Chapter 6

CONNECTORS

Chapter Contents

6.1. GENERAL

6.1.1. Scope and application

Connections consist of members, connection components (cleats, brackets, etc) and *connectors* (welds, bolts, screws, rivets, clinches, nails, adhesives). The design of *connections* is covered in the relevant Chapter. This chapter covers the design of individual *connectors*. A wide range of connectors is used in steel framing and their typical applications are shown in Table 6.1.

Table 6.1 Typical applications of different types of connector

Products to be connected to steel	Type of connector								
	Screws	Rivets	Clinch	Welding/ Brazing	Nails	Adhesive	Bolts	Anchors	Ties/Clips
Steel	✓	✓	✓	✓	✓	✓	✓	✗	✓
Timber	✓	✗	✗	✗	✓	✓	✓	✗	✓
Concrete/Masonry	✗	✗	✗	✗	✓	✗	✓	✓	✓
Internal lining(s)	✓	✗	✗	✗	✓	✓	✗	✗	✗
External cladding	✓	✓	✗	✗	✓	✗	✗	✗	✓

6.1.2. Establishment of design values by testing

Establishment of design values from testing should be carried out in accordance with Chapter 7.

If the test values show significantly larger variations than given below for the coefficient of variation (COV), the cause of the variation shall be determined and taken into account in the design.

- Connectors: The nominal shear and tensile capacity of a connector can be determined by testing by taking the minimum test value from a sample size of not less than 10 connectors. This approximates the 5 percentile capacity values.
- Connections: For connections, the coefficient of variation should be least 20% to allow for the additional variation with the parent material in strength, thickness and the application of the connector.

When testing is used to determine connection capacity, the failure should be ductile. For instance, failure of a single connector should not generally initiate failure of the connection.

6.2. SCREWS

6.2.1. General

Screws can be used to fasten components together in a manufacturing facility or on site. Self drilling screws have the advantage that no preformed hole is needed in the materials to be fastened. Screws should comply with AS 3566. [1.19, 1.20]

There is a range of screws used in steel framing with differing point, head, thread styles and size to suit the application as described in Section 6.2.2.

6.2.2. Types of screws

a) Head types

Table 6.2 lists the most commonly used head types and typical applications used for steel frame construction and finishing.

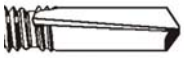
Table 6.2 Screw head types

Head type	Features and applications
Hexagon head 	Good strength and ease of driving. Applications include fixing: • roof battens and sheeting • fixing wall frames together • trusses to top plates • floor frames
Wafer head 	A versatile head style used for many fastening applications including fixing: • frame components together • strap and sheet bracing • ceiling battens
Button head 	A low profile head with a flat underside. This design enables the screw to sit level on the surface behind sheeting such as plasterboard.
Flat top head 	Ultra low profile head with flat underside to minimise the distortion of over laying board materials and to reduce the requirement for dimpling.
Bugle head 	Designed for fixing plasterboard the smooth curved surface under the head is designed to countersink into the face of the plasterboard without damaging or tearing the surface.
Countersunk rib head 	Used for countersinking into timber, particleboard, etc.
Self embedding head 	Has a special flat head with cutters and flutes designed to ream into sheeting such as fibre cement to achieve a flush or recessed finish.

b) Point types

Table 6.3 lists the most commonly used point types and typical applications used for steel frame construction and finishing.

Table 6.3 Screw point types

Point type	Features and applications
Drill point 	A metal drill point is used for fastening steel from 1.0 mm up to 5.0 mm thick.
Universal point 	Universal points are designed for drilling into both timber and metal. Product performance varies greatly depending on the manufacturer and the combination of steel and timber the product is designed for.
Extended drill point 	An extended drill point is used for steel up to 12.5 mm thick.
Needle point 	Needle point screws are used for a wide range of fastening to timber and can be used for steel less than 0.75 mm thick.
Type 17 	Type 17 point can be used for drilling through metal up to 0.75 mm thick. The screw has a special long sharp point fluted to assist insertion into timber.
Wing cutter 	Wing cutters are used to fix timber or fibre cement sheet products to steel. Small metal wings positioned above the drill point clear a passage to prevent the thread from binding in the timber then break off when they come into contact with the steel.

Needle point screws are used to attach to steel frame sections up to 0.75 mm in thickness, and while these screws fasten securely, they often have difficulty penetrating the steel without excessive end load.

