

2022 JOINT CONFERENCE OF HISTORIC PLACES NEW AOTEAROA AND ICOMOS NZ

CURRENT CHALLENGES TO HISTORIC HERITAGE IN NEW ZEALAND



ICOMOS New Zealand
Te Mana o Nga Pouwhenua o Te Ao

THE ENGINEER'S VIEWPOINT

TIAGO ALMEIDA
(BACKBONE STRUCTURES)

12th NOVEMBER 2022

PRESENTATION STRUCTURE

Overview of *The Guidelines*
aka “*The Red Book*”

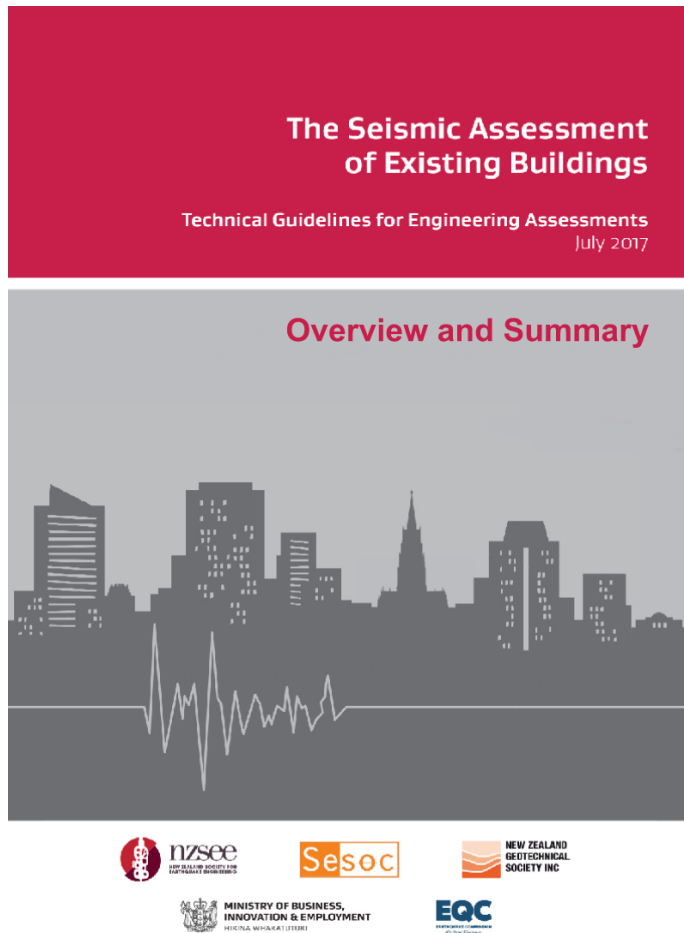


Challenges posed by improving the seismic performance of
existing buildings of cultural heritage value



Examples of strengthening techniques

THE GUIDELINES, AKA “THE RED BOOK”

