

CMHI

CANADIAN
MANUFACTURED
HOUSING
INSTITUTE

Standards for Prefabricated Buildings

Prepared for the
2015 First Nations Northern Housing Conference

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CMHI – Who We Are

Canadian Manufactured Housing Institute

- Canada's national association for factory-based building
- Members from:
 - Canada and the U.S.
 - all facets of the industry
 - factory-builders
 - site builders
 - developers
 - suppliers
 - warranty providers
 - financial institutions
 - regional associations



Royal Homes, Infill

CMHI – Who We Are

- Members produce all types of buildings
 - single & multi family homes
 - hotels
 - office buildings
 - work camps



CMHI – Who We Are

- Products range from simple to leading edge



Build Green, Triple M Housing



First Equilibrium Home, Allouette Homes



2012 Energy Efficient Community Award, North America's first EcoPlus net-zero townhouse community, Fredericton, NB, photo courtesy CNW Group/Maple Leaf Homes, New Brunswick

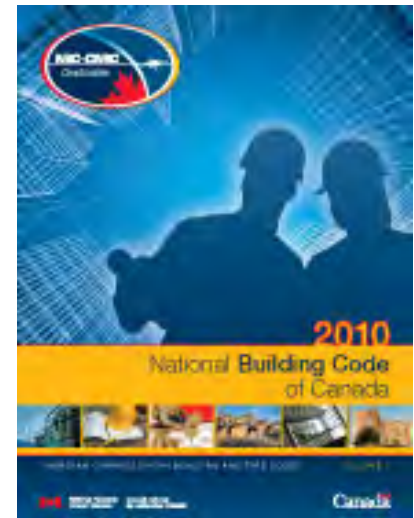
Questions for You

From outside Ontario?

Do you use National Building Code?

Have you heard of –

- CSA Z240 MH Series
- CSA A277
- CSA Z240.10.1



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Outline – Standards for Prefabricated Buildings

- **Z240 MH Series Manufactured Homes**
- **A277 Procedure for Factory Certification of Buildings**
- **Z240.10.1 Site Preparation, Foundation and Anchorage of Manufactured Homes**
- **Take-Aways**

Overview

- CSA Z240 MH Series Manufactured Homes
 - CSA A277 Procedure for Factory Certification of Buildings
 - CSA Z240.10.1 Site Preparation, Foundation and Anchorage for Manufactured Homes
-
- Application/
Content
- Where
Accepted
- Importance
- Up-Coming
Changes
- Status

CSA Z240 MH Series Manufactured Homes

What Z240 MH Series applies to –

Manufactured homes

transportable, single- or multiple-section, one-storey dwellings ready for occupancy on completion of set-up in accordance with the manufacturer's instructions



Supreme Homes

Manufactured



Modular



At the Conference

	Manufactured	Modular	Components, Panels, Kits
Dynamic System Built Homes	✓	✓	-
Eco Fab Structures Inc.	-	-	✓
Guildcrest Homes	-	✓	-
Northern Superior Structural Solutions	✓	✓	-
Olympic Building Centre	-	✓	-
Sioux Lookout Home Hardware Building Centre	-	-	✓
Steelhawk Homes	-	✓	✓

Z240 MH Series – Content

- The Product
 - structure
 - HVAC
 - certification marking
 - building envelope
 - plumbing
 - installation instructions
 - fire protection
 - electrical
- The Design and Construction Process
 - compliance and quality assurance per CSA A277
- Vehicular requirements for transport

Z240 MH Series recognized in –

- Full Z240 MH Series
 - **NO**
 - National Building Code
 - ref. NBC - Northwest, Nunavut, Quebec (Saskatchewan, New Brunswick, PEI, Newfoundland & Labrador)
 - Alberta
 - **YES**
 - Yukon, British Columbia
 - Manitoba (on chassis)
 - Ontario (modules up to 16' wide) ,
 - Nova Scotia (energy efficiency per building code)
- Z240.2.1 – Deformation Resistance Test
 - NBC
 - all codes/regulations based on NBC

Why Z240 MH Series is important –

- Originally
 - stand-alone requirements for mobile homes



Why Z240 MH Series is important –

- Currently
 - numerous references to the National Building Code and duplications of requirements
 - exceptions
 - additional requirements



Kent Homes

Z240.0.1 General Requirements for Manufactured Homes

- Definitions
- What must be completed in the factory
 - everything except
 - installation, service hook-ups
 - gas connections & testing
 - (installation of appliances, cabinetry, finish flooring ...)

