Joint International Symposium

ON

Wood Composites & Veneer Processing And Products

April 5th -- 7th 2011

Seattle Washington

USA.

Innovative LVL Applications In Commercial and Multi-Storey Buildings.

Presented by Murray G. Sturgeon and
Co Authored By Andy Van Houtte
Nelson Pine Industries Ltd.
April 5th 2011.

Nelson Pine Industries Ltd.
Richmond
New Zealand

Abstract

Since Laminated Veneer Lumber (LVL) appeared commercially in the 70s it has made significant inroads into the residential framing market. It has substituted sawn timber in high strength structural applications such as lintels/headers and flanges in floor I-beams allowing for more open plan structures to be built. In the quest for new markets Nelson Pine Industries has invested in new building technology that allows its economical use in commercial and multi-story buildings displacing steel and concrete.

Nelson Pine Industries, along with other industry partners, have funded a research consortium; Structural Timber Innovation Company (STIC) that is researching low to medium rise multi storey buildings, composite commercial flooring systems and large span single storey warehouses. Nelson Pine Industries has been instrumental in implementing this technology over the last three years as the building technology is developed.

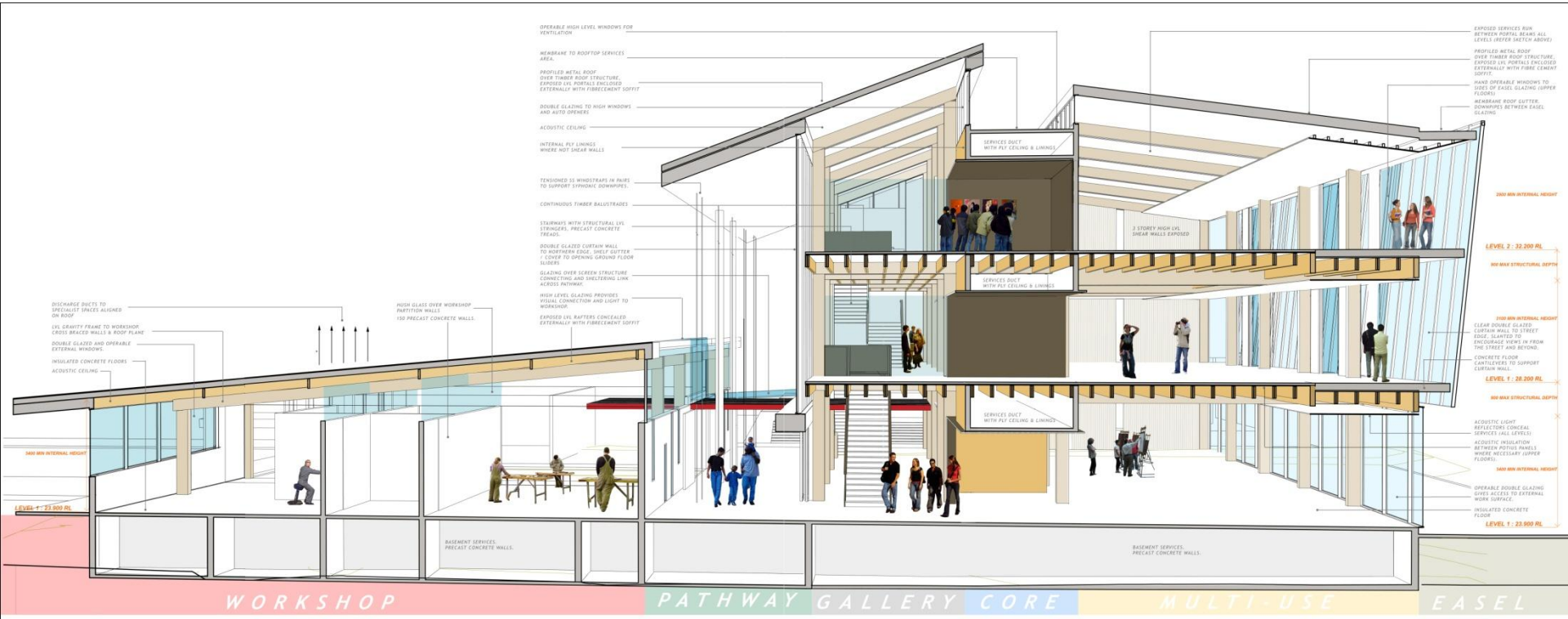
A milestone in this technology development is the completion of the School of Arts and Media buildings at the Nelson Marlborough Institute of Technology (NMIT) in December 2010. This three storey commercial buildings utilises a secondary laminated LVL post and beam structure with an composite long span LVL floor system and a post tensioned LVL lateral load shear wall designed to dissipate energy and self right in a high load environment such as an earthquake. The elastic system eliminates damage from the main structural components and absorbs lateral energy through dissipaters.

