



A PLATFORM FOR SUSTAINABLE BUILDINGS

CASE STUDY SHOWS TECBEAM CAN REDUCE EMBODIED ENERGY BY MORE THAN 75% WHEN COMPARED TO STEEL BEAMS OR OTHER ALTERNATIVES.

The redesign of a residential project in Melbourne¹ has created the opportunity to compare Tecbeam against other floor systems highlighting the savings in embodied energy and material costs.

Concrete Slab Replacement

When redesigning the first floor a Tecbeam beam and Hebel aerated concrete panel system was used to replace a suspended concrete slab. This resulted in a **78% reduction in embodied energy** for the entire first floor system. Significantly there was also a **52% reduction in material costs**.

Steel Beam Replacement

On the project's second floor, Tecbeam joists were used to replace the original steel beam design. In this case the **Tecbeam joists contained less than 15%² of the embodied energy of the steel beams they replaced** without reducing structural or other environmental performance. **The Tecbeam system was 45% cheaper** in material costs³. The total weight of the Tecbeam's was 80% less than their steel alternatives leading to further expected reduction in costs due to ease of handling.

Further environmental benefits are expected to accrue due to the ease with which Tecbeams can be recycled at the end of the project's life. **Up to 9 Green Star Credits are accessible utilising the properties of Tecbeam⁴.**

CONSTRUCTION OPPORTUNITIES

The residential and commercial building sector is entering a period of change as environmental and economic concerns including climate change, energy efficiency, resource depletion waste minimisation begin to enter the equation for new developments. These new imperatives are generally considered under the heading of 'sustainable building'.

Designs which achieve high environmental "star" ratings, "low emission" housing projects and other low impact developments are benefiting from the increasingly high priority placed on sustainability by consumers and government. Subsequently, designers and developers are becoming more critical of environmental performance of building materials and products.

A consequence of this is the recognition of timber for its ability to store carbon when used as a long term structural member, and also to avoid the CO2 emissions produced in the manufacture of other materials such as steel, concrete and aluminium.

Greater use of timber as a substitute for other materials is further assisted by the recent publication of the revised Multi Residential Timber Framing Code. Multi-dwelling construction is a market where timber frame is an attractive substitute for traditional concrete frame construction offering attractive cost and time savings to builders. It now has the potential for a further acceptance and adoption due to lower environmental impact.

The structural properties of Tecbeam offer builders a compelling alternative construction methodology in three to five storey infill development solutions. Tecbeam's key market has been in the replacement of steel beams with Tecbeam joists for multi storey and setback load-bearing applications. Its direct competitors cannot match its record of added value as a high structural capacity component within a timber frame design.

¹ Case study at Bay St Parkdale carried out by Tecbeam. **This study has been checked and verified by environmental consultants The Ark Climate Group (www.arkclimate.com).**

² 85% reduction

³ Further reduction in labour costs likely due to ease of handling but not measured in this case.

⁴ Green Star Rating System for Buildings – Multi Unit Residential Calculator V1 – see Appendix

APPENDIX

Bay Street Parkdale - Steel & Concrete Replacement with Tecbeam

OVERALL REPLACED ORIGINAL STRUCTURE	Area (m2)	Thickness (mm)	Weight Conc. (kg)	Weight Steel (kg)	Energy Conc. (MJ)	Energy Steel (MJ)	Total Energy (MJ)		
Concrete Slab	100	200	49,000	3,000	63,700	96,000	159,700		
Steel Beams	Length (m)								
1B1 – 250UB37	6.3			233.1		7,459			
1B2 – 310UB40	6.6			244.2		7,814			
1B9 – 180UB22	4.5			166.5		5,328			
1B18 – 200UB25	4.5			166.5		5,328			
1B19 – 200UB25	4.5			166.5		5,328			
							31,258		
						A	190,958		
TECBEAM REPLACEMENT	Total Length (m)	Area (m2)	Weight Timber (kg)	Volume Hebel (m3)	Weight Steel (kg)	Energy Timber (MJ)	Energy Hebel (MJ)	Energy Steel (MJ)	Total Energy (MJ)
First Floor Tecbeam	334		1,381		779	3,453		24,933	28,386
First Floor 75mm Hebel		100		8			7,538		7,538
Second Floor Tecbeam	52		213		120	532		3,840	4,372
								B	40,295
ENERGY SAVING (A-B)									150,663

Notes

200mm thick slab weighs 490kg/sq.m. @ 1.3MJ/kg
 Bondek Mesh incl bars - 30kg/sqm @ 32MJ/kg
 Particleboard- 13kg/m2 @ 8MJ/kg

Particleboard on Second Floor same in both cases

Second Floor framing originally called up as Tecbeam / Posi Struts spanning to steel beams.

Only additional lengths of Tecbeam required to delete steel beams are calculated above.

Floor joists that remained constant in both before and after designs are not included in savings calculations

1B1 – 250UB37	6.3 m replaced with 20m TECBEAM
1B2 – 310UB40	6.6m replaced with 18m TECBEAM
1B9 – 180UB22	4.5m replaced with 4.5m TECBEAM
1B18 – 200UB25	4.5m replaced with 4.5m TECBEAM
1B19 – 200UB25	4.5m replaced with 4.5m TECBEAM

Energy Coefficients⁵

Embodied Energy Coefficients

Material	MJ/kg	MJ/m3
Fibreglass Insulation	30.3	970
Wool insulation (recycled)	14.6	139
Polystyrene	117	2340
Softwood timber, kiln dried dressed	2.5	1380
Particle board	8.0	4400
Precast Concrete	2.0	2780
Clay Brick	2.5	5170
Steel	32.0	251200
Concrete (30 Mpa)	1.3	3180
Cement mortar	2.0	3200
*Hebel Supercrcrete AAC	2.1	1005

⁵ Source:

Centre for Building Performance Research
 University of Victoria, Wellington, NZ
www.vuw.ac.nz/cbpr/

Green Star Points Available⁶

Category	Credit	Points Available
Indoor Environmental Quality	Formaldehyde Minimisation - where all engineered wood products ... contain no formaldehyde.	1
Materials	Concrete - Reduction of embodied energy and resource depletion occurring through use of concrete (aerated).	2
	Sustainable Timber - FSC timber	2
	Disassembly - 50% (by area) of structural framing and roofing	1
	Dematerialisation - >10% less steel	2
	Flooring - reduced environmental impact	1
TOTAL		9

⁶ GBCA Multi Unit Residential Calculator V1