Z240.0.1 General Requirements for Manufactured Homes

- Certification Marking
 - identification
 - acceptable location
 - snow load
 - wind pressure
 - thermal resistance
 - electrical rating
 - list of appliances
- Set-up instructions

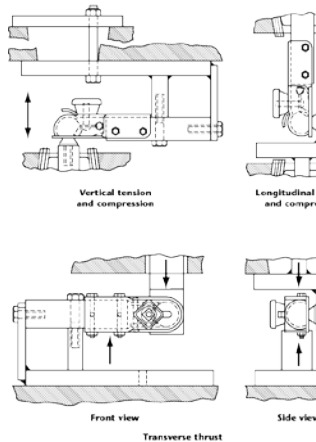
Up-Coming Changes

- Reference A277 for certification marking



Z240.1.1 Vehicular Requirements for Manufactured Homes

- Definitions
- Requirements for
 - couplings
 - tongues
 - A-frames
 - running gear



Z240.2.1 Structural Requirements for Manufactured Homes

Addresses much more than building structure

- Definitions
- References, duplicates or is consistent with NBC in most cases



Z240.2.1 Structural Requirements for Manufactured Homes

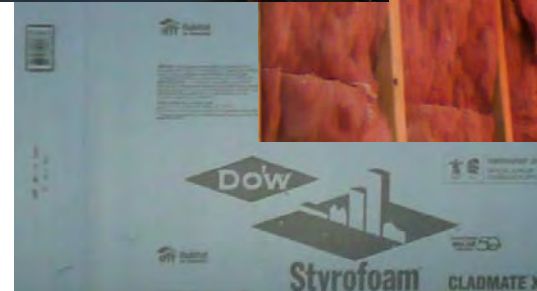
Different / additional requirements

- Structural
 - less stringent
 - max. floor joist/truss deflection
 - min. non-loadbearing stud size
 - construction that is uncommon for site-built homes
 - floor assemblies with longer cantilevers
 - more stringent
 - attachment/fastening to resist transport & installation loads
 - deformation resistance test
 - referenced by NBC for buildings on surface foundations

Z240.2.1 Structural Requirements for Manufactured Homes

Different / additional requirements

- Energy Efficiency
 - less stringent
 - insulation
 - no requirements
 - windows, HVAC, SWH
- Plumbing
 - drain size and slope
- Protection
 - under-floor sheathing



Prestige Homes

Z240.2.1 ~~Structural~~ Technical Requirements

Up-Coming Changes

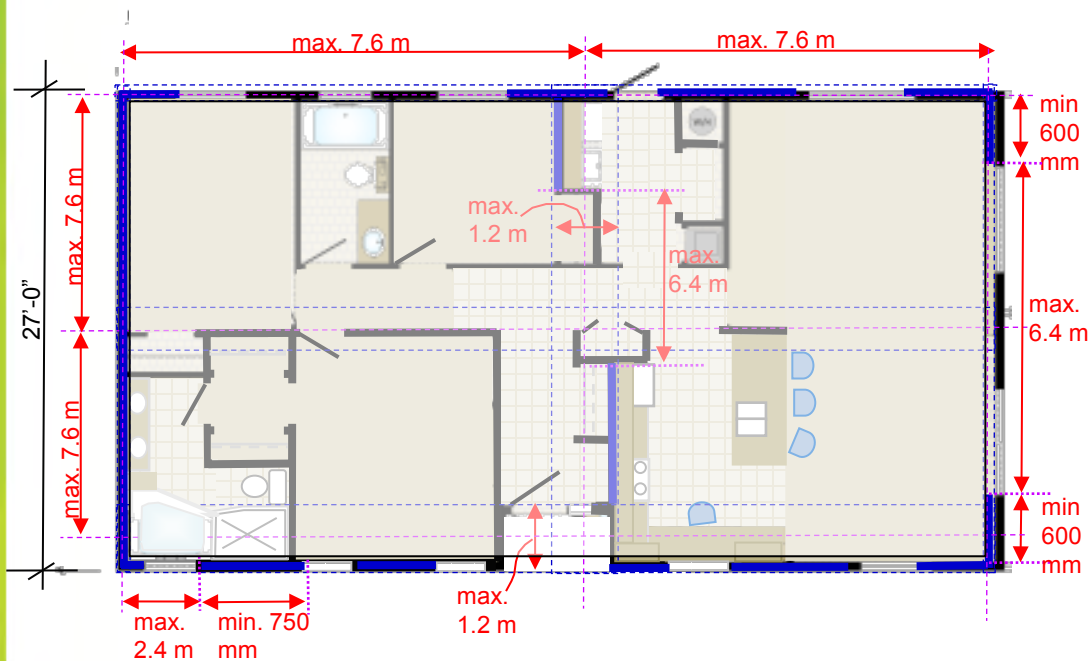
- single reference to NBC
- include individual requirements and exceptions only as necessary for factory-constructed homes

