CCMC CANADIAN CODE COMPLIANCE EVALUATION

CCMC EVALUATION

CCMC 14205-R

CCMC Canadian code compliance evaluation

CCMC number:	14205-R
Status:	Active
Issue date:	2022-02-11
Modified date:	2023-11-08
Evaluation holder:	**Plastiques Cellulaires Polyform Inc.** 454, rue Édouard Granby QC J2G 3Z3 Canada Website: www.polyform.com Telephone: 1-450-378-9093 Email: info@polyform.com
Product name:	NovoFoil®
Compliance:	NBC 2015, NBC 2020, OBC
Criteria:	CCMC-TG-072131.03-15, "CCMC Technical Guide for Foundation Wall System with Low Emissivity Material and Furred-Airspace Assembly" CCMC-TG-072131.03-20, "CCMC Technical Guide for Foundation Wall System with Low Emissivity Material and Furred-Airspace Assembly"

In most jurisdictions this document is sufficient evidence for approval by Canadian authorities.
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Compliance opinion

It is the opinion of the Canadian Construction Materials Centre that the evaluated product, when used as vapour barrier and a thermal insulation installed in conjunction with a furred air space in enclosed foundation walls in accordance with the conditions and limitations stated in this evaluation, complies with the following codes:

National Building Code of Canada 2015

Code provision	Solution type
9.25.2.2.(1) Except as required in Sentence 9.25.2.2. ...	Alternative
9.25.2.2.(1)(d) Insulation Materials	Acceptable
9.25.4.2.(4) Membrane-type vapour barriers other than ...	Alternative
9.25.4.2.(1) Vapour barriers shall have a permeance n ...	Acceptable
9.25.4.3. Installation of Vapour Barriers	Acceptable
9.36.2.2.(4)(b) Determination of Thermal Characteristics of Materials, Components and Assemblies	Alternative
9.36.2.8. Thermal Characteristics of Building Assemblies Below-Gradeor in Contact with the Ground	Alternative

National Building Code of Canada 2020

Code provision	Solution type
9.25.2.2.(1) Except as required in Sentence 9.25.2.2. ...	Alternative
9.25.2.2.(1)(d) ULC CAN/ULC-S701.1:2017 Standard for The ...	Acceptable
9.25.4.2.(1) Except as provided in Sentence 9.25.4.2. ...	Acceptable
9.25.4.2.(5) Membrane-type vapour barriers other than ...	Alternative
9.25.4.3. Installation of Vapour Barriers	Acceptable
9.36.2.2.(4)(b) laboratory tests performed in accordance ...	Alternative
9.36.2.8. Thermal Characteristics of Building Assemblies Below-Gradeor in Contact with the Ground	Alternative

Ontario Building Code

Ruling No. 22-01-370 (14205-R) authorizing the use of this product in Ontario, subject to the terms and conditions contained in the Ruling, was made by the Minister of Municipal Affairs and Housing on 2022-06-09 pursuant to s.29 of the Building Code Act, 1992 (see Ruling for terms and conditions). This Ruling is subject to periodic revisions and updates.

The above opinion(s) is/are based on the evaluation by the CCMC of technical evidence provided by the evaluation holder, and is bound by the stated conditions and limitations. For the benefit of the user, a summary of the technical information that forms the basis of this evaluation has been included.

Product information

Product name

NovoFoil®

Product description

The product consists of a 76.2-mm-thick Type 1, moulded, expanded polystyrene (EPS) insulation board, which is laminated on one side with a facer of aluminized kraft paper with low-emissivity (low-E) characteristics. There is no text or logo printed on the low-E facer.

The product is nailed to the interior side of a 203.2-mm-thick poured concrete foundation wall with its low-E material facing a furred air space assembly (i.e., air cavity, furring and gypsum board interior finish), and the joints of the product are sealed with 50-mm-wide aluminum tape. Three evaluated foundation wall configurations are presented in Figure 1, Figure 2 and Figure 3, which outline the wood furring size, installation orientation and spacing on centre (o.c.).

Manufacturing plant

This evaluation is valid only for products produced at the following plant:

Product name	Manufacturing plant
	Granby, QC, CA
NovoFoil®	✓

✓ Indicates that the product from this manufacturing facility has been evaluated by the CCMC

Conditions and limitations

The CCMC's compliance opinion is bound by this product being used in accordance with the conditions and limitations set out below.

- The evaluation applies to buildings that comply with Sentence 9.36.1.3.(2), Compliance and Application, of Division B of NBC 2015.
- The product is permitted for use in buildings that fall under the scope of Part 9, Housing and Small Buildings, of Division B of the NBC 2015.
- The product must be installed within the wall assemblies specified in:
  - Results of modeling the thermal resistance values for the wall assembly 1;
  - Results of modeling the thermal resistance values for the wall assembly 2; and
  - Results of modeling the thermal resistance values for the wall assembly 3.
- The product must be installed in accordance with:
  - the manufacturer's installation instructions; and
  - Part 9, Housing and Small Buildings, of Division B of the NBC 2015.
- The aluminum foil surface of the product must be clean and free of defects.
- The joints of the product must be sealed with 50-mm-wide aluminum tape.
- The density of the concrete wall used in the full scale test to determine the thermal resistance of the wall is 2 400 kg/m^3, which corresponds to the normal concrete density referenced in CSA A23.1-09, "Concrete materials and methods of concrete construction."
- The tables Results of modeling the thermal resistance values for the wall assembly 1, Results of modeling the thermal resistance values for the wall assembly 2 and Results of modeling the thermal resistance values for the wall assembly 3 state three thermal resistance values per wall assembly:
  - the thermal resistance value of the wall excluding the interior and exterior air films;
  - the design thermal resistance value, which includes the standard air films; and
  - the thermal resistance contribution of the furred air space assembly.
- These values are valid if there are no construction imperfections, no condensation in the cavity, and no dust on the surface of the aluminum foil.

