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SOME IMPORTANT FACTORS OFTEN OVERLOOKED IN HOUSE CONSTRUCTION AND THE ROLE OF TIMBER IN BETTER BUILDING

With the price of an average house in the Sydney area now exceeding $100,000, excluding land, the purchase of a new home is probably one of the most important long-term commitments made by most Australians. All too often though, the old adage 'purchase in haste, repent at leisure' applies to many purchasers of new or existing homes.

While consumer legislation has never been stronger than it is now, with special indemnity schemes and builders being required to provide long warranties against major structural faults, purchasers should still ensure they are aware of the basics of good building practices.

Whether purchasing an existing home, contracting a project or contract builder, or undertaking the job as an owner builder, timber, after the foundations, will probably be the single most important structural component of your new home and some basic understanding of the product, its behaviour under different circumstances, and its role in better building will assist the purchaser in making more informed decisions.

THE SITE

Often buyers of land or existing houses fail to see far past a pleasant leafy outlook, a shiny kitchen, or innovative decorator items. While it may appear to be stating the obvious, the site is one of the most expensive and easiest places to go wrong.

Generally, a reasonably level block in as high a position as possible will ensure minimal site costs and far less chance of drainage difficulties. It will also minimise the risk of overshadowing by neighbouring buildings or trees.

Consideration should also be given to soil conditions. Heavy clay, sandstone or shale all have their own drawbacks, as does the presence of fill, and it would be wise to familiarise yourself with the block's history if at all possible.

Aspect

A north-easterly orientation is normally considered ideal and it would depend on life style whether the front or the rear of the house faces in that direction. Long southerly walls are best avoided where possible because little sun will fall on them, particularly in winter and, even with good circulation of air, algae will often form on brick walls and pathways.

Vegetation

While there is no argument that trees, shrubs and other vegetation are a desirable feature of any home, the planting of inappropriate species on a suburban block, or indeed on any property, will often far outweigh any subsequent advantage of shade and outlook.

The decision to plant Australian natives because of their drought resistance is an admirable one in the push to conserve our precious water resources, but the siting of some trees close to houses, most notably a number of our eucalypt species, will often prove a costly mistake.

Simply, the 90 to 150 cm blue gum, spotted gum or blackbutt of today will be tomorrow's 20 to 30 metre plus giant. The quantity of water needed by trees of this size is enormous and as the average home owner will still water lawns and gardens, many of these trees' roots will stay near the surface and will travel to cool moist areas underneath paving, footings and slabs with obvious consequences. This phenomenon is not only limited to our native species of course. The result of planting many popular trees, particularly species such as liquidamber, rubber or umbrella trees close to houses and swimming pools is often not appreciated until it is too late. By the time the problem of continually blocked roof guttering, ground storm water drainage, sewerage pipes and pool

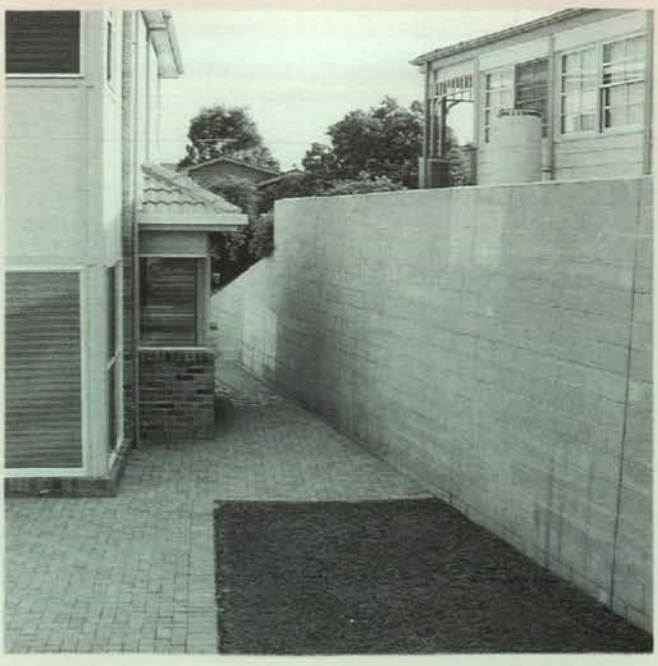
filters is recognised, it will usually be too late to convince your local council that either the trees or you must go. Unfortunately, the problem will not always be yours alone. Some thought should also be given to your neighbours who, while no doubt appreciating some summer shade, will probably not thank you for invasive roots, constantly dropping leaves and twigs, a feature of many native species, or for a heavily shadowed yard in winter.

State Forests of New South Wales has a number of brochures available that will provide guidance regarding the planting of native species. Alternatively, local nurseries should, providing you ask the right questions, be able to offer expert advice.

Bushes and garden beds against the house may block ventilation openings or cover slab edges sufficiently to allow the ingress of water or insect pests through weep holes or other gaps between brickwork and slab. A good rule of thumb is to build the house off the ground and if you must plant against the walls, try to steer clear of shrubs with dense foliage or, in the case of concrete slabs, ensure that gardens remain well below the top of the concrete.

SLAB VERSES SUSPENDED TIMBER FLOOR

For a number of years, concrete slabs have been a popular method of domestic construction because with an ideal site they may offer cost advantages with less organisation of trades for the builder. However, it's a sad fact of life that ideal blocks of land are few and far between. In many instances, particularly in hilly areas, slabs are often an inappropriate method of construction resulting in considerable cutting of the land with resultant alteration of natural drainage patterns. While the amount of fill that can be used is now more limited than in the past, its use will often result in substantial site costs that are normally not included in standard building contracts. Similarly, the cost of drainage and earth retention caused by cutting into the site is normally considered to be a site cost and would be considered an extra.



