



Canada Wood  
Produits de bois canadien



# Wood-Concrete Hybrid Construction

**INTERNATIONAL**  
Building series | NO. 9

Cover photo: APA-The Engineered Wood Association

# Wood-Concrete Hybrid Construction

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## What is Hybrid Construction?

Hybrid means the combination of different elements. In the case of construction it means the combination of different materials or techniques. For this brochure, it means specifically the combination of wood-frame construction with concrete/masonry construction (Photo 1). Hybrid construction allows the designer to combine the best attributes of wood and concrete/masonry to improve performance, economics and occupant satisfaction in a way that might not be possible using only one of the materials and its associated construction techniques.



Photo 1 Neale Staniszkis Doll Adams Architects There are many ways to use wood in combination with concrete/masonry. In this case, wood-framed upper storeys are supported by a concrete ground floor.

Wood-frame construction has long played a leading role in providing safe and comfortable housing, particularly in North America. This building technology is supported by a huge body of research, code development and practical experience that has affirmed the reliability and durability of wood-frame construction for all types of climates and building performance expectations. Increasingly, the performance record, comfort and affordability of wood-frame construction technology are gaining interest in Europe and Asia. For example, China has developed a timber design code that will allow it to access the advantages of wood frame construction. The China Timber Structure Design Code (GB50005-2003) will provide a sound basis for wood-frame construction to be safely utilized in China. In addition, Asian experience with concrete/masonry construction can easily be combined with wood-frame construction to increase floor area and to improve performance, comfort or appearance.

Of all major structural building systems, wood-framing delivers the most strength for its weight. This means that wood structures are relatively light-weight, resulting in smaller foundation requirements, or, for the same foundation, more storeys can be constructed without exceeding foundation capacity. This means it may be possible to add living space to existing foundations that might not be able to support the weight of additional concrete/masonry construction.

This brochure explains several ways that wood-framing can easily be integrated with traditional concrete construction to increase living space and improve building performance, especially heating and cooling efficiency.

## Types of Wood-Concrete Hybrid Construction

In typical housing applications, wood-frame construction is attached to a concrete foundation, so combining wood-frame and concrete construction has a long history. There are several other ways that wood-framing and concrete can be used effectively together and these are also referred to as hybrid construction (Figure 1). For example, the combination can be used to separate a main floor commercial occupancy from the upper floors residential occupancy (Photo 2), or, wood framing and insulation can be added to existing concrete buildings to vastly improve thermal performance. Additional details about each of these types of construction is provided in Examples of Hybrid Construction (Page 6).

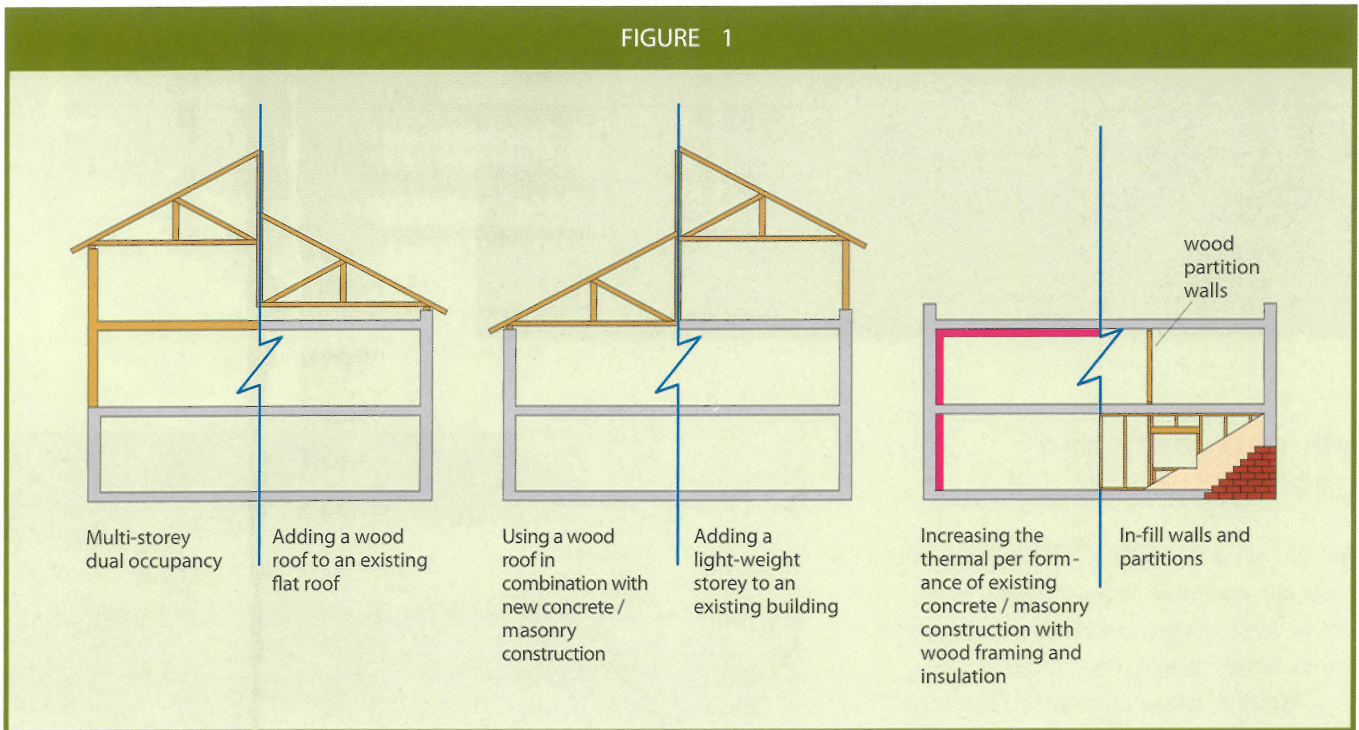


Figure 1 Types of hybrid construction

Photo 2



Photo 2 MITHUN architects + designers + planners A frequent hybrid application is a commercial occupancy on the ground floor and residential occupancy on the upper floors.

## Advantages of Using Wood with Other Materials

The same benefits that apply to wood construction also apply when wood is used in combination with concrete/masonry. These are described in other International Builders Series publications, especially 6. Wood-frame Multi-unit Residences, and are summarized here.



## Product Quality and Durability

Modern lumber manufacturing and drying provides products with consistent characteristics. Engineered wood products provide additional strength and predictability benefits and include:

- Machine-stress rated (MSR) and finger-joined lumber
- Metal plate-connected trusses
- Glued-laminated products (glulam)
- Laminated veneer lumber (LVL), parallel strand lumber (PSL) and laminated strand lumber (LSL)
- Wood I-joists and open-web wood joists
- Oriented strandboard (OSB) and plywood sheathing panels



There are many examples of wood buildings that have lasted hundreds of years, and modern wood-frame construction is better equipped than ever to last at least as long as a building is still meeting the user's needs. Design features that employ good moisture management principles and maintenance are necessary to ensure long-term service for any type of building, and when applied to wood-frame construction, will ensure long service life.

