NASH™
NATIONAL ASSOCIATION OF STEEL-FRAMED HOUSING INC.

www.nash.mx.com.au

FACT FILE 1
Fire

Simply steel will not ignite nor does it burn.

No home can be completely fire safe but there are a number of ways you can plan for a house that has high fire-resistance. Your choice of building materials is very important. Sometimes life depends on it. The right materials can significantly delay, minimise or prevent damage to your house. Should damage occur the materials of construction could mean the difference between repairing your home or having to rebuild it completely.

The CSIRO Division of Building Research, Victoria, produced a paper outlining the features of a house with high fire-resistance. Major factors were:

- steel wall frames, with gypsum board linings* for further protection
- concrete slab floor
- eliminating timber** in the roof (i.e. using steel roof framing)
- brick veneer external cladding

*Although steel is non-combustible, after some time it will eventually lose strength in the 400^0 - 500^{0}C temperature range. Gypsum linings with reliable resistance to fire will protect the steel frame.

**The elimination of timber in the roof is a most important feature. When a roof catches fire, the burning rafters can fall into the cavity between the walls creating an intense local fire via a chimney-like effect (white pine ignites at 280°C).

Fire can take hold very quickly.

Table1: Average stages of fire in the room of a house

Stage of fire	Time (seconds)	Temperature
Small flame	0	Room temperature
Dense smoke	70	300^{0}C
Smoke + flame	90	100^0 C
Flashover	150	600^0 C
Inferno throughout house, floor level or building	3 - 5 minutes	> 600^{0}C

(Data courtesy SA Metropolitan Fire Service)

Fire

In the event of an external fire threatening the house, a bushfire for example, the main focus is to prevent burning embers or sparks from entering the building. It is particularly important to keep them out of the spaces above the ceiling and below an elevated floor.

A roof of steel sheeting fixed to a steel roof frame simply cannot burn. In addition, the long lengths and tight overlaps prevent the entry of fire even when burning embers fall on the roof. Cover plates or closure strips seal off the small openings at the end of steel roofing profiles.

The space below the floor can be eliminated by building on a slab of concrete laid directly on the ground. Alternatively, on a sloping site an elevated floor consisting of a concrete slab on structural steel sub-flooring can perform the dual function of defending the building against fire and termites.

Further references:

AS 3959 *Construction of buildings in bushfire-prone areas* (Referenced in the Building Code of Australia)

Standards Australia Handbook HB 36 *Building in bushfire-prone areas*

The Complete Bushfire Safety Handbook by Joan Webster (Random House)

Bush Fire Protection - a booklet from the NSW Rural Fire Service, tel. (02) 9684 4411

External Water Spray Systems to Aid Building Protection from Wildfire - a report by the Fire Protection Association Australia. Email fpaa@fpaa.com.au

Further information contact:-
The National Association of Steel-Framed Housing Inc.,
PO Box 1085, Hartwell, VIC 3124 Australia
Tel: 61 3 9809 1333, Fax: 61 3 9809 1399
www.nash.mx.com.au
Freecall within Australia 1800 656 986

Fire

NASH™
NATIONAL ASSOCIATION OF STEEL-FRAMED HOUSING INC.

www.nash.mx.com.au

FACT FILE 2: Durability

Protective coatings of either Zincalume® - a zinc/aluminium alloy, or zinc, defend the steel against corrosion. (Note: Zincalume® steel is produced in Australia by BlueScope Steel Limited. Zinc coated steel is commonly known as "galvanized iron")

A natural phenomenon known as sacrificial protection prevents corrosion of any steel exposed at cut edges and penetrations.

The protective coatings. The coatings are tough, continuous, of uniform thickness, tightly adherent, and strongly resistant to corrosion. They are applied to both sides of the steel by the hot-dip process. In this process the steel strip is passed through a bath of molten metal, the amount of coating applied being closely controlled. The coating mass must meet the requirements of the relevant Australian Standard (AS 1397), or its equivalent.