Major implications

- resistance to lateral loads
- energy efficiency

Z240.2.1 ~~Structural~~ Technical Requirements Up-Coming Changes

Resistance to Lateral Loads



	Wind	Seismic
YK		✓
NT	✓	
BC	✓	✓
AB	✓	
QC		✓
NL	✓	

Z240.2.1 Structural **Technical** Requirements Proposed Energy Efficiency Changes

Insulation Levels

- Climate Zones

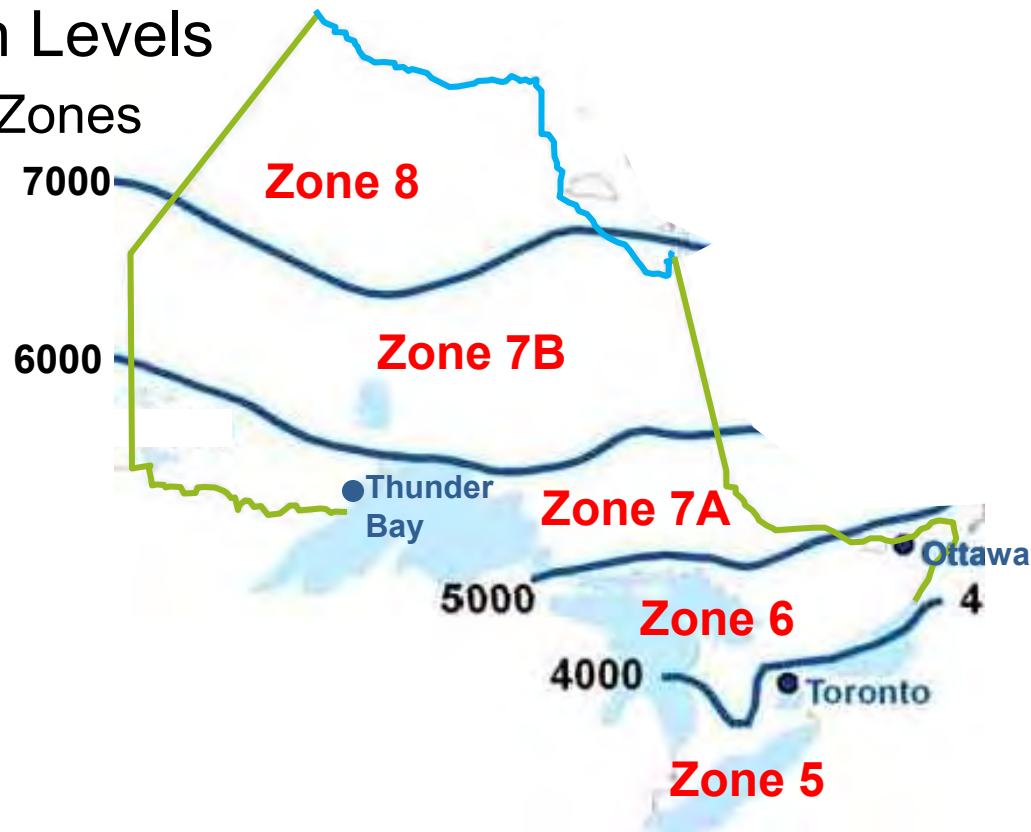


Z240.2.1 Structural Technical Requirements

Proposed Energy Efficiency Changes

Insulation Levels

- Climate Zones



Z240.2.1 Structural **Technical** Requirements

Proposed Energy Efficiency Changes

Insulation Levels

Climate Zone	Floors	Walls (2" x 6" studs)	Attics	Cathedral Ceilings, Flat Roofs
Zone 5	In joist space, min. 10" floor joists	R-22 or R24 - or - advanced framing	Significant increases <ul style="list-style-type: none"> • Building Envelope Trade-Offs for <ul style="list-style-type: none"> - 1-storey buildings - limited window and door area - max 7.8' ceilings • Insulation at Eaves <ul style="list-style-type: none"> - e.g., 2x6+R22 with 4/12 slope - full RSI 1200 mm from exterior 	No implications
Zone 6				Increase by R-3
Zone 7A	In joist space, min. 12" floor joists	Exterior insulation - or - HRV - plus - R-22 or R-24		No implications
Zone 7B				
Zone 8				

Z240.2.1 Structural **Technical** Requirements Proposed Energy Efficiency Changes

Other Requirements

- windows, doors, skylights
- airtightness
- duct sealing materials
- duct and piping insulation levels
- HVAC and SWH equipment efficiencies
- performance path