Note: Should additional insulation material be added to the above-specified wall assemblies, testing or numerical modeling must be conducted to accurately assess the overall thermal resistance of the modified wall assembly. The thermal resistance provided by the additional insulation cannot be added algebraically to the published thermal resistance of the wall assembly.

- The wall configurations specified in Results of modeling the thermal resistance values for the wall assembly 1, Results of modeling the thermal resistance values for the wall assembly 2 and Results of modeling the thermal resistance values for the wall assembly 3 must meet the requirements for air barriers stated in Subsection 9.25.3., Air Barrier Systems, of Division B of the NBC 2015. The product must be installed in conjunction with the Les Plastiques Cellulaires Polyform Inc. proprietary air barrier system, which must be approved by the building official or evaluated by the CCMC.
- The furred air space assembly must be enclosed by a 12.7-mm-thick gypsum board interior finish conforming to Subsection 9.29.5., Gypsum Board Finish (Taped Joints), of Division B of the NBC 2015. The air space must also

be sealed at the interior finish to prevent any air exchange between the furred air space and the interior space. Sealing the air space at the perimeter of the wall, around outlets, etc., must be carried out in accordance with the manufacturer's installation instructions.

- All ends and edges of the gypsum board must occur over furring members or joints must be taped.
- The heat transfer, vapour diffusion and air barrier control details between the floor joists at the rim board must meet the requirements of Section 9.25, Heat Transfer, Air Leakage and Condensation Control, of Division B of the NBC 2015.
- The concrete footing must be installed below the frost level in compliance with the requirements of the local jurisdiction.
- Where applicable, the concealed spaces created by the furred air space assembly must include fire blocks complying with Subsection 9.10.16., Fire Blocks, of Division B of the NBC 2015.
- Product packaging must be identified with the manufacturer's name or logo and the phrase "CCMC 14205-R."

Technical information

This evaluation is based on demonstrated conformance with the following criteria:

Criteria number	Criteria name
CCMC-TG-072131.03-15	CCMC Technical Guide for Foundation Wall System with Low Emissivity Material and Furred-Airspace Assembly
CCMC-TG-072131.03-20	CCMC Technical Guide for Foundation Wall System with Low Emissivity Material and Furred-Airspace Assembly

The evaluation holder has submitted technical documentation for the CCMC's evaluation. Modeling was conducted by experts recognized by the CCMC. The corresponding technical evidence for this product is summarized below.

Material requirements

The NovoFoil® thermal insulation board used within the wall assemblies shown in Figure 1, Figure 2, and Figure 3 conforms to CAN/ULC-S701-11, "Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering," Type I, as presented in the table below:

Table 1. Results of testing the material requirements of the insulation board

Property (1)	Unit	Requirement	Result
Thermal resistance of a 25-mm-thick specimen (EPS only)	$m^2 \cdot °C/W$	0.65	Pass
Water vapour permeance for a 25-mm-thick specimen	$ng/(Pa \cdot s \cdot m^2)$	≤ 300	Pass
Dimensional stability	% linear change	1.5	Pass
Flexural strength	kPa	170	Pass
Water absorption	% by volume	6.0	Pass
Compressive strength	kPa	70	Pass
Limiting oxygen index	%	24	Pass

Note:

1 The evaluation of the EPS board is based solely on its certification by Intertek Testing Services (ITS) North America Limited.

Table 2. Results of testing the material requirements of the low-E facer

Property	Unit	Requirement	Result
Foil conforms to CAN/CGSB-51.33-M89	-	Pass	Pass: Type 1
Emissivity	-	Report value	0.07
Water vapour permeance conforms to ASTM E 96/E 96M-05 (desiccant method)	ng/(Pa·s·m^2)	≤ 60	1.0
Adhesion strength (peel force)	N/mm	Report value	114.9

Table 3. Results of testing the durability requirements of the low-E facer

Property	Unit	Requirement	Result
Emissivity after weathering and heat aging	%	Max. 5% higher than original value	Pass (0.06)
Water vapour permeance after weathering and heat aging	ng/(Pa·s·m^2)	≤ 60	1.0
Adhesion strength after weathering and heat aging	%	≥ 85% of original value	(105.3 N/mm)

Performance requirements

Heat transfer control (NovoFoil® board with a furred air space assembly)

The effective thermal resistance of the manufacturer's designated wall assemblies 1, 2 and 3 shown in Figure 1, Figure 2 and Figure 3 was determined based on numerical heat transfer simulations using COMSOL Multiphysics® for demonstrating compliance with Section 9.36, Energy Efficiency, of Division B of the NBC 2015.

Parameters used for the simulations (modeling)

Simulations were conducted using an indoor air temperature of 21±1°C and an outdoor air temperature of −18±1°C. These temperature parameters comply with the requirements of Section 9.36 of the NBC 2015. The simulations used 0.6 for the emissivity of the facer (result after aging and weathering) and the measured temperature-dependent thermal conductivity of the NovoFoil®. The thermal conductivity was determined as a linear fit of thermal resistance versus temperature, based on testing in compliance with ASTM C 518, "Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus," at mean temperatures of 24°C, 10°C, 4°C, −4°C, and −7.5°C.

