

WHY IS TIMBER CONSTRUCTION ECONOMICAL?

(a presentation given by Warwick Banks of CHH Woodproducts)

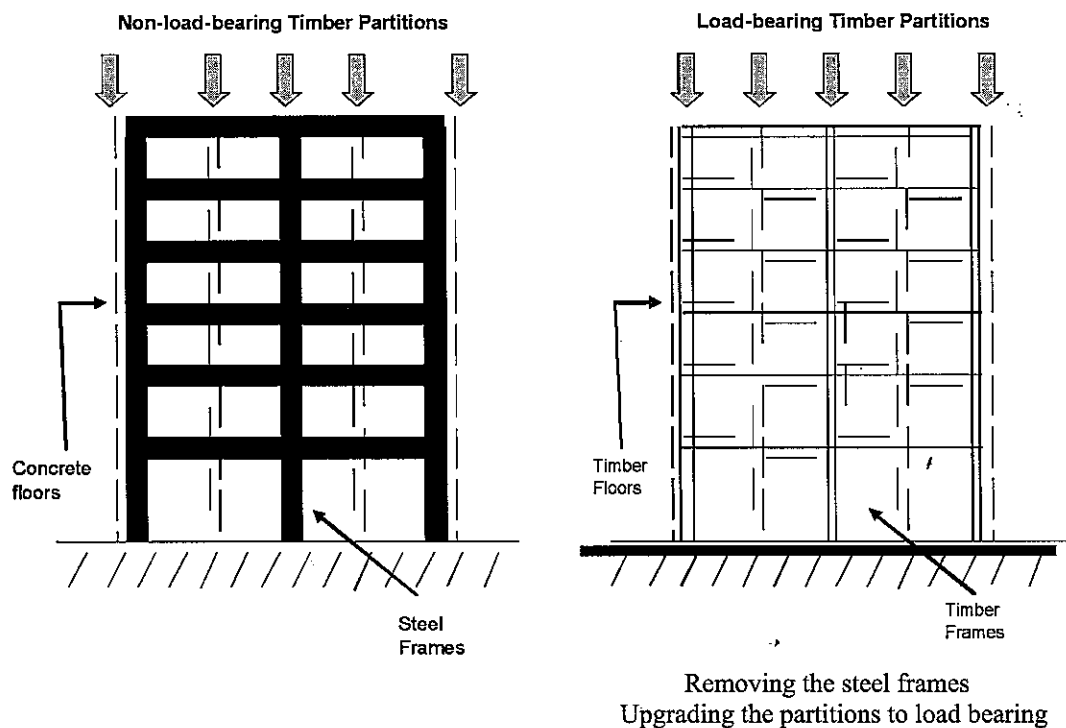
Timber has a high strength to weight ratio.

Light weight buildings require less structure to...

- Hold up the light weight floors – smaller beams
- Brace the building against lower seismic loads – less bracing, smaller frames
- Spread the load to the founding ground level – smaller foundations