Z240.2.1 Structural **Technical** Requirements

Proposed Energy Efficiency Changes

Options for Z240.2.1:

Proposals	House Size, sq. ft. gross			
	Area ≤ 1184 single-section 16' x 74'	1184 < Area ≤ 1296 single section 18' x 72' double-section 27' x 48'	1296 < Area ≤ 1400 single section 20' x 70' double-section 27' x ~52'	Area > 1400
1. Status Quo Z240 MH-2009				
2. Performance < 2009 Average	✓			
3. 2009 Average		✓		
4. Performance > 2009 Average			✓	
5. NBC 9.36.				✓ (1)

(1) with exception re. insulation over exterior walls

Z240.4.1 Installation requirements for gas-burning appliances in manufactured homes

Z240.5.1 Installation requirements for oil-fired appliances in manufactured homes

- Definitions
- References or consistent with standards referenced in the NBC in most cases

Z240.4.1, Z240.5.1

Installation requirements – gas- and oil-burning appliances

Different / additional requirements

- Installation
 - installation to permit removal
- Air sealing and supply
 - combustion air supply
 - make-up air for clothes dryers
 - air sealing between non-direct vent appliances and habitable space

Z240.4.1, Z240.5.1

Installation requirements – gas- and oil-burning appliances

Different / additional requirements

- Testing
 - gas leak testing – factory and on-site
- Transport & On-Site Work
 - disconnection for shipment
 - securement for transport
 - instructions for
 - appliance reconnection
 - vent installation

Z240.4.1, Z240.5.1 Installation requirements – gas- and oil-burning appliances

Up-Coming Changes

- combine and reference from Z240.2.1
- reference applicable standards
- include individual requirements and exceptions only as necessary for factory-constructed homes:
 - securement
 - access for servicing and replacement
 - instructions for site installation
 - protection of gas lines
 - factory and site testing of gas systems

Z240.9.1 Load calculation and duct design requirements for heating and cooling of manufactured homes

- References or is consistent with NBC and standards referenced in the NBC in most cases

Z240.9.1 Load calculation and duct design requirements for heating and cooling of manufactured homes

Different / additional requirements

- Ducting
 - protection of exposed ducts
 - return air ducting for non-direct vent furnaces
 - supply air ducting airtightness test

Z240.9.1 Load calculation and duct design requirements

Up-Coming Changes

- keep individual requirements and exceptions only as necessary for factory-constructed homes:
 - ducting requirements that recognize home airtightness
 - protection of ducting
- incorporate into Z240.2.1

Z240 MH Series Manufactured Homes

Up-Coming Changes

- Z240.0.1 General Requirements
- Z240.1.1 Transportation Requirements
- Z240.2.1 Technical Requirements
- Z240.4.1 Installation requirements for gas- and oil-fired appliances

Z240 MH Series Status –

- 25 November 2014
 - Technical Committee approved all changes except reference to the NBC energy efficiency requirements
- 12 February 2015
 - Technical Committee meeting for final decision on energy efficiency requirements
- Late Summer 2015
 - Publication

CSA A277

Procedure for Factory Certification of Buildings

What A277 applies to –

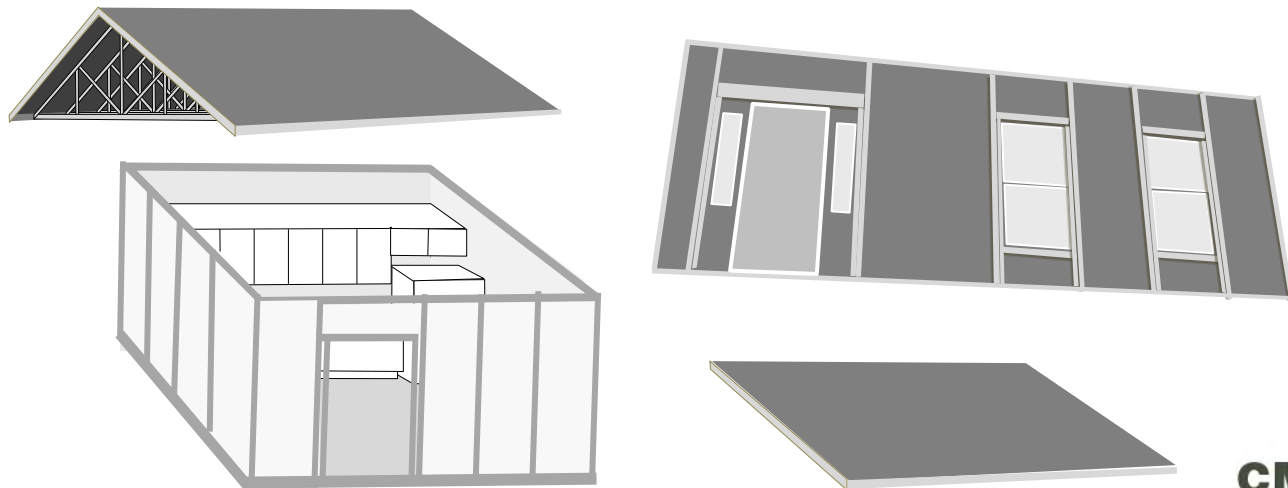
- Factory-constructed buildings:
 - manufactured
 - modular
 - panelized
 - residential
 - commercial
 - industrial
- Factory quality program
 - Auditing of the factory quality program
- Product Certification
 - In-factory inspection
 - Certification marking