Requirements of Article 9.36.2.8. of the NBC 2015

For compliance with Article 9.36.2.8., the minimum effective thermal resistance values for foundation walls in buildings for climate locations with heating degree-days (HDD) corresponding to Zone 4 (HDD < 3 000), Zone 5 (HDD between 3

000 and 3 999), and Zone 6 (HDD between 4 000 and 4 999) are presented in the table below. The minimum requirements apply for buildings with and without heat-recovery ventilators.

Table 4. Minimum effective design thermal resistance requirements and performance – Article 9.36.2.8. of the NBC 2015

Property		Unit	Requirements			Result (1) (2)
			Zone 4	Zone 5	Zone 6	
Minimum effective thermal resistance of wall assembly	**wall assembly 1 (Figure 1)**	$(m^2 \cdot K)/W$	1.99	2.98	2.98	Pass
	wall assembly 2 (Figure 2)					Pass
	wall assembly 3 (Figure 3)					Pass

Notes:

1 See the design thermal resistances of the wall in Results of modeling the thermal resistance values for the wall assembly 1, Results of modeling the thermal resistance values for the wall assembly 2, and Results of modeling the thermal resistance values for the wall assembly 3.

2 The results are based on modeling using NovoFoil® proprietary conductivity-temperature dependant linear fit. This is to simulate the temperature profile of NovoFoil® if the foundation wall assembly had been tested in compliance with ASTM C 1363, “Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus” using the same indoor air temperature (21±1°C) and outdoor air temperature (−18±1°C). The manufacturer attested that the product conductivity values can be maintained during the annual production of NovoFoil®.

Table 5. Results of modeling the thermal resistance values for the wall assembly 1

Property	Unit	Requirement	Result	
			k_1 (1)	k_2 (1)
Room-side air temperature	°C	Report value	21	21
Weather-side air temperature	°C	Report value	−18	−18
Thermal resistance of the wall (2) (3)	$(m^2 \cdot K)/W$	Report value	3.06	2.99
Design thermal resistance of the wall (3) (4)	$(m^2 \cdot K)/W$	(5)	3.21	3.14

Notes:

1 The concrete layer considered in the numerical modeling is 200 mm (8 in.) thick with a density of 2 400 kg/m^3 and two possible levels of conductivity of 1.4 W/m·K for k_1 and 2.9 W/m·K for k_2. As per the ASHRAE Handbook, the average conductivity for concrete with a density of 2 400 kg/m^3 is 2.2 W/m·K. Excludes room- and weather-side air films.

2 Excludes room- and weather-side air films.

3 The uncertainty for the numerical heat transfer simulations is estimated at ± 9%.

4 This value takes into account the interior and exterior air film conductance data from the ASHRAE Handbook of 8.29 W/m^2·K (corresponding resistance is 1/8.29) and 34.00 W/m^2·K (corresponding resistance is 1/34.00), respectively. This is the design thermal resistance value to be used for Code compliance.

5 For the minimum effective thermal resistance requirements, see Minimum effective design thermal resistance requirements and performance – Article 9.36.2.8. of the NBC 2015.

