Canterbury Earthquakes
Royal Commission

Architectural Implications of New Technologies

(in seismic resistant design)

by

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Introduction

1. General observations about the new technologies
2. Identify relevant architectural issues
3. Consider the implications of new technologies on architectural issues

General observations

1. The new technologies are applicable to engineered buildings only

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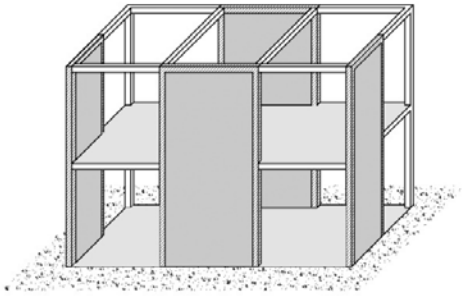
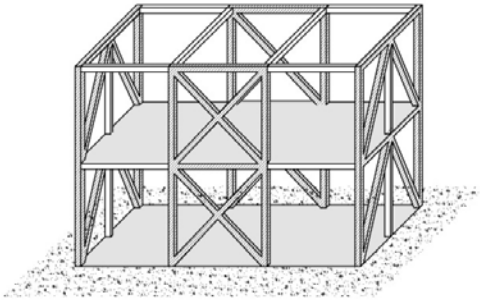
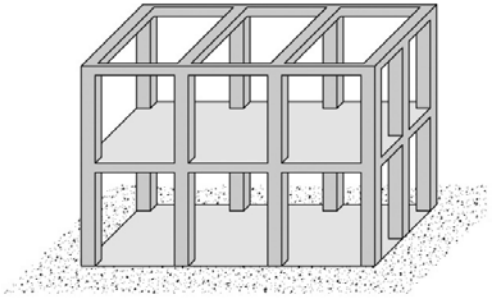
2. The forms of the new technologies are very similar to those of conventional structural systems