## Technical Performance

Wood-frame construction has many positive technical features:

- **Increased thermal performance** leading to lower heating / cooling costs. Compared to building techniques that rely solely on uninsulated heavy masonry construction (stone, brick, block or concrete), typical wood-frame construction is about five times as energy efficient.
- **Low environmental effect:** compared to other structural materials, wood has relatively little impact on energy consumption, air and water pollution and greenhouse gas emissions.
- **High strength-to-weight ratio:** Wood-frame construction is light in weight but can be designed to meet the most severe conditions like the extreme forces of seismic events and hurricanes or typhoons (for example, modern wood construction performed exceptionally well in the 1994 Kobe, Japan earthquake). Wood construction is much lighter than concrete/masonry construction. This means hybrid construction can allow more living area for a given foundation capacity.
- **Sound transmission properties:** The control of airborne and impact sound is an important building design consideration, especially for multi-unit residential buildings. For all building materials and methods, care is required to ensure desired sound control is attained. Satisfactory levels of sound transmission can be easily met with wood-frame construction and is not complicated by its hybrid combination with concrete/masonry.

## Architectural Flexibility

Wood construction offers flexibility in design. It is economically feasible to add features that add interest and appeal, especially for roofs. In addition, wood-frame construction is easy to modify in the event that an addition, window, or other feature is desired in the future. Wood-frame construction also provides:

- **Space economy:** Wood-frame walls include weather protection, structural rigidity, thermal insulation, and interior finish surface in a compact assembly that maximizes liveable floor area. For example, a wall with 38 by 140 mm wood studs can accommodate insulation with an RSI of 3.5 (Photo 3).

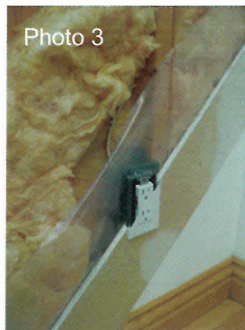


Photo 3

Photo 3 J. Burrows Wood-framing is compact – structure, insulation, air and moisture barriers and exterior and interior finishes are contained in a small, light-weight space.



Photo 4

- **Ease of installing electrical and mechanical services:** Interior wall and floor cavities are used to route vertical and horizontal services, including electrical wiring, plumbing, and heating ducts. (Photo 4).

Photo 4 J. Burrows Services are easily accommodated in interior wall assemblies.

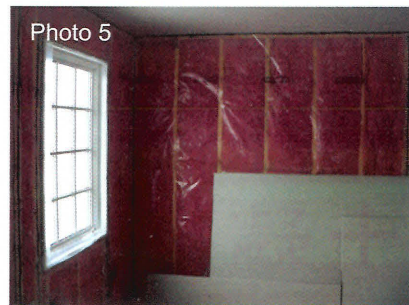


Photo 5

- **Interior finishes:** Typically, wood-frame construction includes gypsum board finishes on all interior walls (Photo 5). This surface is economical, provides a smooth substrate for paint and wallpaper finishes, and provides some inherent degree of fire resistance. On exterior walls, the gypsum board can also serve as the air barrier and enclose the thermal insulation. Wood-frame floors accommodate a variety of floor finishes including resilient flooring, wood strip flooring, ceramic tile, and carpet. In addition, concrete or gypsum toppings can be added prior to the finished flooring to affect certain performance factors or accommodate in-floor radiant heating systems.

Photo 5 J. Burrows Gypsum board provides a quality finish surface and other benefits.

## Examples of Hybrid Construction

### Multi-storey with wood-frame upper floors

A common hybrid application is the construction of one to three wood-frame storeys (up to five storeys in some cases) over a main floor concrete storey (Photo 6). This arrangement can permit the combination of two occupancies in one building and is commonly commercial retail occupancy on the main floor and residential occupancies in the upper floors. Multi-story hybrid wood-frame construction is a light, economical construction technique that can meet all code requirements for strength, fire safety, and thermal and sound performance while imposing a much lower bearing load on building foundations. It is an environmentally sustainable solution to rising land, energy and construction costs.



Photo 6 APA-The Engineered Wood Association Hybrid construction combines the best features of concrete and wood construction.

International Building Series publication 6. Wood-frame Multi-unit Residences provides information about the advantages of wood-framing for multi-storey residential construction. All these benefits apply to the wood portion when wood is used in combination with a main floor of concrete/masonry (Photos 7 and 8). The main issues affecting such hybrid construction are described in sections that follow.

6



Photo 7



Photo 8

Photo 7 and 8 Neale Staniszkis Doll Adams Architects The finished appearance of hybrid construction demonstrates the architectural flexibility it provides.



Photo 9

Photo 9 and 10 Neale Staniszkis Doll Adams Architects The concrete main floor (Photo 9) and the wood-frame upper floors (Photo 10) both provide a pleasing environment.



Photo 10



In some areas, special provisions permit wood-frame construction up to six storeys. A recent example of wood-concrete hybrid construction is a six-storey building comprised of retail spaces in the ground (concrete) story and 46 residential units in the upper five wood-frame storeys



(Photos 11 and 12). The building is 15 by 30 m, 19.8 m high and has a total area of 3,020 m<sup>2</sup>. The ground storey (concrete) is 3.8 m high and the residential (wood-frame) storeys are 3 m high. Photos 11 William Wilson Architects and 12 Paul Knight Cornerstone Condominiums feature a ground floor of concrete and five wood-frame storeys.



Photo 13 Q-WEB On a smaller scale, wood-framing can be added to a house with a concrete ground floor.

## Wood-frame roofs on masonry buildings

A wood-frame roof is unmatched in terms of economy, architectural flexibility, light-weight and long span capability. Buildings with masonry walls can be easily topped with a wood-frame roof (Photos 14 and 15), a type of hybrid construction very common in Europe. Typical choices for wood roofing systems are:

- Prefabricated light weight roof trusses and wood sheathing
- Beams (glulam) and purlins (lumber, glulam, LVL or wood I-joists) combined with wood sheathing (plywood or OSB)
- Dimension lumber rafters and wood sheathing

Photos 14 and 15 Q-WEB These photos from China show the use of wood trusses used in combination with concrete/masonry construction.

Wood roofs can be installed quickly and meet all code requirements. Special hold down devices are embedded in the concrete and nailed to the wood roof elements. This type of hybrid construction combines the advantages of the concrete/masonry walls with the advantages of wood roofs:

- High level of thermal insulation capability
- Light weight
- Wide range of architectural shapes without a high cost penalty.
- Availability of hardware for making the wood to concrete/masonry connection



