS 1397. This occurs as AS 1397 only gives minimum values for strength and there can be quite a difference between manufacturers in the strength of steel depending on chemistry and cold rolling process. This can result in the roll former requiring adjustment to cope with the different steel.

## **Overseas standards**

There are overseas standards which are very similar to AS 1397. However there can be small differences between the standards which may affect the suitability of the steel for its proposed application in building structures. These differences may not be picked up in the test certificate. For instance, until recently the North American Standard did not have any minimum elongation for G550 steels, a property important for design and formability. Therefore it is strongly recommended that the supplier does the necessary work and certifies the steel supply to AS 1397.

If this is not done, then the engineer would have to compare the overseas standard with AS 1397 to ensure conformity. If it does not conform, the engineer must justify and certify that the steel is fit for its intended purpose, having regard to the Evidence of Suitability provisions of the NCC.

Where the steel cannot be satisfactorily identified, the design standard AS/NZS 4600 only allows a design value of about 40% of the usual value to be used. For most practical purposes this means that the steel cannot be used unless a full design check is carried out.

## **Conclusion**

One of the key components in ensuring the steel frame complies with structural design requirements is making sure the steel conforms to the relevant Australian Standard. The first step in this process is buying the steel from a reputable supplier, then getting the order right and following through the delivery process with the correct paper work. Steel clearly identified by branding, as required by AS 1397, promotes efficient, error-free fabrication and enables on-site verification that the supply meets the requirements of the National Construction Code. This is the simplest and most reliable manufacturing path, minimizing the risk of a non-compliant and potentially unsound structure.