(a) Shear walls

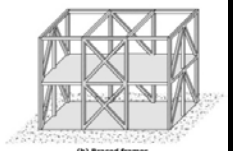


(b) Braced frames

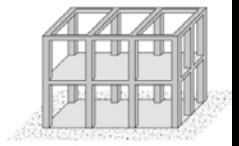


(c) Moment frames

(a) Shear walls

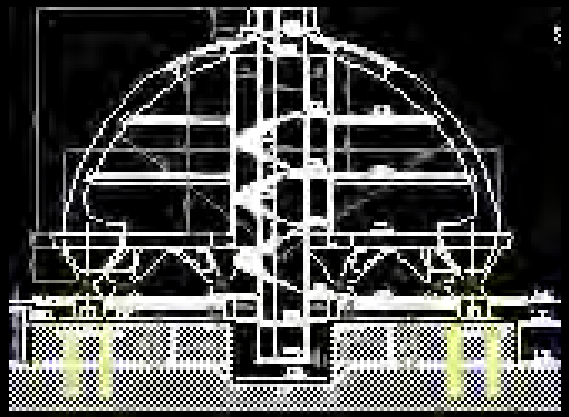


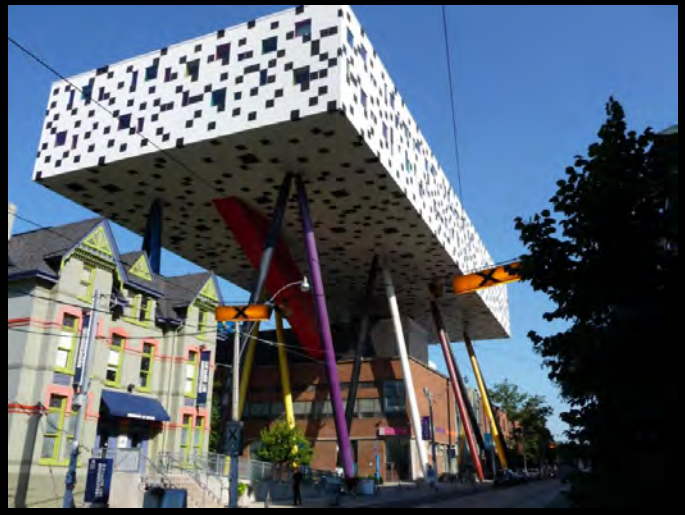
(b) Braced frames



(c) Moment frames

Photographer: Robert Canfield

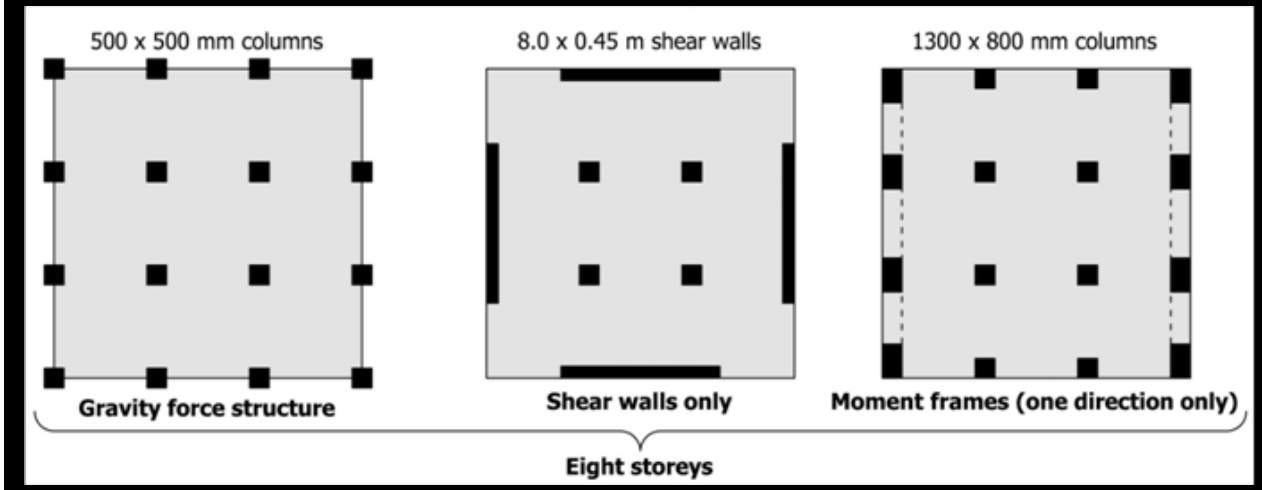


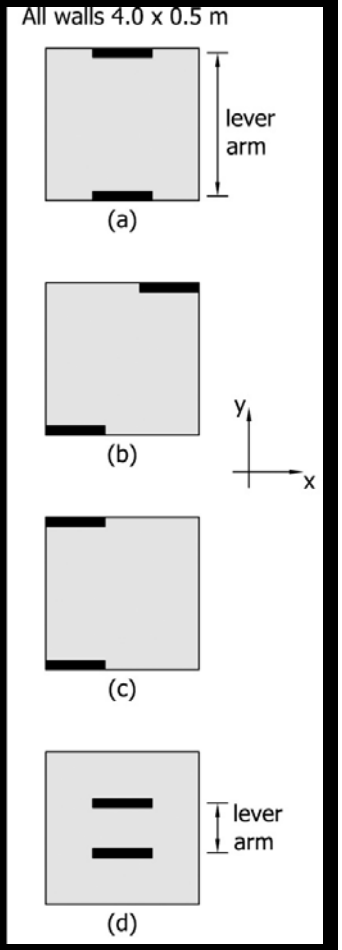


General observations

1. The new technologies are applicable to engineered buildings only
2. The forms of the new technologies are very similar to those of conventional structural systems
3. Amount of structure required by new technologies is very similar to that of conventional structure

No significant change. Seismic resisting structure still has serious implications for architects.