Less structure means less cost

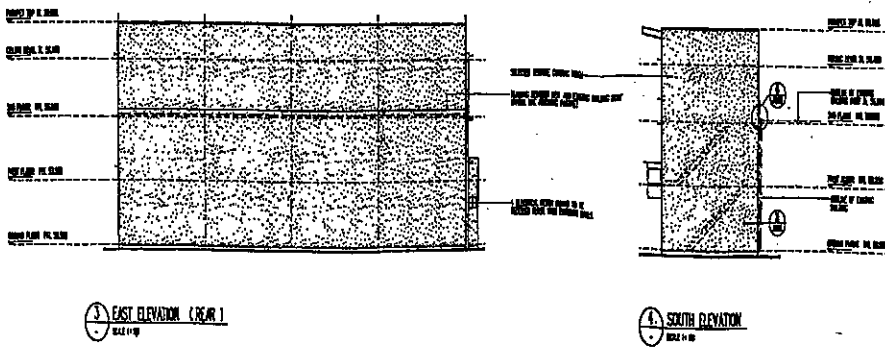
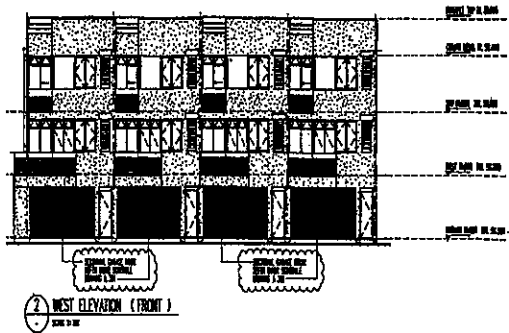
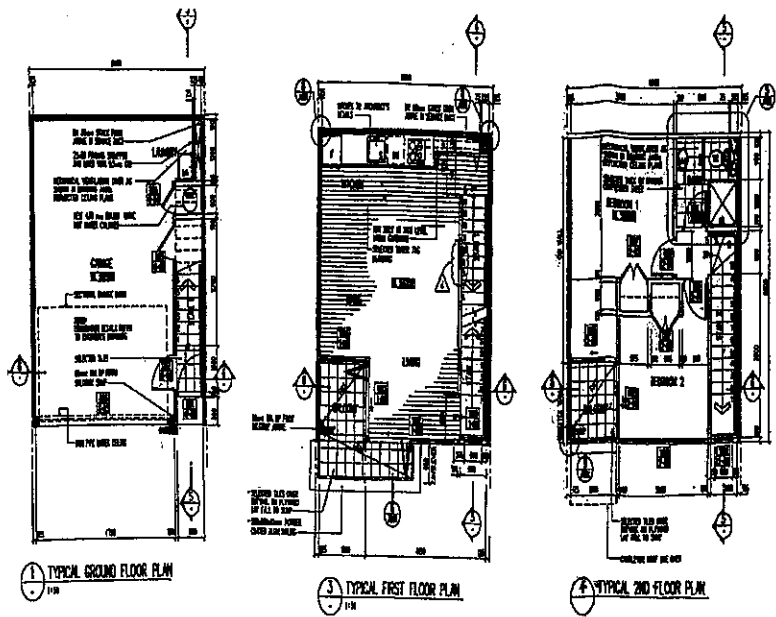
Consider the following two buildings:



- * Savings can be achieved by the removal of supporting structure by relying on load bearing timber partitions or by the reduction of supporting structure due to the light weight nature of timber.

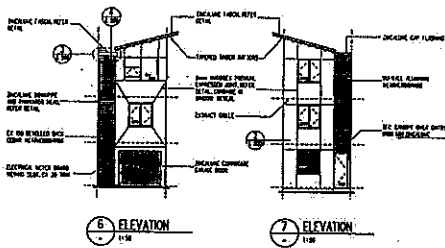
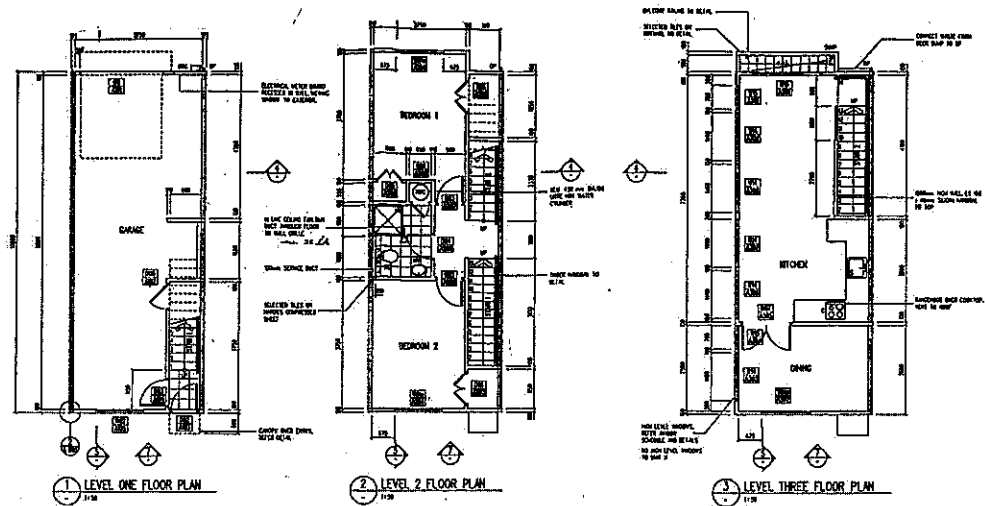
Buildings with many walls and up to 6 storeys in height, will suit construction in Timber