FIGURE 2

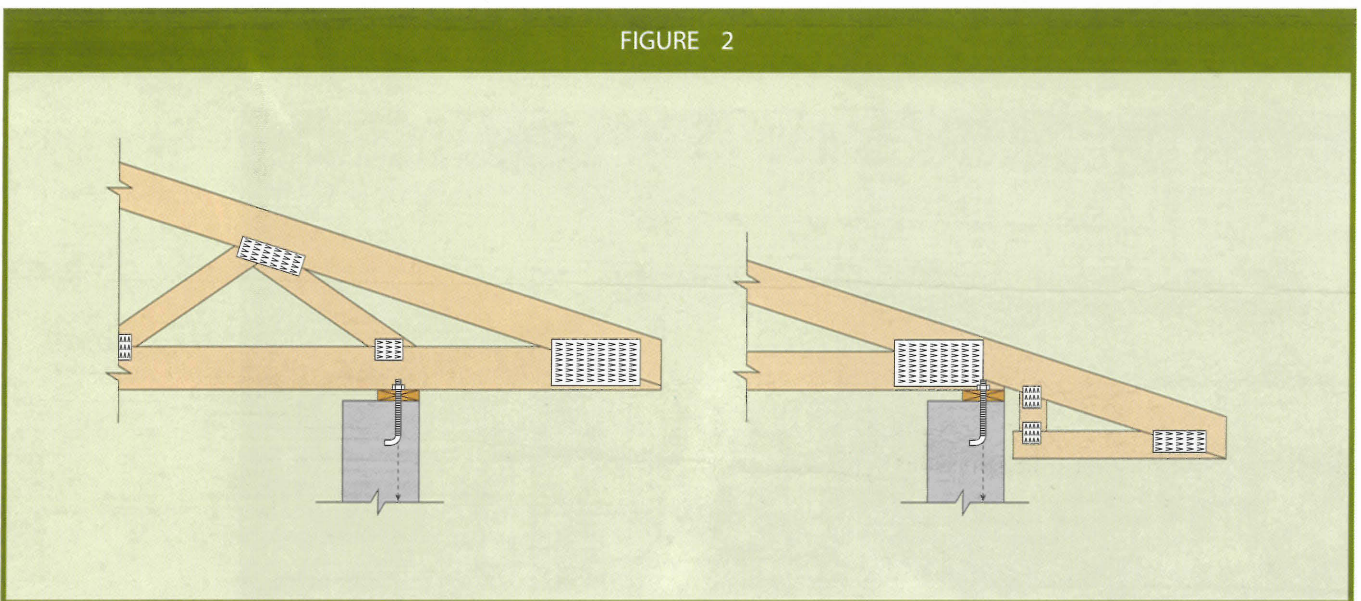


Figure 2 shows two different eave treatments. These and other details are easy to alter simply by changing the truss arrangement.



## Retrofitting flat roofs

There are many examples of flat-roofed buildings that have been retrofitted by installing pitched wood-truss roofs. The same options and benefits that apply to installing wood roofs on new concrete/masonry buildings also apply to the retrofitting of flat roofs.

The slope removes the leakage problems that resulted from ponding water (Photos 16 and 17). In addition, the shaping of the roof can improve the architectural appearance – turning a plain building into an attractive building (Photo 18). The addition of a sloped wood roof can also be an opportunity to easily upgrade the thermal performance of this part of the building envelope. Also, by adjusting the roof truss shape, the roof space can be designed to provide living space (Figure 3) with a minimal increase in building height.

Photos 16 and 17 APA-The Engineered Wood Association Flat roof problems can be solved by adding a sloped, light-weight roof over top an existing flat roof.

Photo 18 J. Burrows Adding a sloped roof provided an additional floor space and improved the architectural interest of this office building. The old roofline is evident on the left side.

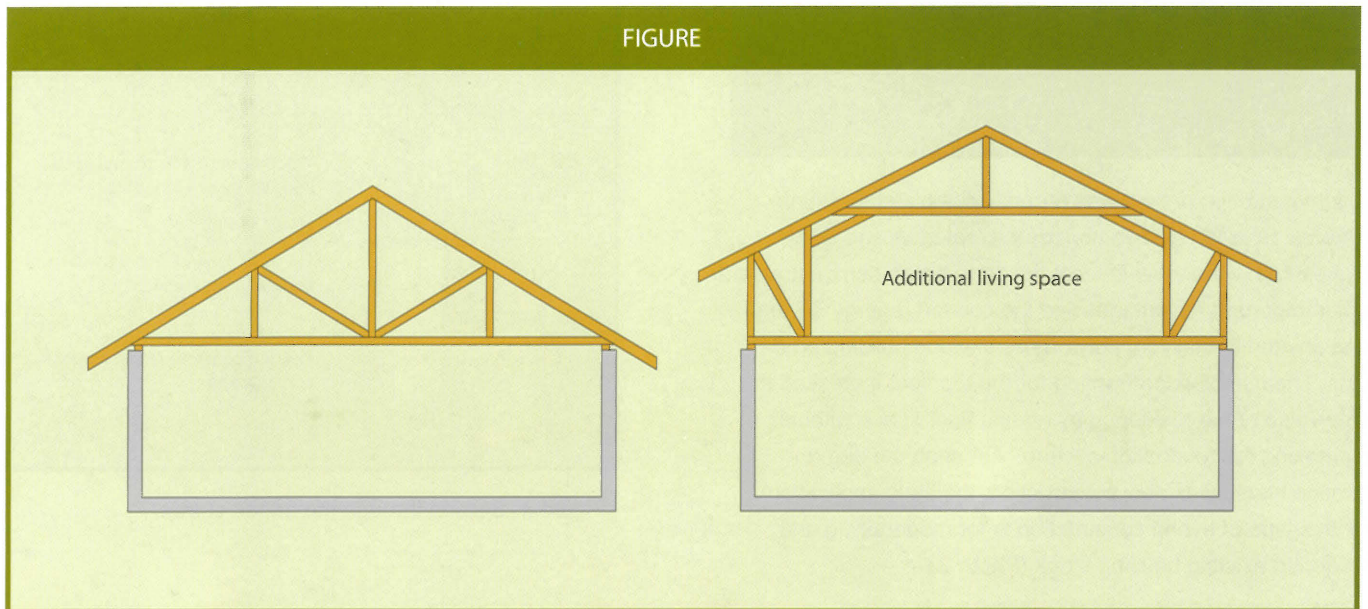


Figure 3 Changing the truss arrangement can provide additional living space.

## Adding a new storey

Wood-frame construction can easily be used to add a storey to an existing concrete/masonry building. The lightweight of wood construction may make it feasible to add a storey without modification to the building foundation. In cases where the concrete roof is adequate, the existing roof can serve as the new floor. In cases where the existing roof is inadequate, a wood floor can be constructed independent of the former roof (Figure 4).



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A demonstration project was recently completed in China (Photos 19 to 22) that demonstrated materials and techniques that were novel to local builders. It also demonstrated other important advantages like the comfort, energy saving and environmentally friendly nature of wood building products. The use of wood-framing for the top floor increased the sale value of the residence by adding floor space without overtaxing the foundation system. Although the demonstration house was new construction, the main application for this type of hybrid construction is for modernizing and enlarging existing housing stock (Photo 23).

