PRACTICE GUIDELINE

SESOC

# Peer Review

*SESOC Practice Guideline*
*Peer Review of Structural Designs for Building Consent*

*Jun 2025*

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# Glossary

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| **BCA** | Building Consent Authority |
| **Compliance Review** | A review process carried out by the BCA and separate to the Design Review. Outside the scope of this document. Refer to section 3 for context. |
| **Design Review, or Peer review** | An independent peer review of a structural design carried out as part of the Building Consent process. The term "Design Review" is consistent with the standard PS2 document and the ENZ Practice Note 2 framework - refer to section 3 for further detail. |
| **Designer** | The structural engineer responsible for the structural design, documentation and PS1. A simplification of "Design Firm" on producer statements. |
| **ENZ** | Engineering New Zealand |
| **NZBC** | New Zealand Building Code |
| **Reviewer, or Peer Reviewer** | The structural engineer responsible for Design Review and PS2. A simplification of "Design Review Firm" and "Design Review Professional" on producer statements. |

# 1. Objective and Scope

The objective of this SESOC Practice Guideline is to provide a framework for independent third-party review of structural designs submitted for building consent. It is a companion document to Practice Note 2 by Engineering NZ, providing more detailed information on the technical aspects of Regulatory Peer Reviews related to building consents. The target audience of this document is professional engineers who are involved in the practice of structural engineering design and design review. It is not intended to be prescriptive, or to be used by others as a basis for prescribing the required scope for structural design reviews. However, it will provide useful background material to others including clients, regulators and BCAs (compliance reviews by BCA are different and are outside the scope of this document, refer to Section 3 for context). It is hoped that this Guideline will lead to a more reliable and more consistent approach being taken by structural engineering designers and design reviewers across New Zealand.

The intended outcome of these design reviews is to meet the objective of the New Zealand Building Code (NZBC) clause B1 - Structure; (which is to safeguard people from injury, to safeguard people from loss of amenity and to protect other property from physical damage caused by structural behaviour or structural failure), and clause B2 - Durability to the extent required for specifically designed structural elements.

It is important to note that the Peer Review is only one part within a wider framework for ensuring competent design as follows:

1. Codes and Standards
2. Competence of the Design Professional
3. Design office practices and quality assurance systems
4. Peer Review (focus of this document)
5. Client review
6. Resource and Building Consent Authorities

At the end of the process the designer and the design reviewer need to verify, on reasonable grounds, that the building, if constructed in accordance with the drawings, specifications, and other documents provided will comply with clause B1 of the Building Code

And meets the performance requirements of clause B2 Durability to the extent that:

- Specifically designed structural elements are detailed for the particular environmental exposure conditions, and;
- Protective coatings and timber treatments for specifically designed structural elements are specified to suit the particular environmental exposure and planned maintenance regime.

This Guideline is written primarily for structures with design actions derived from AS/NZS1170. However, the general principles are applicable to the design review of any

structure, including highway bridges and performance-based design (SESOC is currently preparing further guidance on performance-based design).

Peer review of seismic assessments and seismic improvement is not covered by this Guideline. Specific peer review recommendations for seismic assessments and seismic improvement will be provided in proposed documents by others titled *Guidance for Reviews of Seismic Assessments* (JC25-02), and Retrofit Guidelines (Part D1 and D2) [currently in development]. However, some projects may involve a combination of seismic assessment, seismic improvement, and new build elements. In such cases it is recommended that a review of the seismic assessment is included with the building consent submission, ensuring that the peer reviewer is comfortable with the proposed seismic rating for the new project.

This is the document's first update since its original issue in 2010, including a general refresh to align with other industry guidance, and new information has been added regarding durability and resolving disagreements. This update incorporates feedback from a wider SESOC working group and SESOC members, and Auckland, Wellington and Christchurch Building Consent Authorities (BCAs).

## 2. How to Use this Guideline

It is expected, after initial familiarisation with the content of this Guideline, that structural design reviewers will refer mainly to the sections that contain the detailed content and checklists for design review, as follows:

- Documentation to be submitted by designer
- Scope of design review
- Design review checklist
- Documentation to be provided by reviewer on completion

The detailed content and checklists in the above-listed sections of this Guideline have been developed to include items that would typically be encountered on a major building project. However, it is essential to understand the context in which the detailed content and checklists are given and the limitations on their use by competent structural engineers. The limitations are described further in Appendix A 'Background' and Chapters 4 to 8.

In general, the onus is on the design reviewer to undertake whatever review he or she deems necessary to verify compliance, on reasonable grounds, with sections B1 and B2 of the Building Code. It is expected that the reviewer will have sufficient competency to determine the relevancy of the checklist items, and to exclude non relevant items and include additional items as necessary to suit the specific project requirements.

For special types of structure, for example highway bridges, additional scope and documentation may be required. Conversely, for smaller projects e.g. a single residential dwelling of

less than 3 storeys with an isolated steel beam or other limited specific design structural components, a reduced review scope will normally be adequate.

Consulting companies that commonly review, for example the design of structural elements in small scale residential dwellings, may wish to extract the relevant items from the detailed provisions in this Guideline to create their own in-house abbreviated checklists for standard projects. However, they should be aware that the BCA (or Territorial Local Authority) may relate their reduced design review scope back to this Guideline and request further assurance where (in the BCA's opinion) critical aspects relating to the structural design have not been addressed by the review.

# 3. Other Related Engineering New Zealand Practice Notes and Reports

## *Engineering NZ Practice Note 2 2018*

Engineering New Zealand (ENZ) published Practice Note 2 entitled "*Peer Review*" Version 2 in April 2018.

In Practice Note 2 ENZ describes four review categories, each with its own purpose and scope and entailing particular responsibility for the reviewer, as follows:

- *"Concept (or Strategic) Peer Review*
- *Specific Peer Review*
- *Regulatory Peer Review*
- *Forensic Peer Review"*

Neither ENZ Practice Note 2 or this SESOC Guideline covers:

- *"In-house review processes, where detailed checks of calculations and drawings take place as part of an engineering firm's quality assurance processes.*
- *Compliance reviews undertaken by a regulatory body to check for compliance with consent requirements, codes or other regulations where engineering expertise equivalent to the originating engineer is not required."*

The following extracts from ENZ Practice Note 2 are included below because they clarify the scope of this SESOC Guideline:

***From ENZ Practice Note 2:***

***"REGULATORY PEER REVIEWS***

*A Regulatory Peer Review determines whether aspects of a design comply with relevant regulations, codes, standards or guidelines. As a peer review, it needs to be carried out by an engineer with at least equivalent expertise to the originating engineer.*

*A Regulatory Peer Review provides an assessment of the originating engineer's assumptions, conclusions and recommendations, and also whether the output meets the required code, standard or guidelines. For building consents, this will usually mean checking the proposed design against relevant Building Code clauses.*

*A client can initiate a Regulatory Peer Review to verify compliance as part of their own quality assurance procedures, especially when applying for consent for complex or higher risk projects.*

***A Regulatory Peer Review is different from a compliance review***

*A compliance review does not include a peer review of the design and does not require an engineer with equivalent expertise to the originating engineer.*

*A compliance review is a comprehensive compliance check performed by or on behalf of a regulatory body, such as a Building Consent Authority. It looks at pertinent regulations, consent requirements and laws or guidelines.*

*We recommend that regulatory bodies make it clear what type of review is required when engaging engineers.*

*If an engineer is engaged by a regulatory body to carry out both a Regulatory Peer Review and a compliance review, then these reviews should be worked on and reported on separately."*

SESOC Note: Feedback received from SESOC members and BCAs indicates that the scope and nature of compliance reviews varies widely across the country, and the above definition of compliance reviews by ENZ does not reflect current practice. Compliance reviews were deemed to be outside the scope of this document, but it is hoped that a separate document can be produced to provide more clarity and consistency with compliance reviews. The 2023 SESOC Conference Paper titled "Towards Regularising Regulatory Compliance Reviews" by S. Anand, A. Sinclair & J. Bothara provides useful information (from a Wellington perspective) and outlines a potential framework that could be developed.