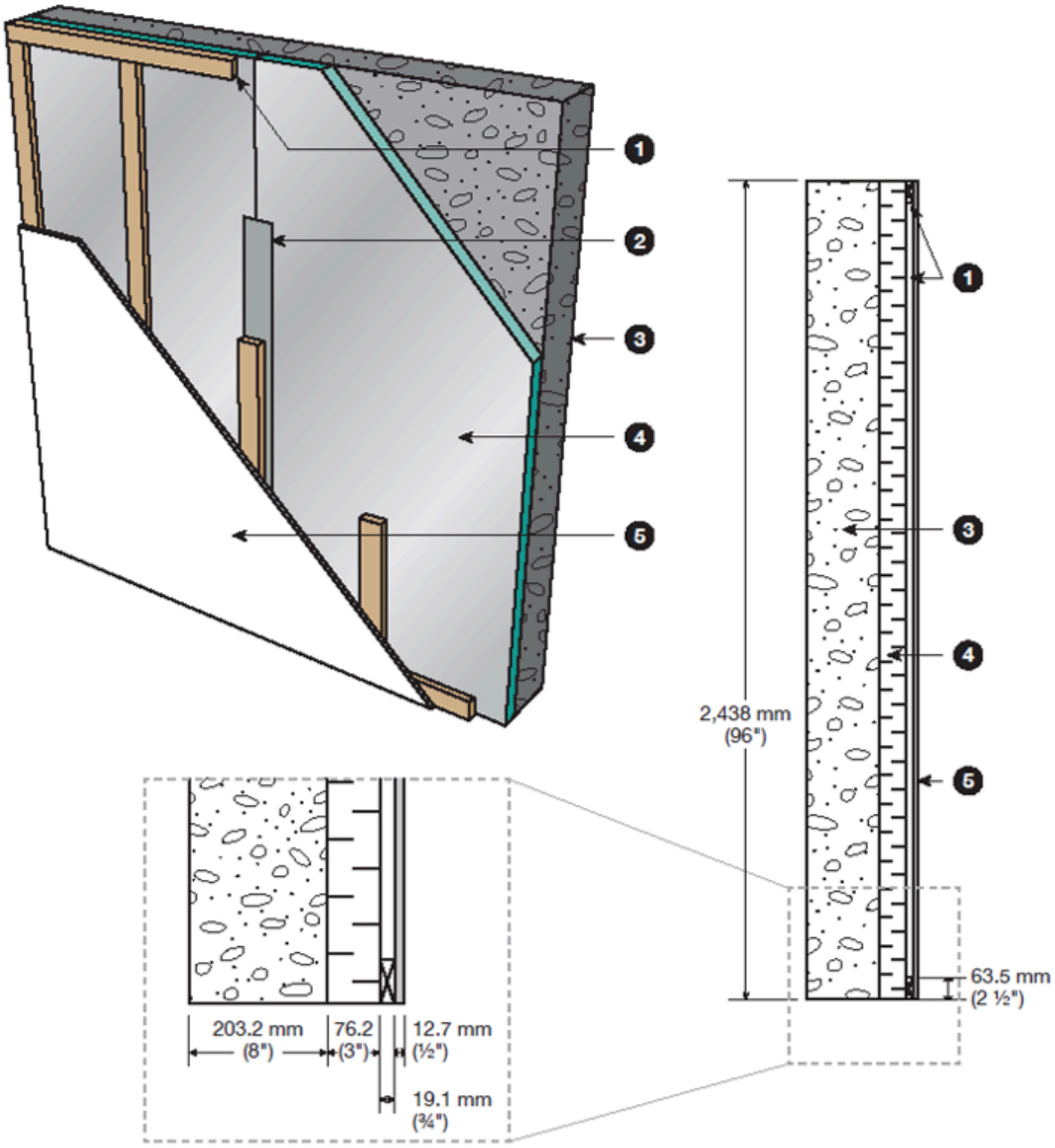

Figure 1. NovoFoil® adjacent to the furred air space assembly installed within the wall assembly 1:

1. Concrete wall (203.2 mm (8 in.) thick)
2. Aluminum tape (50 mm (2 in.) wide)
3. NovoFoil® Type 1 (76.2 mm (3 in.) thick) with low-E material facing furred air space
4. Wood furring (19.1 mm × 63.5 mm (1 × 3)) installed vertically at 609.6 mm (24 in.) on centre (o.c.)
5. Gypsum board (12.7 mm (1/2 in.) thick) installed vertically

Note: There is an air space of 19.1 mm (3/4 in.) between the polystyrene board (NovoFoil®) and the gypsum board.

Table 6. Results of modeling the thermal resistance values for the wall assembly 2

Property	Unit	Requirement	Result	
			k_1 (1)	k_2 (1)
Room-side air temperature	°C	Report value	21	21
Weather-side air temperature	°C	Report value	−18	−18
Thermal resistance of the wall (2) (3)	$(m^2 \cdot K)/W$	Report value	3.18	3.11
Design thermal resistance of the wall (3) (4)	$(m^2 \cdot K)/W$	(5)	3.33	3.26

Notes:

1 The concrete layer considered in the numerical modeling is 200 mm (8 in.) thick with a density of 2 400 kg/m^3 and two possible levels of conductivity of 1.4 W/m·K for k_1 and 2.9 W/m·K for k_2. As per the ASHRAE Handbook, the average conductivity for concrete with a density of 2 400 kg/m^3 is 2.2 W/m·K. Excludes room- and weather-side air films.

2 Excludes room- and weather-side air films.

3 The uncertainty for the numerical heat transfer simulations is estimated at ± 9%.

4 This value takes into account the interior and exterior air film conductance data from the ASHRAE Handbook of 8.29 $W/m^2 \cdot K$ (corresponding resistance is 1/8.29) and 34.00 $W/m^2 \cdot K$ (corresponding resistance is 1/34.00), respectively. This is the design thermal resistance value to be used for Code compliance.

5 For the minimum effective thermal resistance requirements, see Minimum effective design thermal resistance requirements and performance – Article 9.36.2.8. of the NBC 2015.

