Canterbury Earthquakes Royal Commission

Commentary on Professor Charleson's presentation on

Architectural Implications of New Seismic Resistant Design Technologies

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on behalf of
New Zealand Institute of Architects

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General Observations

1. New technologies are applicable to engineered buildings only

2. Forms of the new technologies are very similar to those of conventional structural systems

3. The amount of structure required by new technologies is very similar to that of conventional structure

4 Seismic design requirements need not lessen architectural quality

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Key Architectural Issues; Aesthetics

- seismic resistant systems can either be concealed or exposed

- new technologies in seismic resistant design don't really change the decision whether these systems are concealed or exposed.

however;

- exposed structure can positively contribute to the architectural quality of a building

- exposed new building technologies can have educational benefits

- exposed structure can be beneficial for inspections after an earthquake event and maintenance

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- there is a rich architectural history in Christchurch with using the exposed structure of a building as an integral part of the building architecture

Key Architectural Issues; Materials

- traditional seismic resistant systems in larger buildings generally have been constructed in concrete or steel

- new technologies in seismic resistant design have been developed in concrete and steel, but timber technologies now also exist.

- the decision on what system to use in generally comes down to;
    - economics
    - speed of construction
    - contractor or engineer preference due to historical use
    - aesthetics / architectural

- from the architectural perspective there is no material which is preferred over any other

