



Building a climate resilient future with northern standards

By-the-north, for-the-north
infrastructure standards

scc.ca/NISI



Infrastructure in Canada's North

Canada's north is on the frontline of climate change. As temperatures increase, the north is seeing increasing permafrost thaw, severe storms, precipitation, melting sea ice and coastal erosion.

Adapting and repairing buildings in the north can create a heavy financial burden for communities with small populations. Northern communities need tools to help reduce the vulnerability of infrastructure and limit the impacts of climate change. By supporting the development and dissemination of new resources for northern infrastructure, the Standards Council of Canada (SCC) is making a difference.

Standards are available to help northern communities adapt to climate change

Standards as Tools for Adaptation

As Canada's national standardization body, SCC is helping to advance solutions and strategies that keep Canadians healthy and safe while also protecting the environment and economy.

SCC is working with communities, standards development organizations, and experts from across northern Canada to support the development of standards that are effective in addressing climate change impacts to northern infrastructure design, planning and management. Each standard helps building owners and operators – as well as those responsible for public and community infrastructure – build and maintain infrastructure in a changing climate.



1. Fire resilient planning
2. Solid waste site planning, design, and maintenance
3. Moderating permafrost damage on existing buildings
4. Techniques for dealing with high winds
5. Managing changing snow loads
6. Thermosyphon foundations for buildings
7. Guidelines for building in permafrost
8. Risk based approach to community planning
9. Geotechnical site investigations
10. Community drainage system planning, design, and maintenance
11. Wastewater treatment planning, design, operation, and maintenance
12. Erosion and sedimentation management

National Standards of Canada to Support Northern Infrastructure

New National Standards of Canada will help community members build in permafrost, deal with extreme weather, design with climate change and risk in mind, and design, operate, maintain and ultimately close community systems (like solid waste sites).

These standards are free. For more information, visit [SCC.ca/NISI](https://www.scc.ca/nisi)

Building in Permafrost

CSA S500 – Thermosyphon Foundations for Buildings In Permafrost Regions (new edition available 2021)

Thermosyphons keep the ground frozen and stable in cold climates by transferring the heat from the ground to the air when appropriate temperature differentials prevail. This standard helps to ensure the ongoing stability of new buildings constructed on permafrost with thermosyphon-supported foundations in Canada's North.

CSA S501 – Moderating the Effects of Permafrost Degradation on Existing Building Foundations (new edition available 2021)

Building on permafrost can be difficult because degradation to the permafrost can destabilize the structure. As temperatures continue to warm, more buildings will face challenges. This standard outlines the steps to maintain, assess and mitigate the effects on existing buildings.

CSA Plus 4011 – Technical Guide: Infrastructure in Permafrost: A Guideline for Climate Change Adaptation

This guidance document supports decision makers – who may not be experts in permafrost - who have a role in planning, purchasing, developing, or operating community infrastructure in permafrost regions. This guide is intended to equip decision makers with the ability to ensure that the impacts of climate change on permafrost are considered for new community infrastructure.

CSA Plus 4011.1 – Technical Guide: Design and Construction Considerations for Foundations in Permafrost Regions

This guideline accompanies CSA PLUS 4011 and provides more detailed technical information on the attributes of the various foundation systems, selection criteria, ground conditions, and related issues that should be considered with building foundations in permafrost regions.

Community Systems: From Start to Finish

CSA S503 – Community Drainage System Planning, Design, And Maintenance in Northern Communities (new edition available 2021)

Community drainage planning in the North is unique for a wide variety of reasons. The new standard takes these issues into consideration and provides guidance on planning, design, construction, rehabilitation and maintenance of drainage systems in Canada's North.

CSA W203 – Planning, Design, Operation and Maintenance of Wastewater Treatment in Northern Communities Using Lagoon and Wetland Systems

Most northern communities use lagoons to store wastewater for a significant portion of the year. This standard helps communities with all the lifecycle phases of a wastewater system, from planning, designing, constructing, maintaining, and all the way to closure/remediation of wastewater facilities and wetlands.

CSA R111 – Solid Waste Sites in Northern Communities: From Design to Closure (available 2020)

Solid waste management in the North faces unique challenges given the geographic, climatic, transportation and resource differences between southern and northern Canada. This standard will help with the sustainable design, operation, and management of northern solid waste facilities, considering all phases of their life-cycles, and assessing current risks with respect to service life extension.

Dealing with Extreme Weather

CSA S502 – Managing Changing Snow Load Risks for Buildings in Canada's North (new edition available 2021)

Arctic regions have seen an increase in snowfall and extreme snow events. These events cause excess loads (or weights) on buildings which can lead to structural damage, such as a collapsed roof. This standard informs communities about safe snow removal methods for rooftops to help ensure the safety of buildings and occupants.

CSA W205 – Erosion and Sedimentation Management for Northern Community Infrastructure

Northern communities have seen increased ground erosion, which can lead to unstable foundations for nearby buildings. This standard provides steps to manage erosion and sedimentation risks in coastal and lakeshore environments, open-channel environments, and terrestrial environments.

CSA S504 – Fire Resilient Planning for Northern Communities

Many northern communities, particularly isolated communities, have limited resources to protect themselves against accidental wildfires (which are being compounded by climate change). This standard helps individuals plan for fire resilience by providing requirements for community planning, building design, appropriate materials for new designs, and more.

CSA S505 – Techniques for Dealing with High Winds and Snow Drifting as It Pertains to Northern Infrastructure

Community members have noted that wind conditions have been changing as a result of the warming climate. This standard provides guidance to building operators and owners when dealing with changing wind patterns and strengths, and their impacts on snow drifting.

Designing with Climate Change and Risk in Mind

CAN/BNQ 2501-500 – Geotechnical Site Investigations for Building Foundations in Permafrost Zones

This standard establishes a consistent methodology for performing geotechnical site investigations so that the results can be used to design building foundations with due consideration to the prevailing conditions at the work site. It is a foundational reference which is an important complement to the existing NISI standards.

CAN/BNQ 9701-500 – Risk-based Approach to Community Planning in Northern Regions (available 2021)

When determining the best places to build new community infrastructure, it is important to identify the hazards and vulnerabilities of potential construction areas, as well as the potential future climate risks. This standard will help communities understand the pros and cons of developing infrastructure in different areas.

