

User's Guide – NBC 2010 Structural Commentaries
(Part 4 of Division B)

Errata Package

Updated pages have been produced for your convenience.

Introduction

The purpose of these Commentaries is to make available to the designer detailed design information that will assist in the use of Part 4 of Division B of the National Building Code of Canada 2010 (NBC). The Commentaries are provided as background information and, in some cases, as suggested approaches to certain design questions, but not as mandatory requirements.

Because the information provided in these Commentaries cannot cover all conditions or types of structures that occur in practice, and also because new information may become available in the future, the designer should try to obtain the latest and most appropriate design information available. For unusual types of structures, specialized information such as theoretical studies, model tests or wind tunnel experiments may be required to provide adequate design values.

Commentaries A, F, G, I, J and K were updated by the groups listed below to reflect technical changes made to Part 4 of the NBC 2010.

Revisions to Commentary A, Limit States Design, were prepared by the Standing Committee on Structural Design, which advises the Canadian Commission on Building and Fire Codes on provisions for all structural design other than earthquake engineering.

Revisions to Commentary F, Live Loads (formerly Tributary Area), were prepared by the Task Group on Live Loads Due to Use and Occupancy of the Standing Committee on Structural Design:

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C.R. Taraschuk of the Institute for Research in Construction supported this Task Group.

Revisions to Commentaries G, I and K were prepared by the Task Group on Climatic Loads of the Standing Committee on Structural Design:

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Revisions to Commentary J, Design for Seismic Effects, were prepared by the Standing Committee on Earthquake Design, which advises the Canadian Commission on Building and Fire Codes on provisions for earthquake engineering in the NBC.

No revisions were made to Commentaries B, C, D, E, H and L.

Errata

Issued by the Canadian Commission on Building and Fire Codes

The Change History table that follows describes errata that apply to the User's Guide – NBC 2010, Structural Commentaries (Part 4 of Division B).

Change History — User's Guide – NBC 2010, Structural Commentaries (Part 4 of Division B)

Commentary	Reference	Date (Y-M-D)	Description of Errata
D	Paragraphs 12, 16 and 18	2012-12-21	Term "dead-weight" was deleted
I	Figure I-1	2012-12-21	Figure I-1 was corrected and the reference in Note (1) was corrected to read "Sentence 4.1.7.2.(3)"
I	Figure I-15	2012-12-21	Reference in Note (7) was corrected to read "(see Figure I-10 for the definition of b)"
I	Equation (7)	2012-12-21	"N" above summation in numerator was romanized and "1" beneath summation in denominator was corrected to read "i=1"
I	Figure I-24	2012-12-21	"I _w " was added to the beginning of the equations for F _n and F _t and "w" was deleted from the end of these equations