***"Regulatory Peer Reviews related to building consents***

*Peer reviews carried out as part of the building consent process are called design reviews. The peer reviewer needs to complete a Producer Statement 2-Design Review (PS2). This is submitted to the Building Consent Authority with the design review report, which should include a log of communication between the peer reviewer and the originating engineer.*

*The PS2 is a statement of opinion, based on stated reasonable grounds, that the aspects of the proposed building work covered in the scope of engagement will comply with the Building Code."*

In relation to ENZ Practice Note 2, this SESOC Guideline aims to provide more detailed information on the technical aspects of *"Regulatory Peer Reviews related to building consents"*, rather than other aspects including ethical, contractual and legal responsibilities.

**ENZ / ACE NZ Joint Practice Note 14**

In August 2009 ENZ and Association of Consulting and Engineering New Zealand (ACE NZ) published a joint practice note 14 entitled "*Structural Engineering Design Office Practice*."

This practice note covers topics such as function of a design office, communications and contracts, design office dynamics, design process, (in-house) quality processes and working within competency.

Demonstrating compliance, proprietary design and design for safety are also covered in ENZ / ACE NZ practice note 14 and, where relevant, the design reviewer must satisfy himself or herself on reasonable grounds that the design has achieved those objectives.

SESOC wishes to emphasize a key point that is made in ENZ / ACE NZ practice note 14 under the heading "*Design Process"*. The point from practice note 14 is *"Involve senior and experienced engineers in deciding the structural form*". In SESOC's opinion this is equally relevant for the design reviewer, who should always involve senior and experienced engineers in reviewing the structural form and key design features, as well as overseeing the design review in general.

Information on Producer Statements can be found on the ENZ website. At the time of writing this Guideline update, the current editions of the PS1 and PS2 producer statements are dated November 2021.

**ENZ Report Quality Issues in the Building System 2023**

In 2023 ENZ published a report titled "Quality Issues in the Building System" which outlined weaknesses in the building system in New Zealand and the steps ENZ will take to assist with improving the system. There is a section in that ENZ report for Peer Review Processes, which refers to ENZ Practice Note 2 and this SESOC Peer Review Guideline, and states *"All structural engineers should be conversant with both documents and follow them when conducting a peer review."*

The ENZ report on Quality Issues recommends reviewing engineers should be engaged in review processes early, when required, and that greater focus should be given to validating structural systems at the end of the preliminary design phase.

**ENZ B2 Practise Advisory 2020**

The B2 Practice Advisory note by ENZ provides guidance on compliance with New Zealand Building Code Clause B2 – Durability, particularly for structural elements requiring a minimum 50-year lifespan. It addresses key concerns around design responsibility, liability, and compliance verification.

Key Recommendations:

1. Avoid Producer Statements (PS1, PS2, PS4) for Durability

    a. Standard Producer Statements are not suitable for B2 compliance due to the variety of materials and compliance methods.
    b. Instead, use template letters for design, design review, and construction monitoring.

2. Provide Clear Design Documentation

    a. Each material (reinforced concrete, timber, mild steel) should be addressed separately in a design statement.
    b. Issue a draft structural maintenance schedule at the building consent stage.

3. Construction Monitoring & Compliance Verification

    a. Construction monitoring for B2 relies on contractor quality assurance (QA), third-party testing, and specialist inspections.
    b. A Construction Monitoring Report should outline how compliance has been assessed.
    c. Issue a structural maintenance schedule at the Code Compliance Certificate (CCC) stage.

# 4. SESOC Approach

SESOC's aim with this Guideline is to outline the basic principles and give a framework for the detail of the review, recognizing that specific requirements for each project will need to be taken into account. It is emphasized that design reviewers should not rely only on the provisions in this Guideline to define or limit the scope of their review.

Using this Guideline the reviewer should define and agree with their client, the appropriate review scope for their particular project. Often the clients' main priority is simply the granting of the consent, i.e. what is expedient rather than what is needed. However, the reviewer must include whatever scope they feel is necessary, given the project circumstances to enable them on reasonable grounds to verify compliance with the relevant provisions of the Building Code.

The onus should always be on the designer to demonstrate compliance and ideally the reviewer should not need to solve design problems, or comment on the choice of the design or suggest alternative measures. However, in practice this may happen to a limited extent provided independence is maintained. In SESOC's view a limited proactive approach by the reviewer is acceptable (provided the comments or suggestions that subsequently accepted and incorporated into the design by the designer) and should not relieve the designer of any responsibility in relation to the final design.

Where an independent design review is to be carried out, this should not be relied upon by the designer to avoid the need for adequate in-house design checking and quality control. Senior engineers in the designer's office should always oversee and verify the work of juniors before the detailed design documentation is delivered to the independent reviewer.

Review of designs by a separate office of the same large company as the designer, and the 'buddy system' that is used by some consultants where they review each other's designs on a consistent basis, can be flawed because there is insufficient independence or because these arrangements are more prone to commercial pressures.

Designers and reviewers should bear in mind that there are always limitations and assumptions in codes and standards as explained in the following additional extract from the United Kingdom Standing Committee on Structural Safety (SCOSS – now CROSS) report 13 section 2:

*"Risks not covered by codes and standards*

*Almost by definition, codes of practice may not cover the most recent technical innovations and developments, or changes in conditions. It is therefore important for designers to recognize that current codes may not cover all matters of design that can affect structural safety. Experience has highlighted a number of such risks:*

- *Changes in the loading regime due to subtle changes of use.*
- *Susceptibility of structures to aspects of loading is not normally recognised or considered significant.*
- *Lack of knowledge at the time of design.*
- *Lack of information at the time of design.*
- *Lack of adequate maintenance and/or inspection"*

and;

*"Interpretation of codes*

*There appears to be a trend to treat codes as quasi-legal documents, to be interpreted by semantic and syntactical analysis to find the least onerous solution. It should be readily appreciated that this is seriously misguided and liable to create risks to safety..."*

Where the provisions of the relevant Standard are not entirely clear or considered to be inadequate or inappropriate for the particular circumstances, then the designer and the reviewer should aim to satisfy the intent of relevant Standards, and should also take into account available current knowledge and best practice that may not be covered by the Standard at that time.