Example of extreme excavation (cut) for concrete slab

Points to be considered if a concrete slab is to be used.

1. Ensure the site is reasonably level. If it has to be cut and/or filled, considerable unexpected costs may be incurred.

2. Make sure before the slab is poured that the waterproof membrane is properly lapped and sealed at all joints and around services, that it is not holed during construction and that it is properly turned up around the perimeter.

3. If it is necessary that any part of the underslab area be filled, ensure the soil is correctly compacted and that its area and depth does not exceed the provisions set out in AS 2870 Pt.1 or any special conditions imposed by a number of local Councils.

4. Finally, if possible, request that a fixed price for site costs be included in your quotation and subsequent building contract.

5. The recommended curing time for a concrete slab under ideal conditions is approximately one month per 25 mm thickness. Therefore, floor coverings, timber, etc. may be expected to absorb moisture from the concrete until they reach equilibrium with each other.

Suspended floors

Timber floors have been with us for many years and offer a practical alternative to slab on ground construction.

While both systems have their place, timber floors offer a number of real advantages.

1. Where anything other than a level building block is encountered, there is no necessity to alter the land's natural drainage pattern by excessive excavation of the site. While there will obviously be a need to carry out foundation work and bricking to floor level, this will usually be offset by savings on excavation, drainage and earth retention works.

2. Less drainage will be required. However, ground water must still be directed away from the perimeter of the house to ensure the underfloor area remains dry (preferably below 18%). This is usually achieved with the installation of adequate ventilation and simple agricultural drains on the high side.

3. In NSW, the Building Code of Australia (BCA) has replaced Ordinance 70 as the primary building code. In an attempt to standardise building requirements across Australia, a number of changes and compromises had to be made. The new Code no longer stipulates a minimum height for timber subfloor members above the finished soil surface. However, while the BCA does not require compliance with Australian Standard AS 3660 - 1993 "Protection of Buildings from Subterranean Termites - Prevention, Detection and Treatment of Infestation", this Standard requires a **minimum** clearance of 400 mm (or 16") between the finished soil level and the lowest point of any subfloor member. This recommendation is for ideal conditions and it is suggested that wherever possible this clearance be increased, if for no other reason than to enable easy access to the under floor area for inspection and the installation and maintenance of services such as heating, plumbing, telephones etc.

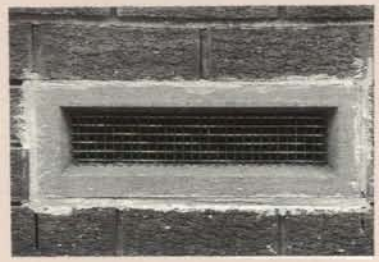
4. If the site is naturally damp and the problem can't be easily remedied, a waterproof membrane can be laid over the soil surface. If ponding occurs at the low side, drain holes in the foundation wall can be easily cut or drilled. In any case, every effort should be made to identify the cause of such a problem and to rectify it as quickly as possible. This is, of course, far easier to accomplish when you have easy access under your house.

VENTILATION

No matter how dry the under floor area may appear to be, there will always be some evaporation from the soil. In the case of a concrete slab, if insufficient care has been taken with the installation of the waterproof membrane or if insufficient provision has been made for ventilation throughout the subfloor area of a suspended concrete or timber floor, musty odours may occur. In severe cases, humidity may be high enough to enable the development of fungal growth on floor members, coverings or walls (see Technical Publication No. 11 "Ventilation under Timber Floors").

As noted earlier, the BCA no longer stipulates the clearances required between subfloor members and the finished soil level. Nor does it now set out the requirements for subfloor ventilation, relying instead on saying that the subfloor must be well ventilated. Adequate ventilation is critical to the health of all buildings and their occupants. Therefore, an absolute minimum recommendation for subfloor ventilation is 2100 mm^2 per lineal metre of external wall. All ventilators must be dispersed evenly throughout the external and internal wall areas to ensure adequate cross flow. The recommended ventilator area should, in fact, be increased wherever possible.

In the past, terracotta vents were common but it was found they were susceptible to being easily blocked. The more accepted method now is to leave open mortar joints around the perimeter wall or bronze mesh vents that provide a substantial air flow. There are now also a number of timber products that enable the clear spanning of floors over considerable distances. These products should be given careful consideration because not only will they ensure better air flow under the building, they also provide the opportunity to make better use of the available under floor area which can then be cleared of intrusive piers with associated cost savings.



Bronze mesh ventilator

If buying an existing house it would be wise to carefully inspect below any wet areas such as shower cubicles, and bathrooms generally, for signs of mould, fungus, or discoloration of timbers that may be an indication of water leaks.

TERMITES

No matter what materials are used in construction, termites are a potential hazard to all buildings in the warmer areas of Australia. The most common subterranean termites require dark and dampness to survive so where they have to emerge from the soil, they build 'tubes' between that and their food source. The presence of these 'tubes' is not always easy to detect in dark corners or in mortar joints between bricks. A trick to make inspection easier is to apply a band of white paint around all piers and on the inside of foundation walls.

Mud plastering and galleries built by subterranean termites in obtaining access to a suspended floor

The correct installation of ant capping at the top of detached piers and of continuous capping along foundation walls and attached piers is a critical operation during construction.

