

## Proposed Change 2267

|                           |                                                                                                |
|---------------------------|------------------------------------------------------------------------------------------------|
| <b>Code Reference(s):</b> | <b>NBC25 Div.B 9.32.3.11. (first printing)</b>                                                 |
| Subject:                  | Piping and Duct Insulation                                                                     |
| Title:                    | Minimum Thermal Resistance Value for Duct Insulation                                           |
| Description:              | This proposed change increases the minimum thermal resistance value (RSI) for duct insulation. |

This change could potentially affect the following topic areas:

- |                                                                               |                                                             |
|-------------------------------------------------------------------------------|-------------------------------------------------------------|
| <input type="checkbox"/> Division A                                           | <input checked="" type="checkbox"/> Division B              |
| <input type="checkbox"/> Division C                                           | <input checked="" type="checkbox"/> Design and Construction |
| <input type="checkbox"/> Building operations                                  | <input checked="" type="checkbox"/> Housing                 |
| <input type="checkbox"/> Small Buildings                                      | <input type="checkbox"/> Large Buildings                    |
| <input type="checkbox"/> Fire Protection                                      | <input type="checkbox"/> Occupant safety in use             |
| <input type="checkbox"/> Accessibility                                        | <input type="checkbox"/> Structural Requirements            |
| <input type="checkbox"/> Building Envelope                                    | <input type="checkbox"/> Energy Efficiency                  |
| <input checked="" type="checkbox"/> Heating, Ventilating and Air Conditioning | <input type="checkbox"/> Plumbing                           |
|                                                                               | <input type="checkbox"/> Construction and Demolition Sites  |

### Problem

Part 9 of the National Building Code of Canada (NBC) 2025 provisions mandate a minimum thermal resistance value of RSI 0.5 (m<sup>2</sup>×K)/W for the insulation of exhaust ducts passing through unheated spaces and of intake ducts carrying untempered outdoor air through heated spaces. As building envelope assemblies become tighter and indoor relative humidity levels are sustained at higher levels, RSI 0.5 is increasingly proving insufficient to prevent condensation in extreme temperature differentials. Furthermore, several provinces and territories have adopted more stringent thermal resistance requirements for these specific duct runs, creating a fragmented regulatory landscape.

### Justification

This proposed change increases the minimum required thermal resistance value from RSI 0.5 (m<sup>2</sup>×K)/W to RSI 0.75 (m<sup>2</sup>×K)/W for the insulation of the following applications:

- exhaust ducts passing through an unheated space or not separated from an

- unheated space by an insulated building assembly, and
- intake ducts carrying untempered, unmixed outdoor air through a heated space.

The primary justification for this increase is to mitigate the elevated risk of condensation caused by the psychrometric realities of modern, airtight building envelope assemblies. Specifically, this enhanced thermal resistance provides a necessary buffer against extreme temperature differentials in the following:

**Exhaust Ducts:** For exhaust air travelling through unheated spaces, upgrading to RSI 0.75 would ensure the moist exhaust air remains above its dew point until it terminates outside. This upgrade would prevent interior duct condensation, frost buildup, and subsequent water damage from backflow.

**Intake Ducts:** For cold outdoor air travelling through heated spaces, the higher RSI 0.75 insulation would act as a more robust thermal break. The increased insulation would prevent the outermost surface of the duct from cooling to the ambient indoor dew point, thereby mitigating the risk of concealed condensation, moisture damage, and mould growth within floor or wall cavities.

Additionally, this increase would align the National Model Codes with the more progressive standards for mechanical installation that have already been adopted by some provincial and territorial authorities, standardizing manufacturing outputs and simplifying cross-jurisdictional compliance for builders.

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## PROPOSED CHANGE

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### NBC25 Div.B 9.32.3.11. (first printing)

#### [9.32.3.11.] 9.32.3.11. Ducts

(See Note A-9.32.3.11.)

- [1] 1)** Except as provided in Sentence (6), ventilation ducts and their fittings shall conform to the requirements of Article 9.33.6.2., except that *exhaust ducts* serving only a bathroom or water-closet room are permitted to be of *combustible* material, provided they are reasonably airtight and constructed of a material impervious to water.
- [2] 2)** *Exhaust ducts* shall not discharge into heated or unheated enclosed spaces.
- [3] 3)** Where an *exhaust duct* passes through an unheated space or is not separated from an unheated space by an insulated *building* assembly, the duct shall be insulated to not less than RSI 0.75~~0.5~~.
- [4] 4)** Where a duct carrying outdoor air that is not tempered and not mixed with indoor air passes through heated space, it shall be
  - [a] a) insulated to not less than RSI 0.75~~0.5~~, and
  - [b] b) provided with a *vapour barrier*.
- [5] 5)** All exhaust intakes located within 3 m horizontally of a *cooktop* shall be equipped with a grease filter at the intake end.