This is recognised in NZBC Verification Method B1/VM1, which includes the following comment in Section 1.0: *"The Standards referenced in this Verification Method relating to building design require the application of specialist engineering knowledge, experience and judgement in their use."*

SESOC concurs with the following, which has been adapted from peer review guidance in the Pacific Earthquake Engineering Research (PEER) report 2017/06 for Tall Buildings:

"*It is important for peer reviewers to have the necessary expertise and experience to perform the peer review, and also the time available to commit to help the process proceed in a timely manner. For complex and/or larger projects, early engagement of the peer reviewer will enable early discussion and agreement of the fundamental design decisions, assumptions, and approaches. This will help avoid re-work later in the design process that may impact on both the project cost and schedule. Early participation in the peer review should also help to establish a good working relationship with the design team. The scope of peer review comments should begin with broad, general issues, and progressively move toward the more detailed. It is generally considered unfair to the design engineer to bring up new general issues at later stages of the design or the review, although such matters should be considered where critical to the design's performance capability.*"

## 5. Competence of Design Reviewer

The current guidance regarding competence from page 3 of the ENZ and ACE NZ Producer Statement PS2 Design Review form is:

***Competence of Engineering Professional***

*This statement is made by an engineering firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its personnel.*

*The person signing the Producer Statement on behalf of the engineering firm will have a professional qualification and proven current competence through registration on a national competence-based register such as a Chartered Professional Engineer (CPEng).*

*Membership of a professional body, such as Engineering New Zealand provides additional assurance of the designer's standing within the profession. If the engineering firm is a member of ACE New Zealand, this provides additional assurance about the standing of the firm.*

*Persons or firms meeting these criteria satisfy the term "suitably qualified independent design professional".*

Also, as mentioned in ENZ / ACE NZ practice note 14, working within the limits of one's own technical competency is a core ethic of the Chartered Professional Engineers Act 2002. The test for professional competence includes asking if the person can:

- *"Comprehend and apply appropriate knowledge*
- *Exercise sound professional judgement*
- *Use relevant codes of practice*
- *Recognise the limitations of standards and then use first principles derived from natural laws to formulate an appropriate course of action*
- *Recognise the limits of their competency."*

SESOC would like to add the following additional comments regarding competence:

In New Zealand certification of structural designs and design reviews is intended to be carried out by suitably qualified and experienced professional engineers. The minimum qualifications for such engineers is generally a recognised four-year degree , followed by a period of responsible employment in the relevant field and periodic assessment qualification as a Chartered Professional Engineer (CPEng).

However, being a member of ENZ (and also being a member of other relevant technical societies (SESOC, NZSEE, Concrete NZ, HERA/SCNZ and NZTDS) is also important to enable designers and reviewers to collaborate and keep up to date with the latest information and technical developments in their relevant practice area.

The practice area of an engineer is defined (in the CPEng Rules and ENZ Regulations for competence registers) as:

*"Practice area means an engineer's area of practice, as determined by—*

*(a) the area within which he or she has engineering knowledge and skills; and*
*(b) the nature of his or her professional engineering activities."*

It goes without saying that professional engineers who carry out design reviews for structures, as described in this Guideline, must be qualified and experienced in the structural engineering practice area.

A design review team, just like a design team, may comprise an appropriate mix of specialists under the direction of a team leader. In this situation the team leader is the person

responsible for overseeing and coordinating the work of the design review and having the authority to sign off on behalf of the team. The design review team leader is expected to be appropriately qualified and competent in the field of structural engineering, as described above.

When deciding whether to take on a design review commission the key question the reviewer should ask themselves is am I (or is my team) competent to design this structure. If the answer to that question is yes, then it will follow that he or she is competent to review a design by others. If the answer is no, then they should not accept the design review commission. This relates to our earlier comment that the design reviewer needs to be sufficiently competent to critically review the structural form and key design features as well as the detail of the design.

Finally, the qualification and experience of a person to an appropriate level is an essential first step in judging competence, but it does not necessarily mean that a person will practice with commensurate competence. It is what people do that matters and not simply what they should have the competency to do.

## 6. Documentation to be Submitted by the Designer

The process of design review of complex structural engineering work will be made simpler, safer, more reliable and more consistent by the provision of high-quality comprehensive design documentation, coupled with high quality and more consistent design review practices, as described in this Guideline.

In 2008 SESOC initiated changes to the New Zealand Construction Industry Council (NZCIC) Design Documentation Guidelines – Structural to reflect current good practice. These changes have now been implemented, and they include the recommendation that Detailed Design documentation should be included with all building consent submissions (previously Developed Design documentation was thought to be adequate), together with a design features report (DFR) that explains the structural systems and load paths, design standards used and key design assumptions.

It is important to understand that the NZCIC Design Documentation guidelines are intended to be a general checklist only. Some of the documentation that is required to support structural building consent applications (for example design calculations) is missing from the NZCIC guideline. This is because the NZCIC guideline is focused on the documents that are relevant for the wider design team and for the builder in relation to the construction and not focused on the requirements for building consent.

Not all the documents listed in the NZCIC guideline will be required for every project, in particular for smaller projects. Depending on the way each particular project team is organized some documents listed in the NZCIC Detailed Design guideline may be provided by

the Contractor, or by a supplier of proprietary products, or by a specialist consultant and not necessarily by the designer.

SESOC has developed standard templates for Structural Design Features Reports (DFR) for Commercial projects and for Domestic Housing projects. These templates are available from the SESOC website.

- The DFR should contain all the agreed criteria on which the structural design is to be based.
- The DFR, in conjunction with the structural specification and the structural (and other relevant) drawings, should contain all information necessary to replicate the design at a future date without any reference to the original design calculations.
- Where relevant the DFR should describe the information that is available from existing records and any assumptions about the interpretation of those records.
- The DFR should also document the loading assumptions and the design and analysis approach.
- Any specific client requirements with regard to the performance of the structure and variances from verification methods and acceptable solutions to the Building Code should be included in the DFR.
- The DFR should define the scope of proprietary elements to be designed by others and how submission and review of those will be handled.
- The means of demonstrating compliance with B2 provisions should be clearly outlined. This may include providing or referencing a draft maintenance schedule. Alternatively, key assumptions or specialist advice sought to demonstrate compliance with B2 should be communicated.

With reference to the NZCIC Detailed Design Documentation guidelines it is recommended the following list of deliverables to be submitted by the designer for review:

- An agreed scope of work for the design review.
- Structural design features report
- Structural drawings
- Structural specifications.
- Other relevant consultant documentation, such as the geotechnical engineering report, fire report and relevant civil engineering and architectural drawings.
- Structural calculations (indexed with a table of contents and including suitable discussion to aid in the interpretation of the calculations).
- Electronic computer analysis files, if relevant or otherwise summary hardcopy analysis input and output.
- Performance specifications for proprietary structural components and how these are intended to be handled for building consent.
- Proposed construction monitoring scheme.
- A draft producer statement PS1 with any qualifying statements and a schedule of documentation should be provided by the designer prior to the commencement of the review. To be finalised and signed by the designer on completion of the review.