BlueScope Steel Limited provides a 50 -year warranty* for its Zincalume® Steel used correctly in steel house frames. Steel framing is the only framing material for which any kind of structural durability warranty is offered. The more traditional galvanized steel also gives satisfactory performance within the building envelope.

Forming and fabrication does not impair the coatings. Because the protective coatings are tough, and their bending properties understood, the forming processes involved in shaping the building frame components do not impair the effectiveness of the protective coatings. The coatings are also tough and resist damage during fabrication and handling on site.

Sacrificial Protection. Frame sections are usually produced from narrow coils of steel strip slit from wider coils. Service holes are punched into the studs during manufacture to enable plumbers and electricians to install piping and wiring. During fabrication of the frame a variety of joining methods are used that usually penetrate the steel. At the slit edges of the plates and studs, at fixing points where the steel is penetrated and where components have been punched or cut, the steel base is exposed, but will not rust. It is protected against corrosion by sacrificial protection.

Sacrificial protection refers to the process initiated when dissimilar metals are in contact in the presence of moisture. The more active metal, in this case the zinc or zinc/ aluminium coating, will sacrifice itself in preference to the steel, thus protecting the steel base and its structural properties.

The effect is well known. It is evident at the ends of sheets of corrugated steel roofing where they have been cut to length, or at the cut edges of steel rainwater guttering.

These articles do not corrode away from cut edges even though they are exposed to more severe conditions than house frames. It is worth noting also that galvanized steel strips with cut edges are commonly used as bracing on timber frames.

Good Building Practice. In certain conditions zinc or Zincalume® steel coatings can be corroded by galvanic action through contact with dissimilar metals. In particular, contact with copper or brass in the presence of moisture will lead to the rapid removal of the coating from galvanized or Zincalume® steel, followed in due course by corrosion of the underlying steel. Plumbers must therefore take care to isolate copper piping from steel framing by inserting specialized plastic plumbing grommets into the pre-punched service holes in the studs.

For the same reasons CCA treated timbers (which contain soluble copper-based chemicals) used in some external claddings must not come into contact with steel frames. They must be isolated by an approved building membrane.

Masonry wall ties must be installed in a way that prevents moisture travelling along the tie to the inner surface of masonry or frame.

When installing elevated steel sub-floor systems, it is important to follow the manufacturers' instructions. The thickness of the galvanizing depends on the coating process, and for certain exposure conditions some manufacturers may recommend additional protective measures.

It should be noted that for all steel framing there can be some unusually corrosive conditions where heavier coatings than normal may be required. NASH or a steel supplier is able to provide advice on this.

*Terms and conditions apply.

References:

AS 1397 *Steel sheet and strip Hot-dipped zinc-coated or aluminium/zinc coated.*

AS 2312 *Guide to the protection of iron and steel against exterior atmospheric corrosion.*

AS 3623 *Domestic metal framing.*

AS 4600 *Cold-formed sections code.*

AS 3700 *Masonry Code (brick ties).*

Building Code of Australia 1996 *volume Two, Part 3.4.2 Steel Framing.*

Building Code of Australia 1996 *volume Two, Part 3.3.3.2 Masonry Construction*

BlueScope Steel Limited Technical Bulletin No. TB 10, *"Cut Edge Protection of Zinc-coated and Zinc/Aluminium Alloy-Coated Steel Sheet."*

Further information contact:-
The National Association of Steel-Framed Housing Inc.,
PO Box 1085, Hartwell, VIC 3124 Australia
Tel: 61 3 9809 1333, Fax: 61 3 9809 1399
www.nash.mx.com.au
Freecall within Australia 1800 656 986

NASH™
NATIONAL ASSOCIATION OF STEEL-FRAMED HOUSING INC.

www.nash.mx.com.au

FACT FILE 3: Movement

Steel frames are often associated with myths regarding major movement due to expansion and contraction resulting in either cracked plasterboard or noisy frames.