Why LVL in Commercial Applications?

- New design techniques allow for damage avoidance rather than controlled failure of structural systems
- LVL has twice the strength to weight ratio of steel
- Light weight components reduce seismic mass
- Compression strength that is equivalent to a high performance concrete
- Large section sizes and long lengths are readily available
- Prefabricated and fast to erect
- Full strength bolted connections for portal knees
- New connection technology with post tensioning cables
- Seismic energy dissipation
- Natural and renewable material
- Inherent fire resistance due to char rating
- Durability in corrosive and aggressive environments
- Carbon sequestering

Design Brief

- Creating an open, light environment, perfect for inspiring creative minds
- Environmentally friendly using minimal energy intensive LVL and sequestering carbon for the life time of the material



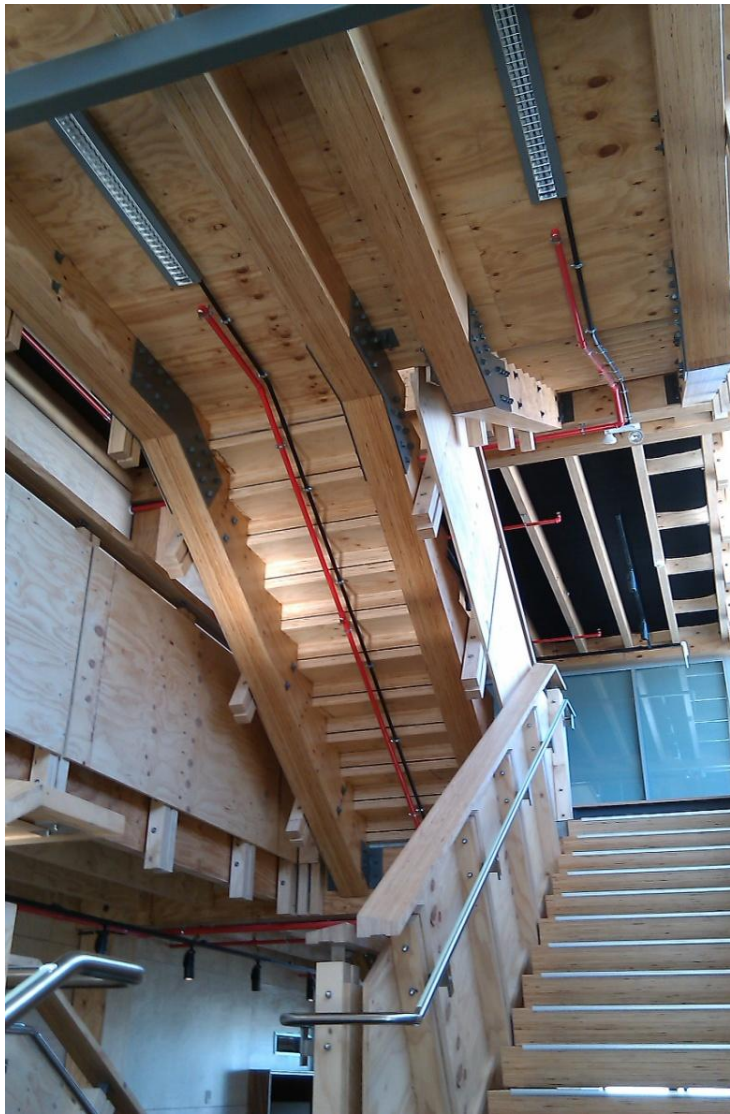
NMIT Building
Nelson New Zealand

NMIT Building
Nelson New Zealand

Key Elements of Design

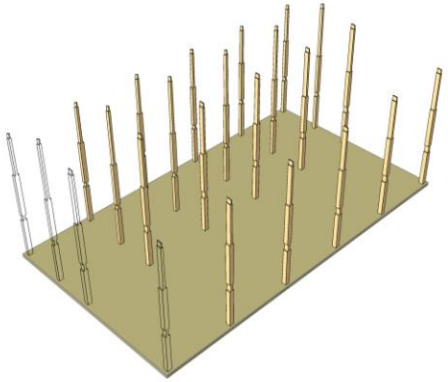
- Exposed LVL design to showcase new technology
- Elastic, self centring, energy dissipating LVL lateral load resisting system
- LVL concrete topped stress skin floor panels
- Post tensioned LVL shear walls

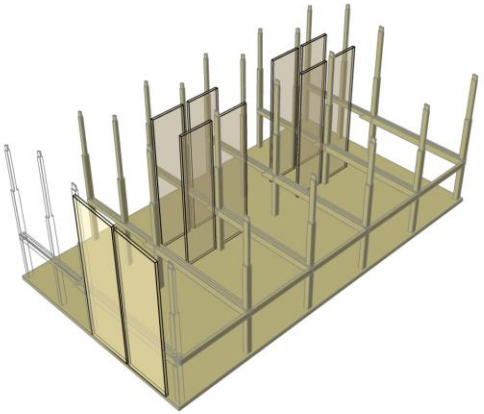
Exposed LVL used on the NMIT Building



Building Sequence

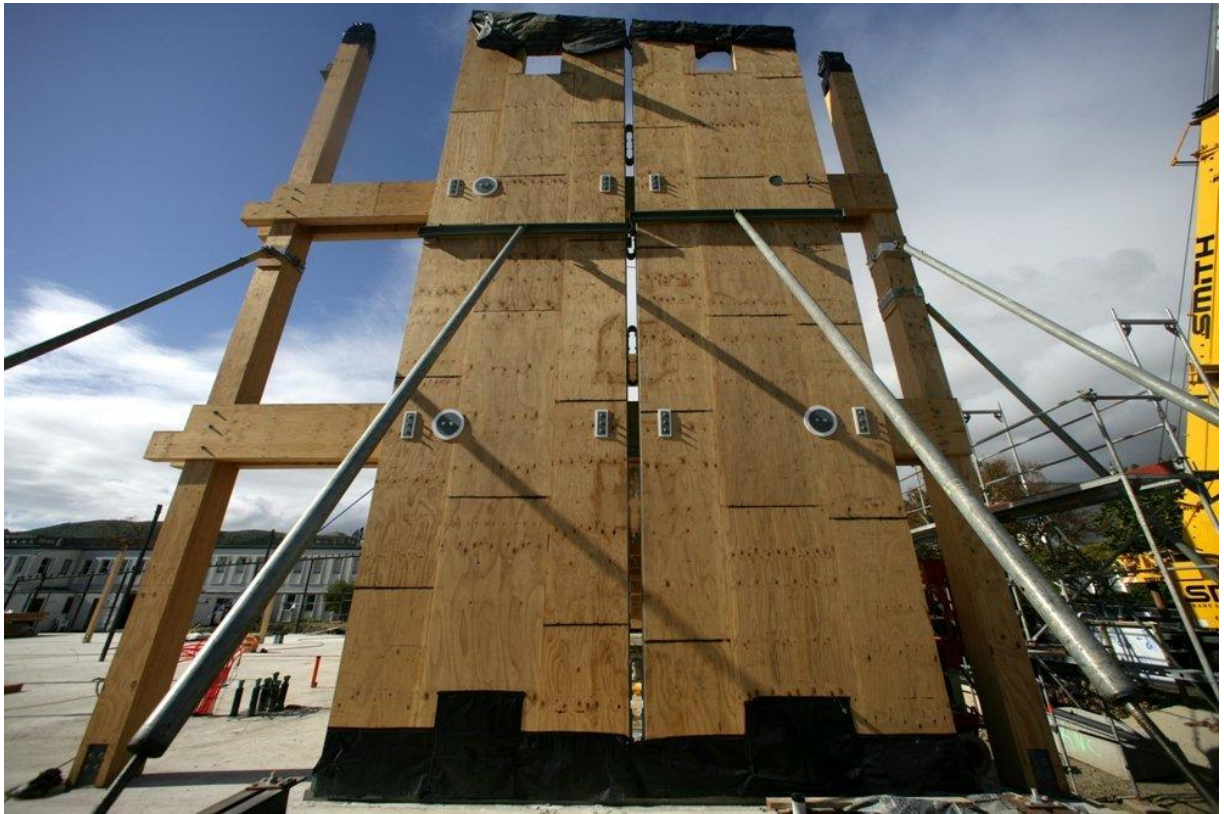
- Gravity frame erected
- Shear walls attached
- 400x400 main columns
- Double 600x63 main floor beams