- Certificate of Design Work, if applicable for Registered Building Work

Any variances from the 'standard' level of design documentation or from the 'typical' verification methods should be notified by the designer prior to contractual arrangements being finalised with the reviewer as there is potential for greater time and expenditure on such reviews. For example, the rare instance that the designer does not wish to issue calculations to protect their intellectual property for innovative designs. In this case the reviewer may need to carry out a full independent design as the review.

## 7. Scope of Review

The following is an extract from the standard producer statement PS2 form.
*"On behalf of the firm undertaking this review, on the basis of the review undertaken, and subject to:*

*(i) site verification of the following design assumptions*
*(ii) all proprietary products meeting their performance specification requirements;*

*I believe on reasonable grounds the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the attached schedule, will comply with the relevant provisions of the Building Code".*

An outline of the scope of design review (or any specific limitations of the review) should therefore be included as part of the building consent submission to clarify "the basis of the review undertaken". An outline of the scope is required so that the BCA may assess whether the review scope meets their requirements and whether the submitted producer statements and other documents reflect the stated scope.

Early engagement with the BCA is recommended, to ensure that the intended peer review scope and procedure will meet their requirements. This is particularly important in the case of large/complex projects or Alternative Solutions, where means of demonstrating compliance (including peer reviews and use of supplementary guidance) should be agreed from an early stage.

The recommended stages for a design review on a complex project would be as follows:
- Preliminary design: review structural systems and compliance pathway
- Developed design: check-in / updates (if required)
- Detailed design: final review
- Construction stage: review of significant changes (if required)

Generally speaking, the reviewer should do whatever is necessary to satisfy him or herself on reasonable grounds that the structural performance requirements of the Building Code will be met.

When determining the scope of the review, and the appropriate fee to be charged, the reviewer should determine an appropriate level of reviewing based on project specific parameters including the following:

- Means of Compliance i.e. Verification Method, Acceptable Solution, or Alternative Solution (e.g. performance-based design type of review).
- Importance level of the structure as defined in NZS 1170
- Innovation/Complexity of design.
- Scope of design submission i.e. all or part of structure.
- Whether the design is to be carried out in stages.
- Deliverables from the designer
- The ability to impose appropriate consent conditions; and
- Any limitations in the client's brief

The reviewer should clearly state any limitations of their review in their review report/PS2. The scope of a design review for building consent need not include verification that the requirements of the client's brief have been met. It should be the responsibility of the designer to incorporate any relevant requirements of the client's brief into the Design Features Report and other documents submitted for review. (It is expected that the designer would have circulated the DFR back to the client and others on the design team to obtain their agreement prior to the review).

The design review of structural performance for building consent does not normally cover review of cost effectiveness, constructability, sustainability or environmental impact. However, it should consider operational requirements where these may affect the structural performance. It may also consider future upgrading when this is identified by the designer as a feature of the design.

The peer reviewer typically doesn't have engagement with the contractor and may not have access to relevant information relating to constructability. If a constructability review is needed, this should be completed by a specialist in that field – refer to ENZ Practice note 13. However, the designer should identify non-typical methods of construction within the DFR.

The wording "*...during construction or alteration...*" from Building Code Clause B1 has been discussed by the SESOC committee in relation to this Guideline. So far as the design review for building consent is concerned, the design reviewer is not expected to review the construction sequence and the stability of the structure at various stages of construction for standard building projects. This is the responsibility of the builder. However, the design review should cover construction sequence and procedures where this influences the final structural design or where it may affect other property, for example on an adjoining site. It will also be important for some special structures, such as highway bridges built using cantilever construction techniques.

Staged consents are worthy of specific mention. A common case is the issue of a foundation and substructure consent in advance of the remaining superstructure. In this instance it is

essential that the design philosophy be robust and well documented, with the analysis of all items directly supported by the part of the structure to be consented essentially complete (or proved to have an adequate level of conservatism with respect to the final arrangement).

When submitting staged consent documentation, the design engineer should clearly state in the DFR the constraints under which the design is valid for a particular stage and include calculations to clarify load limits and other compatibility requirements between stages. Peer reviewers should satisfy themselves that the stage they are reviewing does not contravene the constraints imposed by the previously consented stage(s).

Should peer review of part of the structure only be required, then the reviewer should clarify the review scope and limitations, and it is then the responsibility of the client/designer/BCA, i.e. not the reviewer, to ensure that other subsequent parts are also adequately reviewed. An example would be where foundations are reviewed as stage 1 of a project, but subsequent parts might be reviewed by another engineer in the future.

It is important for staged projects that after all the staged submissions are complete, the design of the structure as a whole has been adequately covered.

The (designer and the) reviewer may need to think beyond the subject structure itself. For example, the NZBC requires that, where necessary, sitework be carried out to provide stability for construction on the site and to avoid the likelihood of damage to other property.

Peer review of seismic assessments and seismic improvement is not covered by this Guideline as described in Section 1 above.

With respect to durability, a review should ensure that the selected design life for each element has been appropriately considered and that the means of compliance are adequately communicated in the submitted documentation. This may be through the specification, design features report, or drawings.

If steelwork cannot be shown to last for the full life of the building, then one option for the designer is to provide a maintenance plan for the steel work. This can be done in conjunction with SNZ TS 3404:2018, section 1.7. The reviewer should review the maintenance schedule is clearly communicated within the DFR. The reviewer should also review the steelwork in question can realistically be inspected and maintained as required.

Typically, a letter is provided outlining the means of compliance for durability, in line with ENZ recommendations, rather than including durability in the producer statement. The peer reviewer should be familiar with the contents of the designer’s letter and should also provide a similar letter that aligns with the designer's approach. ENZ has developed example letters that can be used to demonstrate B2 Durability in lieu of producer statements, which are appropriate for durability. Further guidance on durability is given on the ENZ website.

The performance requirements for moisture management in timber structures impact both B1 (structural stability) and B2 (durability). Unlike other materials, managing moisture during construction is crucial to ensure that the structural properties remain consistent with the assumptions made in the material's design standard. A peer review of timber elements should assess the designer's specifications for moisture content during construction.

## 8. Design Review Checklist

The following is provided as a general checklist to support reviewers and Building Consent Authorities (BCAs). It is not intended to be exhaustive, definitive, or to represent a required minimum scope of review. It should not be relied upon as a complete or catch-all list. Responsibility remains with the reviewer to apply their professional judgement and carry out whatever assessments are necessary to reasonably verify compliance with the relevant provisions of the Building Code. Reviewers are expected to have the competency to assess the relevance of the checklist items, exclude those not applicable, and consider additional matters where appropriate to reflect the specific requirements of the project.