Ant caps are not intended to be impassable barriers. Rather, they are installed so that any insect pests trying to cross them will have to show themselves. If continuous capping is not correctly installed and joined, insects may be able to breach the barrier in areas not able to be easily inspected, with obvious results.

There are three basic materials used for ant capping - copper, galvanised steel and zincalume. Of these, the most widely used is galvanised steel. Copper, while an excellent material, is usually considerably more expensive than the other two, and practical experience relating to the joining of zincalume has usually proved to leave something to be desired. It is imperative that ant capping be continuously and correctly joined with solder or a like material. Reliance on the use of pop rivets and/or silicon sealant is not recommended.

TYPES OF CONSTRUCTION

In recent times a number of new construction materials and methods have become available and some have been heavily promoted with varying degrees of success. The range of structural materials, from timber and steel frames, to full brick and tilt up slabs and everything in between is considerable. However, still the most popular and widely used material by far is timber.

A vast amount of research into timber properties and products has been carried out over the years with the result that it is now readily accepted that most houses built using common practice timber sizes and methods of construction are substantially over-designed when account is taken of the load sharing occurring in an average timber house frame. It is unlikely that this situation will change because, while in theory much smaller sizes could be used, it is considered by most builders that it is impractical to handle and fix timbers of the smaller possible dimensions. The range of structural timbers and timber products is almost as vast as the resource itself which, in New South Wales, amounts to more than 3.5 million hectares in State Forests alone.

The product possibilities from our forest are almost unlimited, from the more traditional sawn unseasoned hardwoods, native pines and other imported softwoods, to our own plantation grown, kiln dried radiata pine and other manufactured products such as plywood, particleboards, gluelam and LVL.

SPECIES GROUPS

Sawn hardwoods

The number of species occurring naturally in New South Wales is not reflected in their availability (see Technical Publication No. 10). The unique properties of the various species though, and the range of sizes, grades and products available, make our hardwoods a valuable resource probably unmatched anywhere else in the world.

The range of hardwood products available, or possible, is almost limitless. From traditional sawn timbers, to high quality tongue and groove flooring and sheet products such as hardboard and plywood, to dried solid structural timber and manufactured products such as gluelam and LVL, our hardwood forests provide a remarkably versatile and abundant renewable resource.

Cypress pine

For many years, cypress was the most widely used flooring material in this State and in sawn form is still used extensively as a wall and roof framing material in the western areas of New South Wales. Among its more desirable properties are its high durability classification (Class 1) and its resistance to termite attack. This native softwood is traditionally sold in an unseasoned or 'green' state and has performed excellently as a framing timber. Some difficulties, however, have arisen in the case of cypress flooring where it has been milled to a tongue and

groove profile and installed still in a green or unseasoned condition. In recent times this problem has been addressed by many of the more progressive cypress sawmillers with the installation of drying facilities and modern milling equipment. 'Gauged' or 'sized' cypress framing and accurately graded, seasoned cypress flooring from reputable suppliers are now first rate products, the equal of any other species.

Radiata pine

Originally known as monterey pine (*Pinus radiata*) this species was introduced into Australia in the late 1800's together with a number of other softwood species and has since become our single most important softwood, displacing a number of imported timbers in the structural market. In New South Wales, all radiata for structural purposes is dried and marked with its relevant stress grade and these days the majority of it is mechanically graded which removes any possible doubt of human error or subjective assessment.

SHRINKAGE IN FRAMEWORK

With the almost universal demand for dried or 'seasoned' wall and roof framing, the incidence of shrinkage or distortion of timber members is not what it once was. However, it should be appreciated that some minor movement in timber may still occur and that a few simple precautions will minimise, if not almost totally eliminate, any noticeable movement in your timber frame.

All buildings will 'move' to a certain extent. Soil will inevitably expand and contract with changing weather conditions, brickwork may 'grow', concrete 'shrink', steel will expand and contract with temperature changes and in the case of metal framing may cause shadowing on internal lining materials due to condensation. The severity of any of these occurrences will very much depend on building practices and physical and climatic conditions.

Timber too is not immune to movement but with the demand for dry or 'seasoned' framing, movement can be expected to be negligible. However, it must be appreciated that some movement of timber members may still occur and while the occasional door may jamb in wet weather, this is usually the result of poor building practices rather than the materials used. Timber is an extremely forgiving material and while it may be forced to move, for instance by soil movement, it will, because of its natural resilience and unlike most other materials, compensate and recover when conditions return to normal. This has been demonstrated many times over the years where timber framed homes have been the subject of catastrophic impact or seismic damage. In many of these instances, where rigid materials such as masonry have subsequently had to be demolished, the timber frames have been recovered, often with relatively little difficulty or expense.

While most homes are now built using prefabricated frames and roof trusses, there are still a good number of 'stick built' houses constructed throughout New South Wales and many builders still prefer to use traditional unseasoned hardwoods or cypress pine. In addition, some frame manufacturers continue to use unseasoned Douglas-fir (Oregon).

A poor understanding of the material often results in problems further down the track. Unseasoned timber will, to varying degrees, shrink as it loses moisture. While this has to be accepted as a fact of life, it is something relatively easy to overcome.

There are two ways of cutting timber, back sawn and quarter sawn (Figure 1), and the degree of shrinkage that applies to most building timbers is considerably more in back sawn boards. Therefore, while probably difficult, quarter sawn timber should be specified if the timber is to be green or unseasoned.