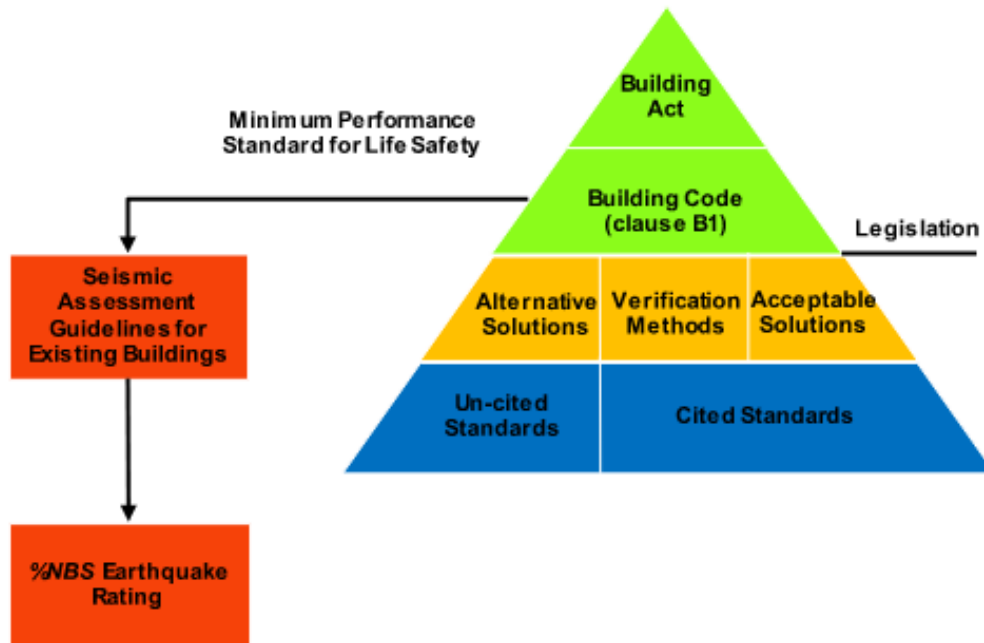


PART C General Issues C1	PART C Concrete Buildings C5
PART C Assessment Procedures and Analysis Techniques C2	PART C Structural Steel Buildings C6
PART C Earthquake Demands C3	PART C Moment Resisting Frames with Infill Panels C7
PART C Geotechnical Considerations C4	PART C Unreinforced Masonry Buildings C8
PART C Timber Buildings C9	PART C Secondary Structural and Non-Structural Elements C10

CLARIFYING SCOPE AND OBJECTIVES

- What is driving the need for the study? In particular, consider whether potential alterations or change of use requirements may force the evaluation at a higher level than the earthquake-prone assessment.
- Does the client wish the study to be limited only to those aspects of the building that require assessment under the earthquake-prone building framework, or do they require the scope expanded to address a broader range of building elements?
- Is the assessment in response to another assessment (e.g. by a TA). If so, does the scope of the proposed assessment address all of the issues that have been raised?
- Are upgrading options to be considered, and if so, what is the performance objective? Are there multiple performance objectives?
- Do future insurance requirements have a bearing on the decisions that may need to be taken for the building?
- Does the building have a heritage rating, and/or what are the major heritage features of the building that should be retained?

OBJECTIVE



%NBS = Percentage of the new building standard that applies to an equivalent building on the same site

$$\%NBS = \frac{\text{Ultimate capacity (seismic)} \times 100}{\text{ULS seismic demand}}$$

Figure A3.1: Relationship between Clause B1 of the Building Code and Earthquake Rating

EARTHQUAKE SCORES

Table 1 – Summary of Seismic Performance

Component	Location	Approximate %NBS rating	Current Assumptions
Timber floor and roof diaphragm connections		<15%	Expected inadequate connections to restrain brick walls out-of-plane. Needs to be investigated further
Timber floor diaphragm capacity		22%	Fair condition assumed, ignores lower rating of connections to walls
URM walls out-of-plane capacity		42%	Assumes adequate connection to roof and floors. Further investigation required
URM walls in-plane capacity	Rear wall critical	34%	URM pier dimensions assumed based on available information
Concrete frame	Shopfront elevation	25%	Assumed dimensions and reinforcement quantities
Concrete frame	Between 952 and 954 New North Road	82%	Details taken from the property files
Parapets	Front façade critical	39%	Scaled dimensions from original plans
Chimneys		25%	Approximate dimensions, assumed as URM construction
Foundations (geotechnical capacity)	Under IT walls	100%	Assumed founded on “Good Ground”, as defined in NZS3604:2011
Rear gangways		>34%	Based on nominal connections

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➔ Critical structural weakness (CSW)



Overall building score

< 15% NBS

THE UNIQUENESS OF CULTURAL HERITAGE VALUE

REGULATORY REQUIREMENTS FOR IMPROVEMENTS

Where buildings are being altered with **no change of use**, section 112 of the Building Act 2004 must be complied with. This requires **that the building** complies with the Building Code (for provisions relating to structure) to **at least the extent that it complied before the alterations**. If the building is earthquake prone, the TA may request that the building is upgraded to no longer be earthquake prone at the same time.

Where buildings are undergoing a **change of use**, section 115 of the Building Act 2004 must be complied with. This requires that the building comply as nearly as is reasonably practicable with the Building Code as if it were an equivalent new building.

“RED BOOK” RECOMMENDATION

Upgrading to as nearly as is reasonably practicable to new building standard is recommended.

IMPROVING HERITAGE BUILDINGS

6. Minimum intervention

Work undertaken at a **place of cultural heritage value** should involve **the least degree of intervention** consistent with **conservation** and the principles of this charter.

