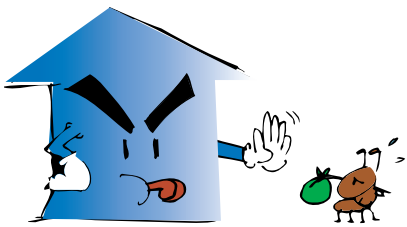
INTRODUCTION

This publication is provided as a guide only - it is not intended to be a training manual or to replace instructions issued by individual framing suppliers and/or building product suppliers.
Information designated “Following Trades” herein is designed to assist qualified tradespersons in the fixing of materials to steel-framed houses and is not intended for use by untrained persons. Do-it-yourself owner-builders should seek advice from qualified persons before installing any building product, and should preferably use qualified sub-contractors.



Termite, borer & rot proof

CONTENTS

THE BENEFITS OF STEEL HOUSE FRAMES

A house frame made of steel cannot be surpassed for quality. It represents value for money and brings peace of mind.

A steel frame has a very high strength to weight ratio, and will not burn, warp, or shrink.

Steel is termite, borer and dry rot proof, which means that these pests cannot attack and destroy the structure of your home.

A steel frame permits freedom in floor layout and architectural style. It facilitates construction of energy-efficient dwellings, and because steel framing is straight and true, it is easy to achieve a first class interior finish that will stay that way.

Because a steel frame's dimensions are stable, walls, ceilings and roofs are free from ripples or bumps, nail-pops do not occur in plasterboard walls, and there are no shrinkage problems with intermediate floor joists. Door and window frames do not distort, eliminating jamming.

For more information, refer to the section: "Frequently Asked Questions Answered".

THE NATIONAL ASSOCIATION OF STEEL-FRAMED HOUSING

The National Association of Steel-Framed Housing Inc. is a non-profit association whose charter is to represent the interests, and support the growth and development, of the steel-framed housing industry in Australia and New Zealand.

Steel house frames represent the future of home building. NASH endeavours to create wider public awareness of steel frames and to encourage their adoption by the building industry.

Utilising resources in the form of voluntary expertise and funding from the industry, NASH works in the fields of trades education, product innovation, market development, information exchange, specification and approval, and codes and standards, in order to hasten the inevitable changes.

NASH has Chapters in Queensland, New South Wales, Victoria/Tasmania, South Australia/Northern Territory and Western Australian, and is affiliated with kindred organisations in Australia and overseas. Membership is open to individuals and organisations engaged in all aspects of steel-framed housing, and comprises component manufacturers, fabricators, builders, erectors, specifiers, raw materials suppliers, engineering consultants, marketing consultants, suppliers of ancillary products, and education providers.

Nash National Office operates an information service. For technical enquires and information about the industry and suppliers, simply contact the NASH National Office on Freecall 1800 656 986, enquiries@nash.asn.au, or visit www.nash.asn.au

STEEL-FRAMED HOUSING

Introduction

Steel framed housing construction in Australia commenced in the 1940's when a shortage of building materials led to the development of steel framing systems using bitumen coated steel sections. During the 1960's galvanised steel frames made from 1.6mm base material were introduced and houses were built in Queensland, NSW, ACT and South Australia.

Over the following years steel-framed houses were constructed throughout Australia using a variety of material thicknesses and profiles.

The first "new era" 1.2 mm galvanised channel section frames were introduced in 1968 and fabricators have been developing individual steel framing systems since that time. Today thinner high tensile steel is generally used for the frames. The industry is highly innovative, due to its drive to become more material and cost efficient. In this it has the support of the Australian Standard for steel framing which is performance-based as opposed to prescriptive.

The idea behind steel framed housing is to use light, strong, cold-formed steel sections to make up the structural frame in a configuration similar to traditional timber construction. The frame is thus compatible with all of the popular cladding and lining materials such as plasterboard, interior feature panelling, particleboard and plywood flooring, brickwork, fibreboard planking, metal cladding, and tiling.

Steel framing systems have become popular with an increasing number of architects, project builders, contract builders, kit home suppliers, owner builders and consumers generally. Builders, engineers and architects specify steel-framed houses because of design versatility and consistency. Every piece of galvanised (hot dip zinc coated) or TrueCore® (45/55 Zinc/Aluminium alloy-coated) cold-formed steel framing is formed from consistent quality-assured material with controlled uniform dimensions, coatings and strength.