The noisy frames myth is a beauty: its wide currency and persistence is only matched by a complete absence of evidence in its support. How and where it started is a mystery. Anyone stating that steel frames are noisy should be challenged and asked for proof in the form of hard evidence - facts and figures, not just hearsay or reference to a single isolated instance.

The fact of the matter is that steel frames are not noisy and solid evidence exists to support this view.

G. A. King, Dr. M. Ridge and G. S. Walker of the CSIRO conducted a properly structured study in which they surveyed a number of occupants of steel-framed dwellings. They published the results in *Building Materials and Equipment, Vol. 17, No. 1.* They found that "most occupants either reported no sound emitted from the frame, or if they did, said that it constituted no problem".

Their findings were in accordance with another study (by Brealey) in which numerous people, living in remote tropical settlements were asked, among other things, their reactions to their houses.

"Many of these had steel frames, and no one complained of annoying noises. In considering the occurrence of thermal noises in steel framed houses it should be borne in mind that considerable noise may be provided in the timber parts of conventional dwellings. In fact four of the subjects volunteered the information that there was less noise in their present homes than in timber or brick veneer houses they had occupied previously."

Whether a steel frame is mechanically jointed or welded, movement caused by changes in temperature is not an issue **in a properly constructed and insulated home.**

From a technical viewpoint it is unlikely that steel framing would generate significant thermally-induced sounds. The steel framing is not directly exposed to radiation from the sun. Therefore the frame itself and any internal linings will not be influenced by the sun's rays. Similarly, the frame will not be directly exposed to the heat from internal heating.

Steel framing expands and contracts at rates reasonably similar to those of other building materials, which means it is unlikely there will be either noise or cornice cracking problems. For example, it is a fact that the coefficient of linear expansion of gypsum plasterboard is nearer to that of steel than that of timber. Furthermore, as the figures in the table below indicate (assuming that relative movement between materials is indeed a factor) when the temperature changes, commonly used external and internal materials will move more relative to timber than to steel.

Coefficients Of Linear Expansion, mm/mm/degree C

Steel	11.7×10^{6}
Fibre cement or similar	Approx. 7.5×10^{6}
Gypsum plasterboard	Approx. 16.5×10^{6}
Wood	Approx. 4 5×10^{6}

It is interesting to note that one supplier of steel-framed kit homes makes a point of following up on its customers for feedback on the performance of their new homes. This company has supplied hundreds of homes to owners. To date not one person has complained about a noisy frame.

Further information contact:-
The National Association of Steel-Framed Housing Inc.,
PO Box 1085, Hartwell, VIC 3124 Australia
Tel: 61 3 9809 1333, Fax: 61 3 9809 1399
www.nash.mx.com.au
Freecall within Australia 1800 656 986

NASH™
NATIONAL ASSOCIATION OF STEEL-FRAMED HOUSING INC.

www.nash.mx.com.au

FACT FILE 4: Electrical Safety

Electrical Safety

Steel house frames can actually be safer than alternatives.

Safety switches. It is a requirement that any new dwelling must be fitted with a safety switch, also known as an RCD (Residual Current Device) or an ELCN (Earth Leakage Circuit Breaker). These devices are designed to prevent death by accidental electrocution in a majority of cases.

Earthing. Steel house frames must be permanently earthed in accordance with the requirements of the local electricity authorities. A temporary earth should be established until the permanent earth is installed.

An electric current will follow the path of least resistance, the amount of current being in inverse proportion to the resistances involved. In other words if there are two paths the current can follow, it will split into two, the stronger current being conducted through the lower resistance. If that resistance is very low relative to the other, nearly all the current will flow through it. This is how the process of "earthing" works. Steel is an excellent conductor of electricity so it is improbable that any electric current would actually pass through a human body (high resistance) instead of the frame to earth system (low resistance). Non-conducting building materials with higher electrical resistances than steel actually increase the chance that more current will pass through the person.

