Introduction
This document provides an overview of the revised New Zealand engineering guidelines for the seismic assessment of buildings, and summarises the key areas of change from the previous version.

The document also summarises the regulatory linkages with the current and proposed new earthquake-prone provisions of the Building Act, intended to come into force in 2017.

The Guidelines were previously referred to as the ‘NZSEE Guidelines’, as they were produced by the New Zealand Society for Earthquake Engineering. The guidelines have now been fully revised, with the new version produced by three technical engineering societies (NZSEE, the Structural Engineering Society (SESOC) and NZ Geotechnical Society (NZGS)), in conjunction with the Ministry for Business, Innovation and Employment (MBIE) and the Earthquake Commission.

The new Guidelines are jointly published by MBIE, NZSEE, SESOC and NZGS, and will be endorsed by MBIE for use as guidance under section 175 of the Building Act to the extent that it assists practitioners and territorial authorities in complying with the Building Act.

The broader objective of the Guidelines is to reduce the variation between assessments on the same building. It should however be appreciated that there will always be a degree of variation between assessments, as the overall process of seismic assessment is a judgement-rich exercise.
Current Status

The initial release of the new Guidelines is as a draft to accompany the briefing of the engineering and building control sectors. The briefings are being conducted during June 2016 and cover the new arrangements as well as an overview of the Guidelines. Wider public consultation on the new earthquake prone building arrangements is planned to follow in August/September 2016.

Version 1 of the Guidelines will be formally issued in the first half of 2017, at which time it will replace the 2006 NZSEE Guidelines. Use of the June 2016 draft version is however encouraged in the meantime; the 2006 NZSEE Guidelines can continue to be used until Version 1 is formally released.

Purpose and Scope of the Guidelines

The purpose of the Guidelines is to provide engineers with the technical basis (framework and tools) to carry out seismic assessments of existing buildings.

The Guidelines support seismic assessments undertaken for a range of purposes, covering both regulatory requirements and property risk identification.

One of the principal uses of the Guidelines is as part of the process of determining whether or not a building is earthquake-prone in terms of the Building Act. Under the new requirements associated with the Building (Earthquake-prone Buildings) Amendment Bill that comes into force in 2017, the Guidelines must be used as the basis for all engineering assessments that determine whether or not a building is earthquake-prone.

Methods covering two levels of assessment are provided – firstly, the Initial Seismic Assessment which enables a broad indication of the likely seismic rating of a building and secondly, the Detailed Seismic Assessment which provides a more comprehensive assessment.

The principal outcome of a seismic assessment using the Guidelines is a rating expressed as a percentage of the new building standard as used for an equivalent new building on the same site (i.e. the minimum expectations/requirements for a new building).

Risk Reduction (‘Improvement’)

The reduction of seismic risk via strengthening or other improvement measures remains the primary objective, rather than just the assessment of a building’s capacity.

The previous version of the NZSEE guidelines contained a section called ‘Improvement’. The new guidelines have a brief section that provides a general overview and outline of the key principles associated with designing seismic ‘Improvement’, with more specific guidance and examples to follow in separate documentation.

The first component of guidance from MBIE and the project group is the development of standard designs and documentation for the securing of URM facades for engineers to include in their documentation. The first draft of these solutions will be shared with engineering practitioners in the second half of 2016.
Document Preparation and Management

The revised guidelines were prepared during the period 2014 to 2016 by a range of practitioner and academic engineers specialising in the seismic assessment of existing buildings. This work has been co-ordinated by a Project Technical Group on behalf of NZSEE, SESOC, NZGS, MBIE and EQC. Funding has been provided by MBIE and EQC, with additional time-in-kind contributions from industry.

Oversight to this work has been provided by a Project Steering Group with representation from the above organisations, plus from Local Government New Zealand and territorial authorities.

The technical sections were peer reviewed by a combination of leading international and domestic specialists in seismic assessment.

The ongoing management and maintenance of the new Guidelines will be undertaken by the parties to the document – namely NZSEE, SESOC, NZGS, MBIE and EQC via a formal Memorandum of Understanding. This will essentially involve a continuation of the current Project Steering Group in a slightly different mode from the beginning of 2017, including the requirement for an annual meeting (as a minimum) to monitor the implementation of the Guidelines and to oversee subsequent technical developments.