General observations

1. The new technologies are applicable to engineered buildings only
2. The forms of the new technologies are very similar to those of conventional structural systems
3. 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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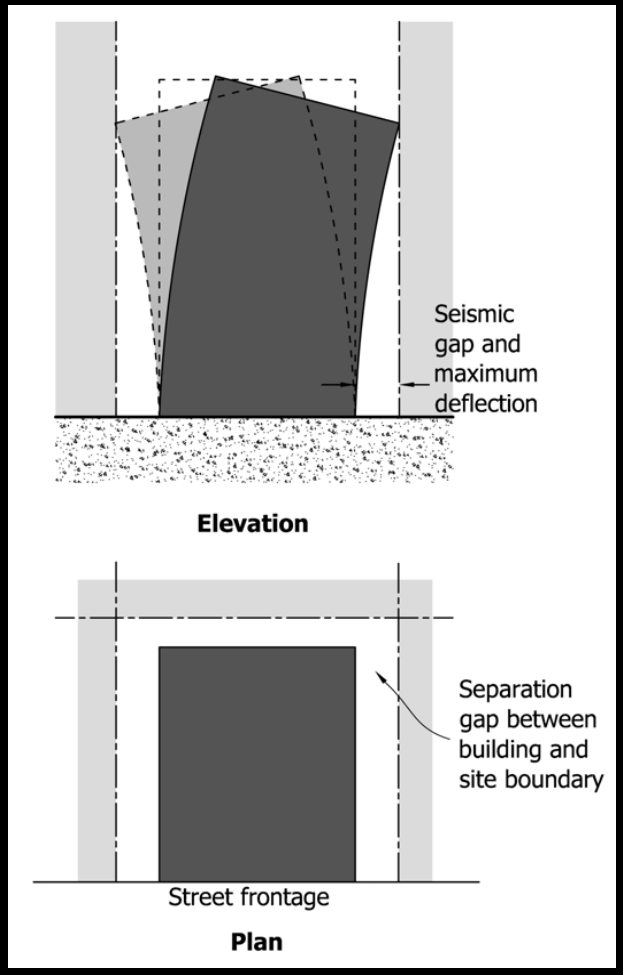
Architectural issues

Siting
Spatial planning and function
Integration with other technologies
Aesthetics (exterior and interior fitout)
Materiality
Costs
Other

Siting


Seismic gap and maximum deflection
Elevation
Separation gap between building and site boundary
Street frontage
Plan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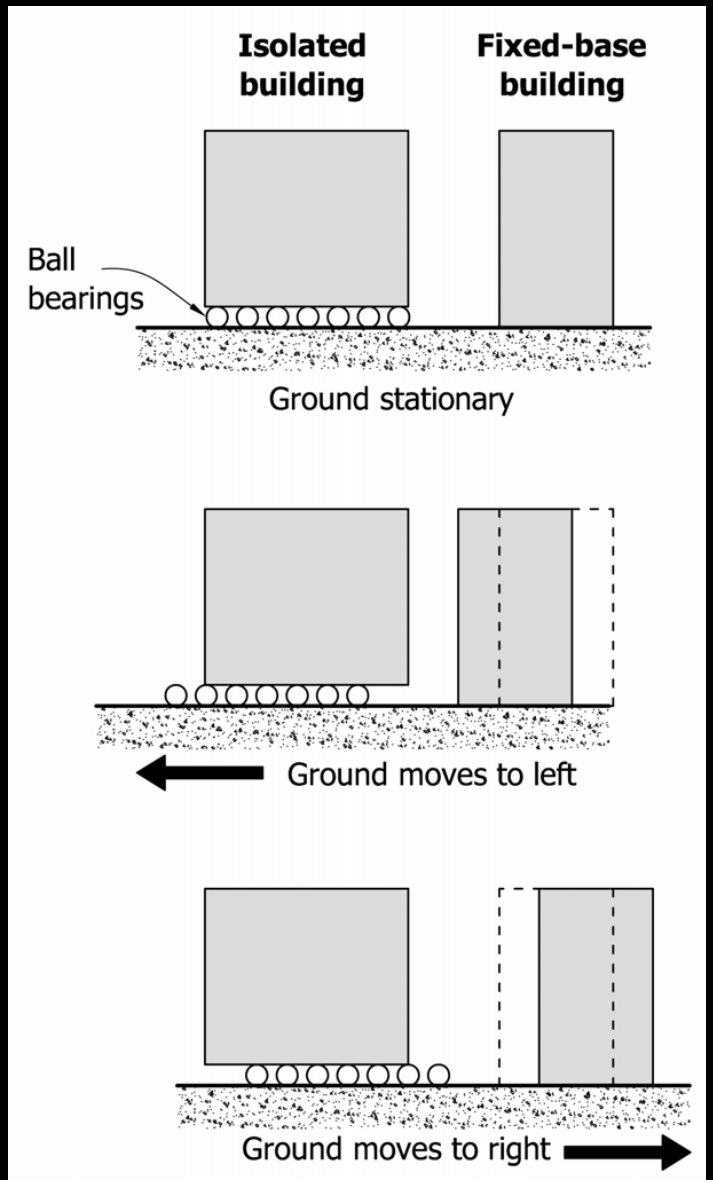
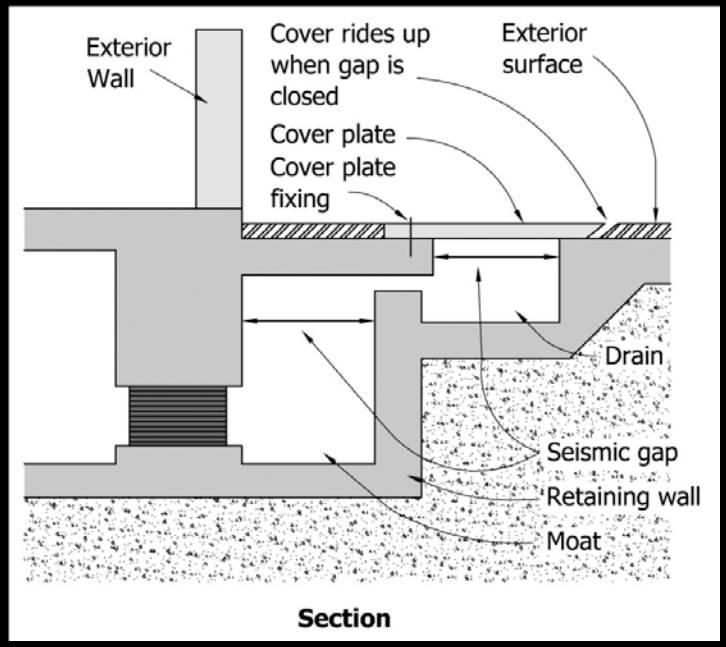
Siting