Typically, a structural design review should incorporate the following steps:

- Review structural Design Features Report.
- Review structural drawings.
- Review structural specification.
- Review other relevant consultant drawings and reports.
- Analysis / modelling review or independent analysis.
- Calculation review or independent calculation (preferred).
- Review scope of proprietary elements.
- Review protection of utilities and other property.
- Review construction monitoring proposals.
- Review draft Producer Statement PS1.
- Review durability and draft maintenance schedule.

Further explanation and detail on each of the above steps is given below:

A. Review structural Design Features Report (DFR).

- Review completeness and coverage of the DFR.
- Review applicability and consistency of compliance verification methods used.
- Review that external documents relevant to the design are coordinated and have been referenced and correctly interpreted, with key parameters included in the DFR e.g. geotechnical report, fire report, site specific wind studies, test data etc...
- Review site excavation and retention proposals to confirm that appropriate assessment has been undertaken and procedures specified for the protection of neighbouring properties from any short- or long-term adverse effects.

- Review appropriateness of structural performance criteria for both the Ultimate and Serviceability Limit States.
- Review appropriateness and adequacy of loading allowances for ALL loading parameters for the location and usage of the structure.
- Review site constraints with regard to their influence on the structure e.g. soil-structure interaction, erection procedure, etc.
- Review lateral and vertical load paths, and load transfer mechanisms throughout the structure.
- Review analysis approach.
- Review the importance level
- Review that ductility chosen is appropriate for the structure globally and is compatible with the materials used and local element geometry.
- Review design methodology against verification method employed.
- Review design aligns with current good practice, latest design standards and other published technical guidance.
- Review compatibility of design with analysis approach and assumptions.
- Review performance indicators associated with performance-based design.
- Review construction methodology and sequence if this influences the analysis or design.

B. Review structural drawings.

- Review that the structural drawing set is complete and sufficient to fully describe the structure to be built.
- Review structural general arrangement drawings and structural form.
- Review that design and analysis assumptions are consistent with the details shown on the drawings e.g. member sizes, end fixity, bolt grades etc...
- Review that design information has been transferred adequately to the structural drawings e.g. floor design loadings, etc....
- Review details are clearly referenced from plans and elevations and are unambiguous.
- Review detailing is consistent with good practice e.g. correct bar anchorages, precast floor seatings etc...
- Review structural detailing is appropriate for the environmental exposure conditions.
- Review construction methodology has been incorporated into design (e.g. location of joints and connections).

C. Review structural specification.

- Review that the structural specification is complete and sufficient and applicable to the project.
- Review appropriateness of materials for use and intended design life.
- Review appropriate protective coatings and treatment are specified to elements within engineer's scope.
- Review materials specified are consistent with the design and analysis assumptions.

- Review that accepted good practice has been prescribed by the document e.g. correct bar bending procedures etc...
- Review that relevant Standards and relevant versions of those Standards are referenced in the specification.

D. Review other relevant consultant drawings and reports.

- Undertake a basic assessment of key architectural drawings and other consultant information provided for familiarisation with the overall design approach and review that adequate load allowances have been made.
- Review that design assumptions are consistent with other external consultant drawings and reports e.g. foundation bearing pressures, design wind pressures etc...
- Confirm that fire resistance ratings for structural elements, including limiting steel temperatures, are clearly stated in the Design Features Report (DFR) and/or on the structural drawings. These ratings should be consistent with the Fire Report, and there should be a clear reference to the selected fire protection method and where it is documented.
- Review that key structural performance criteria have been adequately notified for example seismic clearances for glazing.

E. Analysis / modelling review or independent analysis.

Extent of analysis review may vary from reviewing the designer's model through to a full independent analysis according to the size, complexity and importance of the structure. Where reviewers do not have an analysis software package that is compatible with the designer's software, a detailed review of the designer's model input and output text files is recommended. Alternatively, or in addition, an independent analysis should be created using a suitable alternative analysis package. Analysis reviews should include reviewing the following;

(i) General:

- Review basic model geometry matches structural drawings.
- Review that boundary condition assumptions match actual conditions.
- Review model has appropriate stiffness (i.e. correct member sizes, fixity conditions, material properties and that stiffness modifiers have been correctly applied to structural elements).
- Review analysis model for compatibility with design philosophy detailed on drawings and in the DFR e.g. diaphragm flexibility, member fixity etc...).
- Review correct load cases and load combinations have been applied (e.g. concurrent EQ actions if appropriate, and the correct gravity actions have been applied in combination with seismic actions etc...).
- Review whether diaphragm flexibility has been considered and incorporated if appropriate.

- Review sensitivity studies have been undertaken on critical results (e.g. effect of soil stiffness variations).
- Review that output has been interpreted correctly (e.g. moments about correct axes, forces in correct direction etc...).

(ii) Gravity:

- Review gravity load allowances (dead, imposed, superimposed dead, snow if relevant) including skip (or pattern) loading have been applied correctly including area reduction factors.
- Other design actions e.g. temperature etc... have been applied correctly.
- Staged construction effects have been considered if appropriate and any significant temporary works requirements identified on the drawings.
- Temporary loading requirements have been considered if appropriate.
- Time dependant effects (e.g. creep, shrinkage) have been considered if appropriate.
- Vibration effects (e.g. footfall) have been considered if appropriate.

(iii) Lateral Loading - seismic:

- Reviews on building regularity have been undertaken.
- Seismic loading - appropriate live load reductions, mass, zone factor, importance level, return period, site subsoil category etc.... have been used.
- Skewed earthquake attack has been considered if appropriate.
- Second order effects such as P-delta have been considered.
- Torsional effects have been considered.
- Lateral Loading – non-seismic
- Wind loading - correct design pressures and forces have been applied.
- Wind vibration sensitivity (if relevant) has been considered.
- Review other lateral loading allowances have been applied correctly e.g. hydrostatic, soil pressure etc...

Note: Non-linear analysis methods (e.g. Push-Over and Time History Analyses) require a higher degree of skill and experience than for linear analysis methods and should only be undertaken by engineers experienced in such techniques.

F. Calculation review or independent calculation (preferred).

There is a danger of simply reviewing the designer's calculations because that method of review may not identify critical errors in the assumptions and design approach taken.

It is recommended that some independent calculation is undertaken for all structures regardless of size. This is so that the reviewer may develop a better feel for how the structure is working and where the critical components are located.

Some designers invest considerable time in developing in-house design spreadsheets (and other digital tools) and may be reluctant to share these directly with the reviewer. While this is understandable, the designer is still expected to provide sufficient transparency. At a minimum, this should include a summary of the critical inputs and outputs, a representative validation of any critical spreadsheets, and a sample longhand calculation that clearly demonstrates the methodology used within the spreadsheet.

For computer analyses, such as an ETABS seismic analysis for a multi-storey building, the reviewer may either request an electronic copy of the input file, or alternatively may request a summary of the critical input and output to verify by independent analysis.

