APPENDIX G

Guidelines for Impact Analysis for CCBFC Committees

This document presents 21 guiding principles for the preparation of impact analyses supporting proposed code changes. It is intended to be used by the CCBFC committees when developing proposed changes for public review.

It is important to note that these are general guidelines; each proposed change will be different in nature and may require special considerations beyond the principles presented herein. The applicability of each principle should be determined by the CCBFC committee(s) responsible for the proposed change being developed.

Definitions

Impact

"Impact" refers to the consequences—intended and unintended, positive as well as negative, specific to an objective or in general — that may result from the implementation of a proposed change.

Impact Analysis

"Impact analysis" refers to the methods and processes that are used when comprehensively describing the positive and negative consequences resulting from the implementation of a Code change.

"Impact analysis" implies a systematic practice where assumptions, methods and results are presented in such a way that they can be tested by other analysts.

Impact analyses must consider as many consequences as possible, including those that are not quantifiable in monetary terms.

General Issues

Prescriptive Requirements versus Performance-Based Requirements

The effort required to analyze the costs and benefits of a prescriptive requirement is different from the corresponding effort required for a performance requirement.

Prescriptive requirements state a specific compliance option, which means that building materials and construction techniques on which costing of the proposed change is based are known. On the other hand, performance requirements state a desired outcome and leave the construction compliance method up to the designer: i.e., multiple construction methodologies could be used to achieve the stated performance measure and each one would presumably entail different costs.

For the assessment of benefits, the change in the performance level of the building or its components that would result from implementation of the proposed change may first need to be established. The change in performance level will likely be more difficult to determine for prescriptive requirements, where the performance level of the existing requirement and/or of the proposed requirement may be unknown or difficult to assess. In the case of performance-based requirements, it is more likely that their performance levels will be explicitly stated or more easily determined.

The principles that follow take the differences between prescriptive and performance-based proposed changes into account.

Principles and Analysis

General Principles

Principle 1:
An impact analysis must be prepared for all proposed changes.

The term ‘all proposed changes’ includes changes that present another option to an already established acceptable solution in Division B. This term also includes so called ’enabling provisions’ which are requirements that only come into effect if the code user chooses to incorporate the element, which is the subject of the provisions. ‘All proposed changes’ also includes changes that add a standard reference.

Principle 2:
The level of complexity of the impact analysis should be proportional to that of the proposed change.

It would not be reasonable or congruent with the feasibility of the process to require a rigorous analysis for all Code changes as the vast majority of the analyses will be carried out by the CCBFC committees.

Proposed changes that fall within the criteria of “minor tasks” (see 16.4.4 of the CCBFC Policies and Procedures) would therefore warrant a very simple analysis.

Proposed changes that are contentious or that have significant policy or cost implications (see 17.3.4 of the CCBFC Policies and Procedures) would warrant a complex analysis that may require the hiring of a specialized consultant.

On the spectrum between simple and complex, the level of complexity of the impact analysis should be proportional to the complexity of the proposed change.

Principle 3:
A quantitative analysis should be performed when possible; else, a qualitative analysis is required.

Impact analyses can be expressed in quantitative terms, in qualitative terms, or as a combination of the two. A quantitative assessment should be performed where possible to support the justification and rationale of the proposed change. Where this is not possible, a qualitative analysis is required.

Principle 4:
The impact analysis should be restricted to the direct or primary costs and benefits (indirect costs and benefits can be analyzed separately if deemed of interest).

The impact analysis should include the direct costs and benefits involved in the implementation of the proposed change.

Examples of direct or primary costs are construction materials and labour costs.

Incrementally incurred costs may need to be considered by the committees in their analysis, for example site implications for a possible increase in a building footprint due to a proposed change.

Indirect or secondary costs are any costs that fall outside the scope of the codes, for example training cost, the maintenance of buildings or the purchase of standards. Indirect costs are often difficult if not impossible for the CCBFC committees to assess.

Direct or primary benefits are the benefits related to the applicable Code’s objectives that the proposed change is intended to achieve: e.g., improved safety, reduced negative health implications, reduced energy costs. As with indirect costs, indirect benefits fall outside the scope of the Codes and are difficult, if not

impossible, for the CCBFC committees to assess: e.g., reduced insurance costs, reduction in infrastructure costs.

Indirect costs and/or benefits are worth noting on the proposed change. However, it is a concern that requiring their quantitative assessment would expand the analysis beyond the scope of the Codes and place an undue burden on the CCBFC committees such that the complexity of the analysis would exceed the capacity of the system to complete it.

Principles Related to Benefits

Principle 5:
A benefit is generally defined as an increase in performance level or a reduction in construction cost, or a combination thereof.

In the majority of cases, a benefit will entail a reduction in monetary costs or an increase in performance level, which may, in turn, bring about monetary savings. Typical examples of benefits include:

- removing a hazard or reducing the risk associated with the hazard
- improving the performance of buildings
- clarifying code provisions that ease enforcement and save time, or
- offering design flexibility or less costly acceptable solutions to the industry

It should be noted that what is perceived as a benefit by one committee may be viewed as a cost by another.