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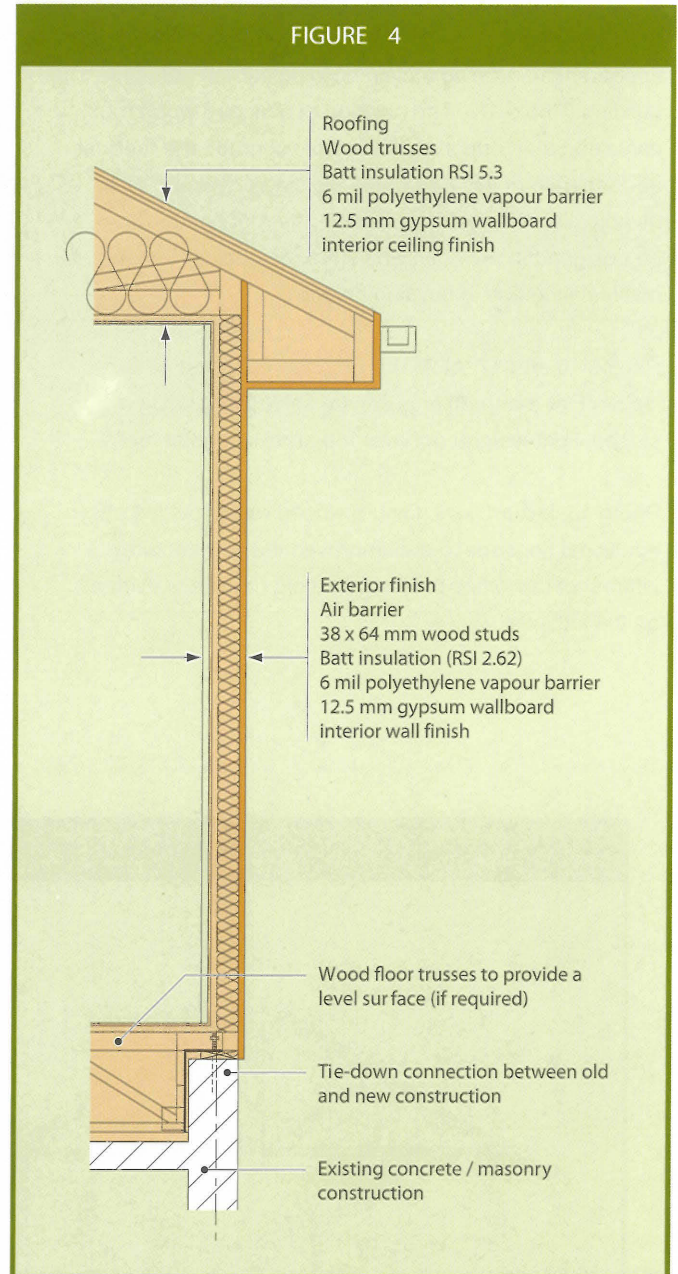


Figure 4 Section through the added storey



Older housing stock in Asia typically consists of a flat, reinforced concrete roof-top (100-200mm in thickness), and a low parapet wall running around the perimeter (usually 1-1.4 meters in height). This parapet wall is either constructed of mud brick and parged with a concrete slurry, or in better quality constructions, reinforced concrete. In either case, the structural integrity of the parapet must be verified to ensure adequate connection of the new wood construction to the existing concrete/masonry construction.

Photos 19 to 22 Canada Wood This Chinese project demonstrated the addition of a new floor to a concrete house, thereby increasing the living area by one third.

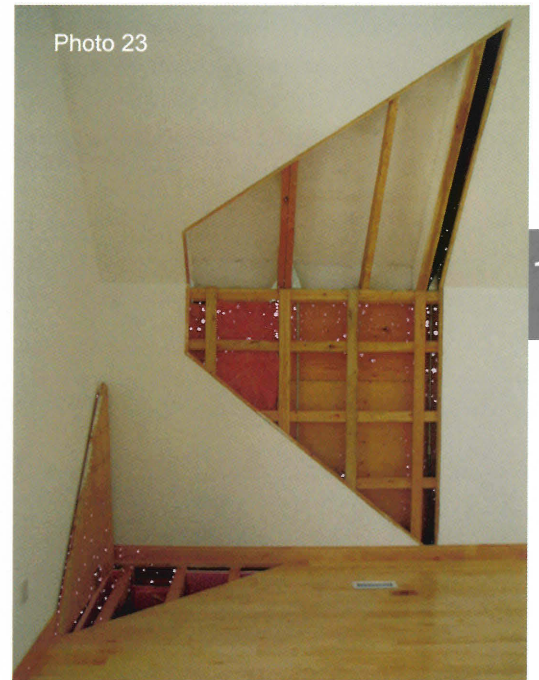


Photo 23 Q-WEB Wood –concrete hybrid construction offers new possibilities for improving older housing.

## Thermal upgrading

Many older low-rise apartments do not meet current requirements for thermal performance. This adversely affects the comfort of residents and results in high heating costs and other building performance problems. Often, it is desired to maintain the exterior appearance and in these cases, adding insulation to the exterior is the preferred option. Although there is some loss of living space, retrofitting from the interior provides additional benefits such as the opportunity to upgrade electrical services on external walls and the provision of a high-quality interior surface.

First, old interior wall finishes are removed down to the masonry surface. Next, wood studs (usually 2 x 2, 2 x 3 or 2 x 4, depending on the amount of space that can be sacrificed) is installed and kept back from the masonry about 25 mm. Next, electrical wiring and boxes are installed (if required). The batt or sprayed insulation is installed. Sprayed insulation can be applied in a wet formulation in which case the excess is shaved away before the gypsum board is applied. If it is applied dry, then it is pumped into holes made in the gypsum board. Attention to detail is important so that moisture from the interior does not escape into the building envelope.

The insulating value of concrete walls can easily be increased with a minimal loss of living area by the addition of wood studs, insulation and a suitable wall finish material (gypsum board) (Figure 5, Photo 24). Whereas a typical concrete wall might have an RSI value of 0.34, the value of the same wall fitted with framing and 7 cm. (3-1/2") of insulation increases to 2.1.



12

Photo 24

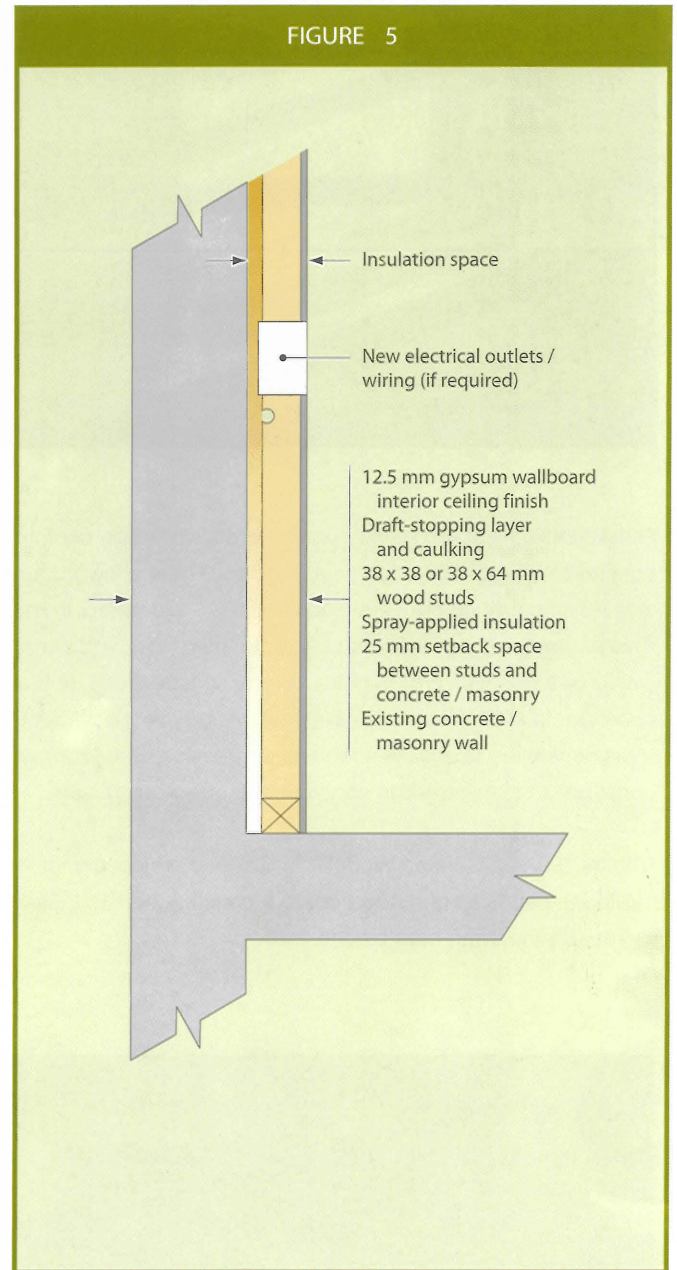


Figure 5 Retrofitting with wood studs, insulation and gypsum board can dramatically increase insulation value, with only slight reductions in living space.