- Review calculations for completeness i.e. are all structural elements and variations thereof covered by the calculations?
- Review that the design calculations are consistent with the analysis philosophy and the structure as detailed on the drawings.
- Review that analysis results have been interpreted correctly.
- Review that effects not explicitly modelled in the structural analysis have been incorporated e.g. eccentricities in connections.
- Review that capacity design procedures have been undertaken where appropriate.
- Review seismic gap allowances and drift limits have been correctly assessed where appropriate. This is to confirm that building deflections, boundary clearances and clearances to non-structural elements are adequate.
- Conduct independent calculations to verify structural component and global design actions. It is recommended that calculations should include (but not be restricted to) items such as structural mass, base shear, gravity actions, structural elements, structural connections, diaphragm elements, foundations, walls, typical frame, transfer beams, fatigue, foundations etc...
- Where design modules of analysis packages have been used to calculate member capacity it is recommended that sample of members should be reviewed by hand calculation to ensure that the correct design parameters have been input and results are correct e.g. effective length of compression members, member orientation etc...
- Review that calculations have been undertaken to verify SLS performance criteria e.g. displacement limits, vibration sensitivity, crack widths etc....
- Review the design of secondary structural elements, e.g. stairs, safety barriers etc.

G. Review scope of proprietary elements to be designed by others, or the design of the proprietary element itself if that is the subject of the design review.

- Review scope of works and design parameters given by / to proprietary element designer.
- Review that proprietary element actions / reactions have been interpreted correctly and incorporated correctly in the primary structural design and in the design of the proprietary element.

H. Review protection of utilities and other property.

- Review proximity of boundaries to other property.
- Review that the design has adequately addressed short and long-term effects on other property and utilities (if appropriate) e.g. dewatering and ground support.
- Review sufficiency of the structural design for ground retention in relation to other property (and buildings supported thereon).

I. Review construction monitoring proposals.

- Review that construction monitoring proposals are appropriate for the building type and complexity. ENZ construction monitoring guidelines are useful for this purpose.

J. Review draft producer statements.

- Review that the PS1 from the designer is consistent with the design presented.
- Review that the PS1 documents represent the scope of works being reviewed.
- Review that Standards/documents associated with the chosen compliance method are stated, including any variations from those Standards.
- Check that all assumptions or caveats are justified and listed clearly on the PS1 and PS2 documents noting that any variations would constitute an alternative solution
- Review all drawings and documents reviewed and relied upon (including revision numbers) are listed on the PS1 and PS2 documents or on an accompanying referenced schedule.
- Review that all assumptions or caveats made on the review are listed clearly on the PS1 and PS2 documents.
- Review that the level of construction monitoring proposed is appropriate.

K. Review of durability and draft maintenance schedule.

- Confirm if the designer/geotechnical engineer has noted any aggressive ground conditions and if appropriate considerations have been made.
- Review that the site exposure classification has been determined using appropriate reference materials (e.g., SNZ TS 3404, NZS 3101).
- Confirm the design life for specifically designed elements has been appropriately selected.
- Ensure the protection methods selected align with the stated performance requirements.
- Review the durability aspects are appropriately documented in the specification and drawings.
- Review the draft maintenance schedule for alignment with the above.

(i) Concrete:

- Review selected covers are appropriate based on the exposure classification and design life in accordance with NZS 3101 Section 3.

- Where elements fall outside the scope of NZS 3101, the review should confirm that specialist advice has been sought.

(ii) Steel:

- Steel elements typically require regular maintenance to achieve their design life. Review that appropriate performance requirements have been stated or loss of steel area has been accounted for via corrosion.
- Hidden elements present a challenge for maintenance. A common approach is to account for a loss of steel area over the remainder of the design life - ensure section thicknesses selected are appropriate (typically >10mm.)
- In areas located close to the sea and where available wall thicknesses may be limited. The reviewer should confirm if reliance on the vapour barrier/facade is being used as the basis for building code compliance and that specialist advice has been sought.
- Review the draft maintenance schedule is appropriate for the particular elements that will require maintenance to achieve their design life.

(iii) Timber And Engineered Wood Products:

- Review the designer has communicated the performance requirements such as the moisture content during construction, mould removal and frequency of moisture measurements.
- Review the timber treatment schedule for conformity with B2/AS1. Alternatively, review the designer has:
    - engaged an expert to demonstrate that the moisture content of the timber will remain below 20% throughout its design life; or
    - referred to the architect or others that have a treatment schedule/specification for timber.

(iv) Compliance letter:

- Review the B2 compliance letter to ensure it is specific to the project and communicates the designers intended compliance pathway.

## 9. Documentation to be Provided by Reviewer

The reviewer should maintain a review log (e.g. a spreadsheet in the format suggested below) of any significant queries, the agreed actions and the status of each at completion of the review.

Date | Drawing Reference | Query by Reviewer | Response from Designer | Status at Completion of Review

This review log should be circulated to the designer and to the reviewer's client (whether that is the BCA, the property owner, the project manager, the building contractor or other). Note: - an initial list of queries from the reviewer to the designer may be quite lengthy and detailed. However, often many of the initial queries are answered quite simply, during the review process without generating significant changes to the structural design. The review log recommended for circulation is a concise summary of the items that were identified by the reviewer.

The review log should not be used by the reviewer as a point scoring mechanism to impress the client at the expense of the designer. However, it is often appreciated by clients because it makes them aware of the significant issues that were raised during the review and so the value of having an independent review carried out.

A completed producer statement PS2 form, referencing the reviewed DFR and drawings, and including a detailed list of the other reviewed documentation with relevant revision numbers and issue dates should also be provided.

The reviewer should confirm the scope of the design review and copy this to the designer, to the reviewer's client and to the BCA for inclusion on the BCA property file, ideally referenced from, and as an appendix to the PS2. Refer to the above section "Scope of Review" for further explanation. It is recommended that the designer's calculations, specifications and any referenced expert reports provided to the reviewer for reference and are held on the property file by the BCA.

There are varying BCA requirements and reviewer preferences across NZ when it comes to signing documents. This should be agreed with the BCA prior to beginning the review. Where documents are signed, this should be accompanied by a stamp/note linking the signature back to the limited peer review scope, so it cannot be otherwise interpreted.

Many reviewers are reluctant to sign a copy of the designer's calculations because they may have done their own independent calculations rather than reviewing the submitted calculations in detail. Similarly, they may not wish to sign referenced expert reports such as a geotechnical, fire or wind report.

In SESOC's view, it should not be necessary for the reviewer to sign the designer's calculations, or other referenced expert reports. The aim should be for the reviewer to review the designer's interpretation of the conclusions and recommendations of those expert reports and the incorporation of those into the DFR.

## 10. Construction Phase Design Changes

As stated in the NZCIC Design Documentation guidelines - Construction Design Phase:

*"Significant changes or clarifications to the structural work in relation to the initial building consent documentation should be submitted to the Building Consent Authority and if necessary, an amended building consent obtained to cover these change".*

It is prudent to share significant changes with the peer reviewer for their consideration.

As part of the Building Consent amendment process the BCA may require the structural design reviewer to review and approve any significant changes or clarifications to the structural work.

It is recommended that significant changes or clarifications to the structural work are to be submitted by the designer on revised or supplementary drawings, rather than as supplementary sketches and instructions that may conflict with the drawings.

## 11. Resolving Disagreements

The purpose of this section is to address cases where the peer review cannot proceed due to disagreement over one or more items on the review log.

