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CSA Z5010:21
National Standard of Canada

Thermal bridging calculation methodology

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Preface

This is the first edition of CSA Z5010, *Thermal bridging calculation methodology*.

CSA Group acknowledges that the development of this Standard was made possible, in part, by the financial support of BC Hydro, Efficiency Manitoba, Canadian Electricity Association, Nova Scotia Department of Energy and Mines, EfficiencyOne, NRCan, NEEA, FortisBC-Gas, and Transition énergétique Québec.

This Standard is considered suitable for use for conformity assessment within the stated scope of the Standard.

This Standard was prepared by the Subcommittee on Thermal Bridging Calculation Methodology, under the jurisdiction of the Technical Committee on Building Energy Systems, and has been formally approved by the Technical Committee.

This Standard has been developed in compliance with Standards Council of Canada requirements for National Standards of Canada. It has been published as a National Standard of Canada by CSA Group.

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Thermal bridging calculation methodology

0 Introduction

In North America, residential and commercial buildings account for more than a third of all energy use and greenhouse gas emissions. Improved energy conservation in buildings has long been recognized as an important and cost-effective approach to reduce energy consumption and to mitigate greenhouse gas emissions. Most, if not all, governments and utilities have a mandate to encourage energy conservation in buildings, and local jurisdictions have been adopting increasingly more stringent building energy efficiency standards. Space conditioning is one of the largest components of energy use in commercial, institutional, and residential buildings in North America. Building enclosure thermal performance is a critical consideration for reducing space-heating loads and will be an increasingly important factor as authorities strive for lower energy consumption in buildings.

Research and monitoring of buildings are increasingly showing the importance of reducing thermal bridging. The impact can be significant to whole-building energy use, the risk of condensation on cold surfaces, and occupant comfort. The traditional approach of building codes to reducing space conditioning loads in buildings was to introduce progressively higher levels of thermal insulation and more stringent glazing performance requirements. This was a logical approach in the past because standard practice was to largely overlook thermal bridging. The effects of thermal bridging were assumed to be negligible if the cross-sectional areas of these conductive components were small, relative to the rest of the building enclosure, or they were ignored due to the difficulty in assessing the impact. However, the additional heat flow due to thermal bridges, including ones with small cross-sectional areas, such as shelf angles or flashing around windows, can add up to be a significant portion of the heat flow through opaque enclosure assemblies. While the impact of thermal bridging can vary greatly, energy modelling has shown that the additional heat flow due to poorly designed thermal bridges can increase the heating load of a building by over 70%. These findings highlight that if thermal bridges are not addressed, then adding insulation to assemblies might not provide significant benefits in reducing the overall heat flow. The cost of adding extra insulation, not just in additional materials but also in potentially reduced useable floor space, is not justified if no substantial energy savings are realized in practice.

In recognition of the impact of thermal bridging on building enclosure energy efficiency, this Standard proposes a methodology on how to calculate the heat loss impact due to thermal bridging.

1 Scope

1.1 Application

This Standard provides requirements and guidelines for the thermal simulation and calculation of thermal bridges in new and existing Part 3 and Part 9 buildings, as defined in the *National Building Code of Canada* (NBC). This Standard describes the requirements for simulating heat flow through building enclosures, and can be used to justify the opaque envelope U-values used for demonstrating prescriptive or modelled compliance with building energy codes.