Benefits

Steel framing systems offer the benefits of:

- The strength, rigidity and reliability of steel – a versatile man-made material manufactured to high standards of quality control
- Close dimensional tolerances in the members themselves, including a high degree of straightness, resulting in a frame that is accurately square with dead-flat wall surfaces
- No shrinkage or warping, so that linings and cornices stay in place – no unsightly cracks or 'popping' of nails
- Freedom from attack by termites, dry rot, and borers
- Non-combustibility, which may attract a lower insurance premium
- A galvanised or Zincalume coating which provides protection from any possible dampness under floors or in wall cavities
- Complete freedom in floor layout and architectural style
- Availability in a variety of fully engineered proprietary systems at economical and competitive cost.

Types of Systems

Because manufacturers and /or fabricators have developed a variety of different steel framing systems, with different sections, steel thickness, and joining methods, the following descriptions are generic. The consumer should discuss the merits of the individual systems on offer with the supplier.

There are two approaches to making up steel house frames. The most widely adopted method is that of factory prefabrication of floor frame units, wall frame units, and roof trusses of transportable size, which are then assembled and erected in place on site. The less popular approach is to deliver the pre-cut straight members to site and to carry out all fabrication and assembly on site.

Both methods have their benefits. Factory precision engineered pre-assembly is very practical for steel framing because the finished modules are straight and true, and light and easy to transport and handle. It also saves on costly site work, minimises possible weather delays and provides a guaranteed quality-assured framing system. Also owner-builders prefer a system which allows them to utilise simple, easy to erect framing procedures with minimum defects.

Fabrication

Initially most manufacturers welded their steel frames together, although a significant number of manufacturers are now using other connection methods as shown in Figure 1.

- **Tab and slot**
  Units have nesting members and are factory pre-assembled using tabs and slots. Final site erection is carried out using connector plates and self-tapping screws.

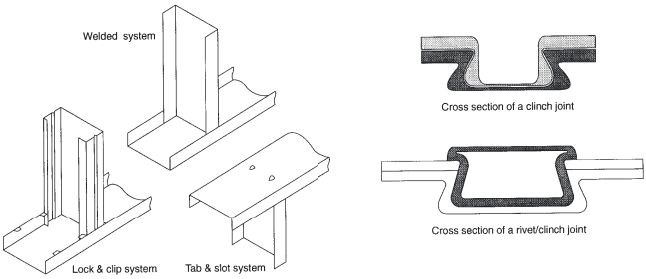
- **Lock and clip**
  Units are either assembled in the factory or on site by locking devices.

- **Factory clinched together systems**
  In a clinch joint two thicknesses of sheet steel are joined by extruding one sheet into the other using a punch and die to form a swaged joint, in such a way that the two pieces cannot be subsequently separated. With no introduced connection material, these joints are fast, simple, clean and economical

- **Riveted Systems**
  Units are either assembled in the factory or on site by conventional riveting.

- **Combination Rivet-Clinch System**
  This joint comprises a half rivet/half swage where one material layer is pierced by the rivet and the adjacent layer is swaged.

Figure 1
Connection methods



Erection

One of the major advantages of cold-formed steel framing is that the frames are pre-fabricated in the factory and delivered to site in bundles of floor frames, wall frames and trusses. The modules making up the frames are identified for easy assembly. Thus, erection of the home involves fixing together these components quickly on site. Self-drilling screws, powder-actuated fasteners and masonry anchors have played a major role in the erection of cold-formed steel framing. Cordless drills are widely used because of their convenience. The high strength clinch joint mentioned previously is also being developed as a connection method for on-site work.

Sub-Floor Systems

There are three types of conventional steel floor framing systems as shown in Figure 2 below.

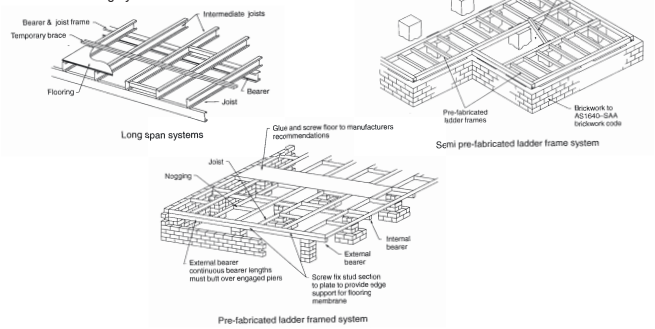
- **Prefabricated Ladder Floor Systems**
  These are completely factory manufactured into a ladder type configuration. The completed frame is delivered to site, set up, levelled and fixed into position with self-drilling screws or other approved fasteners. This system is typically used in lower floor applications.