Photo 24 Forintek Canada Corp. The concrete/masonry wall is framed to provide support for the insulation and the new interior wall finish. Either batt or spray insulation can be used.



## Sidebar

In 1996, a four-storey, 30-unit, 86-year-old, apartment building in Canada was renovated to improve performance. The renovation involved the addition of interior insulation to the solid masonry (clay brick) walls of the building. The project was followed closely by researchers to ascertain the longterm performance for the building, especially whether the durability of solid masonry walls would be affected by interior wall condensation and cyclic thermal stresses.

There are two considerations – one is water leakage from the outside into the building cavity; the second is movement of moisture from the interior by air leakage. As a first step, spray testing was done and determined that the masonry wall was subject to water penetration from the exterior. Therefore a rain penetration strategy was implemented that included repairs to the masonry. Secondly, the gypsum board finish layer was designed and constructed to eliminate drafts.

The performance of the retrofitted wall structure was assessed by a monitoring program devised to record heat, air and moisture conditions at various points through the wall section. Moisture contents of wood joists in the attic space were also monitored. Rain wetting patterns were recorded to determine the relation of rain to the conditions recorded through the wall sections. Local weather conditions and indoor relative humidity and temperature were also tracked.

Conditions were monitored in six wall locations representative of all elevations and floor levels. The instrumentation was connected to a multi-channel data logger located in the building, which accumulated data on 30-minute intervals for 15 months.



## In-fill Walls and Partitions

Wood-framing can be used effectively as in-fill walls (Photo 25) and interior partition walls (Photo 26) for low-rise concrete apartment construction. Again, the compact nature of wood-frame walls is an advantage with thermal, structural, sound and fire safety requirements all being met in a wall width that maximizes interior space. The cost efficiency comes from the possibility of manufacturing in-fill units offsite -including framing, insulation, air and vapour barriers, windows and doors and interior finishes - and installing the unit into the concrete opening and securing it in place. In some cases, the light weight of the wood in-fill walls and partitions might result in cost savings for foundations.

Any number of exterior cladding finishes can be added as the final step. Although high wind loads or large window openings might affect the size of wood studs required, the size is generally determined by the desired depth of the insulation space between the studs. A cost comparison of wood in-fill walls compared to steel-frame or masonry walls indicates that wood frame walls are competitive in European countries and Asian countries like China. Pre-manufacturing wood in-fill units in quantity would result in further cost economy.

Wood-frame partition walls are also a cost-effective way of constructing interior partition walls. The height and occupancy allowances need to be verified against applicable building codes but in general, wood-frame partitions can meet the fire safety requirements for many low-rise and high-rise applications.



Photo 25 Q-WEB – this is the only original Exterior wood frame wall inset from the building perimeter.

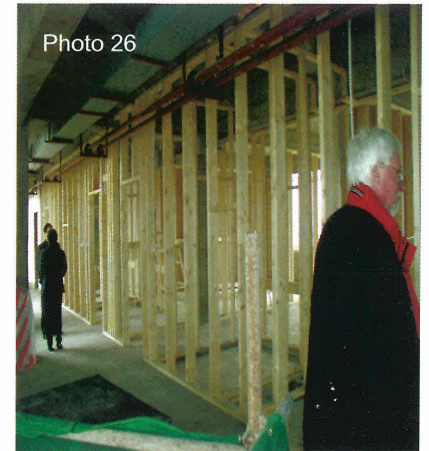
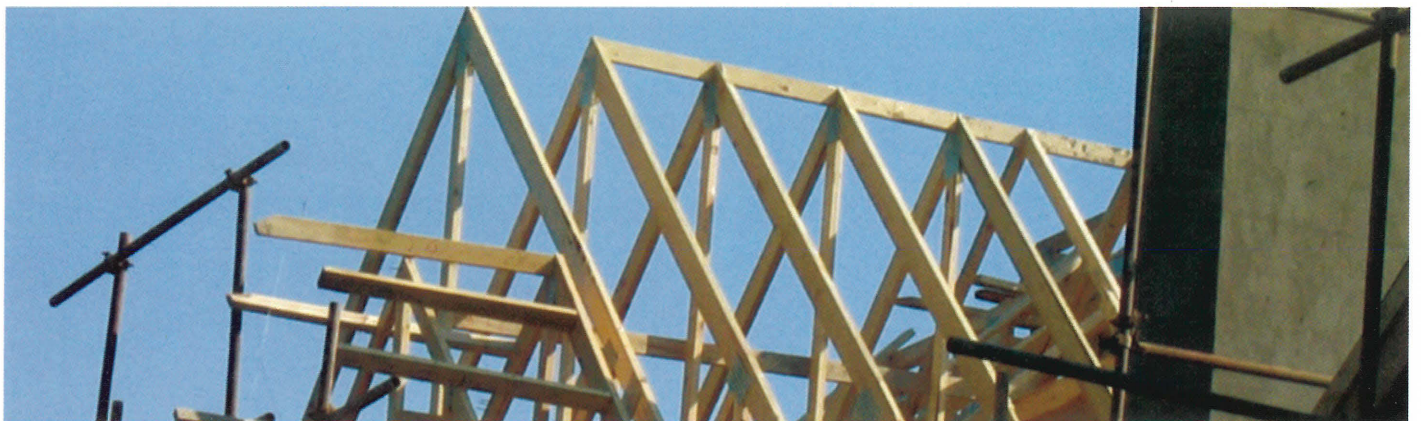


Photo 26 Q-WEB – this is the only original Wood frame partitions in a concrete building.



## General Considerations

Hybrid construction involves combining wood and concrete/masonry – two materials with very different characteristics. For roof or one-storey wood additions, the connection of the wood to the concrete/masonry is the main consideration. Other usual building science factors also must be considered such as moisture management, draft proofing, detailing and thermal insulation. For hybrid buildings that have more than one wood storey, other factors also come into play. The design must take into account changes in dimension due to shrinkage, and resistance to lateral loads and tie-down take on added importance.



## Building Codes

In North America, wood frame construction is usually limited to four storeys above ground level (sprinklered). This means that if the main floor is concrete, three additional wood-frame floors are permitted. There are regions where an additional story beyond this is permitted if certain conditions are met such as: provision of a 3-hour separation (i.e. concrete slab) between the main floor and the upper floors; the top four stories must be residential occupancy; there must be an automatic sprinkler protection system throughout the entire structure; the building height must not exceed 19.8 m; and there must be special fire fighting access. In addition, special inspections are required for the wood framed portion of the structure, primarily of the lateral force resisting elements.

Photo 27



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Photo 27 MITHUN architects + designers + planners This hybrid building is located in a high earthquake zone and is designed to resist the predicted design loads.