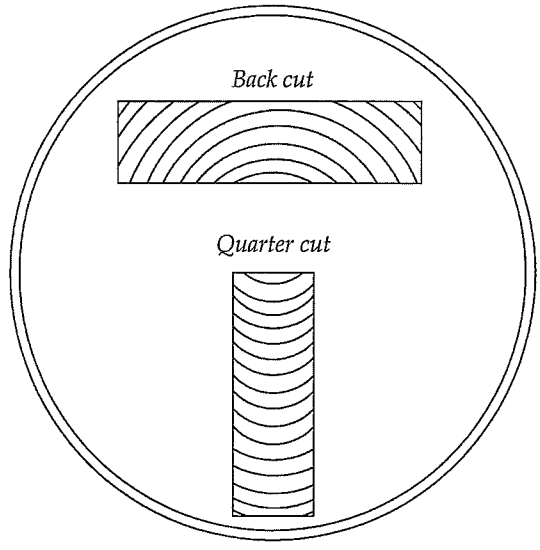


Figure 1.

It should be appreciated that, while in some timber species shrinkage in both width and thickness may be noticeable, longitudinal (length) shrinkage is unusual.

GOOD NAILING PRACTICE

While good nailing practices will not prevent shrinkage, the correct positioning of fixings can certainly minimise the effect. For instance, in a brick veneer home the

external frames will have wallboard (or plaster) only on one side. Therefore, the nails securing the studs to the top and bottom plates should be positioned as close as practicable to the wallboard side. Shrinkage movement will be toward the fixing point (or nails) so most movement will be on the side with the greatest area of unrestrained timber that is, on the non-critical side. Where both faces of a wall are important, such as on an internal wall, the fixing point should be centralised. Naturally this practice would be applied to noggins too. As corners are usually the most critical area for cracking it is best (*with unseasoned timbers*) not to fix wallboard to the studs at the corners but certainly it should be well secured to the noggins and plates which, as referred to earlier, will not shrink noticeably in a longitudinal direction.

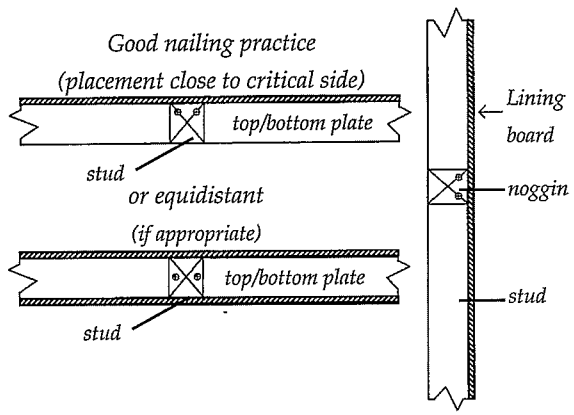


Figure 2.

Where the cladding is brick veneer and where unseasoned bearers and joists and possibly wall plates are used, allowance must be made for differential movement between the frame and the brickwork (Figure 3). A gap of at least 10 mm should be left under window sills and where the brickwork meets the soffit linings of the eaves. While longitudinal shrinkage in the studs will be minimal it must be appreciated that bearers, joists and top and bottom plates will all shrink in width and thickness as they dry out. If unseasoned deep joists are used in first floor construction a greater allowance will have to be made in that area as the rate of shrinkage will be proportionally larger as the dimensions of the timber increase. However, none of this need cause any great difficulty providing good building practices are employed in the first place.

The rule of thumb that should be remembered is that, no matter what, green timber will shrink but if restrained it will take the path of least resistance. Therefore, movement will always be toward the fixing point and the more material between that point and the edge of the timber, the greater the proportional movement will be.

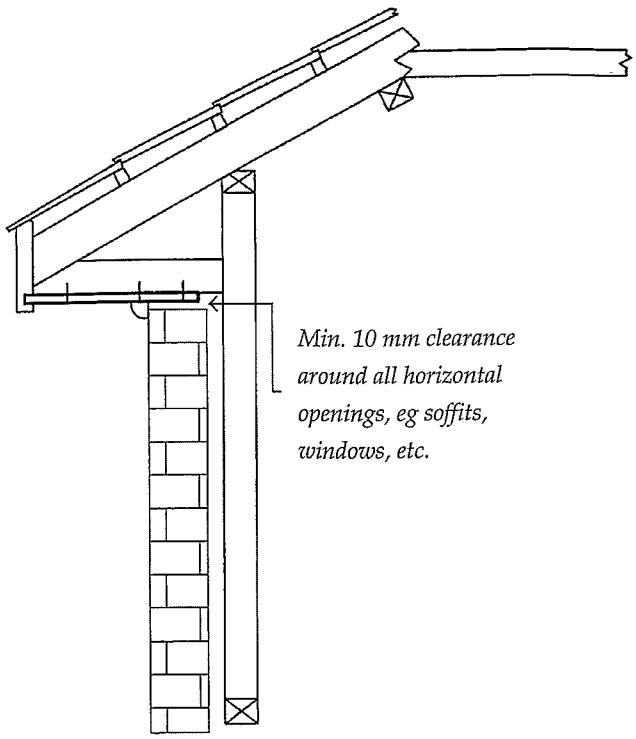


Figure 3.