What A277 applies to –

Up-Coming Changes

Procedure for ~~Factory~~ Certification of Prefabricated Buildings, Modules and Panels

- Clarification of application to modules and panels for buildings



A277 – Content

Up-Coming Changes

- Definitions updated
 - ~~building component, manufactured building, modular building, panelized building~~
 - ~~factory built~~ prefabricated building
 - prefabricated module
 - prefabricated panel
 - factory - facility that provides protection of construction materials, components, equipment and products
- } constructed in a factory

A277 – Content

Up-Coming Changes

- Clarification re. application to products constructed of any material
 - Annex information on certification of
 - fusion welding of aluminum
 - precast concrete products
 - steel building systems
 - fusion welding of steel

A277 – Content

Up-Coming Changes

- Clarification of application to all types of buildings
 - terminology consistent with building codes
 - assembly
 - detention, treatment, care
 - residential
 - business and personal services
 - mercantile
 - industrial
 - use limited only by
 - certification listing for the factory-builder
 - the capabilities of the certification body



Office building, Maple Leaf Homes

A277 – Content

Factory quality program

- demonstrate to third party certification body
 - equipment and procedures are suitable
 - personnel knowledgeable re. product, factory operations, codes and standards, and can perform duties
 - design, construction complies with applicable requirements
- procedures documented
 - document control
 - purchasing
 - in-house inspection
 - etc.



Prestige Homes

A277 – Content

Factory quality program (cont'd)

- work verified at every step
- record kept
 - with building to end of process
 - on file



Prestige Homes



A277 – Content

Product Certification

- third-party in-factory inspection by certification body



A277 – Content

Product Certification (cont'd)

- Certification marking
- label
- specification sheet



MODULAR HOMES SPECIFICATION NAMEPLATE PLAQUE SIGNALÉTIQUE POUR MAISON MODULAIRE

**DO NOT REMOVE
NE PAS ENLEVER**

DATE OF MANUFACTURE / DATE DU FABRICANT:	ROOF DESIGN SNOW LOAD / Charge de neige de conception de toit:	
MANUFACTURER / FABRICANT:	GROUND SNOW LOAD / Charge de neige au sol:	
FACTORY ADDRESS / ADRESSE DE L'USINE:	THERMAL RESISTANCE OF INSULATION / Résistance thermique d'isolation:	Floor / Plancher Wall / Mur Ceiling / Plafond
MODEL NUMBER / NOMBRE DE MODÈLE:	WINDOW RATINGS (STRUCTURAL / THERMAL) / Fenêtre Specification (Structural / Thermique)	
SERIAL NUMBER / NOMBRE DE SÉRIE:	OUTSIDE DESIGN TEMPERATURE / La température extérieure de conception:	
CERTIFICATION LABEL SERIAL NUMBER / ÉTIQUETTE DE CERTIFICATION QAI NUMÉRO:		

FACTORY INSTALLED APPLIANCES / APPAREILS INSTALLÉS À L'USINE

APPLIANCES / APPAREILS	MAKE / MARQUE	MODEL / MODÈLE	FUEL / COMBUSTIBLE
Refrigerator / Réfrigérateur:			
Air Conditioner / Climatiseur:			
Microwave Oven / Micro-ondes:			
Dishwasher / Lave-vaisselle:			
Clothes Washer / Laveuses:			
Clothes Dryer / Sécheuses:			
Other Appliance / L'autre Appareil:			

ELECTRICAL SYSTEM /
INSTALLATION ÉLECTRIQUE: Volts: _____ Hertz: **60** Amps: _____

PLUMBING SYSTEM / PLOMBERIE: Pressure system tested at 700 kPa (100psi) / Installation sous pression (prouvée à 700 kPa (100 psi))