## Lateral Load Resisting Systems

Hybrid buildings combine a lower concrete floor that is relatively stiff with an upper wood-frame structure that is relatively flexible. A static lateral analysis is required to provide suitable behaviour in the event of earthquake loading. Building codes generally require the concrete and wood portions to be analyzed as two separate buildings, with the earthquake base shear of the wood portion added to that of the concrete building (Photo 27). The lateral load resisting system includes adequate securing of the wood portion to the concrete lower storey and securing the wood storeys to each other to provide continuous tie-down between the foundation and the roof.

For the wood-frame portion of a hybrid building, resistance to lateral loads is provided by shear walls and diaphragms that are sheathed with structural wood panels like plywood or OSB. These structural elements maintain high stiffness and strength in the design range, and if pushed to their ultimate capacity, tend to yield only gradually while continuing to carry high loads. In addition, these assemblies can absorb a great deal of energy before failure. Wherever openings for windows and doors occur in shearwalls, provision must be made to maintain the capacity of the shear walls. This can be done by designing and installing metal straps or other devices to transfer shear forces around openings.

The wood stud bearing walls in the lower storeys carry higher vertical loads than the walls in the upper stories. For this reason, in addition to increased shear resistance in the lower storeys, the spacing of the wood studs often needs to be closer.

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## Fire-Safety

Building codes limit the height and area of wood-frame construction. Many building codes throughout the world typically allow wood-frame multi-family residential buildings up to four storeys, while some have no limits to the height. Safety measures include requiring the floors and walls separating dwelling units to provide a set level of structural fire resistance. As the buildings get larger, building codes require additional safety measures such as sprinkler systems and increased fire resistance for the load bearing structural elements. Most North American codes require four-storey residential buildings to be sprinklered and the structure must have the same fire-resistance rating (one hour) regardless of whether the structure is wood, steel or concrete.

Hybrid buildings often have a ground floor occupancy that is different from the occupancy in the storeys above. As a result, the floor/ceiling assembly above the ground floor is required to be constructed as a fire separation, usually with a fire-resistance rating of 2 hours. Although a 2-hour fire separation is possible to build with wood construction, it is normal in hybrid construction for the ground floor to be concrete and for the ground floor ceiling/floor assembly to also be concrete. The fire safety issues for the wood-frame portion of a hybrid building are usually the same as for a building constructed entirely of wood frame and of similar area and height.

Fire loss statistics and research demonstrate that people are likely to be as safe from fire in wood-frame multi-family housing as they would be in housing built with any other material. The fire performance of wood-frame construction is based on many years of experience and extensive testing, including tests on full-size buildings. Wood-frame walls and floors and roofs using conventional wood joist framing, wood trusses and wood I-joists, when protected by gypsum board, can be designed to provide fire-resistance ratings up to two hours, the maximum normally required by North American codes for residential occupancies. Gypsum board not only provides essential protection of structural components for a certain period of time in the event of a fire, it also provides an economical interior finish wall surface.

## Dimensional Change

With hybrid construction, it must be taken into account that shrinkage will occur in the wood portion but not in the concrete portion. As long as this phenomenon is recognized, design and construction steps can be taken to ensure damage from shrinkage does not cause damage to interior finishes and the exterior of the building envelope.

Shrinkage can also be minimized by using wood products with low moisture content, such as kiln dried (KD) lumber, or engineered wood products like wood I-joists. In any case, care of the wood products on the site will reduce the amount of moisture uptake and thereby reduce dimensional changes of the finished structure. One strategy to minimize the impact of shrinkage on the building finishes is to delay the start of interior finish installation as long as practical to allow most of the wood shrinkage to occur. For example, specifications could require a moisture content of 12% or less before the installation of interior finishes and portable heaters could be used to help with the drying.



## Wood Trusses

One thing all types of wood-concrete hybrids have in common is the use of wood trusses for roofing (see International Building Series No. 2 Wood Trusses). This highlights the point that wood trusses are an excellent choice in any building code-approved application. Design software and advanced manufacturing processes permit the fabrication of wood roof trusses to suit a vast array of roof shapes, while meeting strength requirements. Wood trusses are very versatile and compatible with other structural products. They can be connected to other engineered wood products or to steel or concrete.

Wood trusses are widely used in single- and multi-family residential, institutional, agricultural and commercial construction. They rely on a triangular arrangement of webs and chords to transfer loads to reaction points (Photo 28). This arrangement gives them high strength- to-weight ratios, which permit longer spans than conventional framing, and offers greater flexibility in floor plan layouts. They can be designed in almost any shape or size, restricted only by manufacturing capabilities, shipping limitations and handling considerations. Wood trusses are pre-fabricated by pressing galvanized steel truss plates into wood members that are pre-cut and assembled in a jig.



Photo 28



18

Photo 28 J. Burrows Wood trusses rely on quality lumber and toothed metal-plate connectors to provide structural reliability for a very wide range of roof shapes.

## Wood to Concrete Connections

Attaching wood-frame construction to concrete foundations with anchor bolts is a common occurrence and the same technology applies to wood-concrete hybrid construction. Whether it is a wood roof attached to a concrete building or multi-storey wood framing attached to a concrete ground floor, the wood to concrete connection must be designed and constructed to meet all anticipated loads.



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## Wood walls to concrete/masonry

The attachment of wood shear walls to the concrete slab is typically accomplished either by casting anchor bolts during concrete placement or by installing mechanical or adhesive anchors in the cured concrete. Cast-in-place anchor bolts (Figure 6) require a high degree of precision to ensure the shearwall capacity is not reduced by misplaced bolts too close to the edge of the wood sill plate, or loosely fitting in oversized holes in the wood plates made to compensate for misalignment. Alternatively, if anchor bolts are drilled into the slab, it is possible that drilling will damage a portion of the reinforcing steel. To compensate, additional reinforcing is typically added to the top of the concrete slab. It is also acceptable to cast steel plates into the concrete and to field weld bolts to the plates.

Codes require a tight fit between the bolt and the sill plate hole. Usually, the sill plate bolt holes should be no more than 1.6 mm (1/16") larger than the bolt diameter. Typically, bolts are cast in the concrete in which case precise location of the bolt-holes is required so that the wall unit can be lowered over the bolts. If the bolt-holes are made larger to facilitate fitting the sill plate, the annular space between the bolt and the holes needs to be filled so that there is no slippage in the event of lateral loading (Photo 27). This can be done by placing a metal tube in the boltholes and grouting the space between the bolts and the sleeves. In general, there should be a membrane separating the concrete and the wood, or the wood sill should be treated.