- [6] 6)** Ductwork for cooking *appliance* exhaust fans shall
- [a] a) be of *noncombustible*, corrosion-resistant material,
  - [b] b) lead directly to the outdoors with no connections to other exhaust fans or ducts, and
  - [c] c) be equipped with a grease filter at the intake end.
- [7] 7)** All ductwork shall be installed to avoid crushing and shall be permanently supported to prevent sagging.
- [8] 8)** Joints in all ventilation system ducting shall be sealed with mastic, metal foil duct tape or the manufacturers' specified sealants.
- [9] 9)** Except where the size of a duct can be determined using Table 9.32.3.11.-A or Table 9.32.3.11.-B, duct sizes shall be determined according to Subsection 9.33.4.

**Table [9.32.3.11.-A] 9.32.3.11.-A**  
**Equivalent Duct Sizes**  
**Forming Part of Sentence [9.32.3.11.] 9.32.3.11.([9] 9)**

| Fan's External Static Pressure, Pa | Duct Diameter, mm | Maximum Airflow in Duct, L/s |    |    |    |    |    |     |
|------------------------------------|-------------------|------------------------------|----|----|----|----|----|-----|
|                                    |                   | 7                            | 15 | 25 | 35 | 50 | 75 | 100 |
|                                    |                   | Maximum Length of Duct, m    |    |    |    |    |    |     |
| 25                                 | 75                | 6                            | 1  | 0  | 0  | 0  | 0  | 0   |
|                                    | 100               | 25                           | 6  | 2  | 1  | 0  | 0  | 0   |
|                                    | 125               | 60                           | 17 | 6  | 3  | 1  | 0  | 0   |
|                                    | 150               | 60                           | 42 | 16 | 8  | 4  | 2  | 1   |
|                                    | 175               | 60                           | 60 | 34 | 18 | 9  | 4  | 2   |
|                                    | 200               | 60                           | 60 | 60 | 35 | 18 | 8  | 5   |
| 50                                 | 75                | 16                           | 4  | 1  | 0  | 0  | 0  | 0   |
|                                    | 100               | 60                           | 16 | 6  | 3  | 1  | 0  | 0   |
|                                    | 125               | 60                           | 47 | 18 | 9  | 5  | 2  | 1   |
|                                    | 150               | 60                           | 60 | 44 | 23 | 12 | 5  | 3   |
|                                    | 175               | 60                           | 60 | 60 | 49 | 25 | 12 | 7   |
|                                    | 200               | 60                           | 60 | 60 | 60 | 48 | 22 | 13  |
| 62.5                               | 75                | 22                           | 5  | 2  | 1  | 0  | 0  | 0   |

| Fan's External Static Pressure, Pa | Duct Diameter, mm | Maximum Airflow in Duct, L/s |    |    |    |    |    |     |
|------------------------------------|-------------------|------------------------------|----|----|----|----|----|-----|
|                                    |                   | 7                            | 15 | 25 | 35 | 50 | 75 | 100 |
|                                    |                   | Maximum Length of Duct, m    |    |    |    |    |    |     |
|                                    | 100               | 60                           | 21 | 8  | 4  | 2  | 1  | 0   |
|                                    | 125               | 60                           | 60 | 24 | 12 | 6  | 3  | 1   |
|                                    | 150               | 60                           | 60 | 58 | 31 | 15 | 7  | 4   |
|                                    | 175               | 60                           | 60 | 60 | 60 | 33 | 15 | 9   |
|                                    | 200               | 60                           | 60 | 60 | 60 | 60 | 29 | 17  |
| 100                                | 75                | 38                           | 9  | 3  | 1  | 0  | 0  | 0   |
|                                    | 100               | 60                           | 36 | 14 | 7  | 3  | 1  | 1   |
|                                    | 125               | 60                           | 60 | 41 | 22 | 11 | 5  | 3   |
|                                    | 150               | 60                           | 60 | 60 | 53 | 27 | 12 | 7   |
|                                    | 175               | 60                           | 60 | 60 | 60 | 57 | 27 | 15  |
|                                    | 200               | 60                           | 60 | 60 | 60 | 60 | 51 | 30  |
| 150                                | 75                | 59                           | 14 | 5  | 2  | 1  | 0  | 0   |
|                                    | 100               | 60                           | 57 | 22 | 11 | 6  | 2  | 1   |
|                                    | 125               | 60                           | 60 | 60 | 34 | 17 | 8  | 4   |
|                                    | 150               | 60                           | 60 | 60 | 60 | 42 | 20 | 11  |
|                                    | 175               | 60                           | 60 | 60 | 60 | 60 | 42 | 24  |
|                                    | 200               | 60                           | 60 | 60 | 60 | 60 | 60 | 46  |