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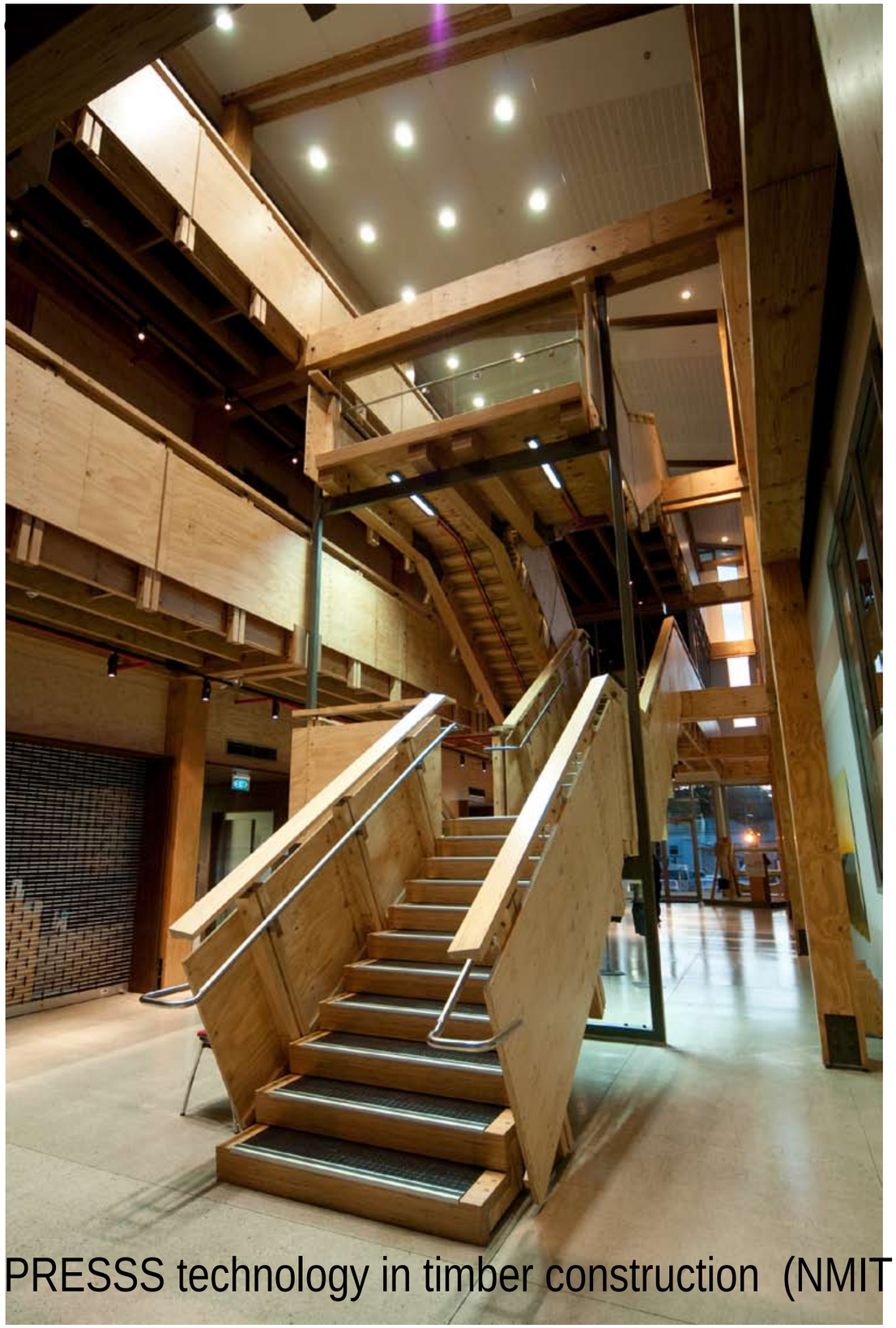
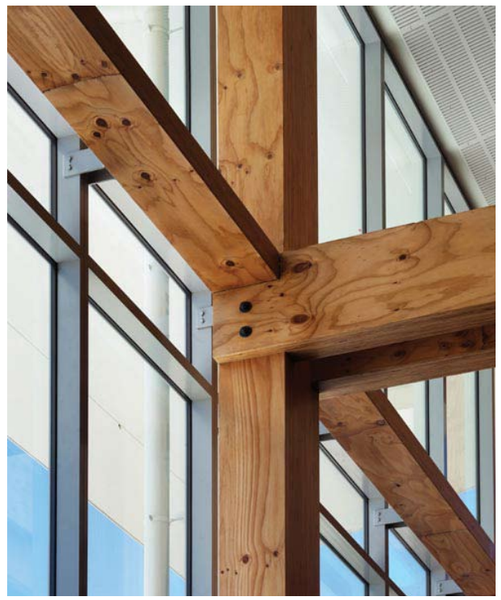
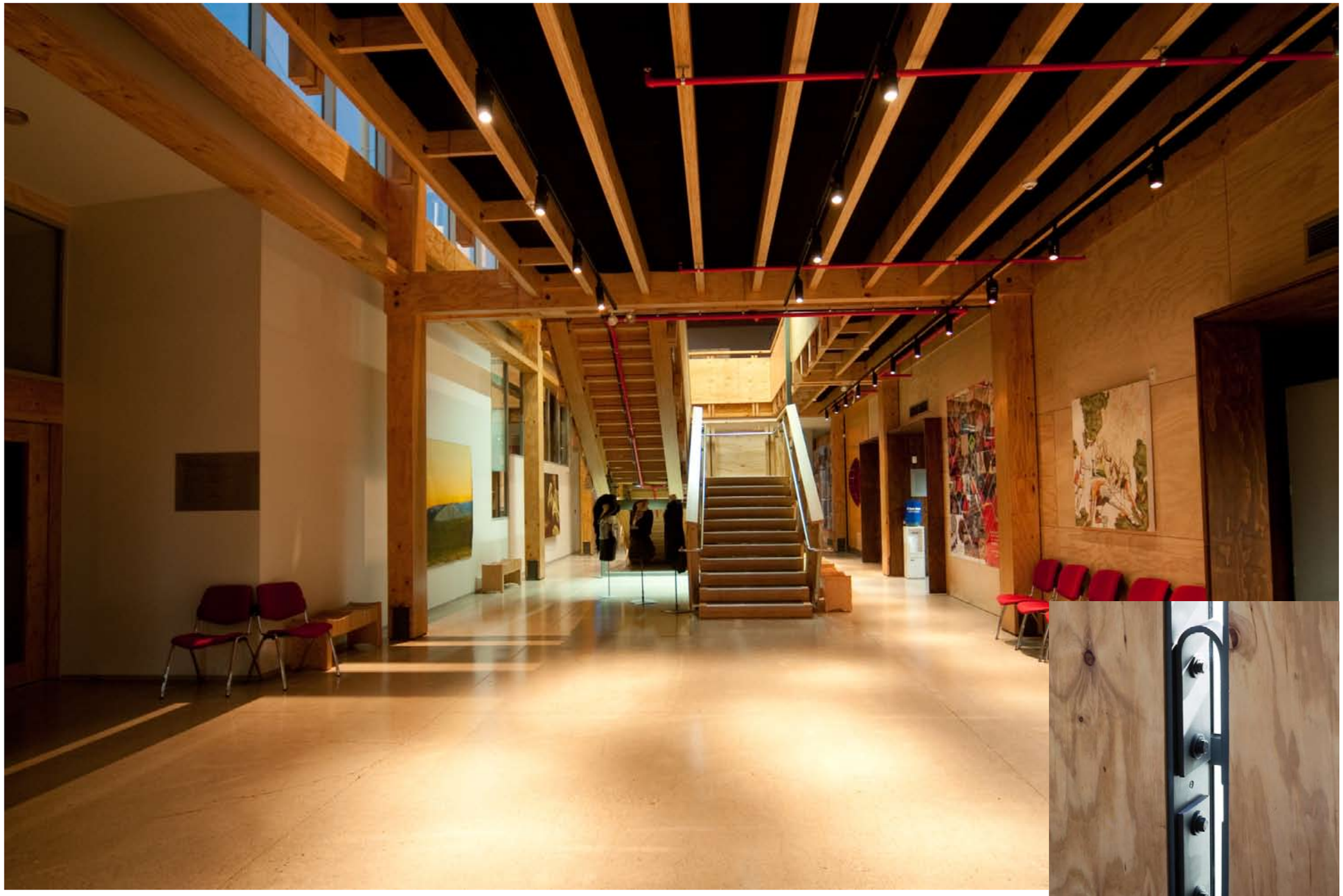
PRESSS technology in precast concrete (Alan MacDiarmid Building Wellington)