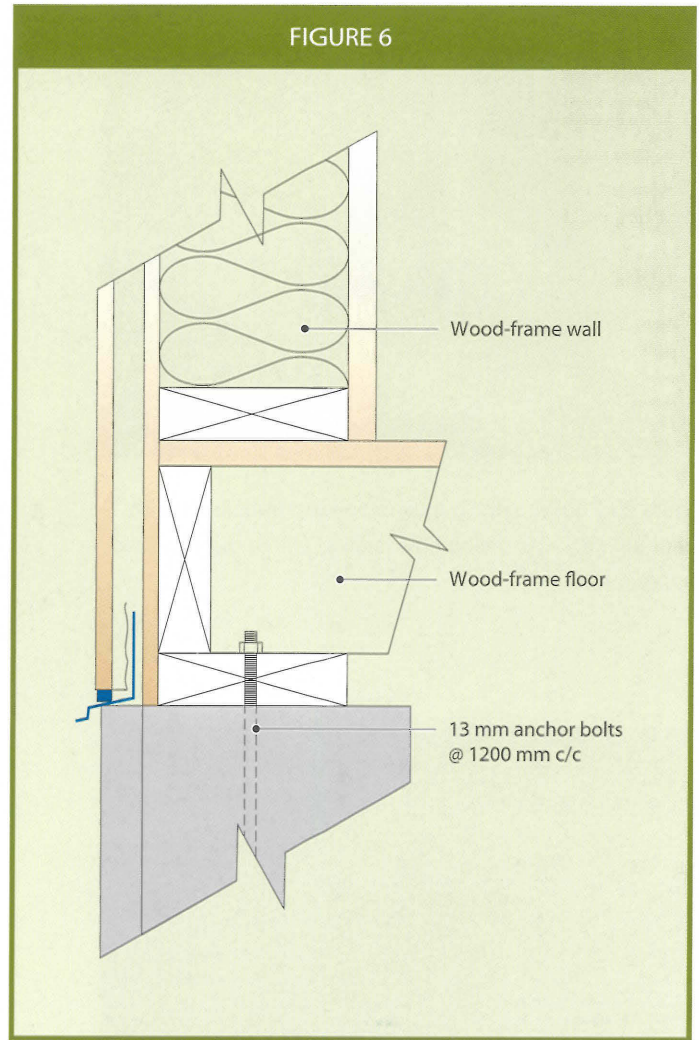


Figure 6 Cast-in-place anchor bolts are the most common method of attaching wood framing to concrete construction.





Photo 29

Photo 29 Paul Knight To maximize load transfer, the annular space in the drilled hole is filled with a metal sleeve and grouted.



Photo 30

Photo 30 Canada Wood Special connections may be used to transfer forces from floor to floor.

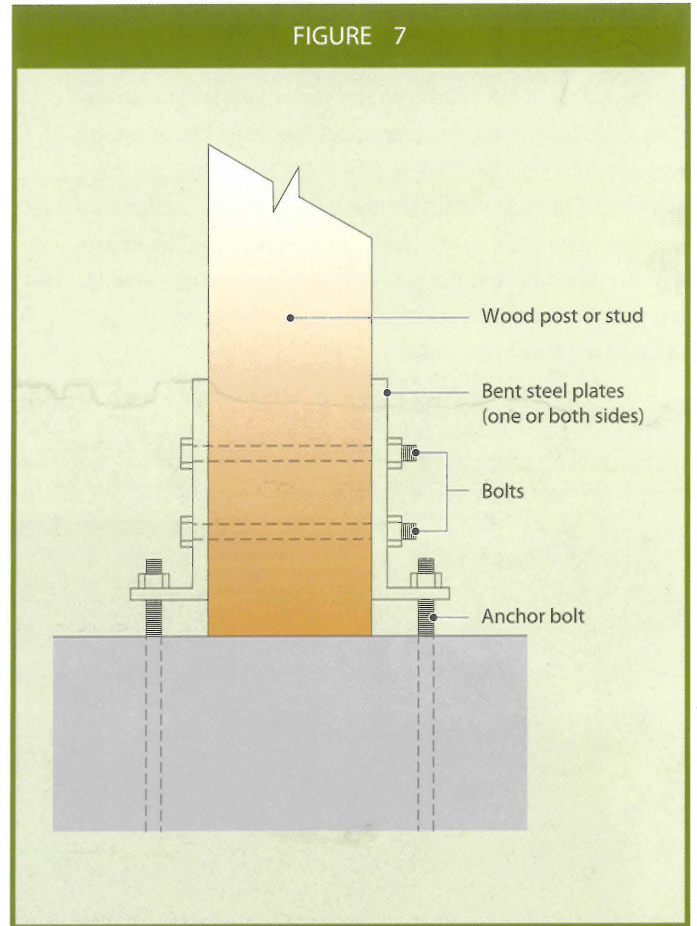


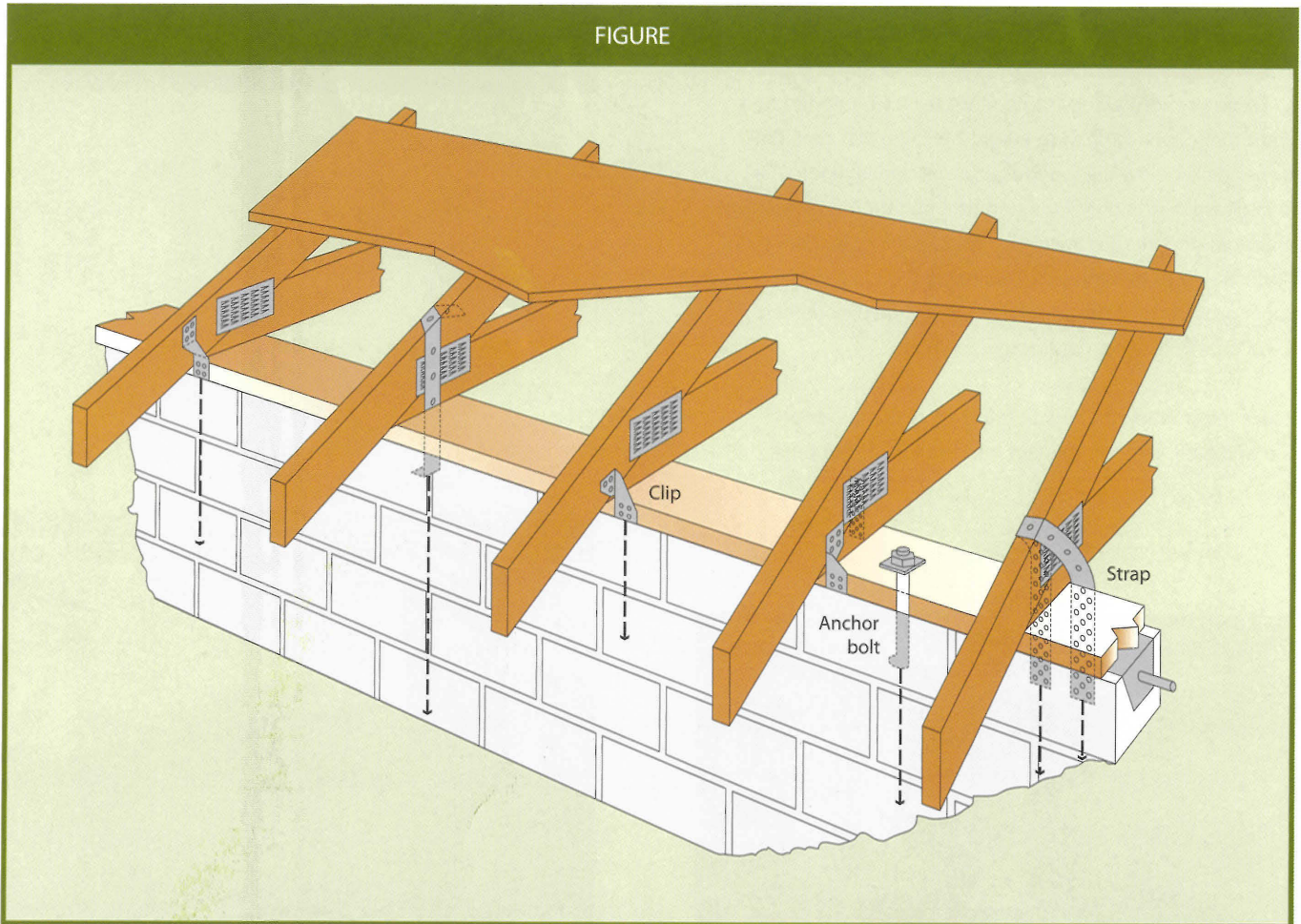
FIGURE 7

In some cases, special tie-down devices may be installed to resist uplift forces (Figure 7 and Photo 30).