Terraced Housing



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<p>Helmas Consulting Group</p> <p>1/18</p>
<p>TYPICAL 3-STORY CONCRETE UNIT</p> <p>1 OF 50</p> <p>DATE: 2002 04 14</p> <p>SCALE: 1/18</p>
<p>PLANS & DETAILS</p> <p>35200-SK2 0</p>



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6	
TYPICAL 3-STORY CONCRETE UNIT	
1 of 50	
Scale:	1:50
Drawn by:	...
Checked by:	...
PLANS & DETAILS	
35200-SK14	0

Cost of components in terraced houses

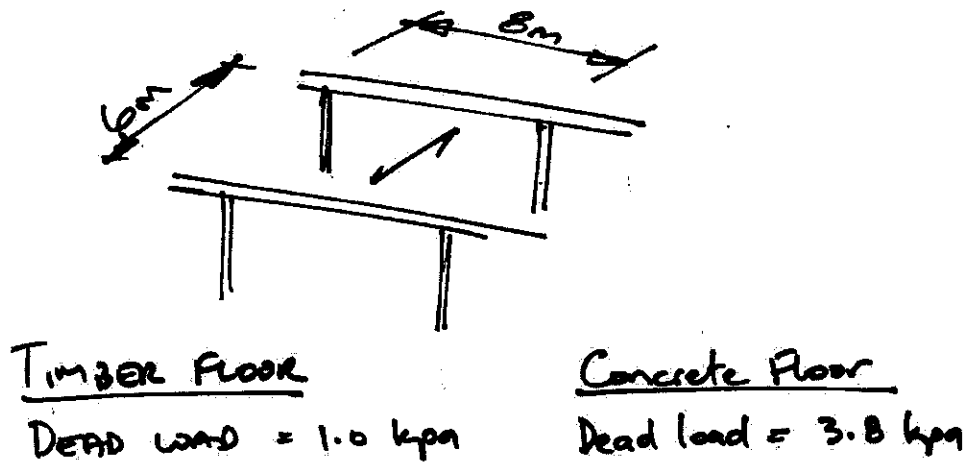
Load bearing timber framed walls, inc cladding or linings at around	\$130/m ²
125 Precast Concrete Panels at around	\$200/m ²
200 solid filled Block walls at around	\$150/m ²
Timber Floors, including acoustic treatment at around	\$150/m ²
Concrete Floors at around	\$150/m ²

When comparing the costs of components, only the walls show any real difference.

For buildings of this nature where there is a high wall area to floor area ratio, the **cost savings** between concrete tilt panel type construction and timber construction have been shown to be around **\$100/m²** when using timber.

