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## Application of the *National Energy Code for Buildings* 2011 to a Steel Building System

### Introduction

The National Energy Code for Buildings (NECB) was published in the fall of 2011. It is a National Model Code which will be adopted by the Provinces and Territories to the extent it meets their plans. It applies to the construction of new buildings that are required to meet the provisions of Part 3 of the National Building Code of Canada, or the applicable Provincial Building Code.

There are four paths through which building designs may comply with NECB 2011:

1. The Prescriptive Path (Section 3.2.) in which assemblies and components must meet minimum prescribed performance requirements.
2. The Simple Trade-off Path (Subsection 3.3.3.) in which certain assemblies or components may not meet the prescribed performance requirements, while other assemblies or components exceed the prescribed performance requirements, such that the overall performance of the building will not use more energy.
3. The Detailed Trade-off Path (Subsection 3.3.4.) in which a computer model is used to establish a reference building envelope energy target. Some components are permitted to be less energy efficient provided it can be demonstrated the building envelope will not transfer more energy than the building envelope energy target.
4. The Performance Path (Section 3.4.) in which the Trade-Off methodology is extended to include equipment inside the building, (i.e. fans, appliances, elevators, etc.) and a computer model is used to determine that the building assemblies, components and equipment in aggregate, will not use more energy than the reference building envelope energy target.

The Prescriptive Path provides maximum overall thermal transmittance for the building walls, roof, fenestration and doors (refer to Subsection 3.2.2.). The Prescriptive Path also allows certain percentages of total wall area for vertical fenestration and doors (Sentence 3.2.1.4.(1)). For heating degree days (HDD) less than 4000, the ratio of area of doors and fenestration to total wall area can be a maximum of 40%. For HDD between 4000, and 7000, this ratio is calculated as  $(2000 - 0.2 \times \text{HDD}) / 3000$ . For HDD over 7000, this ratio is 20%. As it gets colder, the allowable area for doors and windows decreases. The Prescriptive Path further allows up to 5% of the gross roof area to be skylights (Sentence 3.2.1.4.(2))

The Simple Trade-off Path demonstrates that the sum of the areas of vertical (or horizontal) assemblies of the building envelope multiplied by their respective overall thermal transmittance is not more than the corresponding assemblies in the reference building. The reference building for the Simple Trade-off Path is the same building used with the Prescriptive Path.

If certain components are more energy efficient than those prescribed in the Prescriptive Path, the trade-off calculation is permitted to take this increased performance into account. To perform the calculation, vertical (wall) portions of the building envelope can only be traded off against other vertical (wall) portions, and horizontal (roof) portions of the building envelope can only be traded off against other horizontal (roof) portions.

The Simple Trade-off Path cannot be used for semi-heated buildings, which require less energy than a reference building with a temperature set point of 18°C, and have heating capacity no greater than the heating load plus 5%. For semi-heated buildings, the Detailed Trade-off Path or the Performance Path must be used.

The Detailed Trade-off Path and the Performance Path utilizes computer energy modeling and the services of a professional engineer proficient in this work. It is beyond the scope of this fact sheet.

## **Air Leakage**

NECB requires that the building envelope be provided with a continuous air barrier to control air leakage (refer to NECB Article 3.2.4.1. and NBCC Article 5.4.1.2.).

## **Calculation of Thermal Transmittance**

Any recognized procedure may be used to calculate thermal transmittance (Article 1.1.4.2.), as long as it takes into account the thermal bridging effect of closely spaced repetitive members (Sentence 3.1.1.7.(1)). Prescribed test procedures may also be used (Article 3.1.1.5.). Computer models may also be used (Article A-3.1.1.5.).

## **Exemptions Due to Special Occupancy Requirements**

The Authority Having Jurisdiction has latitude to review building occupancy and exempt certain occupancies from having to meet some, or all, of the provisions of the NECB. Only occupancy is to be considered, not economic factors.

Examples of buildings that may be exempted include buildings with process heat such that no other heating source is needed, in which case insulation requirements may be reduced; industrial buildings with large ventilation requirements, in which case the air tightness requirements may be exempted; and buildings such as bleacher areas of some ice arenas, and bus shelters, in which only local heat is provided to occupants, with no temperature control of the ambient air.

## **Proof of Compliance with the NECB**

The structural design of the steel building system (SBS) is the responsibility of the SBS manufacturer but not the proof of compliance with the NECB requirements. The owner of the building must retain a design professional to undertake this work and coordinate the building envelope requirements with the SBS manufacturer.