

## **CONCEPT REVIEW**

In April 1991, the APEGBC Special Review Committee, as one of 12 recommendations responding to the Closkey Commission Inquiry Report on the 1988 Station Square Roof Collapse, recommended "that members and engineering firms shall establish a quality assurance program for their engineering practice . . . ". Elements of the quality assurance program included that the Engineer of Record maintain a complete design file, obtain a thorough review of designs and, in particular, a review of structural designs by a professional engineer not involved in the design, and that construction of an engineered project be reviewed by a professional engineer. All 12 Special Review Committee recommendations were approved by membership ballot during the summer of 1991. Bylaw 14(b), Quality Management, was subsequently prepared and approved by membership ballot in the summer of 1992 and came into force on November 16, 1992 (published January/February 1993 issue of The BC Professional Engineer).

Since 1992, there has been considerable diversity of opinion regarding the interpretation of Bylaw 14(b)(3), which deals with concept reviews of structural designs. In December 1993, the Consulting Practice Committee decided to form an APEGBC Task Force, which included representation from the Consulting Engineers of British Columbia (CEBC), the Structural Engineering Consultants of British Columbia (SECBC) and the Heavy Industrial Structural Engineers Group, to deal with this issue. The objective of the Task Force was to clarify and provide guidance on the interpretation of Bylaw 14(b)(3) and to work with the City of Vancouver, which had issued draft concept review requirements and a draft concept review letter of assurance. The Task Force felt that it was extremely important to clearly establish the concept review requirements of APEGBC under Bylaw 14(b)(3) for all structural engineers in the Province of British Columbia. Should a particular jurisdiction having authority, such as the City of Vancouver, require further or other documentation, then they would make such requirements in addition to the APEGBC Bylaw requirements.

The Task Force held eight meetings and produced nine drafts before reaching consensus on the final version of the Guideline for Professional Structural Concept Review, which is provided here for the information of the members.

### **GUIDELINE FOR PROFESSIONAL STRUCTURAL CONCEPT REVIEW August 1994**

Under provincial statute, the Association of Professional Engineers and Geoscientists of British Columbia can pass, alter or amend bylaws to govern members and licensees. Bylaw 14(b), introduced in November 1992, requires that all members and licensees participate in quality management processes. One provision of this bylaw is that all structural designs be independently reviewed.

This guideline expands and clarifies section 3 of Bylaw 14(b), which pertains to concept reviews of structural designs. The intent of the guideline is to assist members and licensees in applying and maintaining uniform standards of review. The guideline states the Bylaws, explains the intent of structural concept reviews, delineates the qualifications for reviewers, suggests the documents to be provided by the Engineer of Record, outlines the steps reviewers might follow, and describes some stages of a project where concept reviews are appropriate.

## INSERT QUALITY MANAGEMENT BYLAW

### **Intent of Structural Concept Review**

The purpose of the structural concept review is to enhance public safety. As one element in a quality management process, it provides an independent overview of the primary structural system by reviewing structural design concepts and structural system integrity.

Structural concept review is undertaken by an independent experience structural engineer to determine if the structural system is sound, the documents appear to be complete, the design parameters are relevant and the structural members are appropriately sized and detailed. Except for some smaller projects as outlined below, concept review applies to all structural designs including new buildings, alterations and additions to existing buildings, structural components and structures other than buildings.

It is important to recognized that concept review is intended to supplement, but not replace, in-house design checks.

### **Projects Exempt from Structural Concept Review**

although Bylaw 14(b)(3) implies that all structural engineering design requires concept review, there are certain types of projects that may require structural engineering design but are exempt from concept review, including:  
conventional one- and two-family dwellings; and  
simple structures not governed by the BC Building Code

### **Structural Components Designed by Others**

Many projects incorporate structural components that are designed by specialty engineers retained by the component manufacturer or contractor (eg open web steel joists, precast concrete beams, etc). The Structural Engineer of Record has overall responsibility for coordinating the structural design and shall be the designated structural concept reviewer of design by specialty engineers.

The Structural Engineer of Record shall not delegate the lateral design of the primary structural system to others. An independent concept review shall always be performed on the primary seismic and wind-resisting system.

### **Qualifications for Structural Concept Reviewers**

Engineers performing structural concept reviews shall meet the following qualifications:

- be a registered professional engineer in British Columbia;
- have a minimum of 10 years of relevant structural experience;
- be independent of the project's structural design team; and
- not be involved in the development of original design concept, preliminary design, detailed design or preparation of construction documents.

Structural concept reviews may be performed by engineers within the same firm that generated the original design, provided that an independent perspective is maintained.