PRESSS technology in timber construction (NMIT building, Nelson)



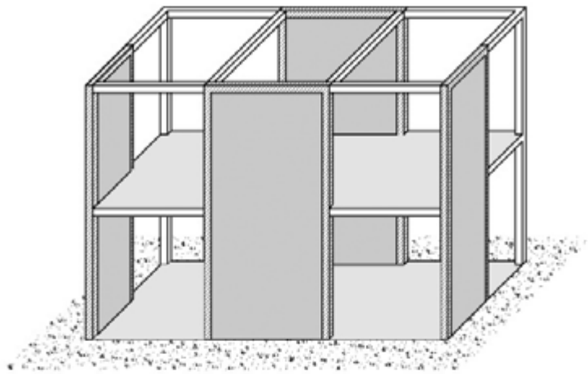
Key Architectural Issues; **Spatial Planning & Function**

- lateral resisting structural systems;

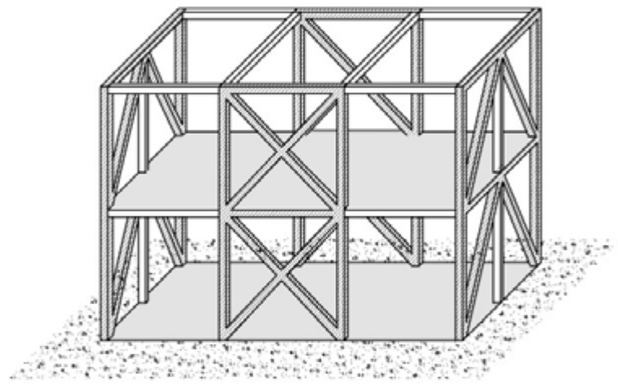
  - **shear walls**; generally the least flexible in respect to planning & service reticulation
  - **cross bracing & k-frames**; difficult to deal with diagonals with intersections with partitions and services and interrupts views
  - **moment frames**; provides the greatest degree of flexibility and openness

- new technologies in seismic resistant design use all these systems but these neither markedly improve or lessen the advantages or disadvantages of each system