Commentary I

Wind Load and Effects

Summary of Changes from the National Building Code of Canada 2005

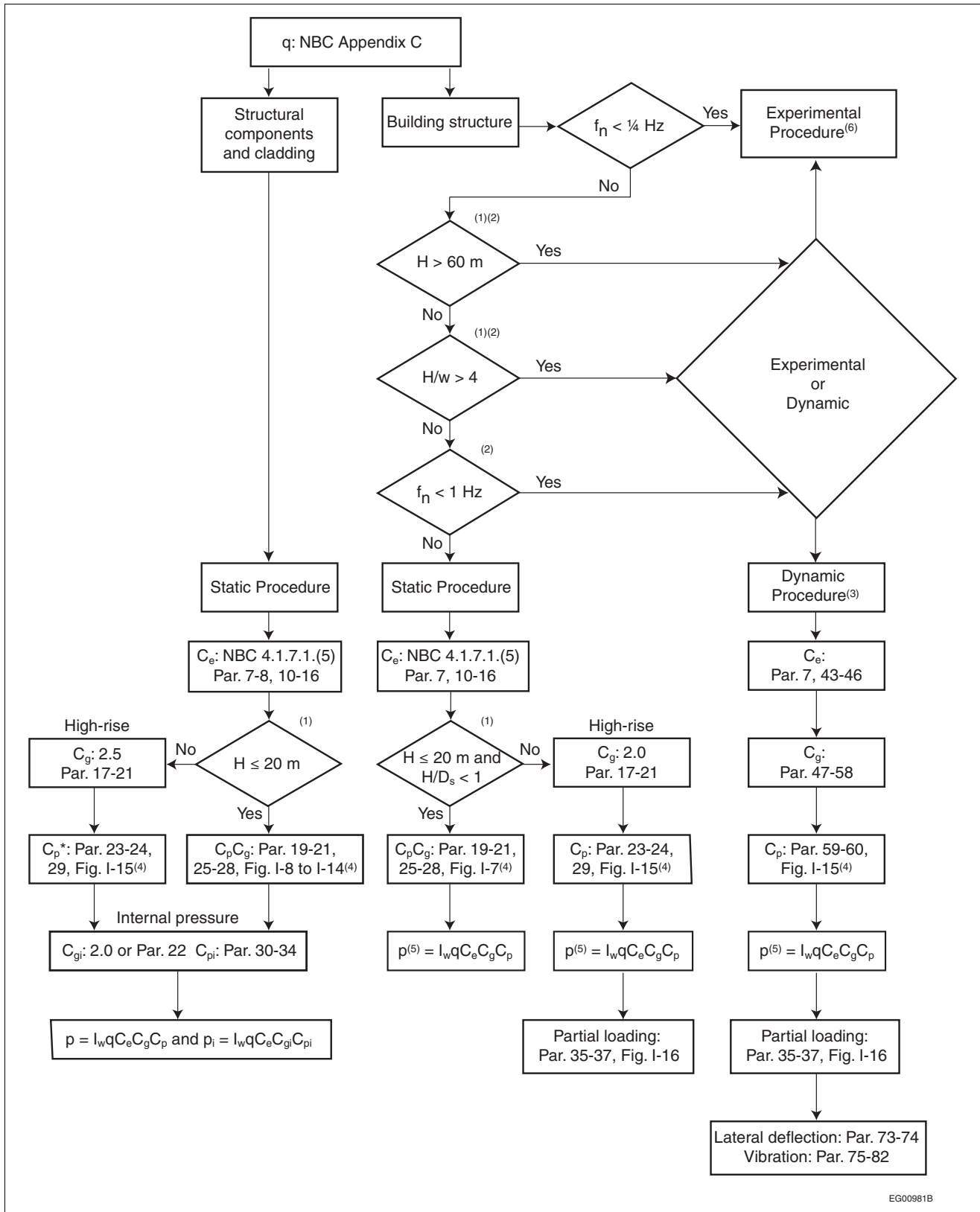
Notable changes in the National Building Code of Canada 2010 (NBC):

- Change to building height that triggers the use of the Dynamic or Experimental Procedure from 120 m to 60 m
- Introduction of 1 Hz as the lowest natural frequency that triggers the use of the Dynamic or Experimental Procedure
- Introduction of $\frac{1}{4}$ Hz as the lowest natural frequency that triggers the use of the Experimental Procedure
- Removal of Exposure C

Notable changes in this Commentary:

- Introduction of equation to determine lowest natural frequency, f_n

Commentary I



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Figure I-1
Flow chart for calculating wind load and effects on buildings

Notes to Figure I-1:

(1) H is the height, D_s the smaller plan dimension, and w the effective width of the building as defined in Sentence 4.1.7.2.(3) of the National Building Code of Canada 2010 (NBC).