Structure cost saving examples

Consider a floor spanning 6m, supported by beams spanning 8m:



Beam Design

Timber Floor

$$\begin{aligned} WG &= 1.0 \times 6 = 6.0 \text{ kN/m} \\ WQ &= 3.0 \times 6 = 18 \text{ kN/m} \\ W* 1.2G \ \& \ 1.5Q &= 34.2 \text{ kN/m} \\ M* 1.2G \ \& \ 1.5Q &= 273 \text{ kNm} \end{aligned}$$

⇒ 460UB67

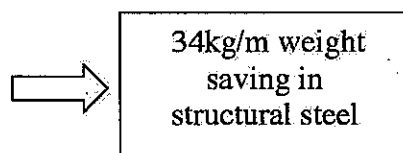
$$\begin{aligned} \varnothing Mb &= 302 \text{ kNm} \\ _G \ \& \ Q_s &= 11.9 \text{ mm} \end{aligned}$$

Concrete Floor

$$\begin{aligned} WG &= 3.8 \times 6 = 22.8 \text{ kN/m} \\ WQ &= 3.0 \times 6 = 18 \text{ kN/m} \\ W* 1.2G \ \& \ 1.5Q &= 54.4 \text{ kN/m} \\ M* 1.2G \ \& \ 1.5Q &= 435 \text{ kNm} \end{aligned}$$

⇒ 610UB101

$$\begin{aligned} \varnothing Mb &= 612 \text{ kNm} \\ _G \ \& \ Q_s &= 10.7 \text{ mm} \end{aligned}$$



Structural beam weight savings

In this example we have a 34kg/m weight saving in a structural steel beam.

At say \$5/kg this works out to an approximate saving of \$170/m.

With beams at 6m centres, this works out to a saving of \$28/m².

Over a 6 storey building with a 32m x 30m footprint this equates to a savings of around \$160K based on the weight savings of the beams alone.

Foundation savings

Based on the same 6 storey building with the 6m x 8m grid, there would be 30 pad footings.

Each footing would be 2.7m x 2.7m for the timber floor option, whilst the concrete floor option would need footings of 3.5m x 3.5m.

Assuming a constant footing thickness of 600mm, this equates to a saving of 89m³ of pad footing, at about \$1000/m³ results in foundation savings of around \$89K.

Lateral systems structural savings

Based on the same 6 storey building, the lateral system may be something like 2 full height shear walls in each direction of say 12m long each.

Cost of 200 thick concrete shear walls based on \$300/m ²	\$87K
Cost of 200 thick timber framed plywood shearwalls based on \$150/m ²	\$44K

This equates to a \$43K saving or a \$8/m² savings!

Total Cost Savings – 6 storey building

Based on the same 6 storey building with the 6m x 8m grid, the overall cost savings on a \$/m² basis is as follows:

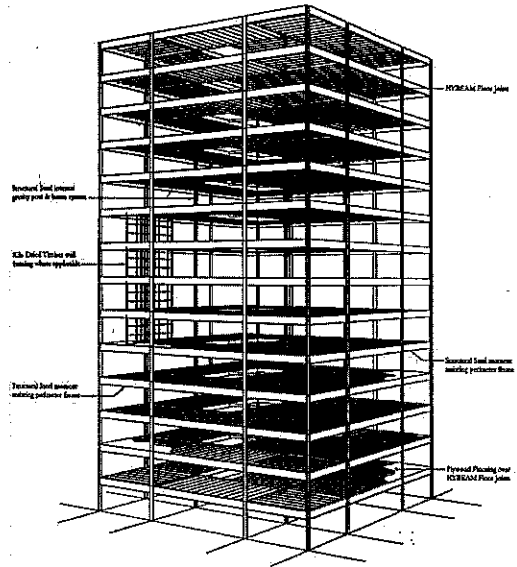
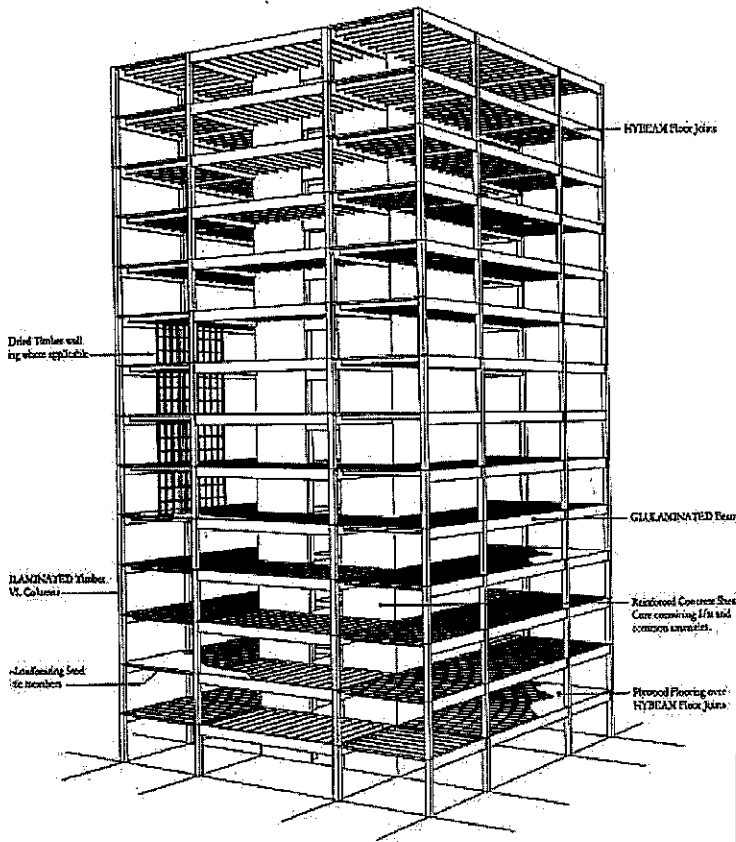
Floor beam weight savings	\$28/m ²
Foundation volume savings	\$16/m ²
Timber shear wall savings	\$8/m ²
Total savings/m²	\$52/m²

Total savings for the building: around \$300K.
Perhaps 5% of the total cost or 20% of the structure cost.