Principle 6:
Where benefits of proposed changes are related to an increase in performance level, the net benefit must consider the probability of occurrence.

Where the net benefit results from an increase in performance level and where a formula can be used to estimate it, the net benefit is the product of the value of the benefit times the probability of occurrence.

Principle 7:
When there is uncertainty about the quantitative analysis of benefits (the probability of occurrence and/or the dollar value of the benefit), a likely range of values should be provided.

In many cases, it may be difficult to acquire definitive numbers for the probability of occurrence and to assess the monetary value of a benefit. Where these parameters cannot be determined with a reasonable degree of certainty for the specific case covered by the proposed change, the benefit should be expressed in terms of a likely range of values.

Principle 8:
The direct benefit should relate directly to one or more approved Code objectives that the proposed change addresses.

To keep within the scope of the Codes, the direct benefit should relate specifically to at least one of the Codes' objectives: energy use and water use efficiency, fire and structural protection of buildings, fire and structural safety, health and accessibility. Each objective may have its own unique characteristics. Where a single provision is attributed to multiple objectives, only one impact analysis is required. Where objective-specific principles apply (Principles 9-13), they should be considered in the context of all other objectives to which a provision is attributed.

Principle 9:
The benefits of proposed changes linked to the objective of energy use and water use efficiency

under Environment should be expressed in quantitative terms as monetary savings or as incremental annual energy or water savings.

Energy use and water use efficiency under Environment – The benefits of proposed changes linked to these objectives are typically quantifiable in terms of monetary savings. While there is typically no statistical analysis related to probability of occurrence associated with such provisions (as is often the case for health and safety-related objectives), assumptions or benchmarks can be established that facilitate predictions on national annual energy or water use savings. If deemed relevant, the committees can note large-scale benefits, such as positive effects of a proposed change on community infrastructure, in qualitative terms.

Principle 10:
The benefits of proposed changes linked to the objective of fire and structural protection of buildings should be expressed in quantitative terms as monetary savings resulting from the value of the benefit or as an incremental benefit calculated as the product of the benefit times its probability of occurrence.

Fire and structural protection of buildings – The benefits of proposed changes linked to these objectives are also quantifiable in terms of monetary savings, however, there is a statistical component related to probability of occurrence that needs to be factored in the equation. The CCBFC committees should strive to determine this probability of occurrence to yield a net benefit in dollars.

Principle 11:
For proposed changes linked to the objective of safety, the aspect of the benefit related to injury should be expressed in quantitative terms as monetary savings resulting from the value of the benefit times the probability of occurrence of the hazard, and the aspect related to loss of life should be expressed in terms of number of deaths avoided.

Safety – The safety objective relates to the risk of injury and/or death resulting from a sudden hazardous event, such as an accident, fire, or failure of a building system. Benefits related to injury reduction should be based on medical treatment costs averted over the life of the injured person times the probability of occurrence of the hazard. The aversion of loss of economic productivity and reduction of negative impact on quality of life are examples of indirect benefits related to the safety objective.

Principle 12:
For proposed changes linked to the objective of health, the aspect of the benefit related to illness should be expressed in quantitative terms as monetary savings resulting from the value of the benefit times the probability of occurrence of the hazard, and the aspect related to illness should be expressed in terms of illness avoided.

Health – The health objective relates to the risk of illness that may or may not lead to death. Direct benefits related to illness reduction should be based on comprehensive medical, caregiver and transportation costs averted over the life of the ill person times the probability of occurrence of the event that caused the illness. Similar to the safety objective, the aspect related to loss of life (in this case, death resulting from illness) should be expressed in terms of number of deaths avoided. The aversion of loss of economic productivity and reduction of negative impact on the quality of life are examples of indirect benefits related to the health objective.

Principle 13:
For proposed changes linked to the objective of accessibility, the benefits should be expressed in quantitative terms to the best possible extent; else, a qualitative assessment is required.

Accessibility – The accessibility objective relates to the reduction of impediments to the access of buildings and their facilities/amenities. Benefits related to this objective are largely societal in nature and will typically be expressed in qualitative terms. In some cases, it may be possible to describe the benefits in terms of numbers of persons assisted and/or building types impacted.

Principles Related to Costs

Principle 14:
A cost is generally defined as reduction in performance level or an increase in monetary cost.

The corollary to the benefit being a positive impact of the proposed change is that a cost is perceived to be negative. In the majority of cases, cost refers to an increase in monetary costs introduced by the proposed change. It is also possible to express a reduction in performance level as a cost, for example if the implementation of a proposed exemption brings about an increase in hazard in some situations.

Principle 15:
Monetary costs refer to the incremental capital cost of construction, but, depending on the scope of the proposed change, might include operational costs.

The monetary costs should be based on the incremental capital cost of materials and labour; in other words, on the difference between the cost of Code-compliant construction to the current code and the cost of construction as described in the proposed change.