## Wood roofs to concrete/masonry

Whether a wood roof is attached to wood-frame walls or to concrete/masonry walls, there is a wide range of stock hardware available to ensure a solid connection (Figure 8). In all cases, it is necessary to ensure there is a continuous load path between the roof and the foundation.

FIGURE



## Conclusion

Wood-frame construction is receiving a high level of interest in Europe and Asia because it is a fast, affordable, proven method for constructing comfortable and safe multi-unit residential buildings. Wood-concrete hybrid construction, the combination of wood-frame construction with concrete elements, provides building designers with several ways for improving building performance and gaining added space.

Whether wood-framing is used to add a storey to an existing building or to provide a sloped roof over an existing flat roof, it can solve these building problems economically and effectively. Three or more wood-frame storeys can be added to a concrete main floor to provide a light building with an effective separation below the wood-frame residential floors. Or, wood in-fill walls and partitions can be used for the exteriors and interiors of concrete buildings. And with increasing energy prices, wood framing and insulation is a cost-effective way of improving thermal performance and quickly paying back the cost in the form of energy savings.

For more information on how to improve building performance and size, use the contact information on the back page.





APA-The Engineered Wood Association

Contact Canada Wood:

For more information please contact our office at:

Canada Wood Head Office

Website: [www.canadawood.cn](http://www.canadawood.cn)

Canada Wood China

Beijing Office

Suite 12B10, HanWei Plaza

No. 7 Guanghua Road

ChaoYang District

Beijing, China 100004

Tel:(86-10) 6561 1041

Fax:(86-10) 6561 1037

Shanghai Office

9G29 & 9G31, Shanghai Mart

2299 Yan An Road West

Shanghai 200336, China

Tel:(86-21) 6236-2516

Fax:(86-21) 6236-2536

E-mail: (86-21) 6236-2536

Canada Wood Europe 12A Place Stéphanie

B-1050 Brussels, Belgium

Tel: (32-2) 512 5051

Fax: (32-2) 502 5402

E-mail: [info@canadawood.info](mailto:info@canadawood.info)

Canada Wood UK

Suite 8, St-Albans House

40 Lynchford Road

Farnborough, United Kingdom

GU14 6EF

Tel: (44-1252) 522545

Fax: (44-1252) 522546

E-mail: [office@canadawooduk.org](mailto:office@canadawooduk.org)

Canada Wood Japan

Tomoecho Annex-11 9F

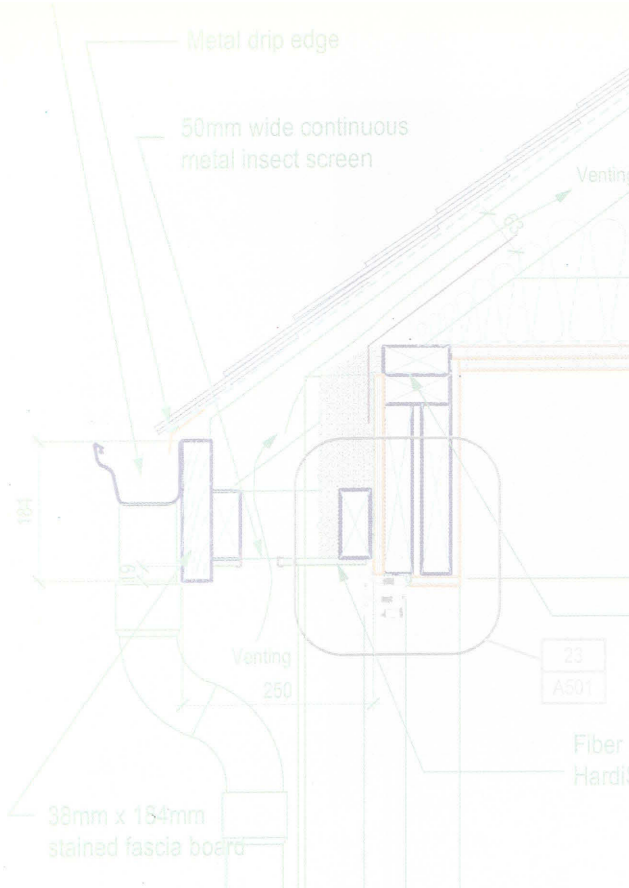
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Minato-ku

Tokyo 105-0001, Japan

Tel: (81-3) 5401-0531

Fax: (81-3) 5401-0538



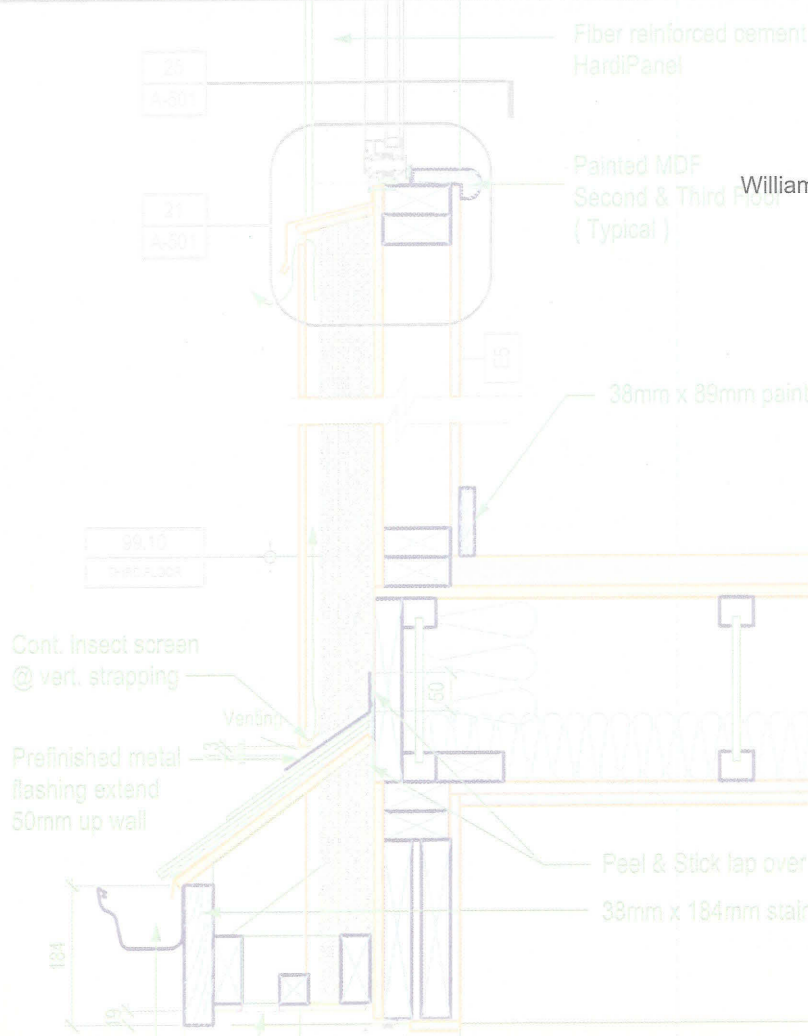
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