Disagreements are common within structural peer reviews, particularly with more complex designs. Differences of opinion may occur regarding the interpretation of Standards, the appropriateness of the analysis and calculations that have been performed, or the interpretation of results or level of conservatism that is appropriate. Such matters can be debated and are normally resolved by independent calculation or through reasonable discussion between competent engineers. Any difference of opinion should be recorded as part of the review log. Neither the designer or the reviewer is automatically correct.

At the extreme end of the scale comes compliance risk and damage to the reputation of individuals and the profession.

Should significant disputes arise, to increase the likelihood of a positive outcome, a standard process to resolving disagreements is recommended and outlined below. This is based on an effective process set up by ENZ for resolution of insurance matters following the Christchurch earthquakes.

1. Meet as engineers only, as the presence of others can influence discussion.
2. Opening statement by each party in a concise manner without interruption.
3. Identify areas where there is agreement.
4. Identify areas where this is disagreement.
    a. Are these differences of fact? And can these be investigated further and resolved?
    b. Are these differences in opinion? And if so, how are these best presented?
    c. Explore the issues based on the above.
5. If there are residual issues following the above:

    a. Are there alternative options which would satisfy both sides?
    b. Are the residual differences meaningful from a compliance perspective?
6. Resolution (where possible)

Following the above process if there is no resolution, the process can be followed through again with an independent facilitator (an independent and experienced structural engineer), whose purpose would be only to assist communication and ensuring issues are fully summarised and explored.

## 12. Acknowledgements of Contributors

This document was prepared by:

- Ashley Smith, Director at Structure Design
- Derek Bradley, Principal at Compusoft
- Brad Nichols, Principal at Robert Bird Group
- Andrew Gaul, Director at BGT
- Bill Vautier, Structural Engineer at Auckland Council (original 2010 document only)

Reviewers:

- Jeff Matthews, Project Director at Holmes NZ LP
- Carl Ashby, Director at WSP

# Appendix A – Background and International Experience

In response to John Scarry's Open Letter of 2002, an IPENZ (now Engineering New Zealand) Structural Engineering Taskforce investigated concerns about the standard of structural engineering in New Zealand and published a report with seven key recommendations for change in the industry. [Refer to the 2003 "Report of the IPENZ Structural Engineering Taskforce Enquiring into the State of Practice in Structural Engineering in New Zealand"]

Of particular relevance to this SESOC Guideline is recommendation number 5 by the IPENZ Taskforce, as follows:

*"Improved Consent and Audit Processes:*

> *The variability in the enforcement of standards between Territorial Local Authorities, and the unacceptably low standards in some cases, must be eliminated by ensuring that consent approvals and code compliance certification take place only after high quality evaluation processes, including peer review by expert structural engineers where the building has non-standard structural features.*
>
> *Territorial Local Authorities must establish a culture of complaining about the competence of engineers who present sub-standard work repeatedly, so that such practitioners can be investigated by the registering authority under the Chartered Professional Engineers of NZ Act 2002."*

As a follow-up to the IPENZ Taskforce report, SESOC published an article in their April 2007 journal entitled "IPENZ Structural Task Force – SESOC Committee Update".

In that article, for each of the key IPENZ Taskforce recommendations the SESOC Management Committee identified what they believed to be the key issues, outlined what had already been done in response and also what further work was planned. The following extracts are from SESOC's 2007 article in response to IPENZ Taskforce recommendation number 5 above. Note that Territorial Authorities (TA's) would now be referred to as Building Consent Authorities (BCA's).

*"Key Issues:*

> *The emphasis for SESOC, and for this (2007) paper, relates to the compliance checking of building consents for projects with significant structural content. The issues which are important to achieving an effective review process for building consent documentation are:*
>
> - *Sufficiently competent design professionals;*
> - *Sufficiently comprehensive and detailed documentation by design offices;*

- *Improved competence of reviewing engineers in Territorial Authorities (TA's) or parties acting on behalf of TA's;*
- *Lesser reliance on Producer Statements as a replacement for technical review.*

*An essential component of building consent review for structures is a preliminary review of the documentation by a competent and experienced structural engineer to confirm the presence or otherwise of "significant structural engineering content". ……If deemed to be required a technical review should ascertain that the designer used or supplied:*

- *Appropriate design loadings;*
- *Appropriate design standards;*
- *Regularity in the structural form;*
- *Identifiable gravity supporting systems;*
- *Identifiable lateral load resisting systems in each direction;*
- *Detailing of principle lateral load resisting elements appropriate for the assumed ductility;*
- *Comprehensive documentation;*
- *Identification of complex or unusual structural aspects.*

*Ideally the designer and the TA and the client should agree on who is to be engaged as the design reviewer before the design review commences, particularly for complex or high-risk projects. ……*

*There needs to be a minimum standard for what must be done for a design review. A random % technical audit process is also recommended for a sample of projects from each TA after the design review and consent process has been completed. This would audit all three parties including the designer, the reviewer and the TA.*

*The Territorial Authority building consent review process is the critical gate in achieving building code compliance. The SESOC committee is concerned that the emphasis of the (DBH) Building Consent Authority development guide appears to be so heavily on systems and processes to be adopted by the Building Consent Authority in order to achieve accreditation and not on the technical assessment of the building consent application documentation.*

*Does SESOC support Producer Statements? The committee agreed yes - provided they are not seen as a replacement for technical review, and provided that both design and design review producer statements are required for projects with significant structural content.*

*Should full documentation always be submitted for building consent, even where Producer Statements are used? The SESOC committee agreed yes. Documentation should always include a full set of drawings and specifications + structural design features report + full calculations. …..Reasons why the committee recommends the submission*

*of full design calculations include their importance for future reference by building owners when alterations are carried out and to facilitate an audit process.*

*Is protection of copyright for designs important? (It was suggested to the SESOC committee that some specialist designers may not want to submit full calculations because others could then copy them). The committee agreed that was not a valid reason. The designer can normally agree to someone who is appropriate to carry out the review in such cases. ("Full calculations" is not intended to apply to large voluminous computer output, for which a representative sample can normally be agreed between the designer and the reviewer).*

*The recently published Construction Industry Council (CIC) Documentation Guidelines are supported by SESOC and are seen as very helpful for the industry as a whole. However, a companion document is required that specifically targets structural documentation for building consent in more detail. This is seen as the primary gateway where structural designs need to be adequately documented so that the structural design review process is meaningful and thorough.*

*With variations to consents it is important to clarify the extent of changes to a structure that should trigger resubmission for design review and consent. It is also necessary to streamline that variation process.*

*SESOC is generally against TA's keeping independent listings for competency of engineers in their area. Standards of competence should be uniform across all TA's nationally and so one only competence register is recommended i.e. CPEng."*

New Zealand is not alone in experiencing problems with the building consent processes. The following extract is from the United Kingdom Confidential Reporting on Structural Safety (CROSS) Newsletter No 7, July 2007 (refer www.cross-structural-safety.org):

*"This Newsletter is about the quality of submissions for Building Regulations checking and the views of Building Control officers. Key points from two long and detailed reports are:*

- *many submissions demonstrate inadequate understanding of basic structural issues*
- *poor co-ordination between designers, sub-contractors, and suppliers*
- *quality and standards have dropped*
- *Local Authority Building Control Departments are under increasing financial and resource pressures*
- *there may be conflicts between the role of Approved Inspectors and Local Authorities*
- *risk analysis is being used as a way of deciding what should be checked*
- *submissions to Local Authority checking must not be a substitute for proper professional design and in house checking."*

Some further useful insights were given in a more comprehensive earlier report by the United Kingdom Standing Committee on Structural Safety (SCOSS) following that

committee's review of major accidents and disasters within the UK and internationally. The committee saw strong parallels between the systems leading to those disasters and the systems used within the construction industry for the execution of construction projects. Of particular relevance to this SESOC Guideline is the SCOSS article entitled *"The Control of Risks to Structural Safety*" in section 2 of their 13th report in 2001.