Examples of light weight buildings with significant timber components



Gulf View Towers, Auckland, 5 stories,
all light weight timber construction



Theoretical light weight building, multi-storey, steel frame, timber floors

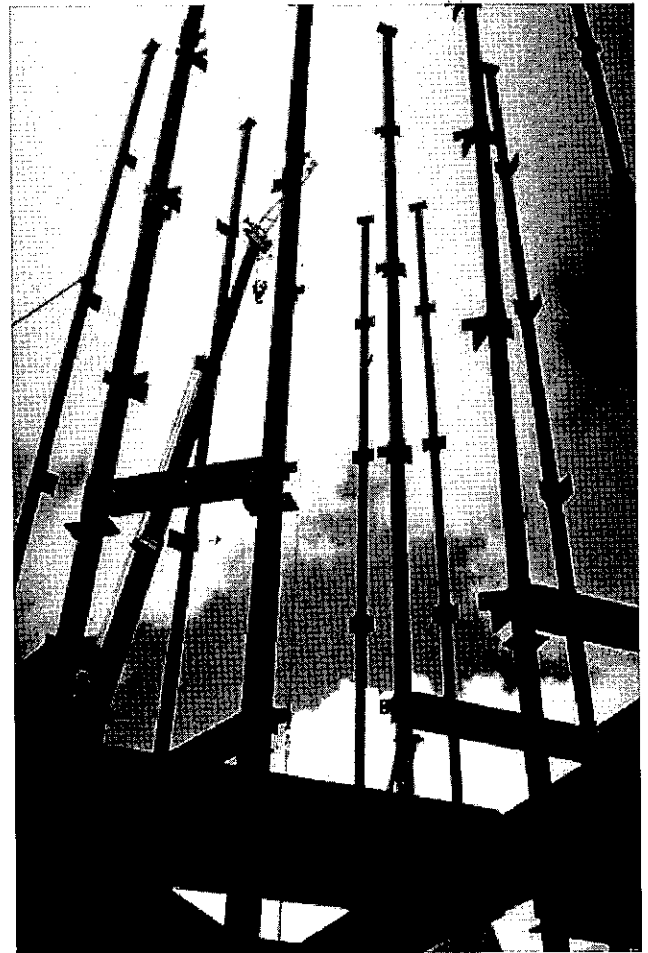
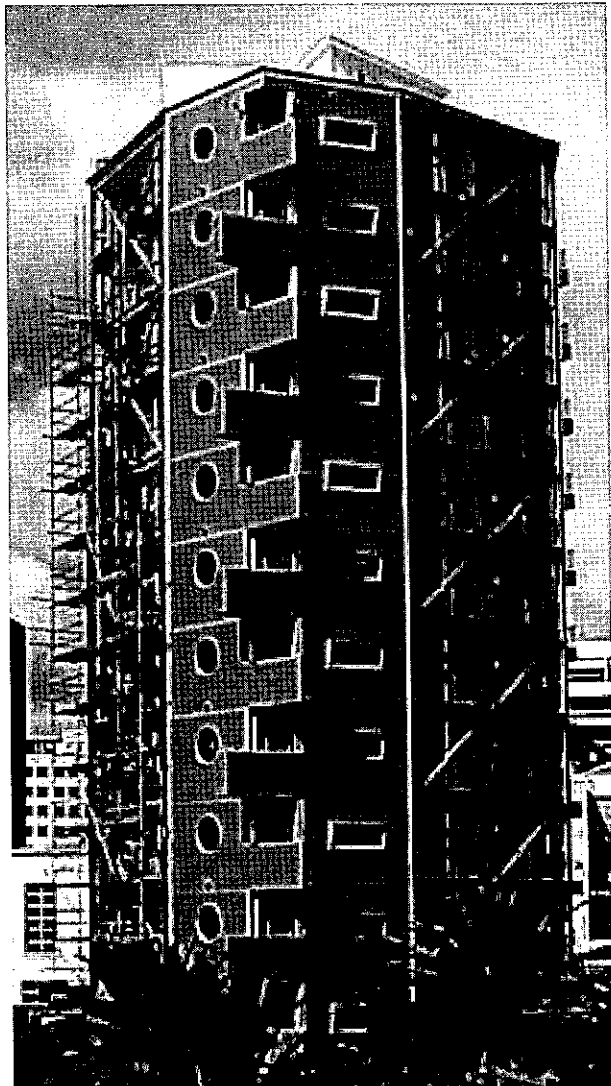
Theoretical light weight building, multi-storey, reinforced concrete shear core, light weight timber floors, columns and beams

Six storey addition to an existing building in Wellington utilising steel frames and light weight timber floors



Augustus Tce, Auckland, 5 storey, predominantly light weight timber construction.

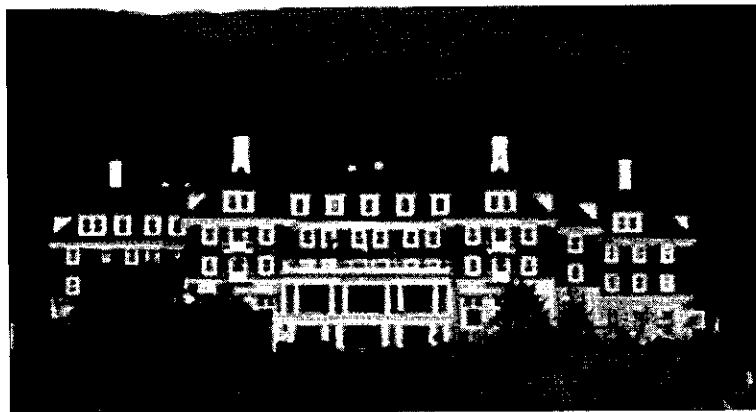




Scotia Place apartments, Auckland, multi-storey,
steel frame, light weight timber floors



Martin square apartments, 6 storeys, predominantly light weight timber construction



The Grand Chateau, Tongariro, 5 storey addition all light weight timber frame construction using off site modular construction techniques