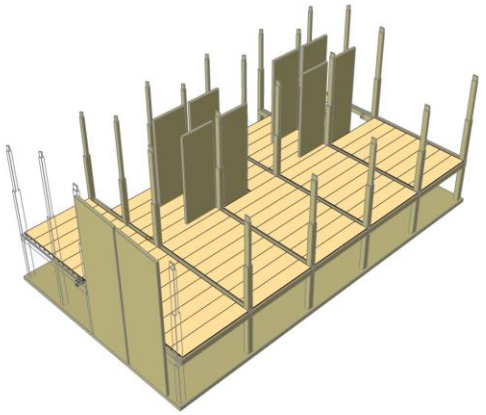
Lateral Resistance Shear Walls

- 3.0 x 14.4m hollow shear walls
- Post tensioned to the foundations to provide self centering and elasticity deformation under earthquake and wind loading
- Sacrificial energy dissipaters



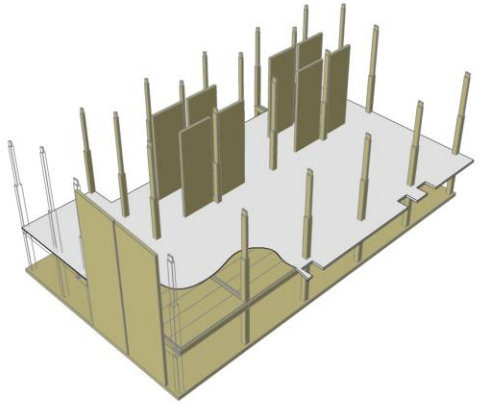
Energy Dissipating LVL Lateral Load Resisting System

Building Sequence Contd.



- Floor systems installed
  - Stress skin panel structural design
  - 36mm crossbanded floor skin
  - 90mm joists for fire resistance

- Concrete topping on floor system poured
  - 75mm concrete topping for thermal mass storage, acoustical separation between floors, dynamic dampening, floor performance



Composite Floor Systems

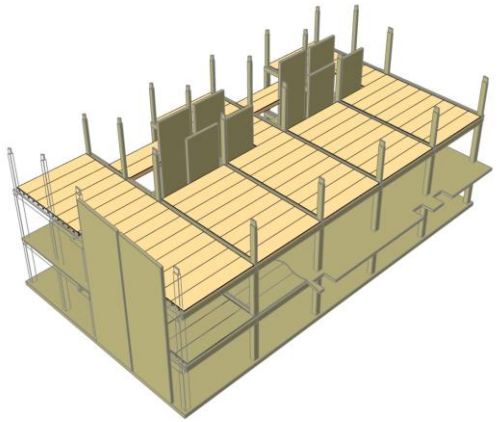
- 8.0m span
- Flange hung for aesthetics