From the introduction of SCOSS report 13 section 2:

*"Design of new structures and structural assessment of existing ones have always been about the identification, assessment and control of risks. In particular, these tasks have involved consideration of risks in the loading to be experienced by the structure during its intended future lifetime including loads due to accident, misuse or malicious action), risks in the behaviour and reliability of materials and in workmanship, and risks of errors being made in design and construction processes.*

*Engineers have, through research and experience, accumulated data and found safe ways of dealing with the risks to structures, and have translated that research and experience into practical guidance in the form of codes and standards (which will be referred to below jointly as 'codes'). These avoid the need to repeat a full risk assessment exercise afresh for each project for common situations and common risks. Providing codes are adequate and are kept up to date with the state of knowledge and any changes in conditions, their use achieves both consistency and economy of effort. There could, however, be risks to safety if codes are inadequate or are not kept up to date.*

*Codes have always been intended for use by individuals who are competent, particularly to appreciate the limitations of the guidance. They have not been intended to be interpreted as quasi-legal documents to find the least onerous solution. There can be risks to safety if the application of codes is entrusted to individuals who are not competent, or if the codes are interpreted in a deliberately narrow or literal way."*

And the conclusions from SCOSS report 13 section 2:

*"In drawing the conclusions listed below, the (SCOSS) Committee has sought to identify the key factors and requirements for assuring structural safety in the future so that the industry, the professions and government may consider them in developing suitable systems. The Committee believes this Report may also assist individual engineers, including those in training, to develop greater awareness of structural safety issues.*

*The control of risks to structural safety:*

*(1) Structural safety can be placed at risk by active errors by designers, site personnel and the like and by latent errors introduced through inadequate procurement procedures, codes, standards and regulations.*

*(2) Codes and standards provide a core means of controlling risks to structural safety. Identified shortcomings should be addressed with urgency. It must be recognised that there may be gaps in codes and they may not cover recent innovation.*

*(3) The control of risks to structural safety depends primarily on the competence and integrity of individuals and organisations. The possibility that individuals or organisations might not be competent, or that their competence might be affected by commercial or other pressures is a risk to structural safety and needs to be controlled.*

*(4) Supervision and management systems used to control risks to structural safety should include appropriately independent arrangements for checking safety-critical elements. There is doubt as to whether systems conforming to ISO 9000 are adequate for this purpose.*

*(5) The certification of structural safety-related work should be entrusted only to appropriately qualified and experienced engineers.*

*(6) Certification by the work originator of the design and construction of structures whose failure would not have high consequences can give adequate assurance of structural safety provided there are appropriate systems in place for ensuring competence.*

*(7) For safety-critical aspects of design and construction of structures whose failure would have high consequences, third party independent certification is needed to give adequate assurance of structural safety.*

*(8) For structures whose failure would have high consequences and for structures that are innovative or unfamiliar in relation to the experience of the project team, an explicit process of risk management should be used. The process should include the systematic identification of hazards and assessment of risks to structural safety, followed by the selection of critical situations for design."*

# Appendix B – When is Independent Peer Review Needed?

Across New Zealand, BCA practices vary significantly when determining whether a PS1 is sufficient on its own or whether an independent peer review (e.g. PS2) is required for building consent. This decision is typically influenced by the scale, complexity, and risk profile of the proposed building work.

In section 2.6 of SCOSS Report number 13 mentioned above, the SCOSS committee referred to self-certification and stated their belief that:

*".....adequate assurance can be provided through self-certification only if self-certification is entrusted to:*

- *appropriately qualified and experienced persons and they are certified as competent by an independent accredited body that also audits their work.*
- *individuals and not to enterprises or groups of unidentified people."*

In New Zealand the relevant "independent accreditation body" is ENZ who administer the CPEng and other registers of professional structural engineers. The scheme relies on engineers working within their areas of competence and not being unduly influenced by commercial pressures because they are bound by a professional code of ethics.

At present there is no formal auditing process by ENZ and this may be viewed as a potential weakness with the current system. However, ENZ does have the ability to call back any CPEng qualified engineer for reassessment if there are concerns expressed about his or her work by others.

The current system therefore relies on ENZ being informed about bad work practices and alleged incompetence or negligence. ENZ have encouraged their membership, including professional engineers who work for the BCA's to give that feedback. However, in many cases engineers are unable to complain about others because of confidentiality agreements, contractual arrangements, the unwillingness of the client to support a complaint or other commercial pressures. They may also be reluctant to lodge complaints because of the (voluntary) time that is required to prepare and justify a complaint.

*A further extract from SCOSS report 13 section 2:*

*"Definition of the limits of scope of structural engineering work that individuals can self-certify is necessary. Whilst the definition of scope may be difficult to determine, it is important since work beyond the scope may invalidate any indemnifying insurance. A reasonable approach would be to base the limits of scope on the competence of the individual as demonstrated by experience and track record with an overriding requirement for defined structures that are innovative or whose failure would have high consequences to be checked independently. Some*

*form of independent certification of engineers, as envisaged in the DETR paper, will be needed to control certification of individual's competence.*

*There appears to be a general acceptance that truly independent third-party checking is the surest form of checking that structural design is sound. Accepting this view as valid, it remains necessary to determine in what circumstances independent third-party checking is necessary or essential. An approach to answering this question might be developed on the basis of the risk (probability and consequences) should a fatal error in design go undetected. The greater the risk, the greater should be the independence and thoroughness of checking.*

*This principle has been used successfully for many years by the (UK) Highways Agency in approval procedures for highways structures. (Highway) Structures are classified into four categories depending on cost and complexity. A hierarchy of approval and checking levels is specified, the more stringent levels being required, the more costly and complex the structure. For the lowest category, design may be checked by another engineer within the design team. At the other extreme, the design of complex structures has to be checked by an independent separate organisation. Independent checking of erection proposals and temporary works details is also required for major highway structures on trunk roads and motorways. The requirements apply also to any innovatory or special 20 SCOSS Thirteenth Report temporary works or false work. These requirements recognize experience indicating that risks to the safety and stability of highway structures are generally greatest during erection."*


SESOC