Note: 1. Any additions or modifications to factory installed systems must be authorized by the appropriate provincial or municipal authorities having jurisdiction. Toute modification aux installations dont le placement est effectuée à l'usine doit être approuvée par les autorités provinciales ou municipales compétentes. The systems noted above only when installed by the modular home manufacturer. La certification QAI englobe les installations indiquées ci-dessus si leur placement est effectué par le fabricant de maison modulaire. Reading "Factory Installed Appliances" indicates that appliances are not factory installed. (N/A) Sous l'entête « Appareils installés à l'usine », les appareils non installés à l'usine. The plate and the exterior QAI label provide the only evidence of Listing. Cette plaque signalétique ainsi que l'étiquette extérieure QAI constituent les seules preuves de la certification QAI. If the Modular Home to be completed on site are subject to inspection by local building inspectors (A277 A1.2). Les parties de la maison modulaire qui sont complétées sur l'emplacement sont sujettes à l'inspection par les inspecteurs des bâtiments locaux (A277 A1.2). This label has been constructed to the following building codes / Des maisons modulaires portant ce label ont été construites en fonction des codes de bâtiment:

WARNING:

This system is designed for use with either propane or natural gas. Installation around propane cylinders requires periodic removal of dirt. Certain appliances are suitable for the gas to be used. Refer to manufacturer on each gas appliance for correct data. Make certain all gas connectors have been made tight, all propane valves are turned off, and any unconnected outlets are capped.

- All connections, including those at the appliances and cylinders, should be leak tested periodically with soapy water by the occupant. Never use a lighted match or other flame when checking for leaks.
- Do not leave system turned on or containers connected until system has been proven to be gas tight.
- Light all pilots.
- Securely cap gas inlet into modular home.

AVERTISSEMENT:

- Cette installation est conçue pour le propane ou le gaz naturel. La ventilation autour des bouteilles de propane nécessite l'enlèvement périodique des déchets.
- S'assurer que les appareils conviennent au gaz qui doit être utilisé. Consulter la plaque signalétique de chaque appareil pour les renseignements appropriés.
- Vérifier l'étanchéité de tous les raccords de gaz, la fermeture de tous les robinets d'appareils et l'obturation de toutes les sorties non raccordées.
- L'occupant doit vérifier périodiquement l'étanchéité de tous les raccords, y compris ceux des appareils et des bouteilles, en y appliquant de l'eau savonneuse. Ne jamais se servir d'une allumette ou d'une flamme quelconque pour la détection des fuites.
- Ne pas laisser l'alimentation ouverte ni les récipients raccordés, avant de s'être assuré de l'étanchéité de l'installation.
- Allumer toutes les veilleuses.
- S'assurer que l'orifice d'alimentation de la maison modulaire est fermée au moyen d'un bouchon étanche.

WHEN GAS SUPPLY IS DISCONNECTED /
LORSQUE L'ALIMENTATION DE GAZ EST DECONNECTEE

VEHICULAR SYSTEM WARNING /
INSTALLATION VEHICULAIRE
AVERTISSEMENT:

It is recommended that highway authorities be consulted on regulations applicable in areas into which this unit may be moved, especially in regard to permits and maximum allowable lengths and widths. Il est recommandé de consulter les autorités régionales au sujet des règlements applicables dans les régions à l'intérieur desquelles cette unité peut être transportée, particulièrement en ce qui concerne les longueurs maximales admissibles.