Commentary I

Dynamic Procedure

Application

38. NBC Sentence 4.1.7.2.(1) requires the use of the Dynamic or Experimental Procedure for buildings whose height is greater than 4 times their minimum effective width, or greater than 60 m, and other buildings whose lowest natural frequency, f_n , is < 1 Hz and $\geq \frac{1}{4}$ Hz as determined by rational analysis. Minimum effective width is defined in NBC Sentence 4.1.7.2.(3).
39. NBC Sentence 4.1.7.2.(2) requires that the Experimental Procedure be used for buildings whose lowest natural frequency, f_n , is $< \frac{1}{4}$ Hz as determined by rational analysis.
40. The lowest natural frequency, f_n , referred to in Sentences 4.1.7.2.(1) and (2) may be estimated using the following approach (Rayleigh's method):
 - the building is divided into a number, N , of vertical levels, each level typically being one floor denoted as the i^{th} level or the roof;
 - each level or floor has an associated wind force, F_i , which may be computed using the Static Procedure;
 - each level or floor also has an associated mass, M_i ; and
 - the horizontal deflections of each floor, x_i , caused by F_i are computed using appropriate structural static analysis methods, including the deflection of the top level, x_N , i.e. at the N^{th} level.

The lowest natural frequency in Hz can then be estimated using the following equation :

$$f_n = \frac{1}{2\pi} \sqrt{\frac{\sum_{i=1}^N F_i \frac{x_i}{x_N}}{x_N \sum_{i=1}^N M_i \left(\frac{x_i}{x_N}\right)^2}} \quad (7)$$

It is important to note that the period determined from Equation (7) is to be used only for estimating the lowest natural frequency that triggers the requirement to use the Dynamic Procedure for design for wind forces and should not be used in the calculation of design seismic loads.

41. In the Dynamic Procedure for calculating wind load on the building structure, the exposure factor, C_e , and external gust effect factor, C_g , are different from the factors used in the Static Procedure, but the pressure coefficient, C_p , is the same. See Figure I-1 for guidance on how the Dynamic Procedure for the structure is carried out in conjunction with the Static Procedure for the cladding.
42. In addition to the calculation of wind load, the calculation of wind-induced lateral deflection, vibration and vortex-shedding effect can also be important for some buildings that are required to be treated by the Dynamic Procedure. These topics are dealt with separately under the sections of this Commentary entitled Lateral Deflection of Tall Buildings, Building Vibration and Vortex Shedding.

Exposure Factor, C_e

43. In the Dynamic Procedure, the exposure factor, C_e , is based on the profile of mean wind speed, which varies considerably with the general roughness of the terrain over which the wind has been blowing before it reaches the building. To determine the exposure factor, two categories of terrain exposure have been established and are illustrated in Figures I-2 to I-5.

Exposure A (open or standard exposure): open level terrain with only scattered buildings, trees or other obstructions, open water or shorelines thereof. This is the exposure on which the reference wind speeds are based.

$$C_e = \left(\frac{h}{10}\right)^{0.28} \quad \text{for } 1.0 \leq C_e \leq 2.5 \quad (8)$$