OTHER TRADES AND SERVICES

Careful attention should be paid to the installation of services, particularly where they involve any breaching or cutting of structural timber members. It is an unfortunate fact of life that some installers of plumbing, electrical, air-conditioning and other services, have little appreciation of the necessity not to hack or drill out large sections of critical structural members and, while there is considerable load sharing in the average timber frame, there are points where that does not apply, for instance in large section, long spanning deep floor joists that could be easily weakened by excessive notching or the boring of large holes in the chords and webs of truss members which are equally critical.

SARKING, FLASHING AND VAPOUR BARRIERS

Sarking is a vapour permeable but waterproof fabric that is fixed immediately beneath roof covering or behind timber wall cladding (Figure 4). Its intent is to prevent any water that may penetrate the cladding from wetting interior linings and to provide a draft proof barrier for the building.

While sarking must be waterproof it must still allow the free flow of vapour from the back surface of the cladding.

If it prevents the flow of vapour, timber cladding, which for instance has taken up moisture during periods of wet weather, may tend to cup as the outside face dries. It is recommended that only vapour permeable building paper should be used. Polythene film, foil or other non-permeable material should never be used as sarking immediately behind timber cladding. Building papers with fire retardation properties are also available.

Note: Manufacturers' instructions regarding the use of perforated foil should be followed or they should be installed in accordance with Australian Standard AS 1904 "Code of Practice for Installation of Reflective Foil Laminate in Buildings".

Where weatherboards are used, it is excellent practice to fix a vapour permeable sarking material to the outside of the studs directly behind the timber cladding. It is highly recommended that sarking be used in walls where the building is subject to high wind conditions, updrafts, or wherever weatherboards are fixed diagonally or vertically. The use of sarking is not intended as a substitute for properly installed cladding and it should not be installed as a principal means of weatherproofing.

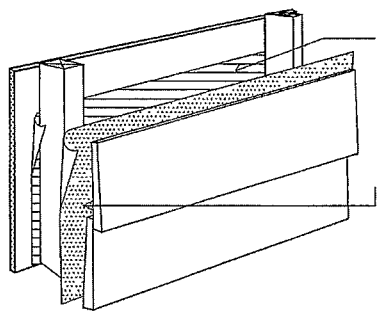


Figure 4.

Where sarking is intended for use as a secondary waterproofing material under cladding, flashing should be used at all corners, vertical joints and around openings. Even though sarking is not always used under external cladding it is essential that flashing is installed in the above areas to ensure water is prevented from penetrating the wall frame cavity. As its use is only localised, non-permeable materials are usually used as flashing.

VAPOUR BARRIERS

The use of vapour barriers (Figure 4) will depend primarily upon the climate, the intended use of the structure and the method of construction. Where the potential exists for considerable variation between internal and external temperatures, the likely incidence of water condensation on either side of wall linings is high.

Unflued heaters, showers, clothes dryers, cooking, and even people generate considerable amounts of moisture vapour within buildings. Some of that vapour will move outwards through plaster, wood and other permeable materials until it disperses into the atmosphere, reaches an impermeable barrier, or meets a surface cold enough to condense. Where water vapour is able to cross a wall cavity when the outside temperatures are low, moisture may condense on the back of the cold outer cladding or sarking. Where this condition is allowed to continue over a long period of time timber frames and/or cladding may take up this moisture which could eventually result in decay in non-durable species of timbers.

While the general rule is that vapour barriers should be positioned on the warm side of all infill insulation material, in some areas of Australia, such as in the snow fields where daytime conditions could be the reverse of those at night because of heat reflection from the snow, expert advice should be sought from insulation specialists.

THERMAL INSULATION

While air in a confined space is a fair insulator, timber is excellent but impractical as an infill material. However, the use of specifically designed and manufactured thermal insulation material between timber members will greatly improve the comfort factor in most buildings if installed correctly.

There are many types of insulation, from fibreglass batts and loose fill mineral wool and treated cellulose material (paper), to any number of other proprietary products that when used correctly will, to varying degrees, do the job expected of them. Basically though, the intent of all insulation material is to slow the passage of heat by creating tiny pockets of air. In these days of rising energy costs the use of insulation in ceilings, walls and even floors is highly recommended, particularly if coupled with good sealing around doors and windows and with the use of boxed pelmets, insulated curtains and other methods designed to slow the exchange of cold and heated air. Where extensive use is made of insulation and buildings are correctly designed to take advantage of passive solar energy with the use of properly designed shading and heat sinks etc., considerable long-term energy savings and comfort levels are possible.

WINDOWS

Until about 30 years ago timber was the most widely used window framing material; today aluminium is

more popular for reasons of maintenance and stability. However, while aluminium has many excellent properties, insulation is not one of them and its use in positions exposed to direct sunlight during summer and in situations where heating is used in winter will have a definite negative effect on building comfort.

EXTERNAL TIMBER CLADDING

There are many materials available, from New South Wales hardwoods and preservative treated softwoods, to plywood and proprietary hardboard products. However, as with any material, ensuring the best performance of your chosen cladding will very much depend upon good design, good building practice and correct installation.

To ensure the best possible performance of your timber cladding preference should be given, where possible, to designs that enable the material to be protected from the elements by wide overhangs such as verandas or eaves. This will give weather protection to your walls and will greatly reduce the necessity for maintenance in the form of painting. Critical areas with which extra care should be taken during construction are end joints, corners and wherever the timber cladding abuts doors, windows or other such points. Extra care should also be taken in all these areas to ensure flashing and sarking is correctly installed and that the end grain of the timber is properly sealed.

External timber cladding should finish at least 150 mm above ground level (Figure 5). If not, moisture uptake may eventually cause deterioration near the ground.