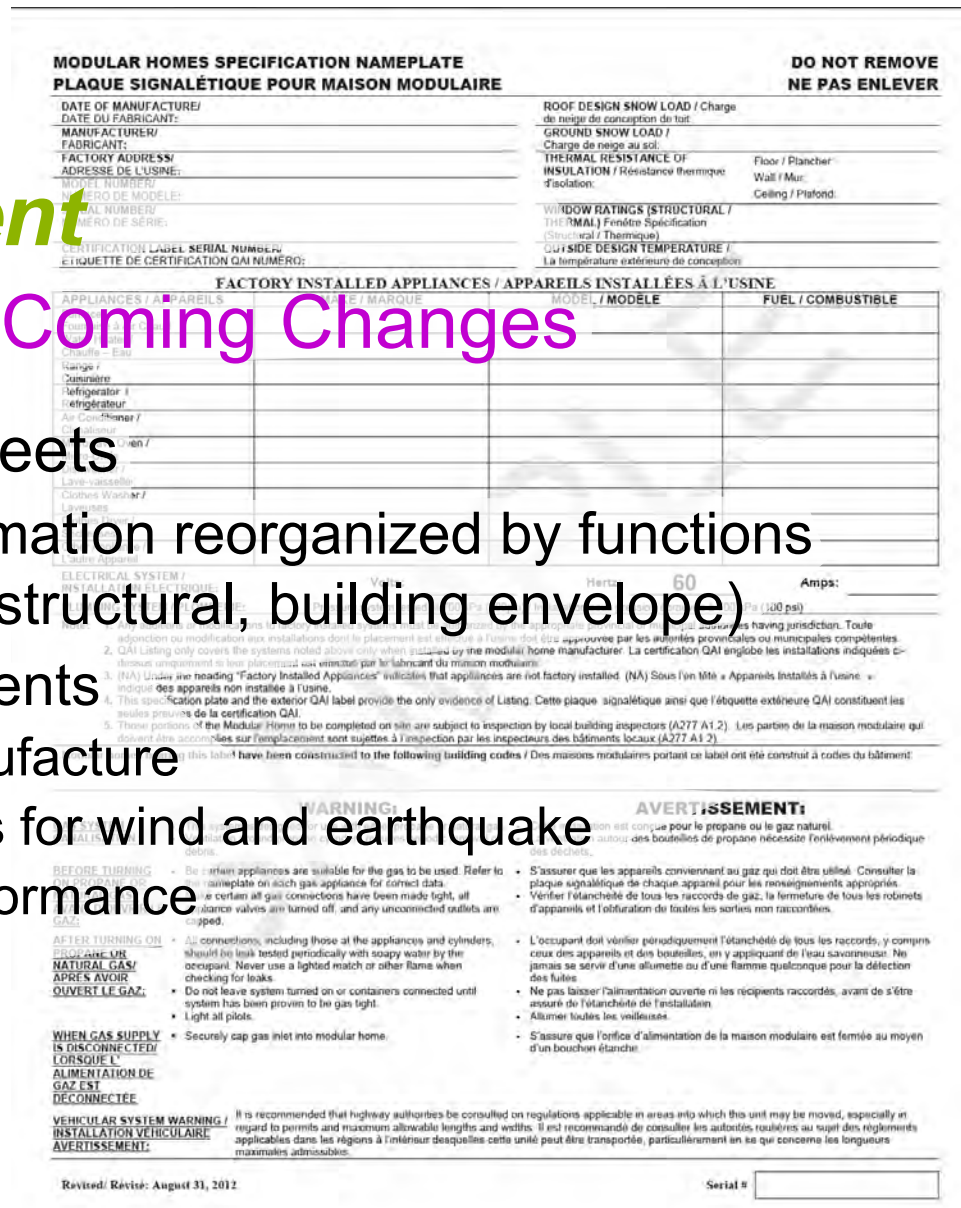
Revised / Révisé: August 31, 2012

Serial #

A277 – Content

Up-Coming Changes

- Specification Sheets
 - required information reorganized by functions served (e.g., structural, building envelope)
 - new requirements
 - date of manufacture
 - design loads for wind and earthquake
 - thermal performance



Approval Process

Standards Council of Canada
provides accreditation to certification bodies



Certification bodies
approve and audit factory quality programs and inspect products

- CSA (Certification and Testing)
- Intertek Testing Services
- Quality Auditing Institute



Factories document everything;
comply with codes/standards/regulations in effect at the installation site;
apply certification marks (label, specification sheet)



Local inspectors verify compliance at the site;
the certification marks are your assurance that factory work complies

A277 is recognized by –

- **NO** (except in appendix note)
 - National Building Code
 - reference NBC
 - Northwest, Nunavut
 - (Saskatchewan, Manitoba, Quebec, New Brunswick, Prince Edward Island, Newfoundland & Labrador)
 - British Columbia
- **YES**
 - Yukon, Alberta, Ontario, Nova Scotia

A277 – Content

Administrative Requirements

Technical Requirement

- Reference the construction codes and standards that apply **where the building will be installed**
 - building code/standard
 - applicable provincial, territorial or municipal building code, or
 - National Building Code of Canada
 - CSA Z240 MH Series Manufactured Homes
 - Canadian Electrical Code
 - National Plumbing Code of Canada
 - other applicable codes, standards, and requirements

Why A277 is important –

- Establishes certification criteria for factory-constructed buildings and the factory process –
 - buildings meet the technical requirements for buildings at the installation site
 - the design and construction processes
 - involve the right people, and
 - have the right controls to ensure consistency in meeting the technical requirements
- Means that building officials do not need to travel to the factory to inspect the buildings

A277 Status –

- 25 November 2014
 - Technical Committee approved changes for 2015 edition
- Late spring or early summer 2015
 - Publication