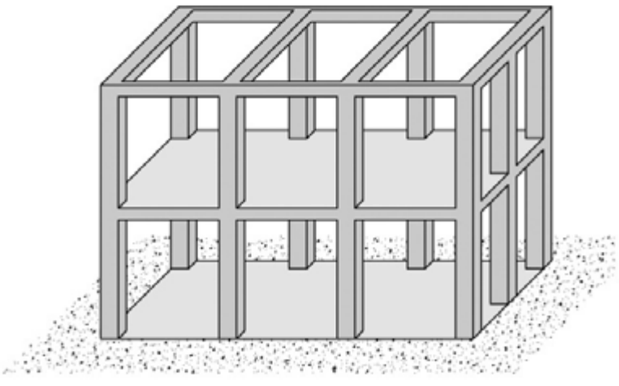
- however one issue is that due the increased level of movement with the new technologies, the junctions with non-load bearing partitions and ceilings tend to be more difficult to detail



(a) Shear walls



(b) Braced frames



(c) Moment frames

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Architectural Issues; Spatial Planning & Function

seismic resisting structure still a challenge for architects; k-bracing / cross bracing

k-bracing / cross bracing - used as a positive architectural element

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k-bracing / cross bracing - used as a positive architectural element

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Architectural Issues; Secondary Building Elements

- there are a number of lessons from the Canterbury earthquakes, outside of the primary structure, which need to be addressed with new building technologies going forward

- in parallel with new seismic resistant technology of the primary structure, new building technologies are needed to address the following secondary building elements;

  - fire stairs
  - partitions
  - access to structural connections

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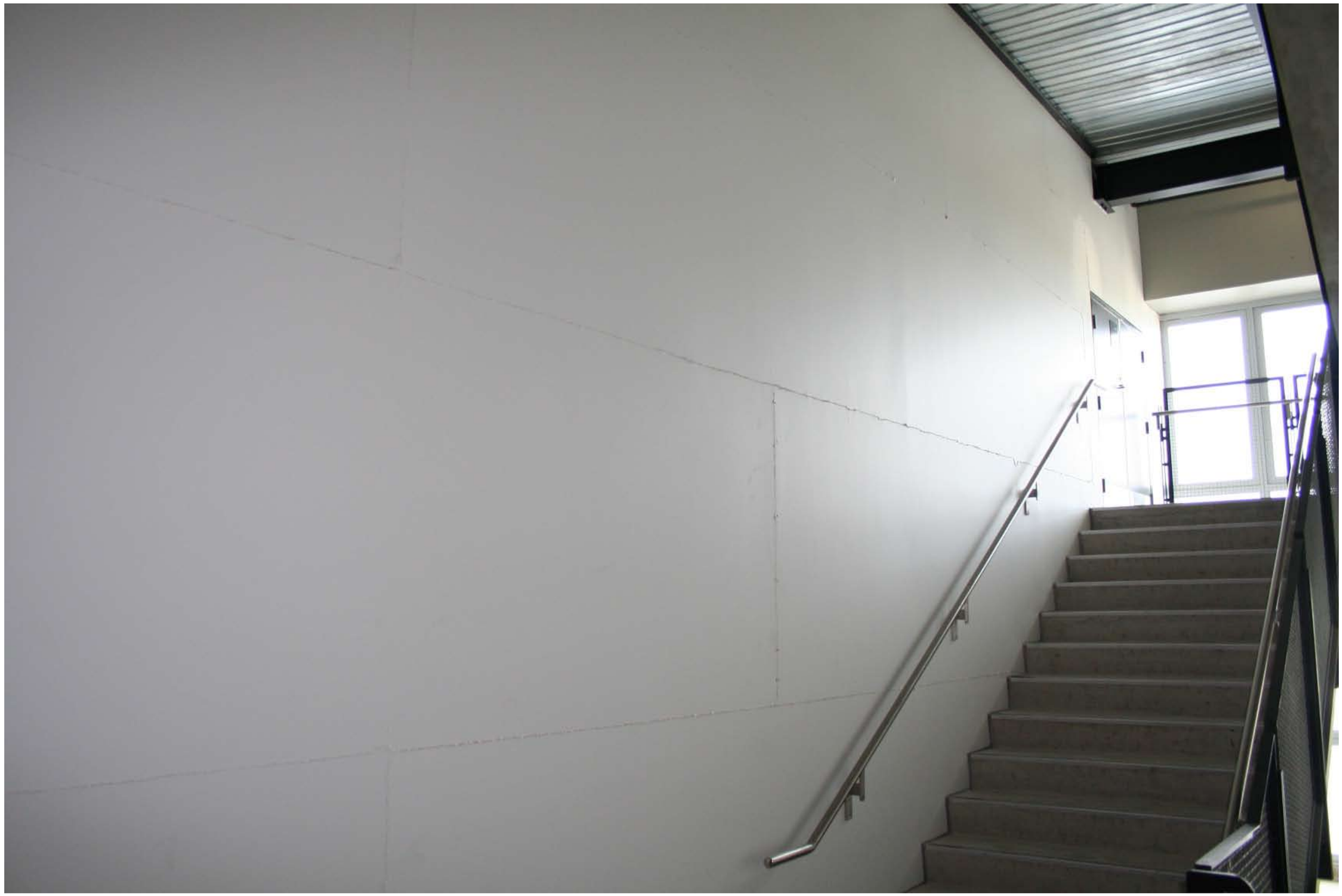