Intervention should be the minimum necessary to ensure the retention of **tangible** and **intangible values** and the continuation of **uses** integral to those values. **The removal of fabric** or the alteration of features and spaces that have **cultural heritage value** should be avoided.

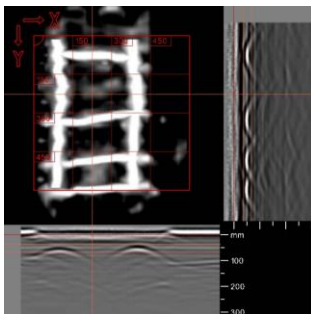
How do engineers advise building owners and their advisors about achieving different levels of resilience?

>34% >67% or 100%



ACHIEVING THE BEST OUTCOME

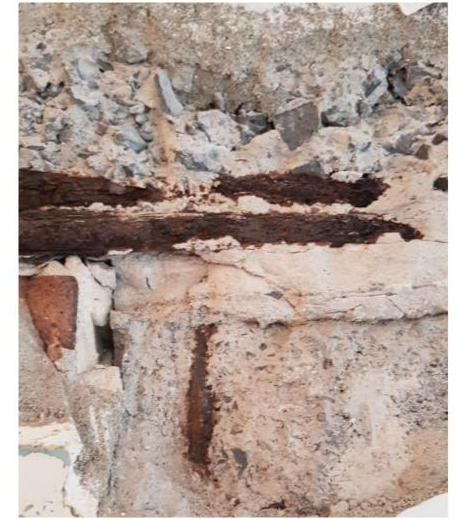
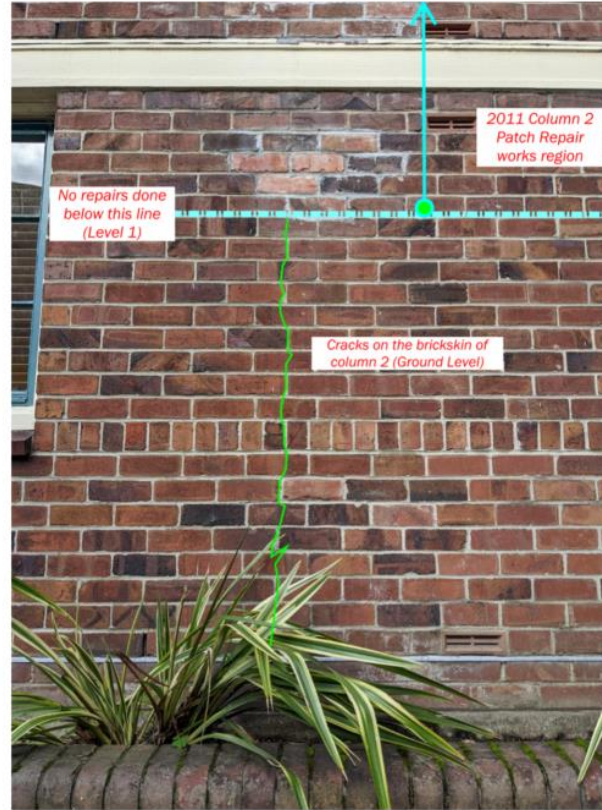
- Careful information gathering and investigations



Don't be surprised you will find surprises!!!

ACHIEVING THE BEST OUTCOME

- The role of the Conservation Architect



ACHIEVING THE BEST OUTCOME

How do engineers resolve any conflict between the structural requirements for achieving a particular strengthening standard and the conservation advisors' conviction or preference to minimise alteration, removal of the original fabric and other forms of intervention?

- Team effort – a true partnership among the project team members

THE END GOAL

The building strengthening work is complete and the objectives are met:

- complies with the Building Act requirements
- preserves the building's heritage
- it meets the needs of the owner