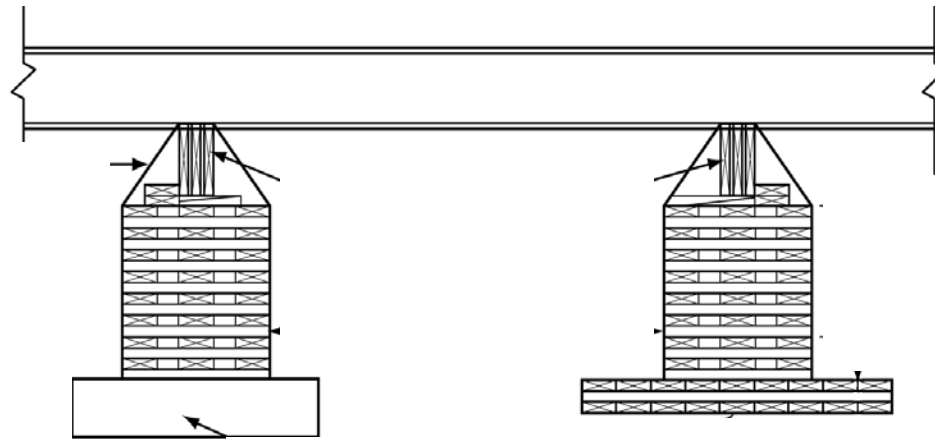
CSA Z240.10.1 Site Preparation, Foundation and Anchorage of Manufactured Homes

What Z240.10.1 applies to –

- For homes not installed on full perimeter foundations:
 - site preparation
 - foundations
 - anchorage
 - connection of multi-section homes
 - skirting
- For homes on full perimeter foundations:
 - references the NBC

Where Z240.10.1 is recognized –

- NBC and provincial codes/regulations for
 - foundations for deformation-resistant buildings (not just homes)
 - anchorage of smaller 1-storey buildings (not just homes)



Why Z240.10.1 is important –

- Provides minimum requirements for:
 - site preparation
 - grading, fill, ground cover
 - foundations
 - location, clearance, depth, footings, piles and piers
 - anchorage
 - spacing, depth, pull-out resistance
 - connection of multiple-module buildings
 - structural, building envelope, fire blocking
 - skirting
 - construction, access to & ventilation of crawl space

Z240.10.1 Up-Coming Changes –

CSA Z240.10.1 Site Preparation, Foundation and ~~Anchorage~~ Installation of ~~Manufactured Homes~~ Buildings

- Application
 - general – all buildings
 - surface foundations and anchorage
 - 1-storey buildings
 - max. 2.4 kPa design live floor load

Z240.10.1 Up-Coming Changes –

- General reference to applicable codes or NBC
 - individual requirements and exceptions only as necessary to address
 - site preparation
 - footings
 - piles and piers
 - anchorage
 - connection of multi-section buildings
 - skirting

Z240.10.1 Up-Coming Changes –

- Minimum clearance to ground reduced
- Structurally integral footings for piles in frost-susceptible soil
- Reference the CSA standard for preservative treatment
- Update exposure factors for wind

Z240.10.1 Up-Coming Changes –

- Update minimum footing area requirement
 - calculation to clearly address
 - snow load
 - occupancy load
 - building load
 - tributary area
 - allowable soil bearing pressure
 - simplified look-up Tables
 - Annex information

Z240.10.1 Status –

- A number of up-coming changes accepted by Technical Committee for public review
- Foundation and anchorage requirements under review to:
 - address earthquake loads
 - update calculation for resistance to overturning and pier toppling due to wind based on limit states design
- May move forward with work completed to date for fall 2015 rather than winter 2017 publication

Take-Aways

CSA Z240 MH Series Manufactured Homes

1. compliance/quality assurance per A277
2. NBC requirements with
 - a few exceptions
 - additional requirements
3. proposed reference to NBC energy efficiency requirements being reviewed

CSA A277 Procedure for Certification of Prefabricated Buildings, Modules and Panels

1. compliance/quality assurance requirements
2. specification sheet provides clear information on
 - the codes/regulations the product complies with
 - where a building can be installed
3. changes to facilitate
 - application to modules and panels
 - referencing by codes and regulations
 - building type terminology consistent with building codes
 - clarification of involvement by qualified professionals and building officials

CSA Z240.10.1 Site Preparation, Foundation and ~~Anchorage~~ Installation of ~~Manufactured Homes~~ Buildings

1. application to more than manufactured homes
2. referenced by building codes for surface foundations and anchorage
3. work underway on
 - overturning and pier toppling calculation
 - requirements to resist earthquake loads

Thank you!

Questions



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