Chapter 7

TESTING

Chapter Contents

7.1. SCOPE AND GENERAL

This chapter discusses the role of testing in the design of steel framing systems.

Within the structural area, testing can be used for a number of purposes such as:

a) determining the mechanical or section properties of the material, component or connector; or
b) prototype testing of subassemblies to determine adequacy to carry relevant loading or to determine design capacity.

Design by testing is an internationally recognised method and is covered in ISO 2394. Testing can be used as either a substitute for calculation or to supplement calculations in design.

7.2. DETERMINATION OF PROPERTIES OF MATERIALS AND COMPONENTS

7.2.1. Material properties

Materials can come from a variety of sources and testing may be required to determine the properties eg. yield stress, ultimate strength and elongation. Information on testing can be found by referring to AS/NZS 4600 or AS 4100. For calculation purposes, the yield stress and tensile strength of cold formed materials of G550 grade less than 0.9 mm thick should be reduced according to AS/NZS 4600.

Properties of unidentified materials and components can also be established by means of standard tests to remove the uncertainties with regard to their applications.

7.2.2. Member section properties

Section properties of members can be difficult to calculate where the shape is not simple or where composite action with other materials or bracing from other members affects the behaviour of the member. Testing can be performed in such cases to determine the properties.

For example:

- A bending test can be performed within the elastic range to determine the bending stiffness property (EI) of a section.
- A short span beam test can be used to determine the shear or bearing capacities.
- A torsion test can be used to determine the torsional stiffness (GJ) of a section.

7.2.3. Connector capacities

Testing can be used to determine the capacity of a type of connector. For example, shear and tensile capacities of connectors can be determined by testing small scale samples (see Section 6.1.2). Some guidance is given in AS/NZS 4600 for testing single point connectors.

7.3. PROTOTYPE TESTING

7.3.1. General

This section refers to the testing of a representative sample of full size units from a nominally identical population of complete assemblies, structures or parts of a structure, or connections, to establish the suitability of the unit to withstand a specific loading condition. Prototype testing can be used for one of two purposes.

- Verification test – To verify the design for a required capacity. The unit is loaded up to a predetermined value of load to check its suitability. Failure may not be reached in this type of test.
- Capacity test – To determine the capacity of the unit. In this case, the testing is continued until ultimate strength is reached or excessive deformation is observed.

7.3.2. Test specimens

The test specimen should be full size and nominally identical to the actual structure or part of the structure for which the verification is required. The materials, connections and assembly methods used for the construction of the test specimen should be a true representation of the conditions to be met in practice. Care should be taken to avoid introducing additional restraints to members or assemblies that will not be present in the actual structure.

7.3.3. Sampling factor

The sampling factor k_t specified in the NASH Standard Part 1 is aimed at establishing 5 percentile for a population from a limited number of tests. The assumed distribution is Weibull and the degree of confidence of the values is 99%.

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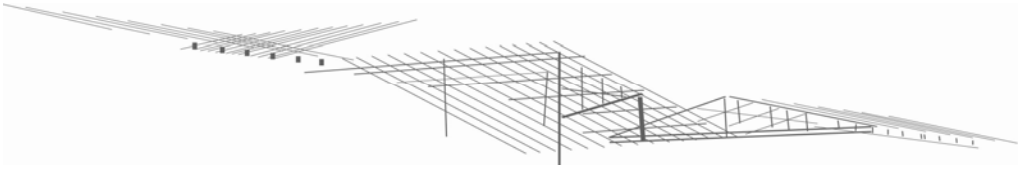
NASH Handbook

Design of Residential and Low-rise Steel Framing



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In particular, and to avoid doubt, the use of the Handbook does not:

- Guarantee acceptance or accreditation of a design, material or building solution by any entity authorised to do so under any law;
- Mean that a design, material or building solution complies with the Building Code of Australia (BCA);
- Absolve the user from complying with any Local, State, Territory or Australian Government legal requirements.

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

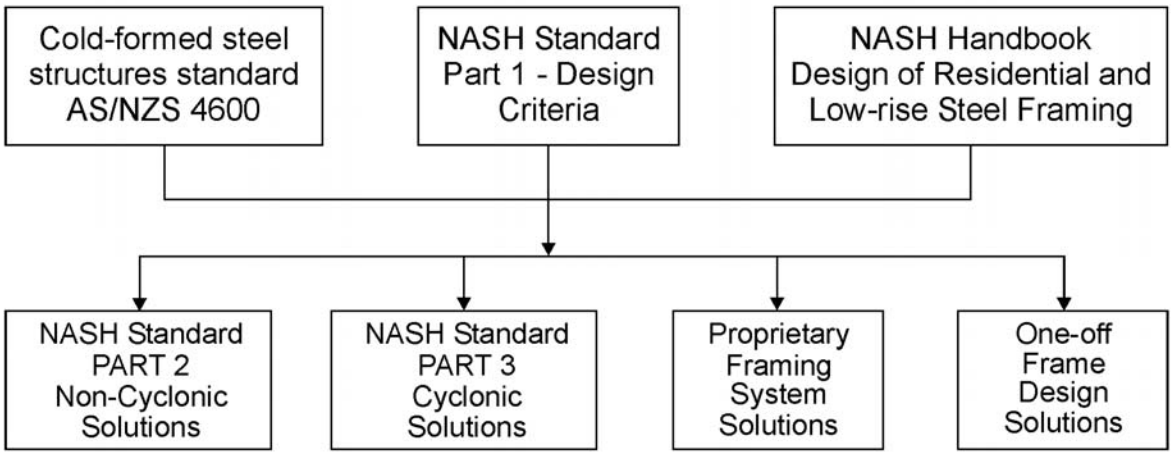
The NASH Standard – Residential and Low-rise Steel Framing Part 1: Design Criteria sets out the design criteria, in terms of structural adequacy and serviceability, for use in the design of low-rise steel framing. This includes houses as well as other low-rise residential and commercial buildings.

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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