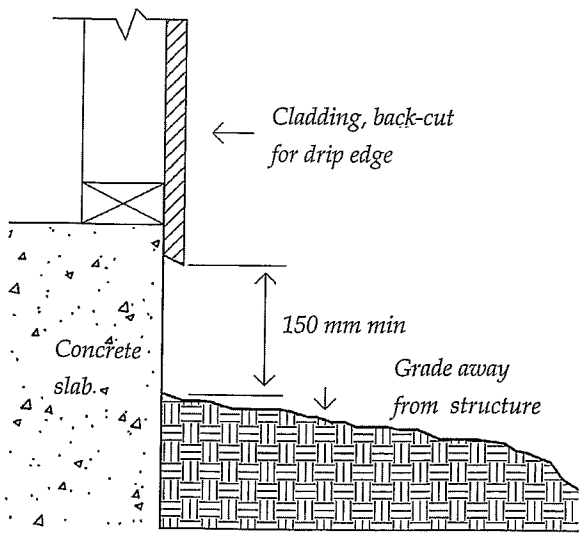


Figure 5.

Buildings clad with timber have a number of natural advantages, particularly in high wind areas, extreme climates, highly reactive soil areas and subsidence or earth tremor zones. Unlike other rigid materials, the natural resilience and high strength to weight ratio of timber enables it to withstand far greater stresses and movement.

As mentioned earlier there are a number of timber species suitable for cladding. These are generally produced in widths from 150 mm to 200 mm wide. Because of the risk of movement, it is not recommended that boards wider than 200 mm be used, other than re-manufactured timber cladding materials such as exterior grade hardboards. There are a number of different surface finishes and profiles available but with the exception of radiata pine, these often vary considerably from area to area and it is recommended that the local supplier be contacted and asked for advice.

Storage and handling

As with any valuable building product, seasoned timber cladding should be kept clean and dry from the time it is received on site until it is fixed and finished. If outside storage cannot be avoided the timber should be stacked on a well drained level site at least 150 mm clear of ground on bearers spaced at no more than 900 mm centres. The stack should be covered with a waterproof membrane that finishes just clear of the ground to allow ventilation under the stack. The provision of a similar membrane to cover the soil beneath the stack is also recommended.

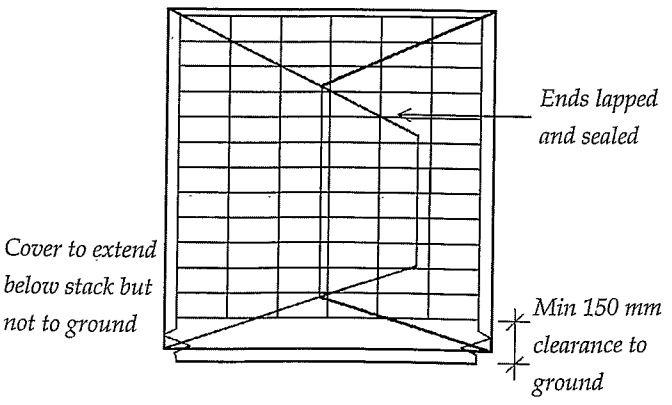


Figure 6. Plastic covered stack.

Painting and finishing

Some timbers, notably western red cedar and preservative treated pine, are occasionally fixed in place and allowed to weather naturally. While the natural grey colouring that results is considered by some to be attractive, the

same effect can be obtained with certain timber finishes. It is highly recommended however, that timber used externally be properly coated with an appropriate exterior stain or paint as unprotected timber will deteriorate physically when exposed to extreme atmospheric changes. Sun, rain, wind, frost, deleterious fumes, shrinkage and swelling will gradually cause disintegration.

Weathering is essentially a surface effect and most properties, apart from surface abrasion resistance, are hardly changed. However, weathering should not be confused with decay which results from fungi acting in the presence of excess moisture and air over an extended period.

Weathering protection may be provided by the application of coatings such as paints, water repellents, water repellent preservatives or pigmented penetrating stains (see Technical Publication No. 3). The main objective of any of these treatments is to prevent or retard the uptake of moisture and the absorption of ultra violet light.

Note: Linseed oil or a mixture of linseed oil and mineral turpentine should never be used on timber cladding as a natural finish. Further information regarding timber cladding may be obtained in the NAFI Timber Manual Data File FP1 "Timber External Cladding".

DECAY

Timber will be susceptible to fungal attack if any of the following four conditions exist -

1. Moisture content between 20 and 25% or more.

2. The presence of oxygen. (Timber completely saturated, submerged or 600 mm or more below ground level is rarely attacked.)

3. Temperature within the range of 5° to 40°C. A temperature range of 25° to 40° C is considered ideal for fungal attack. At higher or lower temperatures fungal attack is retarded.

4. Food in the form of unprotected nutrients must be present. Nutrients in the sapwood can be protected by preservative treatment.

LOW PITCHED OR FLAT ROOFS

Where it is not practical to provide for the free passage of air between the roof covering and the ceiling, such as in a flat roof structure, full use of appropriately placed permeable and non-permeable membranes and suitable insulation material should be made. Manufacturers' recommendations should be sought.

Where a low pitched roof is unavoidable, for example such as where the pitch changes for a veranda roof, there is always the chance that rain could 'beat' up under the tiles. Where this is a possibility, sarking should be considered a necessity.

FLOORING

There are three basic types of timber flooring used in Australian homes, sheet, tongue and groove, and parquetry.