Separation gaps to boundaries less than 2% building height (80 mm for a single-storey 4 m high building

However, base-isolation requires a gap of between 400 mm and 600 mm wide.


Isolated building
Fixed-base building
Ball bearings
Ground stationary
Ground moves to left
Ground moves to right


Exterior Wall
Cover rides up when gap is closed
Exterior surface
Cover plate
Cover plate fixing
Drain
Seismic gap
Retaining wall
Moat
Section

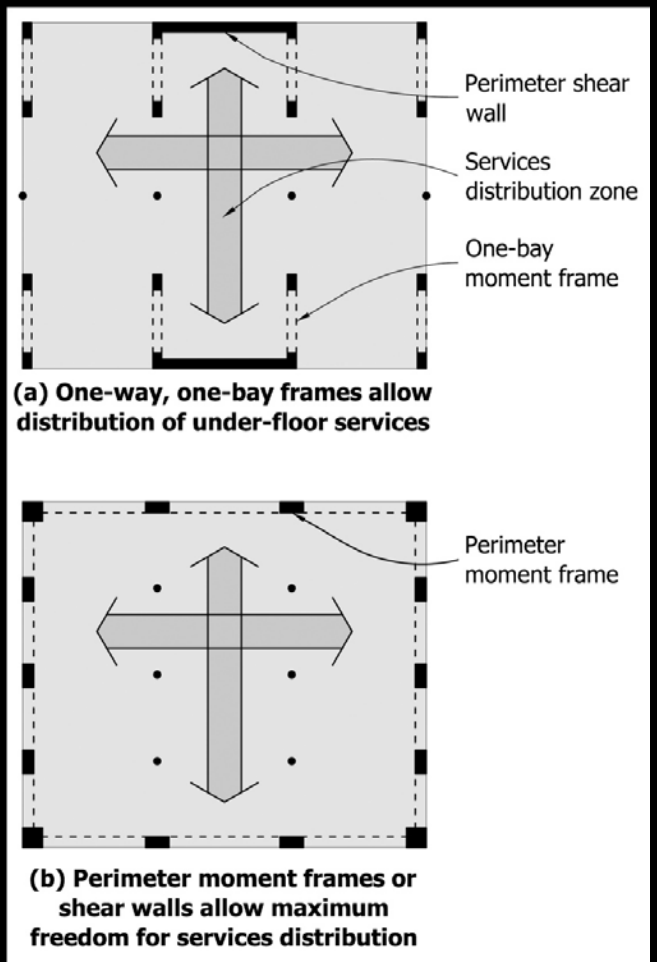
Spatial planning and function

Seismic resisting structure still a challenge for architects.