- **Site Assembled Ladder Floor Systems**
  Special bearer sections are installed on piers with drop-in joists fixed between them using self-drilling screws. As above, these are also typically used in lower floor applications.

- **Other Site Assembled Systems (Long Span)**
  These are usually installed in a similar manner to timber systems. Rolled steel members (typically C-sections) are installed on bearers or on lower floor wall frames. Typical applications are upper or intermediate floors or longer span applications than are suitable for ladder floors.

There are also several proprietary sub-floor systems available that incorporate easily adjustable levelling mechanisms that make them very easy to install. Because of their longer spanning capability, it is generally possible to build using fewer piers. Steel eliminates shrinkage which is the most common reason for callbacks to completed projects. Shrinkage causes squeaky floors, cracks in cornices and tiles, and doors and windows that stick. Elevated steel sub-flooring facilitates under-floor inspection. Inspection is recognised by the Australian Standard series AS 3660 as the only truly safe termite prevention method.

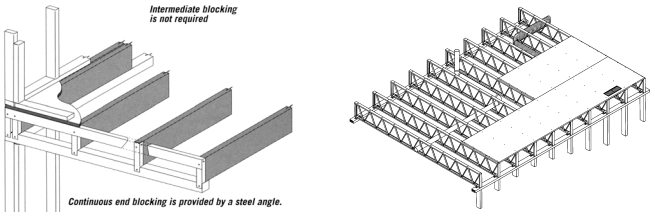
Figure 2
Steel floor-framing systems



Steel Upper-Level Floor Framing Systems

There are several systems available that are suitable for use as upper level flooring. These feature steel beams of different configurations designed to give high strength, light weight, long spans, no "bounce", and provision for services. They are precision made and will not shrink or twist, hence flooring sits uniformly flat on joists. Some of the proprietary sub-floor system beams are also suitable for use between upper floors. A couple of examples are shown in Figure 2a.

Figure 2a
Upper-Level Flooring



Walls

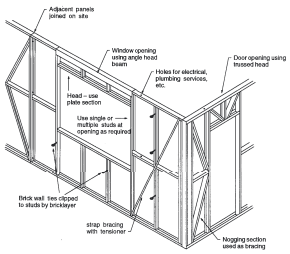
Wall frames are generally pre-fabricated in lengths up to 7.5 m maximum, for ease of transport and site handling. Methods of framing vary among manufacturers but the following members are generally present:

- Top and bottom plates
- Studs
- Noggings
- Bracing
- Lintels or beams

After delivery to site, the frames are erected in a manner similar to timber frames. They are placed in position, aligned, squared, levelled and fixed through the bottom plates and corner junctions. Typical fixings include bolts, self-drilling screws, rivets, expanding masonry anchors or power-driven nails. Choice of fixing is dependent upon the system used or requirements of local government authorities and engineers.

Most manufacturers provide factory-punched holes at convenient locations in the steel studs to allow for the installation of plumbing and electrical wiring. Plastic grommets or bushes are available to avoid metal-to-metal contact between copper piping and the studs, and to prevent damage to cable insulation. An example of wall framing is shown in Figure 3.

Figure 3
Steel wall framing



Roof and Fascia

Steel roof truss systems can be provided to suit all types of roof construction such as hips, gables, dutch gables, mansard etc. The strength and uniformity of the steel members enables standard design trusses to be used for spans up to 15 metres. Steel or timber battens can be fixed to the trusses to accommodate either metal roofing or roof tiles.

Lightweight steel roof battens provide substantial benefit over their timber equivalents. They are straight, and remain so, long after they are installed. This is particularly important when some of the newer, almost flat, shingle-type tiles are used, as these tend to highlight any change in alignment.

Due to their top-hat shape, steel battens nest together, simplifying transport and storage. They are also easy to install and can be lapped rather than butt-joined at a rafter.