With the exception of the NFC, operational issues are not within the scope of the Codes; however, reduced operational cost savings are used to rationalize proposed changes in the National Energy Code for Buildings (NECB) of Canada even though the NECB does not apply to the operation of buildings.

Principle 16:
The cost analysis should be transparent and reflect a national perspective (not regional ones).

The cost analysis should be carried out from a national perspective using information that is weighted by population. It must be transparent so that jurisdictions and organizations can tailor it to suit their particular situation.

Occasionally a proposed change will deal with an issue whose costing will require some consideration of regional differences. An example of such an exception is a proposed change dealing with residential sprinklers: their installation in areas connected to a municipal water system would entail substantially different costs than in areas served by wells. The CCBFC committees must be cognizant of underlying factors that could affect the cost analysis.

Principle 17:
Costing tools, such as RSMeans, should be used to determine the incremental capital cost of construction.

Costs should be based on a standardized and readily accessible source of information. Many of the CCBFC committees have successfully used the *RSMeans* cost manuals to perform their analyses. These manuals contain factors that take into account construction costs by geographic location, which facilitate the determination of a national cost by weighting according to population.

Principle 18:
A quantitative cost analysis is the default approach for prescriptive proposed changes; in rare cases where it is not possible to do so, a qualitative cost analysis is required.

As prescriptive provisions typically present an exact construction methodology, a quantitative cost analysis of such proposed provisions should be viable.

Principle 19:
A qualitative cost analysis is acceptable for performance-based proposed changes, if the cost of implementation is projected to be no more than 0.5% of the total cost of construction for the building.

Performance-based proposed changes can be implemented through a variety of design and construction methods; hence, the effort to assess the costs of such proposed changes can be exponentially greater than that required for prescriptive changes. As such, performance-based proposed changes have a minimum threshold below which a qualitative analysis is sufficient, which is set at proposed changes that amount to no more than 0.5% of the total construction cost for the building. For these proposed changes, a qualitative cost analysis rather than a quantitative one is deemed acceptable.

Principle 20:
A quantitative cost analysis is required for performance-based proposed changes, if the cost of implementation is projected to be more than 0.5% of the total construction cost of the building. This analysis should be based on a representative number and type of archetype buildings most likely to be impacted by the change. The results should then be weighted by percentage of buildings constructed.

Assessment of Cost versus Benefit

Principle 21:
The costs and benefits analyses should be transparent and clearly stated so that stakeholders can easily compare them with their particular purposes in mind.

Caution is advisable when comparing costs and benefits analyses that are based on projections of future scenarios. They are inherent in such analyses as net present value, which uses discount rates, inflation rates and the assessment period.

Life-cycle costing is another widely used form of analysis; however, it is an optimization tool that accounts for issues that are beyond the scope of the Codes, such as maintenance costs, and thus, should not be used.

The cost-versus-benefit assessment should be easy and straightforward; e.g., where specific formulas or assumptions have to be used, these should be stated.

Tools

The following table presents a simple way to determine the degree of complexity of a proposed change.

	Degree of Complexity					
Simple proposed change						Complex proposed change
Non-controversial						Controversial
No policy issues						Policy issues (as defined in 17.3.4)
Within scope of Codes						Beyond scope of Codes
No enforcement issues						Significant enforcement issues
Very low or no costs						High costs

Once the complexity of the proposed change has been established, the proportional level of impact analysis should be determined using the flowchart below (Figure 1).

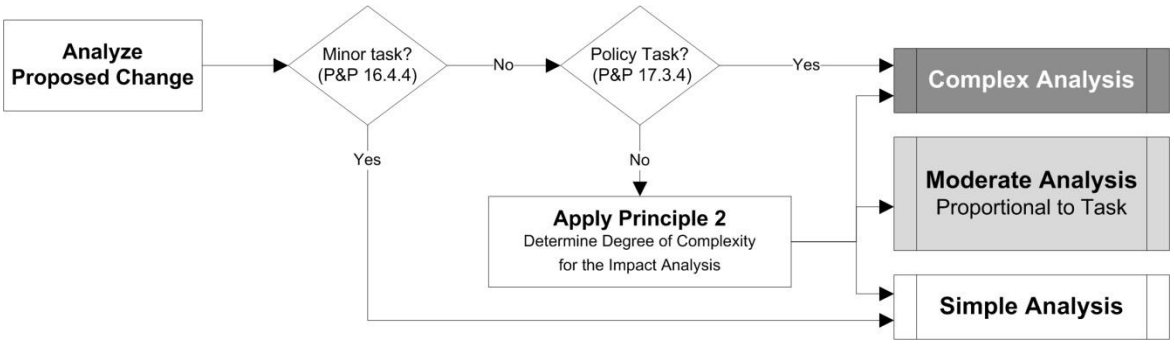

Figure 1. Determining Proportional Level of Impact Analysis

The flowchart below (Figure 2) shows the impact analysis methods for proposed changes that are moderate or complex.

Figure 2. Flowchart for Moderate or Complex Impact Analysis