New technologies neither ease nor hinder

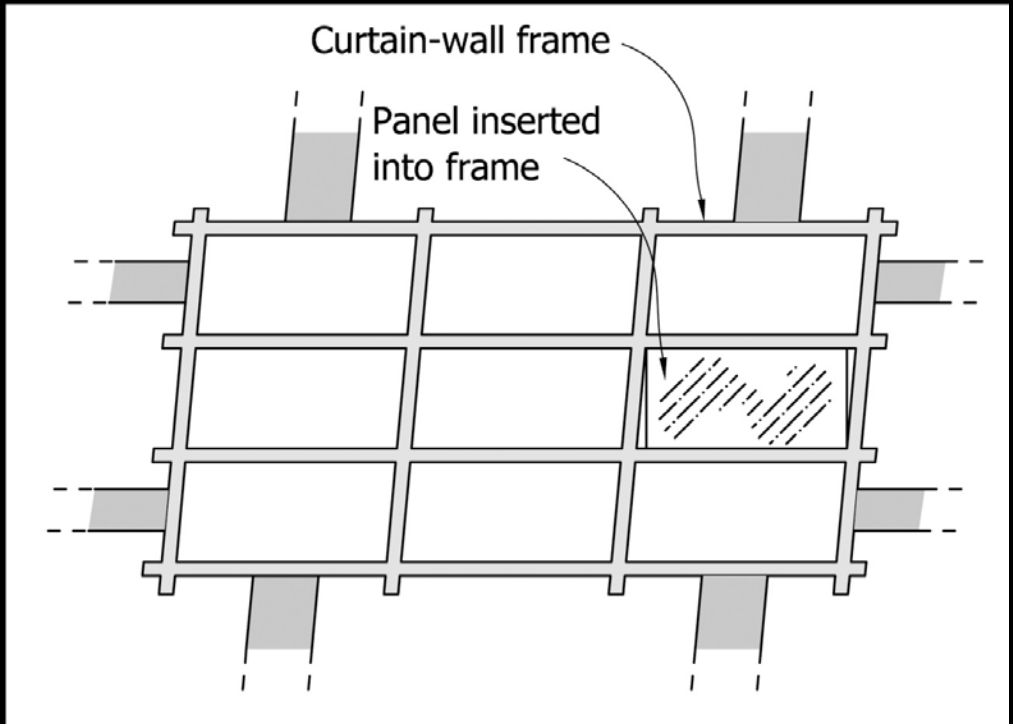
Base-isolation may offer opportunities and challenges at foundation level