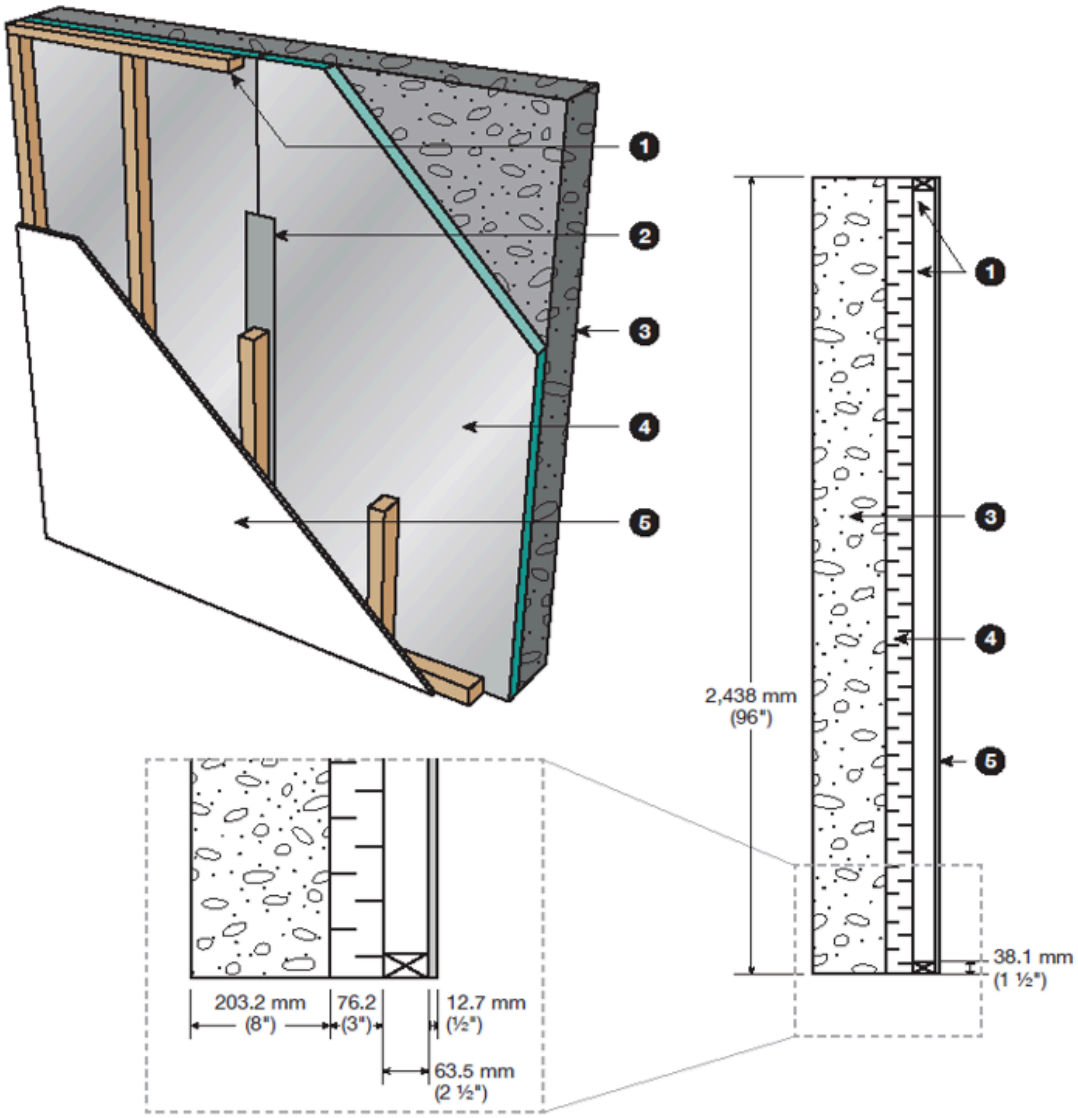

Figure 2. NovoFoil® adjacent to the furred air space assembly installed within the wall assembly 2:

1. Concrete wall (203.2 mm (8 in.) thick)
2. Aluminum tape (50 mm (2 in.) wide)
3. NovoFoil® Type 1 (76.2 mm (3 in.) thick) with low-E material facing furred air space
4. Wood furring (38.1 mm × 63.5 mm (2 × 3)) installed vertically at 609.6 mm (24 in.) on centre (o.c.)
5. Gypsum board (12.7 mm (1/2 in.) thick) installed vertically

Note: There is an air space of 63.5 mm (2 1/2 in.) between the polystyrene board (NovoFoil®) and the gypsum board.

Table 7. Results of modeling the thermal resistance values for the wall assembly 3

Property	Unit	Requirement	Result	
			k_1 (1)	k_2 (1)
Room-side air temperature	°C	Report value	21	21
Weather-side air temperature	°C	Report value	−18	−18
Thermal resistance of the wall (2) (3)	$(m^2 \cdot K)/W$	Report value	3.10	3.02
Design thermal resistance of the wall (3) (4)	$(m^2 \cdot K)/W$	(5)	3.25	3.17

Notes:

1 The concrete layer considered in the numerical modeling is 200 mm (8 in.) thick with a density of 2 400 kg/m^3 and two possible levels of conductivity of 1.4 W/m·K for k_1 and 2.9 W/m·K for k_2. As per the ASHRAE Handbook, the average conductivity for concrete with a density of 2 400 kg/m^3 is 2.2 W/m·K. Excludes room- and weather-side air films.

2 Excludes room- and weather-side air films.

3 The uncertainty for the numerical heat transfer simulations is estimated at ± 9%.

4 This value takes into account the interior and exterior air film conductance data from the ASHRAE Handbook of 8.29 $W/m^2 \cdot K$ (corresponding resistance is 1/8.29) and 34.00 $W/m^2 \cdot K$ (corresponding resistance is 1/34.00), respectively. This is the design thermal resistance value to be used for Code compliance.

5 For the minimum effective thermal resistance requirements, see Minimum effective design thermal resistance requirements and performance – Article 9.36.2.8. of the NBC 2015.