Screws with a metal drilling point penetrate the steel well, but have been traditionally used in steels above 1 mm in thickness. When they are used in steel of 1 mm thickness and below, they can experience low pullout loads and stripping on installation.

Some manufacturers are now offering metal drilling screws with modified points and threads suitable for steels of 1 mm and below.

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NASH Handbook

Design of Residential and Low-rise Steel Framing

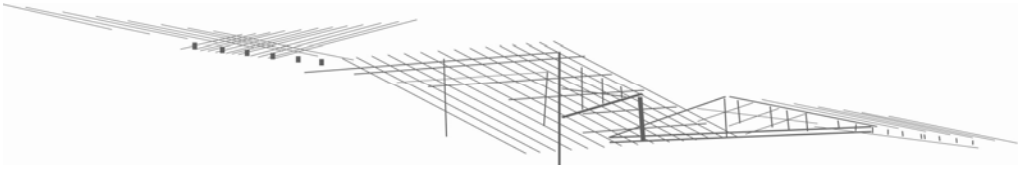

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Table of Contents

Preface

Steel framing is commonly chosen for houses and other forms of low-rise construction as it is:

- Cost effective
- Dimensionally stable
- Non combustible
- Termite and borer proof
- Durable
- Strong but lightweight
- 100 percent recyclable
- Consistent in its properties and performance

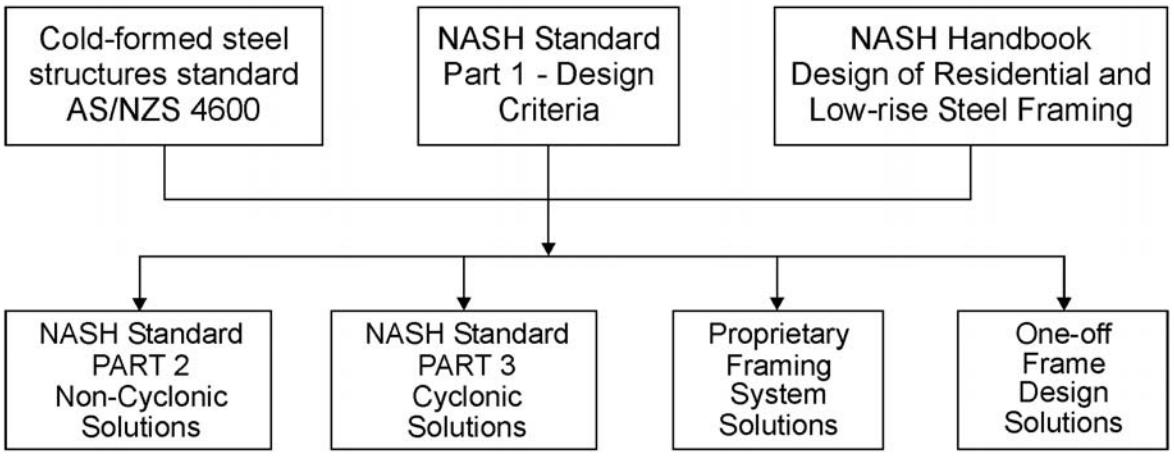
The NASH Standard – Residential and Low-rise Steel Framing Part 1: Design Criteria sets out the design criteria, in terms of structural adequacy and serviceability, for use in the design of low-rise steel framing. This includes houses as well as other low-rise residential and commercial buildings.

This Handbook aims to assist the steel framing designer in the application of the NASH Standard Part 1. However, it does not purport to provide a detailed guide on the use of the Cold-formed steel structures standard AS/NZS 4600 or replace engineering judgement.

The Handbook contains performance data for a number of proprietary components such as screws, rivets, bolts and anchors. This information has been reproduced in Appendices in good faith from information provided by the relevant manufacturers. It has been included to assist the use of the Handbook as a reference for users, but is not exhaustive. Handbook users should contact relevant manufacturers directly for additional performance information.

Two separate Standards (Part 2 & 3) are being developed to provide steel framing span tables and related information and these will be published in due course. The relationship between the Standards and this Handbook is illustrated below.

The NASH web site www.nash.asn.au is regularly updated and provides supplementary information to this Handbook.



National Association of Steel-Framed Housing Inc

NASH is an active industry association centred on light structural framing systems for residential and similar construction. NASH represents the interests of suppliers, fabricators and customers – all those involved in steel framing systems.

NASH's key objectives are to:

- Support the long term growth and sustainability of the steel frame industry.
- Maximise awareness of the steel frame industry in the market place.
- Promote the advantages of steel frames to the building industry and homeowners.

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