NZSEE will continue as the lead organisation to organise training and respond to enquiries and questions on the guidelines.

Key Changes and New Developments

The new Guidelines represent a full revision of the NZSEE Assessment and Improvement of the Performance of Buildings in Earthquakes guidelines that was first published in 2006.

The new guidelines are structured in three parts, as follows:

Part A: Assessment Objectives and Principles

- This part outlines the scope and application of the Guidelines, and provides an overview of the seismic assessment process generally. The linkage with the relevant requirements of the Building Act is described, including the earthquake prone buildings (EPB) regulations via the EPB (Chief Executive’s) Methodology.

- Part A also includes a brief section that provides a general overview and outline of the key principles associated with designing seismic 'Improvement'.

Part B: Initial Seismic Assessment

- This part describes the method of application of the Initial Seismic Assessment methodology (including the Initial Evaluation Procedure), which enables a broad indication of the likely level of seismic performance of a building. The linkages with the earthquake prone buildings regulations via the EPB Methodology, covering both the initial identification and engineering assessment processes are defined.

- This part is based on the current Section 3 of the 2006 NZSEE Guidelines which was updated in 2014.
Part C: **Detailed Seismic Assessment**

- This part describes the method of application of the Detailed Seismic Assessment methodology, which provides a more comprehensive assessment of the likely seismic performance of a building. The linkages with the earthquake prone buildings regulations via the EPB Methodology, covering the engineering assessment process are defined.
- There has been a full revision of current Sections 4 to 12 of the 2006 NZSEE Guidelines, including Section 10 addressing unreinforced masonry (URM) buildings, which was fully revised in 2015.

A new section on Geotechnical Issues (C4) provides Guidance on the geotechnical considerations in assessing existing buildings, including when they can be expected to significantly influence the overall behaviour of a particular building.

Another new section on timber-framed structures (C9) addresses a gap in the previous guidelines. The assessment of both wall-braced and framed structures are covered. This section, along with the further developments in other sections, will address the gaps in the current Guidelines with respect to low-rise structures.

There is also better integration of several sections with latest research outcomes and international Codes and documents for the assessment of existing buildings. For example, American standard ASCE 41 may be used with appropriate interfacing and integration with Guideline procedures.

In addition to the reporting framework and covering letter for Initial Seismic Assessments, a corresponding framework is provided for Detailed Seismic Assessments. A template for summarising the key points from Detailed Seismic Assessments is also included. In the form of a table, this summary is to be included at the front of all DSAs using the new Guidelines, as a means of enabling more consistency in the information provided and the way it is provided, and hence clearer communication between all parties.

**Key Technical Features**

The new Guidelines place greater emphasis on understanding the ‘deformability’ of the building in order to obtain more appropriate ratings, rather than assigning the overall building rating just on the basic strength of the weakest member or element.

For Detailed Seismic Assessments, the focus on displacement capacity allows the capacity of different structural systems to be appropriately added together by providing direct allowance for non-linear behaviour. Emphasis is placed on the use of the Simple Lateral Mechanism Analysis (SLaMA) at the initial stages of a Detailed Seismic Assessment.

The new Guidelines place particular emphasis on the need to assess the primary gravity structure as well as the primary lateral structure, recognising that it is the performance of the former and the degree of protection afforded to it by the latter that determines how well the whole building will meet its safety objectives during earthquake shaking.
Further Developments Proposed

A further section covering secondary structural elements and heavy elements that do not form part of the primary structure is being prepared. This section will provide a linkage with the requirements of the Bill to include Parts of buildings, and is subject to a clearer regulatory indication of the intended scope of and criteria for building ‘Parts’ with respect to the earthquake prone buildings provisions.

An additional section on reinforced masonry (typically in the form of concrete block masonry) is intended to be developed during 2016/17.

The current sections will continue to be refined and developed in some areas, including in response to feedback from sector briefing and the training sessions on the Detailed Seismic Assessment sections to be held in the second half of 2016.

Monitoring and Feedback

Comments and questions on the new Guidelines should be submitted to NZSEE via questions@EQ-Assess.org.nz. While it may not be possible to reply to specific individual questions, Q&As will be prepared in response to common issues raised, and posted at www.EQ-Assess.org.nz.

It is envisaged that overall technical feedback will come via the technical societies, with feedback on the regulatory aspects via MBIE and its interaction with Territorial Authorities.