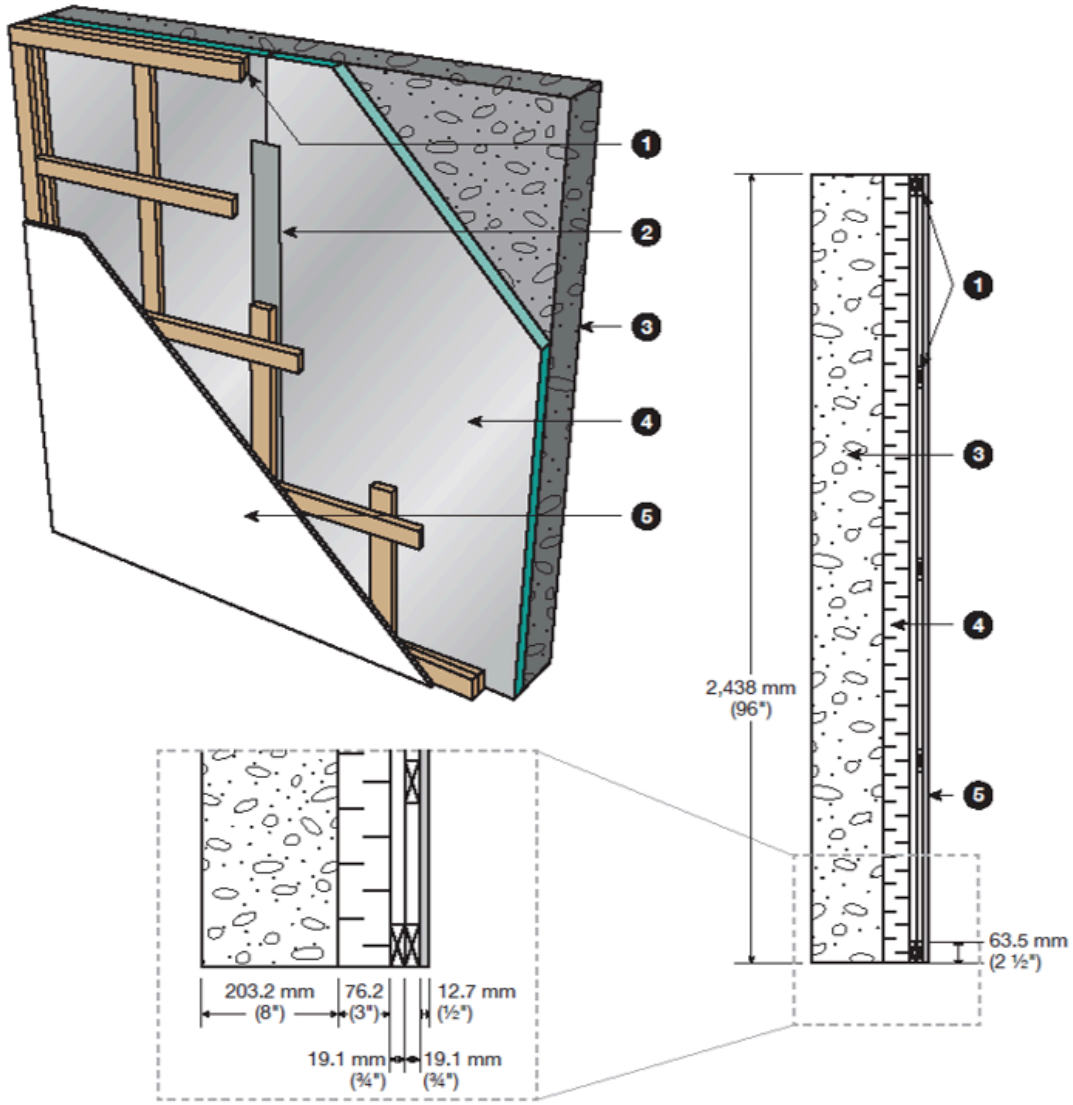

Figure 3. NovoFoil® adjacent to the furred air space assembly installed within the wall assembly 2:

1. Concrete wall (203.2 mm (8 in.) thick)
2. Aluminum tape (50 mm (2 in.) wide)
3. NovoFoil® Type 1 (76.2 mm (3 in.) thick) with low-E material facing furred air space
4. Double wood furring (19.1 mm × 63.5 mm (1 × 3)) installed vertically at 609.6 mm (24 in.) on centre (o.c.) and horizontally at 406.4 mm (16 in.) o.c.
5. Gypsum board (12.7 mm (1/2 in.) thick) installed vertically

Note: There is an air space of 31.8 mm (1 1/2 in.) between the polystyrene board (NovoFoil®) and the gypsum board.

Additional data

Data in this section does not form part of the CCMC's Code compliance opinion.

Heat transfer control (NovoFoil® board with a furred air space assembly)

The following data are provided for comparison purposes with the requirements of the Novoclimat - Small Multiple-Unit Building (Novoclimat) program only. Novoclimat is a program administered by the Québec Ministry of Energy and Natural Resources. The latest requirements were issued on January 1, 2021.

Parmeters used for the simulations

The effective thermal resistance of the manufacturer's designated wall assemblies 1, 2 and 3 shown in Figure 1, Figure 2 and Figure 3 was determined based on numerical heat transfer simulations using COMSOL Multiphysics®. Simulations were conducted using an indoor air temperature of 21±1°C and an outdoor air temperature of −35±1°C. These temperature parameters comply with the Novoclimat requirements. The simulations used 0.6 for the emissivity of the facer (result after aging and weathering) and the measured temperature-dependent thermal conductivity of the NovoFoil®. The thermal conductivity was determined as a linear fit of thermal resistance versus temperature based on testing in compliance with ASTM C 518 at mean temperatures of 24°C, 10°C, 4°C, −4°C and −7.5°C.

Novoclimat requirements

For compliance with Novoclimat, the minimum effective thermal resistance values for foundation walls in buildings for climate locations with heating degree-days (HDD) < 6 000 are presented in the table below. The minimum requirements apply to buildings with heat-recovery ventilators.