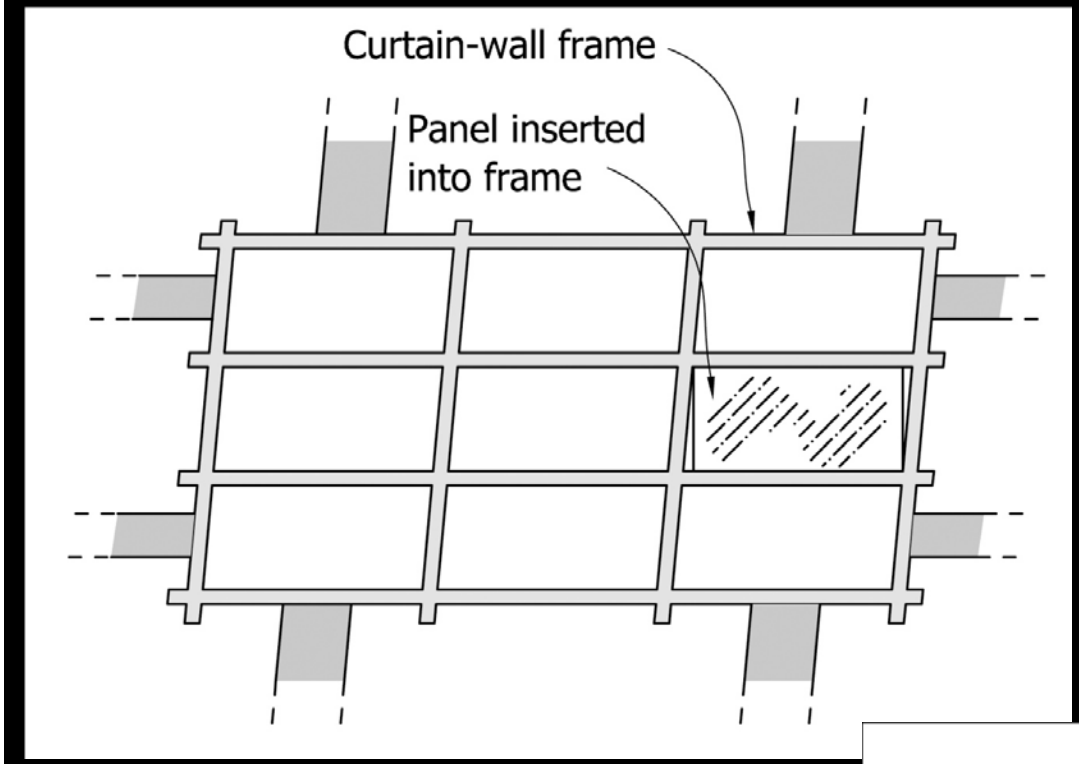
Integration with other technologies

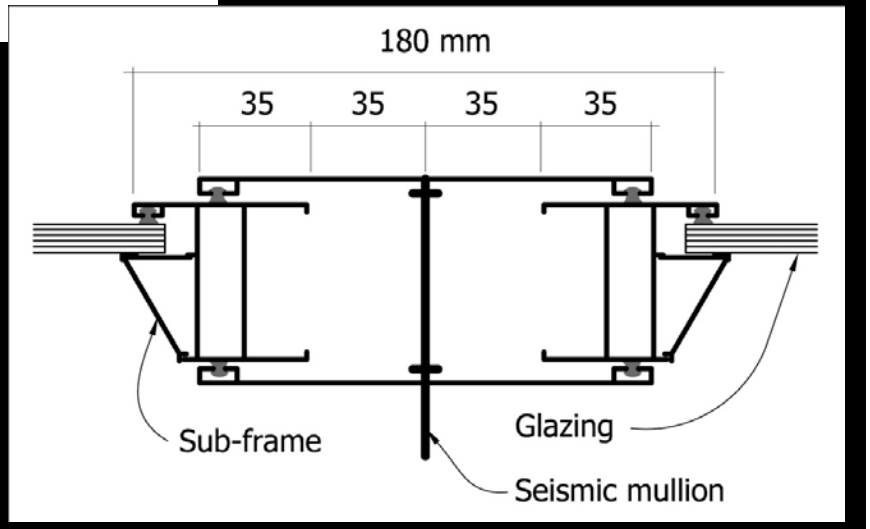


Aesthetics (exterior and interior)

Cladding or skin – new technologies don't have much impact – except for base-isolation




Curtain-wall frame
Panel inserted into frame


180 mm
35
35
35
35
Sub-frame
Glazing
Seismic mullion

Materiality

A wider range of structural materials can be used

PRESSS technology introduced into timber construction

More devices like dampers, springs, which can either be exposed to view or concealed

Costs

Initial costs during construction

Post-earthquake costs

Personal speculation!

Costs	Conventional structure	New technologies	Base-isolation
Initial building cost during construction	100	102+	103+
Post-earthquake costs (building and contents (20%))	120+	20+	<2
Total cost	220+	122+	104+

Other architectural issues

Maintenance

Insurance

Maintenance

New technologies need more maintenance

Annual checks as part of Building Warrant of Fitness? (Essential for base-isolation)

Access required for checking affects architectural detailing

Insurance

Insurers will be more ready to insure a building with new technology, especially base-isolation

Some premium discount may be available, but self-insurance with base-isolation is an option

Read the fine print

Summary

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