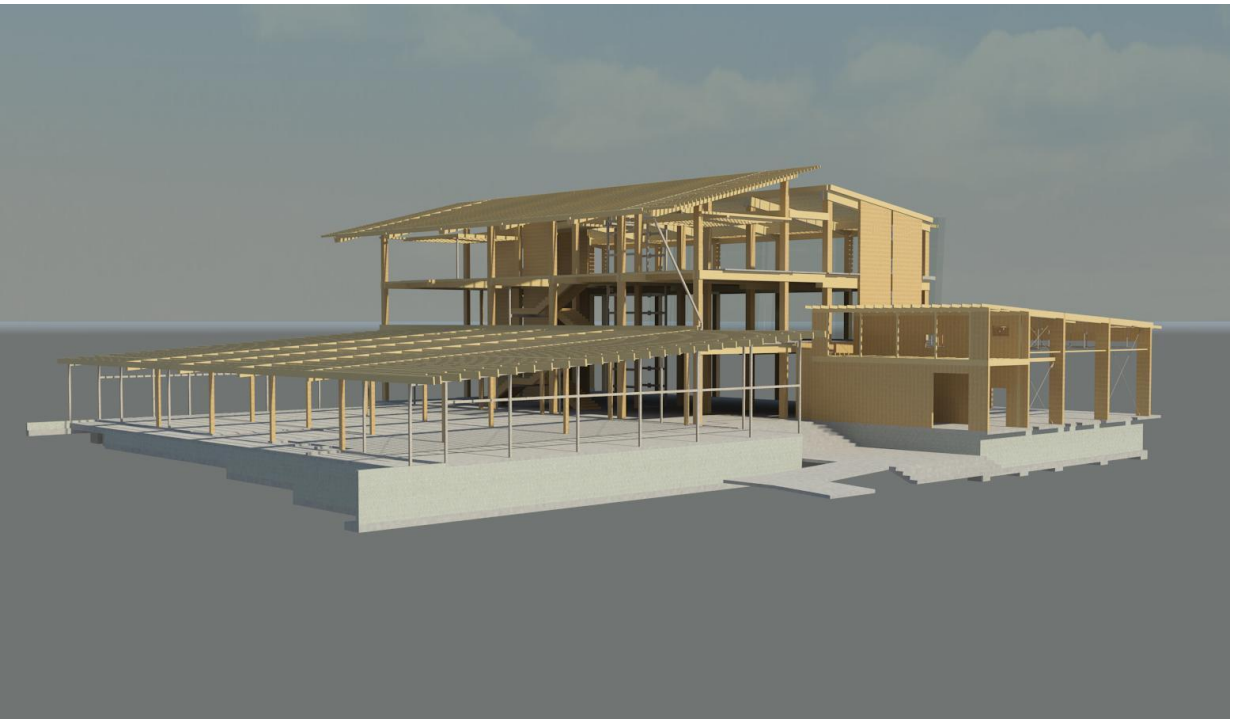
Composite Floor Systems

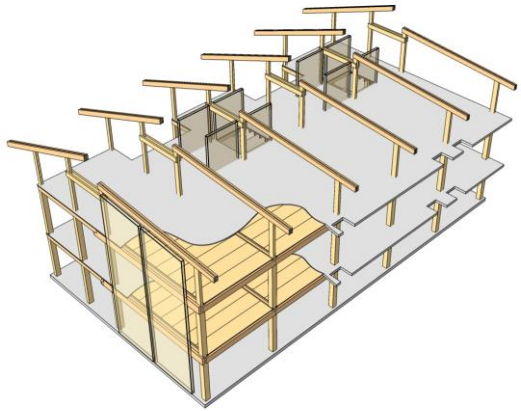
- Henley Homes Australia
- NMIT
- Potius panels for residential buildings

Building Sequence Contd.