Figures

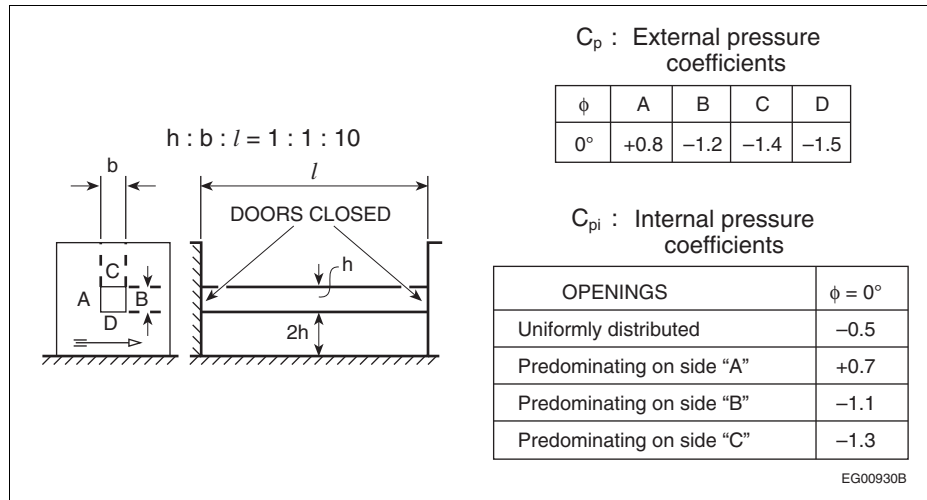


Figure I-23
Closed passage between large walls

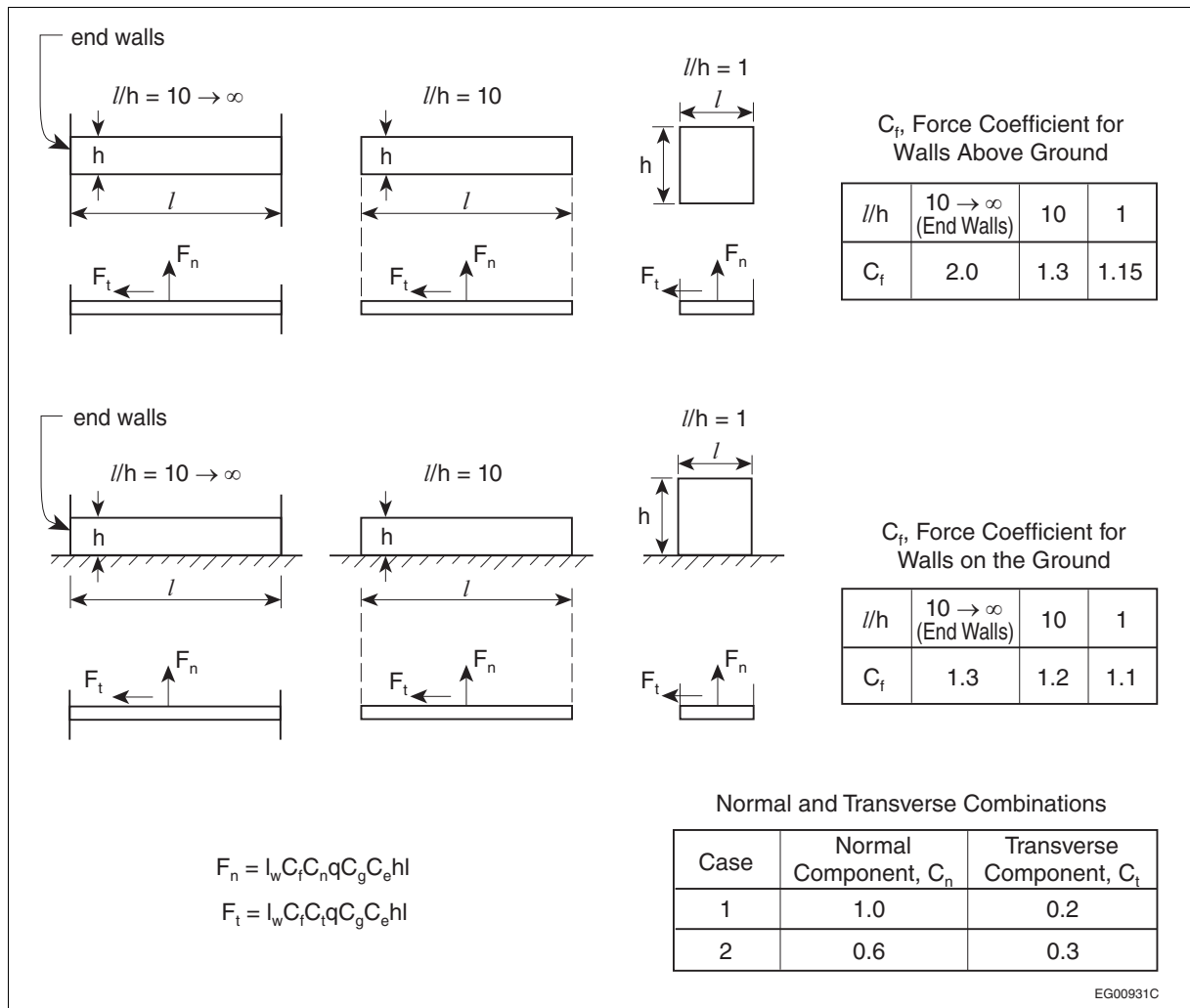


Figure I-24
Free-standing plates, walls and billboards