### **Documents to be Supplied by the Engineer of Record**

The Engineer of Record shall provide the following documents to the engineer performing the concept review:

1. All structural plans and supporting documents plus plans and supporting documents of other disciplines that may be necessary to review the structural concept, or which the reviewer requests.
2. The structural specifications, plus specification of other disciplines that may be necessary to review the structural concept, or which the reviewer requests.
3. The geotechnical report.
4. A summary sheet documenting:
  - the structural system and design approach in sufficient detail to identify the lateral and vertical load resisting systems including any special or unconventional aspects;
  - site-specific design data including climatic and seismic criteria;
  - project-specific design parameters including seismic R value, soil bearing capacity, lateral soil pressure, pile capacity, etc
  - the design loads from use and occupancy, snow, rain, wind, superimposed dead loads, mechanical and electrical equipment, and architectural features such as cladding, window-washing equipment and land-scaping; and
  - any special loading conditions or performance criteria.
5. The structural design notes and calculations when requested at the discretion of the reviewer.

### **Structural Concept Review Process**

The steps for a structural concept review are as follows:

1. Review the design criteria and loads, including loads imposed by components designed by other disciplines.
2. Verify that material properties are adequately defined in the documents.
3. Review the concept and integrity of the gravity and lateral load resisting system.
4. Review the continuity of load paths for both gravity and lateral loads.
5. Review the structural plans and supporting documents to determine whether they are sufficient to identify the essential components of the structural system.
6. Perform design calculations on a representative sample of structural elements to determine whether the analysis, design and detailing generally comply with the appropriate codes and standards. (The representative sample shall be determined at the discretion of the reviewer to suit the size and complexity of the projects. At least 10% of each structural element type shall be checked: ie 10% of beams, columns, diaphragms, shear walls, etc.)
7. Discuss any concerns with the Engineer of Record.
8. Provide a formal Record of Professional Structural Concept Review to the Engineer of Record, including the attached checklist and noting any unresolved issues.

### **Structural Concept Review Options**

The requirement for structural concept review can be met at various points in the design process. Some potential scenarios are as follows:

- the review can be undertaken once the structural plans and supporting documents are complete, just prior to the release of a building permit;
- the review can be combined with an in-house design check once the construction documents are near completion; or
- the review can be undertaken during the design process with independent reviews at various stages of design development.

If the third method of review is chosen, then a final structural concept review is also required once all of the structural plans and supporting documents have been completed.

# CHECKLIST FOR PROFESSIONAL STRUCTURAL CONCEPT REVIEW

The Structural Engineer of Record

Re: Project Name (print) \_\_\_\_\_ P.Eng. Name (Print) \_\_\_\_\_

Address of Project (print) \_\_\_\_\_ Firm Name (print) \_\_\_\_\_

Legal Description of Project (print) \_\_\_\_\_ Address (print) \_\_\_\_\_

ITEM	REVIEWED	REMARKS
	Initials	
1. Design code loadings and serviceability limits.		
2. Material specifications and geotechnical recommendations.		
3. Concept and integrity of the gravity load resisting system.		
4. Concept and integrity of the lateral load resisting system.		
5. Drawing completeness and continuity of load paths.		
6. Design check of representative structural elements.		
7. Review of representative structural details.		
8. Effects on adjacent structures (seismic clearance, snow buildup, foundations).		
9. Concerns discussed with the Engineer of Record.		

## The Concept Review Engineer

P.Eng. Name (Print) \_\_\_\_\_

Firm Name (Print) \_\_\_\_\_

Address (Print) \_\_\_\_\_

Signature \_\_\_\_\_

Date: (yy/mm/dd)

# CHECKLIST FOR PROFESSIONAL STRUCTURAL CONCEPT REVIEW

To: The Structural Engineer of Record

\_\_\_\_\_  
P.Eng. Name (print)

\_\_\_\_\_  
Firm Name(print)

\_\_\_\_\_  
Address(print)

Re:

\_\_\_\_\_  
Project Name (print)

\_\_\_\_\_  
Address of Project (print)

\_\_\_\_\_  
Legal Description of Project (print)

The undersigned hereby records that an independent structural concept review of the project, based on the attached list of the structural plans and supporting documents prepared by the *Registered Professional* of the structural components, has been completed by this *Registered Professional*.

I certify that I am a *Registered Professional* as defined below

Name (print)

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signed

\_\_\_\_\_  
Address (print)

\_\_\_\_\_  
Phone

(Affix PROFESSIONAL SEAL here)

(If the *Registered Professional* is a member of a firm, complete the following)

I am a member of the firm \_\_\_\_\_

and I sign this letter on behalf of the firm.

(print name of firm)

## NOTE:

1. The above letter must be signed by a *Registered Professional*, which is defined to mean a person who is registered or licensed to practise as a professional engineer under the *Engineers and Geoscientists Act* in BC.
2. Concept review as used herein shall mean such reviews of the structural plans and supporting documents as described in the Guideline for Professional Structural Concept Reviews as prepared by the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC) and which, in this *Registered Professional's* discretion, is considered necessary to fulfill the requirements of APEGBC Quality Management Bylaw 14(b)(3).
3. This letter is endorsed by the Association of Professional Engineers and Geoscientists of British Columbia.