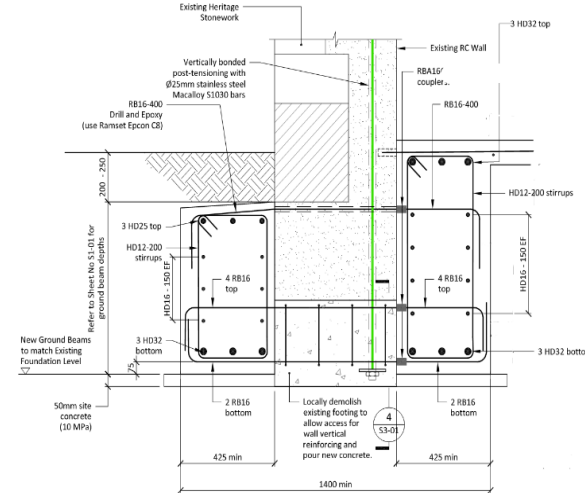
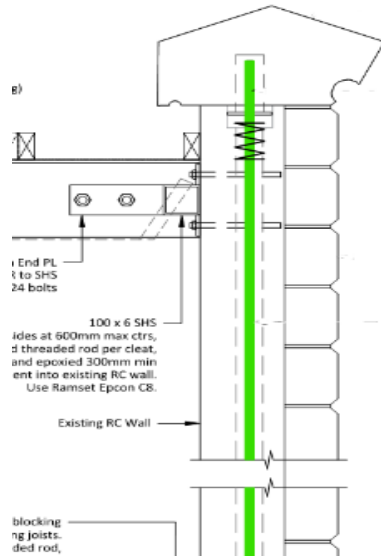
ie, strengthen the building in a manner that conceals the work and leaves no signs we were there!

THE FORMER ARTS BUILDING AT UoA



THE FORMER ARTS BUILDING AT UoA

STRENGTHENING WITH POST-TENSIONED BARS



THE FORMER ARTS BUILDING AT UoA

CELEBRATING THE STRENGTHENING WORKS



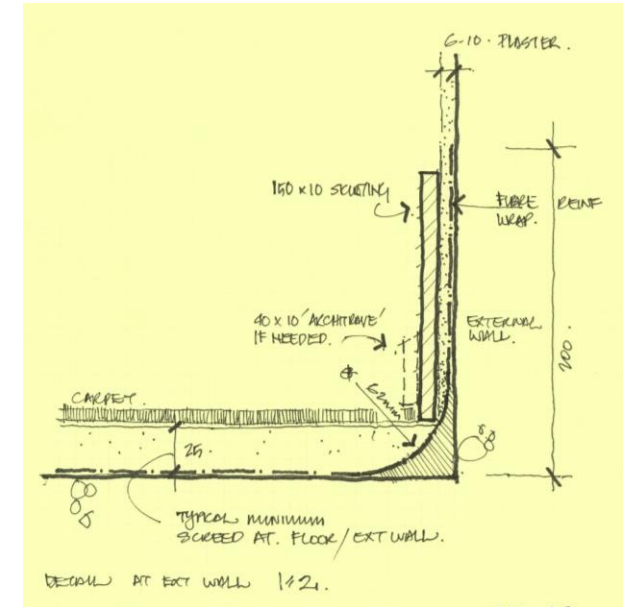
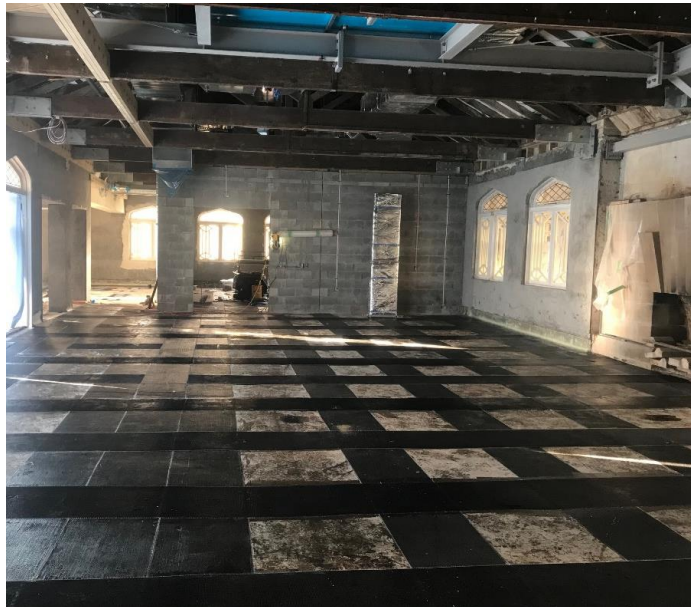
THE FORMER ARTS BUILDING AT UoA

STRENGTHENING WITH FRP SYSTEM



THE FORMER ARTS BUILDING AT UoA

STRENGTHENING WITH FRP SYSTEM



GRAND TEA ROOM PENTHOUSE APARTMENT



GRAND TEA ROOM PENTHOUSE APARTMENT



THANK YOU!