Table 8. Minimum effective thermal resistance requirements – Novoclimat

Property		Unit	Requirement zone HDD < 6 000	Results (1) (2)
Minimum effective thermal resistance of the wall assembly	**wall assembly 1 (Figure 1)**	$(m^2 \cdot K)/W$	3.17	Pass
	wall assembly 2 (Figure 2)			Pass
	wall assembly 3 (Figure 3)			Pass

Notes:

1 See the design thermal resistances of the wall in Results of modeling the thermal resistance values for the wall assembly 1, Results of modeling the thermal resistance values for the wall assembly 2, and Results of modeling the thermal resistance values for the wall assembly 3.

2 The results are based on modeling using NovoFoil® proprietary conductivity-temperature dependant linear fit. This is to simulate the temperature profile of NovoFoil® if the foundation wall assembly hadbeen tested in compliance with ASTM C 1363, "Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus" using the same indoor air temperature (21±1°C) and outdoor air temperature (−35±1°C). The manufacturer attested that the conductivity values can be maintained during the annual production of NovoFoil®.

Table 9. Results of modeling the thermal resistance values for the wall assembly 1

Property	Unit	Requirement	Result	
			k_1 (1)	k_2 (1)
Room-side air temperature	°C	Report value	21	21
Weather-side air temperature	°C	Report value	−35	−35
Thermal resistance of the wall (2) (3)	$(m^2 \cdot K)/W$	Report value	3.15	3.09
Design thermal resistance of the wall (3) (4)	$(m^2 \cdot K)/W$	(5)	3.30	3.24

Notes:

1 The concrete layer considered in the numerical modeling is 200 mm (8 in.) thick with a density of 2 400 kg/m^3 and two possible levels of conductivity of 1.4 W/m·K for k_1 and 2.9 W/m·K for k_2. As per the ASHRAE Handbook, the average conductivity for concrete with a density of 2 400 kg/m^3 is 2.2 W/m·K. Excludes room- and weather-side air films.

2 Excludes room- and weather-side air films.

3 The uncertainty for the numerical heat transfer simulations is estimated at ± 9%.

4 This value takes into account the interior and exterior air film conductance data from the ASHRAE Handbook of 8.29 $W/m^2 \cdot K$ (corresponding resistance is 1/8.29) and 34.00 $W/m^2 \cdot K$ (corresponding resistance is 1/34.00), respectively.

5 For the Novoclimat minimum effective thermal resistance requirements, see Minimum effective thermal resistance requirements – Novoclimat.

Table 10. Results of modeling the thermal resistance values for the wall assembly 2

Property	Unit	Requirement	Result	
			k_1 (1)	k_2 (1)
Room-side air temperature	°C	Report value	21	21
Weather-side air temperature	°C	Report value	−35	−35
Thermal resistance of the wall (2) (3)	$(m^2 \cdot K)/W$	Report value	3.25	3.18
Design thermal resistance of the wall (3) (4)	$(m^2 \cdot K)/W$	(5)	3.40	3.33

Notes:

1 The concrete layer considered in the numerical modeling is 200 mm (8 in.) thick with a density of 2 400 kg/m^3 and two possible levels of conductivity of 1.4 W/m·K for k_1 and 2.9 W/m·K for k_2. As per the ASHRAE Handbook, the average conductivity for concrete with a density of 2 400 kg/m^3 is 2.2 W/m·K. Excludes room- and weather-side air films.

2 Excludes room- and weather-side air films.

3 The uncertainty for the numerical heat transfer simulations is estimated at ± 9%.

4 This value takes into account the interior and exterior air film conductance data from the ASHRAE Handbook of 8.29 W/m^2·K (corresponding resistance is 1/8.29) and 34.00 W/m^2·K (corresponding resistance is 1/34.00), respectively.

5 For the Novoclimat minimum effective thermal resistance requirements, see Minimum effective thermal resistance requirements – Novoclimat.

Table 11. Results of modeling the thermal resistance values for the wall assembly 3

Property	Unit	Requirement	Result	
			k_1 (1)	k_2 (1)
Room-side air temperature	°C	Report value	21	21
Weather-side air temperature	°C	Report value	−35	−35
Thermal resistance of the wall (2) (3)	(m^2·K)/W	Report value	3.16	3.09
Design thermal resistance of the wall (3) (4)	(m^2·K)/W	(5)	3.31	3.24

Notes:

1 The concrete layer considered in the numerical modeling is 200 mm (8 in.) thick with a density of 2 400 kg/m^3 and two possible levels of conductivity of 1.4 W/m·K for k_1 and 2.9 W/m·K for k_2. As per the ASHRAE Handbook, the average conductivity for concrete with a density of 2 400 kg/m^3 is 2.2 W/m·K. Excludes room- and weather-side air films.

2 Excludes room- and weather-side air films.

3 The uncertainty for the numerical heat transfer simulations is estimated at ± 9%.

4 This value takes into account the interior and exterior air film conductance data from the ASHRAE Handbook of 8.29 W/m^2·K (corresponding resistance is 1/8.29) and 34.00 W/m^2·K (corresponding resistance is 1/34.00), respectively.

5 For the Novoclimat minimum effective thermal resistance requirements, see Minimum effective thermal resistance requirements – Novoclimat.