fire egress stairs - ensure resilience of linings

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ease of inspections of structural connections

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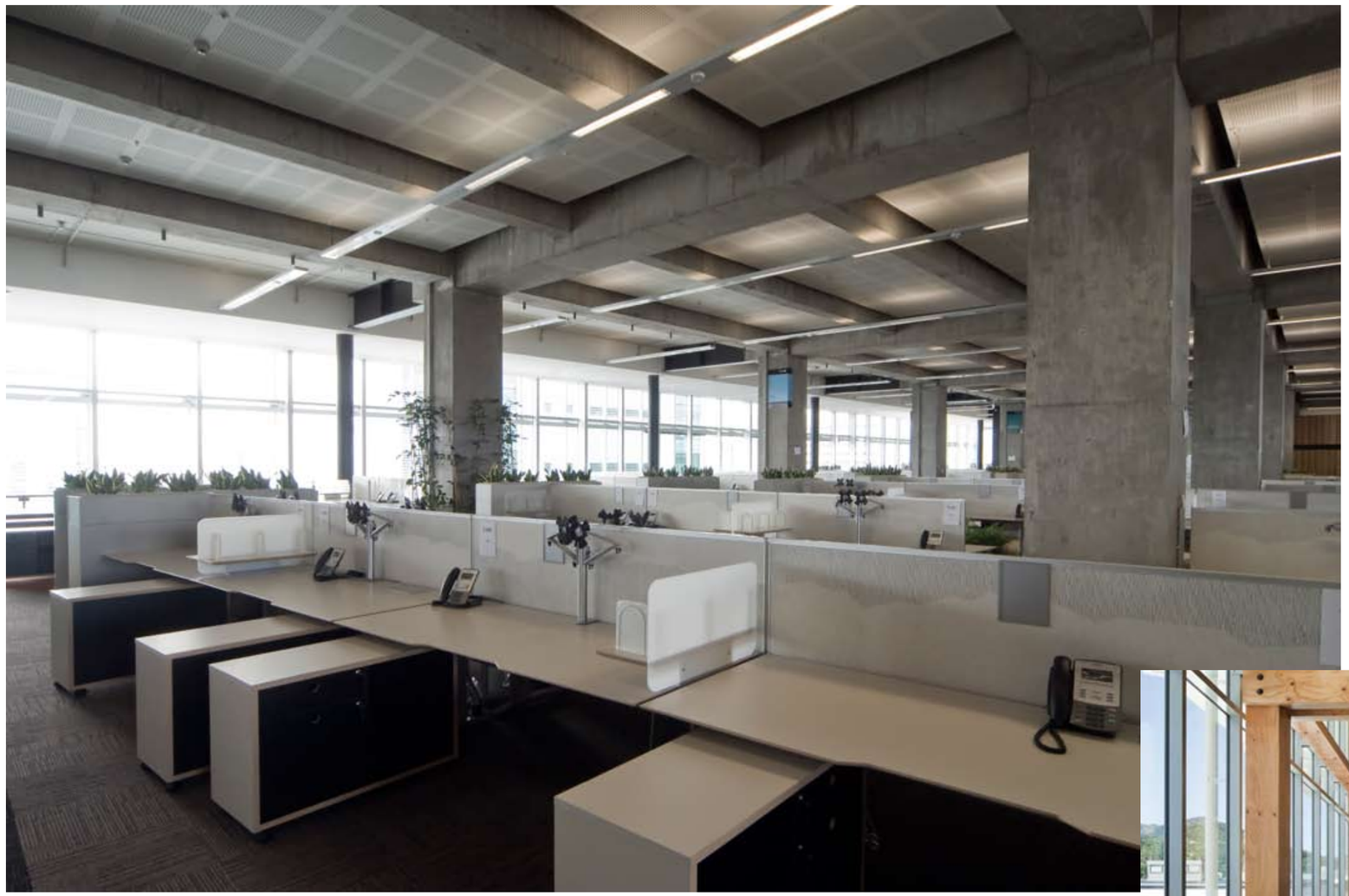