Sheet

Sheet flooring is more often employed in the platform system, that is the building is taken to floor level and sheet flooring is laid over the entire floor area to create a working platform. All frames are subsequently placed on top of the sheet material. This system is often favoured where roof trusses are used to enable the placement of non-load bearing internal walls freely within the building without regard to subfloor construction. Manufacturers usually recommend that their sheet material should not be left unprotected from the weather for more than 90 days if all other recommendations are followed.

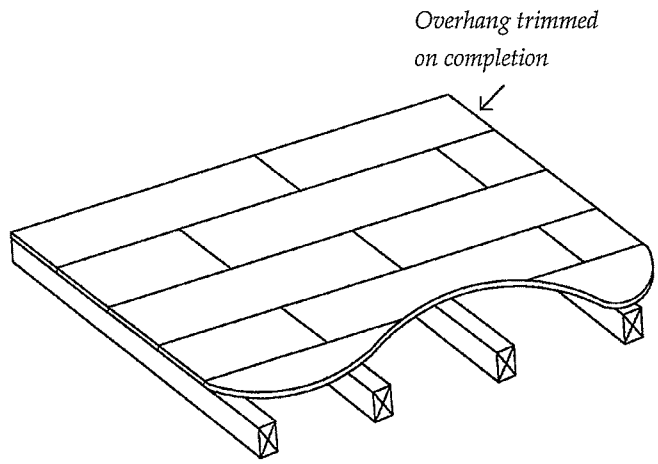


Figure 7. Sheet platform flooring.

Tongue and groove flooring

Most tongue and groove floors are 'cut in'. That is, the building is usually brought to a stage where the interior is protected from the weather and the flooring boards are then cut to fit individual rooms. While such timber must be sold in a seasoned state unless otherwise agreed in writing between buyer and seller, that is 10-15% mc, that

range is relatively wide, particularly if air-conditioning or central heating is to be installed. In any case, flooring should ideally be allowed to attain balance with its surrounding atmosphere before final fixing takes place. This would usually entail the cutting of all boards to fit their individual rooms before leaving them upside down in place to protect their top surfaces for a week or two while other work proceeds. Where possible, a longer period of time is desirable. If cut and placed accurately this system should provide a stable work surface and not present any real hazard to tradesmen.

Parquetry

In domestic construction, parquet flooring is normally laid as a high quality feature floor surface and is usually considered a job for experts. It must be laid on a solid stable base such as concrete or a timber sheet product such as plywood or hardboard and would normally not be installed until most other work, particularly wet trades, have finished.

CANTILEVERED BALCONIES

A number of problems with this system of construction have become apparent in recent years. In some instances balconies have literally fallen off because of decay in unprotected timber joists, occasionally with people on them. While this is alarming to say the least, it is generally not the fault of the timber; rather it is the result of inappropriate building practices that have allowed unsuitable timber species and poor attention to detail to be used. The use of **untreated** low durability timbers in such a situation is a recipe for disaster. Unless all timber members are totally protected from the weather, AS 1684 "The National Timber Framing Code" directs that a minimum Class 2 durability species or its preservative treated equivalent must be used in such situations. Even so, the proper detailing of timber members against moisture should be a priority because, be it timber or even steel, if the material is inadequately prepared and maintained there is always the risk of eventual failure.

It would also be wise, for obvious reasons, to ensure any railings or balustrades in such situations are of an equal or more durable species too.

CARE OF MATERIALS ON THE BUILDING SITE

All too often timber will be seen lying unprotected from the rain or in mud and water on a building site. Where that timber is in the form of seasoned frames or trusses it should be of particular concern to the prospective home owner. In simple terms, the reason that timber is dried in the first place is to ensure its stability and where critical members such as roof trusses are soaked or distorted because of incorrect stacking, unnatural stresses may be placed on nail plates or other critical jointing systems. Unfortunately, once these members are in place and covered, they are very difficult if not impossible to properly repair without major expense. Equally, windows and flooring cannot be expected to perform properly if mistreated. Often these problems will not become apparent until much later and as many may only be considered a nuisance, they may not be sufficiently serious to warrant major repairs or claims against the builder. While there is little an owner can do if purchasing a ready built home, other than visiting other sites under the builder's control to see what level of care is taken with materials, if directly contracting the builder there is no substitute for letting him know from the outset of your expectations and intention to regularly monitor work in progress.

CONTROLLING BUILDING COSTS

Any individually fabricated materials will invariably cost more than standard lines and this should be kept in mind when specifying room sizes, stud spacing and layout etc. For example, if a platform floor is used, non-load bearing wall studs can be laid out without regard to joists and where trusses are able to be positioned directly over or within the thickness of a load bearing stud, top plates can be considerably smaller than otherwise. Similarly, if rooms are able to be kept to standard wall sheet lining dimensions, or their multiples, there will be far less wastage. An uncomplicated roof line, if designed properly, can be aesthetically pleasing and will result in worthwhile savings while providing less likelihood of future maintenance difficulties. Box gutters should be avoided wherever possible, particularly if trees overhang the house.

It is very easy to be swept away in the euphoria of building a new home. Everything has to be just right and a wall moved slightly or a few extra power points are always tempting. If money is not a major consideration there is no real problem. However, while major structural changes are certainly best carried out during construction, extras or last minute unquoted variations can often be far more complicated than they seem on the surface and will inevitably cost more than expected and should be kept to a minimum or avoided where possible.