Administrative information

Use of Canadian Construction Materials Centre (CCMC) assessments

This assessment must be read in the context of the entire CCMC Registry of Product Assessments, any applicable building code or by-law requirements, and/or any other regulatory requirements (for example, the Canada Consumer Product Safety Act, the Canadian Environmental Protection Act, etc.).

It is the responsibility of the user to confirm that the assessment they are using is current and has not been withdrawn or superseded by a later version on the CCMC Registry of Product Assessments.

Disclaimer

The National Research Council of Canada (NRC) has evaluated only the characteristics of the specific product described herein. The information and opinions in this evaluation are directed to those who have the appropriate degree of experience to use and apply its contents (such as authorities having jurisdiction, design professionals and specifiers). This evaluation is valid when the product is used as part of permitted construction, respecting all conditions and limitations stated in the evaluation, and in accordance with applicable building codes and by-laws.

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Language

Une version française de ce document est disponible.
In the case of any discrepancy between the English and French version of this document, the English version shall prevail.

Copyright

CCMC recognition

The Canadian Construction Materials Centre (CCMC) assesses compliance with Canadian building, energy and safety codes. We are the only construction code compliance service supported and operated by the Government of Canada. Trusted by over 6,000 regulators across Canada.

> Most Canadian authorities having jurisdiction (AHJs) consider CCMC product assessments acceptable as evidence for product approval.

CCMC assessments are recognized by construction authorities across Canada:

Alliance of Canadian Building Official Associations (ACBOA)	(Alliance of Canadian Building Official Associations (ACBOA))
First Nations National Building Officers Association (FNNBOA)	(First Nations National Building Officers Association (FNNBOA))
Canadian Home Builders' Association (CHBA)	(Canadian Home Builders' Association (CHBA))
Alberta Building Officials Association (ABOA)	(Alberta Building Officials Associations (ABOA))
Saskatchewan Building Officials Association (SBOA)	(Saskatchewan Building Officials Association (SBOA))
Manitoba Building Officials Association (MBOA)	(Manitoba Building Officials Association (MBOA))
Ontario Building Officials Association (OBOA)	(Ontario Building Officials Association (OBOA))
New Brunswick Building Officials Association (NBBOA)	(New Brunswick Building Officials Association (NBBOA))
Nova Scotia Building Officials Association (NSBOA)	(Nova Scotia Building Officials Association (NSBOA))

> The CCMC provides code compliance assessments to Canadian code requirements, consulting nationwide with construction regulators to elicit regional variations in code requirements as well as provincial and local interpretations. Users are advised to review the technical information presented in CCMC assessments when making approval decisions. Learn more about how the CCMC provides a unique service for Canada.

For more information, contact the CCMC by phone at (613) 993-6189 or by email at ccmc@nrc-cnrc.gc.ca

NOTICE

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Code compliance as an acceptable solution

Code Compliance via Acceptable Solutions

> If a building design (e.g. material, component, assembly or system) can be shown to meet all provisions of the applicable **acceptable solutions** in Division B (e.g. it complies with the applicable provisions of a referenced standard), it is deemed to have satisfied the objectives and functional statements linked to those provisions and thus to have complied with that part of the Code.
>
> — **National Building Code of Canada, Sentence A-1.2.1.1.(1)(a)**

The CCMC has determined that compliance with this provision of the Code has been demonstrated as an **Acceptable Solution**. The evaluation report provides a summary of the basis of CCMC's compliance opinion.

CCMC's code compliance opinions

All CCMC evaluation reports are opinions of code compliance established in accordance with the National Building Code of Canada, Subsection 1.2.1. "Compliance with this Code," which requires compliance to be achieved by:

- complying with the applicable acceptable solutions in Division B, or
- using an alternative solution that will achieve at least the minimum level of performance required by Division B in the areas defined by the objective and functional statements attributed to the applicable acceptable solutions.

The CCMC assesses compliance with Canadian building, energy and safety codes, and is trusted by over 6,000 regulators across Canada.

Code compliance as an alternative solution

Code Compliance via Alternative Solutions

> Where a design differs from the acceptable solutions in Division B, then it should be treated as an "**alternative solution**." A proponent of an alternative solution must demonstrate that the alternative solution addresses the same issues as the applicable acceptable solutions in Division B and their attributed objectives and functional statements. However, because the objectives and functional statements are entirely qualitative, demonstrating compliance with them in isolation is not possible. Therefore, Clause 1.2.1.1.(1)(b) identifies the principle that Division B establishes the quantitative performance targets that alternative solutions must meet. In many cases, these targets are not defined very precisely by the acceptable solutions [...] Nevertheless, Clause 1.2.1.1.(1)(b) makes it clear that an effort must be made to demonstrate that an alternative solution will perform as well as a design that would satisfy the applicable acceptable solutions in Division B—not “well enough” but “as well as.”
>
> — **National Building Code of Canada, Sentence A-1.2.1.1.(1)(b)**

The CCMC has determined that compliance with this provision of the Code has been demonstrated as an **Alternative Solution**. The evaluation report provides a summary of the basis of CCMC's compliance opinion.

CCMC's code compliance opinions

All CCMC evaluation reports are opinions of code compliance established in accordance with the National Building Code of Canada, Subsection 1.2.1. "Compliance with this Code," which requires compliance to be achieved by:

- complying with the applicable acceptable solutions in Division B, or
- using an alternative solution that will achieve at least the minimum level of performance required by Division B in the areas defined by the objective and functional statements attributed to the applicable acceptable solutions.

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