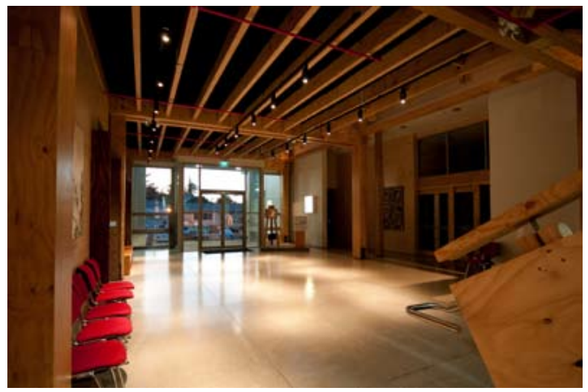

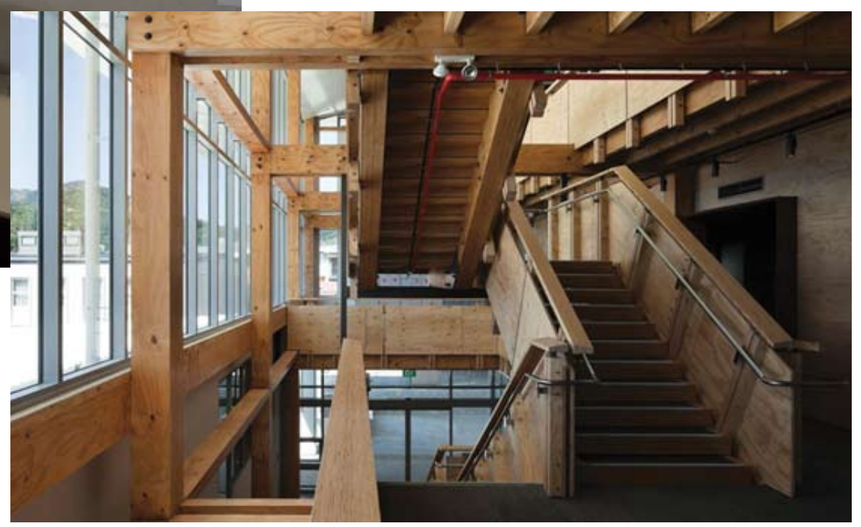

exposed structure provides ease of inspections of structural connections

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damage to interior partitions - additional movement joints required in secondary elements

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case study; massey university wellington - college of creative arts

athfield architects ltd

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LVL timber post tensioned frame - a world first for multi-storey construction

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LVL timber post tensioned frame - a world first for multi-storey construction

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prefabricated combination timber / concrete floor units

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Summary

The introduction of new technologies into mainstream design & construction practice is expected to have very few significant architectural implications

The challenge for architects is to work closely with the engineering community and create buildings which positively embrace these new technologies