Leaking current. A broken or pierced wire in a timber frame can remain live, and leaking current can cause troublesome faults and fire risk. Also, a timber frame can get wet in a storm or heavy rain and can become live if there is an electrical short. Specifically designed flared service holes or plastic electrical grommets are inserted into the pre-punched service holes in steel framing to prevent damage to the insulation. In the unlikely event of any shorting, current will be carried straight to earth.

Lightning. Lightning has less effect on steel as the energy is conducted straight to ground and not released destructively within the frame. There have been reports of lightning igniting timber frames.

Further information contact:-
The National Association of Steel-Framed Housing Inc.,
PO Box 1085, Hartwell, VIC 3124 Australia
Tel: 61 3 9809 1333, Fax: 61 3 9809 1399
www.nash.mx.com.au
Freecall within Australia 1800 656 986

NASH™
NATIONAL ASSOCIATION OF STEEL-FRAMED HOUSING INC.

www.nash.mx.com.au

FACT FILE 5: The Environment

Consumers are becoming increasingly concerned about the environment. They need to be able to make informed decisions about the impact of their activities.

The policy of the National Association of Steel Framed Housing is to support informed public debate on the issues and to provide factual information to enable specifiers, designers, householders and others to make sensible decisions.

Construction using any building material has some impact on the environment. Effects can occur in production, transport, distribution, the building process, service or disposal. Consumers are urged to consider the wider picture. They will be bombarded by isolated "facts" given out of context to create a favourable image. For example, the planting of trees is promoted as a wholly good thing: "young growing trees use carbon dioxide from the atmosphere". The loss of native habitat, the use of pesticides and herbicides, and the downstream effects of the planting of introduced species of trees on large tracts of land are conveniently ignored.

Design-professionals, and particularly architects, strive to specify materials that minimise harm to the environment. They are among the leaders in the drive for buildings that are as friendly towards the environment as possible. Independent bodies (and some steel producers) around the world have performed life-cycle analyses on the environmental impacts of using steel. Based on the results, well-informed architects freely specify steel products in their various forms for projects of all sizes, including single and multiple dwellings.

Steel is 100% recyclable, and approximately 60% of all steel in use in Australia has been produced from recycled scrap. Steel recycling programs reduce the solid waste stream, resulting in saved landfill space and the conservation of natural resources.

Steel frames provide excellent design flexibility, enabling the design, orientation, and construction of energy-efficient housing that is not only extremely "liveable", but minimises total energy consumed in heating and cooling over its lifetime. This saves the householder money, and just as importantly lessens the impact on the environment.

Elevated steel sub-floor systems enable construction on fragile sites to proceed with less disturbance to the site. Interference with natural contours can be minimised, retaining natural control of storm-water and reducing downstream sedimentation. Also, an elevated steel sub-floor system acts as an excellent chemical-free first line of defence against termites.

Steel frames are lightweight but strong. They are made of thin gauge, high tensile steel and have been engineered to achieve a very high efficiency of material use. Because steel properties are predictable, over-engineering is minimised and no superfluous material is designed in.

Steel frames are fabricated from components made specifically for each individual job, thus minimising wastage due to scrap. Scrap wastage on the actual building site is also minimal because very little if any cutting is required.

Termites cannot destroy steel frames. Thus, in accordance with the Building code of Australia, there is thus no need for the repeated use of toxic chemical treatments to defend the perimeter of the house against termite attack nor is there for the use of treated timber in the house. This avoids potentially harm to the environment and to the people who may come in contact with the chemicals.

Steel frames have proven ideal for the "healthy home" concept. The incidence of asthma and sensitivity to chemicals is on the increase and steel frames have been used to achieve allergen-free and dust-free interiors. This requires techniques such as special sealing around windows, moisture barrier systems in the walls, extensive insulation, and whole house ventilation systems. Steel frames retain their original dimensions, which is a major factor in maintaining effective long-term sealing.