- Roof and cladding installed
- Services and stairwell completed
- Furnished

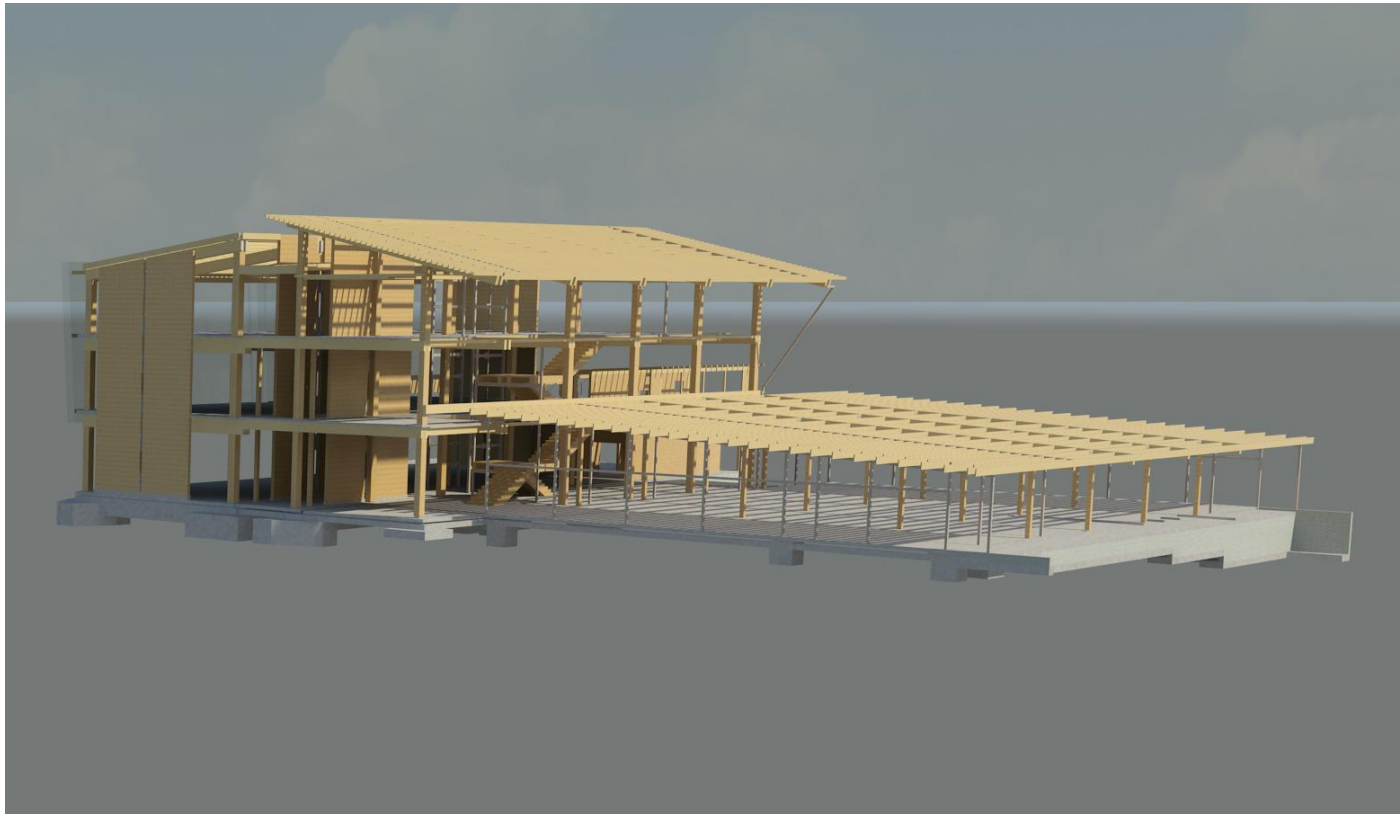






Key Building Statistics

- 400m3 of LVL
- 3000m2 of floor area
- USD7.0 build budget
- Iconic LVL building



LVL Construction Benefits

- Speed of erection
- Smaller cranes required and less crane movement
- Cleaner work environment
- Easier to adapt components onsite
- Easy to install services

Long Span Roof Systems

- Nelson Pine Industries warehouse
  - 64m portal with central column, 12,000m2
- ITM Hastings moulder building
  - 36m clear span roof system, 8,000m2

NelsonPine LVL Innovation

- 400m3 supplied for the NMIT building
- All LVL is LVL 11 grade.
- 36mm thick crossbanded LVL for 8.0m floors
- 90mm thick LVL joists for fire performance
- 63 and 45mm thick supplied in 14.4m lengths for gravity frame and shear walls

NelsonPine®
Laminated Veneer Lumber LVL

Waitomo Caves Visitors Centre

NZ Timber Design Awards winner of the Commercial Engineering and Architectural Excellence

- 32m span,
- Segment of a 128m diameter donut in shape
- Cladded in inflatable ETFE (Beijing National Aquatics Centre)

Summary Of Conclusion

- We have demonstrated that LVL is suitable for Commercial Applications.
- LVL is an ideal substitution for Steel and Concrete.
- LVL Cost $1800 M3 Erected Vs Steel $2500 Tonne At NPIL Warehouse.
- LVL is Manufactured from a Renewable Resource.
- Buildings can be Erected Faster when compared to Existing Methods.
- Building Sites are Safer using LVL on Erection.
- LVL allows Engineers & Designers to be More Innovative.

THANK YOU