There is no point insisting on and paying for higher grade framing materials for non-load bearing walls when lower grades will be more than adequate. As long as material such as plywood and other products are structurally sound, there is little use specifying appearance grades for uses where they will not be seen or are not necessary, such as in wall frame bracing etc.

Service areas such as bathrooms, kitchens and laundries should be kept, where practicable, in as close proximity to one another as possible to reduce the overall cost of water and waste services.

While probably costing more initially, the use of durable timbers in external situations will invariably translate into long-term savings on maintenance.

SOME POINTS TO LOOK FOR WHEN PURCHASING AN EXISTING HOME

The following is not intended to be an exhaustive check list. Rather, it highlights a number of major areas of interest that should be carefully examined before committing to a purchase. There are a number of companies and individuals that offer pre-purchase building inspection services. It would, however, be worthwhile having your legal advisor check the terms and conditions attached to such contracts because some offer so many disclaimers and 'outs' that they offer very little protection to the client.

Floor and subfloor

- Dryness of the soil. Look for any signs of cracking in the soil that might indicate very wet soil conditions during periods of wet weather.
- Staining of subfloor timbers or mould growth, particularly around bathrooms and laundries etc. It is advisable to use a long sharp probe to check the soundness of all accessible structural timbers adjacent to these areas, particularly bottom plates, bearers and joists etc.
- Signs of termite activity. Look for evidence of mud tubes in dark corners and between timber bearers and joists or even between flooring boards or sheets. They can be hard to detect so a very bright light is recommended.
- The general cleanliness of the under floor area. The presence of timber offcuts, cardboard etc., particularly in a long standing building is not a good indication of care taken by previous owners.
- Check the joins in the continuous ant capping. If there are problems they will usually be evident where the capping for attached piers is joined to the continuous capping.
- Look for any evidence of rusted ant capping or wet or damp brickwork above the ant capping. This is often a good indication of leaks from wet areas or that the damp course is incorrectly installed, damaged or non-existent.
- Check for squeaky or bouncy floors. This should ideally be done during a period of dry weather.
- Look for any signs of leaking pipes or floor wastes.
- Where possible, check the integrity of vermin proofing wire between the outer wall and the timber frame.
- Ensure that adequate provision has been made for ventilation and that the under floor area is clear of all obstructions. Make sure provision has been made for adequate ventilation openings in internal masonry walls.

Wall framing and internal

- Wall framing is generally inaccessible but the use of a long straight edge and a good sized square on internal walls should give a fair indication of the accuracy and care taken during construction.
- Check windows for any signs of leaking and for general soundness.
- Bathrooms should be checked for evidence of leaks in shower cubicles that are often apparent because of silicon sealant at floor or wall junctions. In the case of buildings on slabs, such leaks are sometimes evidenced by musty odours or by water stains on adjacent carpets.
- Check ceramic tiles for soundness. Sharp rapping with the knuckles will sometimes return a hollow sound which indicates drummy tiles. This is occasionally found in older buildings (late 1960's to mid 1970's) because of installation methods and materials used at those times.
- Look for any bows in ceiling plasterboard. This may indicate incorrect fixing or roof leaks and will be practically impossible to properly rectify without totally removing and replacing the sheets in question if it is a long standing problem.
- Cracks in the plasterboard, extensive patching or fresh paintwork all indicate that some additional care should be taken with your inspection.
- Generally check the walls for soundness by pressing the wall lining firmly back against the frame to see if there is any excessive movement. If there is, it will more likely be in the fixing of the lining to the frame, but again it is some indication of the building practices used.
- Check the operation of doors and windows and ensure there are no obvious or excessive differences in the clearance between them and their surrounding frames.

Roof and ceiling space

- Look for any obviously deflecting roof members such as purlins, struts or bracing etc. that appear to be out of line or obviously not doing their intended job. (If you have any doubts, a good builder or structural engineer should be consulted. In the long term it may be money well spent.)

- Check for water staining of roof members that may indicate roof leaks. Also look carefully at insulation material. Quite often, particularly with fibreglass batts, dripping water will make small holes in the material.

- Check for any signs of light through the tiles. While this is to be expected in the main body of an unsarked roof, if it is evident along the ridges it will indicate missing pointing that will have to be corrected.

- Valley boards should be checked for soundness. If the valley gutters are subject to build up of debris they will often overflow or rust.

- Roof gutters, downpipes, facias and eaves linings should all be carefully inspected for soundness. Gutters should be free of rust and have sufficient fall. Down pipes should flow freely and discharge to the street if the building is on the high side. Eaves and facias should be well maintained and free of water staining that may indicate overflowing gutters.

External

- Check brickwork for soundness. The existence of cracking along mortar joints or through bricks could indicate a foundation problem.

- Ensure gardens and shrubs do not obscure ventilation openings.

- Make sure that any garden beds do not come within at least 100 mm of the top of the concrete slab.

- If timber clad, check the soundness of the timber, particularly at corners and where it abuts window and door frames and along the bottom edge of the lowest board.

- As far as possible, ensure all building debris and tree stumps etc. have been removed from the site.

- Make sure any paths or soil are battered away from the building, that all drainage is connected and discharges to the low side of the site.

- Take particular note of overhanging trees or those that have the potential to become a nuisance.

State Forests of New South Wales operate a Timber Inspection Service which, for a fee, will inspect and report on any or all timber or timber components or products for compliance with your written specifications. The Timber Services Branch can be contacted on (02) 980 4100 or through State Forests Regional Offices at Coffs Harbour, Taree, Eden, Albury or Dubbo.

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