Chapter 8

DURABILITY

Chapter Contents

8.1. SCOPE AND GENERAL

Metallic coated steels and appropriately protected hot and cold rolled steels are highly durable, long life products. Using good practice and familiar tools, materials and methods, steel framing made from these steels can be adapted to meet to a wide variety of design challenges. In the majority of construction environments, steel can be expected to perform its structural function almost indefinitely provided it is protected from specific and well understood hazards. Sources of potential damage are readily identifiable, and this chapter provides guidance on how to protect the integrity of the steel frame before, during and after construction.

8.2. BASIC CONCEPTS

The actual life of a building or component depends on many factors. The NASH Standard Part 1 states that:

> *"The design criteria have been developed on the assumption that materials used and their installation and maintenance ensure that components will fulfil their intended structural function for the intended life of the structure."*

All building practitioners, regardless of their role in the process, should consider the impact of their work on durability. Durability is defined as the capability of a building or its parts to perform a function over a specified period of time. The ABCB Guideline on Durability in Buildings [4.9] notes that:

"Durability is not an inherent property of a material or component. It is the outcome of complex interactions among service conditions, material characteristics, design and detailing, workmanship and maintenance. Consideration of all of these should be part of the design process."

The design life of a building or any part of it may be defined by state or national regulation. It may also be implied by relevant standards, or stipulated by the owner. Once the design life is established, the designer should devise a design specification and associated procedures through which the design life may be met or exceeded. The selected materials, their stated method of assembly and construction and their nominated maintenance requirements all form part of the design.

8.3. DURABILITY PRINCIPLES

- Design life is defined as the intended period for which a building, building element or subsystem is expected to fulfil its intended function.
- The normal design life of a building of any class is 50 years unless a longer or shorter life is specifically indicated by regulation or owner requirements.
- The appropriate design life of a building component or subsystem is a function of the *design life of the building* and the *accessibility of the component* for repair or replacement as shown in Table 8.1.
- Design lives for major components and systems in buildings with normal building design life are shown in Table 8.2.
- Expected life is defined as the likely period for which a building element or subsystem will be able to fulfil its intended function.
- The design should specify materials, systems and construction details so that the expected life of the component or system is not less than the design life.
- The design should identify and communicate all maintenance requirements on which expected life is dependent.
- Designers may assume that where the durability of any component is dependent on the long term performance and maintenance of *other components and systems*, those systems will perform and be maintained for the life of the building.

Table 8.1 Building and component design life

Design life of building (dl_b) (years)		Design life of components or subsystems (dl_c) (years)		
		Category		
Category	No. of years	Readily accessible and economical to replace or repair	Moderate ease of access but difficult or costly to replace or repair	Not accessible or not economical to replace or repair
Short	$1 < dl_b < 15$	5 or dl_b (if dl_b<5)	dl_b	dl_b
Normal	50	5	15	50
Long	100 or more	10	25	100

Source: ABCB Durability Guideline [4.9]

Table 8.2 Component design life for normal buildings

Component or subsystem	Component design life (dl_c) years	Comments
Roof framing system	50	Inspection may be possible, but uneconomical to replace or repair.
Wall framing system	50	Inspection usually impractical, and uneconomical to replace or repair.
Floor bearers and joists	50	Life may depend on soil conditions, ventilation, floor clearance. Inspection possible, but uneconomical to replace or repair.
Flooring	50	Life may depend on soil conditions, ventilation, floor clearance. Inspection possible, but uneconomical to replace or repair.
Decking/balcony – integral (eg. cantilevered)	50	Applies when decking/balcony structure is integral with building structure. Inspection possible, but very difficult and costly to replace or repair due to impact on main structure.
Decking/balcony - independent	15	Applies when decking/balcony has structure independent of main building. Accessible and easy - but difficult or costly - to repair or replace.
Verandah roof members	15	Applies to unlined verandahs. For fully lined verandahs, 50 years may be more appropriate.
Posts	15	Accessible but costly to repair or replace. Both ends should be accessible for practical replacement.
Stump and piers	15	If not accessible, 50 years may be more appropriate. Accessible but costly to repair or replace.
Roof cladding	15	Protects the roof and wall framing systems.
External wall cladding	15	Protects the wall framing system. Some maintenance may be required to achieve this life for steel cladding in unwashed areas

Based on ABCB Durability Guideline Recommendations

8.4. DURABILITY STRATEGY

8.4.1. Informed choices

All designers should follow the methodology and principles outlined in Section 6 of the ABCB Guideline on Durability in Buildings. [4.9].

Durability may be achieved by a maintenance program, by repeated cycles of repair or, in those cases where maintenance or repair cannot (or is not expected to) be carried out, by design so that deterioration will not lead to premature failure. (See Figure 8.1)

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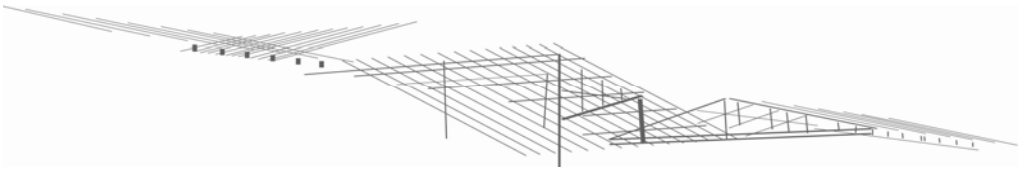
NASH Handbook

Design of Residential and Low-rise Steel Framing



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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

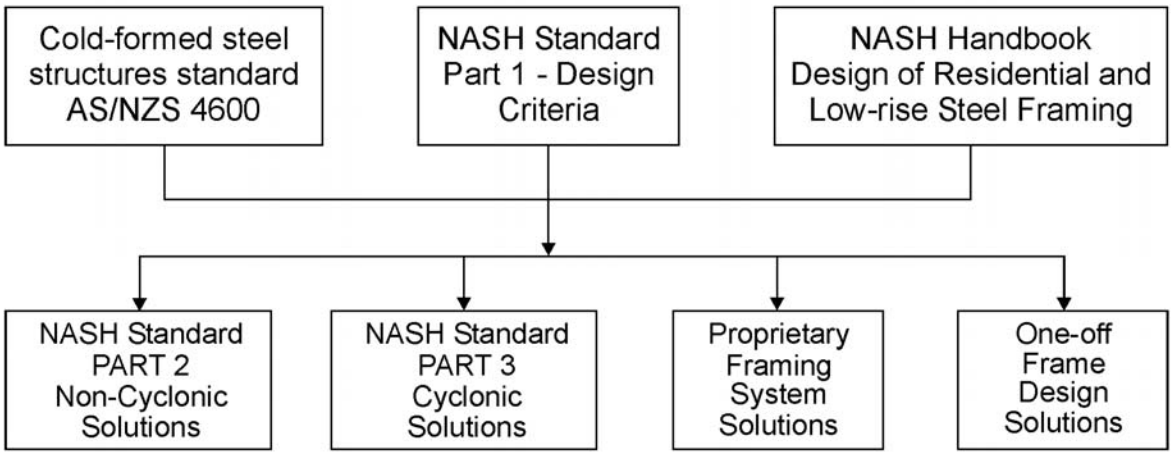
The NASH Standard – Residential and Low-rise Steel Framing Part 1: Design Criteria sets out the design criteria, in terms of structural adequacy and serviceability, for use in the design of low-rise steel framing. This includes houses as well as other low-rise residential and commercial buildings.

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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