Further information contact:-
The National Association of Steel-Framed Housing Inc.,
PO Box 1085, Hartwell, VIC 3124 Australia
Tel: 61 3 9809 1333, Fax: 61 3 9809 1399
www.nash.mx.com.au
Freecall within Australia 1800 656 986

NASH™
NATIONAL ASSOCIATION OF STEEL-FRAMED HOUSING INC.

www.nash.mx.com.au

FACT FILE 6: Termites

termite

Termites cannot eat steel.

To take the first and most basic step towards minimising the risk you face from the termite menace, for the lifetime of your home, you need to impose an absolute limit on the amount of damage they can inflict. Achieve this by making sure your home has a steel frame. Don't accept alternatives.

All households are exposed to a risk posed by termites. Just two things determine how great that level of risk is. The first is the likelihood that termites will enter your home; the second is the amount of damage they can wreak before detection and eradication.

The likelihood that termites will enter your home varies with factors such as region, construction type, materials used, expertise of the builder and vigilance of the householder, but is far higher than generally recognised! The incidence of termite attack appears to be increasing everywhere and has reached disturbing levels. Conventional termite barriers fail for a variety of reasons, and there is convincing evidence that these failures are on the increase. Often it's only a matter of time. If you choose to build or buy a house **with an untreated termite-susceptible timber frame**, automatically your level of risk will be high, **because termites could seriously damage the entire frame**. Usually the first sign of termite attack is within the home to items such as doorframes or skirting boards. With a non-resistant frame, by then it is too late. It has already been attacked, and if, as often happens, termites have destroyed most of the frame, they have for practical purposes destroyed your house, because the frame supports the house. Often the result is a condemned building, or expensive, time-consuming, and disruptive repair work at least. Do not accept this risk. The cost of rebuilding or restoration could be a financial disaster. Also, bear in mind that termites are not the only organisms that attack timber. **Borers and fungal rot cause far more damage than is generally realised, and barriers cannot keep them out.**

The Building Code of Australia allows a steel-framed house to be built without any extra defence against termites. Depending on factors such as the local environment, style of building (for example one with an elevated sub-floor system of steel), and personal circumstances, you may decide you don't need a barrier, because your frame will be safe and potential damage will be moderate. You may judge this option to be an "acceptable risk".

termite

Owners however have two very low-risk options available to them:

1. A steel-framed house, with non-structural components of termite-resistant materials. In this case no barrier is necessary.

2. A steel-framed house, plus a termite management system that conforms at least to the minimum requirements of the relevant Australian Standards (AS 3660 series).

Builders are traditionalists. Most have been trained as carpenters, and prefer working with timber because of their long-standing familiarity with it. Also, under the so-called "whole of house protection" policy espoused by some state government agencies many will not build a steel-framed house without a termite barrier, because of the chance of termites damaging non-structural parts of the building. Builders have been told that if this happens they will be held responsible for fixing such damage. Because of this, many take the view that if they have to install a barrier with a steel frame anyway, why bother building in steel. Some will even try to dissuade you from building with a steel frame but **don't be talked out of it.**

NASH, in line with the Australian Standard (AS 3660 series), strongly recommends regular competent inspections of buildings for any signs of termites. Termite barriers don't stop termites. They force their earthen leads into the open where they can be seen. Steel frames don't attract termites, but they will not stop some species. There is no substitute for vigilance, and being well informed.

NASH believes that the cost of inspection for termites should be lower for steel-framed dwellings than for timber framed dwellings. This is because the frame is generally inaccessible, but being inaccessible doesn't matter if the frame is built of steel. Bear in mind also that pest inspectors do not accept liability for the condition of concealed members, simply because they are so difficult to inspect properly.

Further information contact:-
The National Association of Steel-Framed Housing Inc.,
PO Box 1085, Hartwell, VIC 3124 Australia
Tel: 61 3 9809 1333, Fax: 61 3 9809 1399
www.nash.mx.com.au
Freecall within Australia 1800 656 986