**[10] 10)** In using Table 9.32.3.11.-A,

- [a] a) when sizing branch ducts, "maximum length of duct" refers to the physical length of the duct from the interior grille served by that branch duct to the exterior hood,
- [b] b) when sizing a trunk duct, "maximum length of duct" refers to the physical length of the duct from the interior grille of the longest branch served by that trunk to the exterior hood,
- [c] c) outdoor air supply ducts shall be sized as trunk ducts,
- [d] d) "maximum airflow in duct" refers to the maximum airflow rate that a given section of duct (branch or trunk) must provide to satisfy the ventilation system design, and
- [e] e) "fan's external static pressure" refers to the external static pressure

at which the fan is rated to achieve the maximum airflow rate that the fan is required or intended to provide.

- [11] 11)** Where flexible duct is used, it may be sized by choosing the next higher diameter in Table 9.32.3.11.-A or by choosing the diameter for a duct twice as long as the actual length.
- [12] 12)** Where rectangular duct is used in place of round duct, it shall be selected according to Table 9.32.3.11.-B.

**Table [9.32.3.11.-B] 9.32.3.11.-B**

**Equivalent Duct Sizes**

**Forming Part of Sentences [9.32.3.11.] 9.32.3.11.([9] 9) and ([12] 12)**

| Required Round Duct Size, mm | Permitted Equivalent Rectangular Duct Size, mm |              |              |              |
|------------------------------|------------------------------------------------|--------------|--------------|--------------|
|                              | Stack duct                                     | 100 mm depth | 125 mm depth | 150 mm depth |
| 75                           | 75 × 150                                       | 50 × 100     | —            | —            |
| 100                          | 75 × 250                                       | 75 × 100     | 75 × 125     | 75 × 150     |
| 125                          | 75 × 250                                       | 125 × 100    | 100 × 125    | 100 × 150    |
| 150                          | 75 × 300                                       | 200 × 100    | 150 × 125    | 125 × 150    |
| 175                          | 75 × 350                                       | 275 × 100    | 200 × 125    | 175 × 150    |
| > 175                        | Design to Subsection 9.33.4.                   |              |              |              |

## Impact analysis

The direct material cost increase associated with this proposed change would be marginal. Upgrading to an RSI 0.75 insulated flex duct or sleeve for heat/energy-recovery ventilator (HRV/ERV) systems adds a minor premium. As RSI 0.50 products cost \$3.00 to \$3.60 per linear foot and RSI 0.75 products cost \$3.80 to \$5.00 per linear foot, the premium would be only \$0.80 to \$1.40 per linear foot. Given the short lengths of these specific runs in residential occupancies, the impact on the total HVAC installation cost would be negligible. Labour expenditures would remain unchanged, as the installation and sealing methodology for RSI 0.75 products is identical to that required for current RSI 0.50 products.

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## Enforcement implications

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No change to current enforcement procedures would be required. Building officials could verify compliance through visual inspection of the manufacturer's printed RSI value on the outermost surface of the insulated duct or sleeve during the standard mechanical inspection.

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## Who is affected

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Designers, engineers, architects, builders, building officials, and consultants.

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## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

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### NBC25 Div.B 9.32.3.11. (first printing)

- [\[9.32.3.11.\]](#) 9.32.3.11. ([\[1\]](#) 1) no attributions
- [\[9.32.3.11.\]](#) 9.32.3.11. ([\[1\]](#) 1) [F81-OH1.1]
- [\[9.32.3.11.\]](#) 9.32.3.11. ([\[2\]](#) 2) [F40,F52,F63-OH1.1]
- [\[9.32.3.11.\]](#) 9.32.3.11. ([\[2\]](#) 2) [F52,F63-OS2.3]
- [\[9.32.3.11.\]](#) 9.32.3.11. ([\[3\]](#) 3) [F63-OH1.1]
- [\[9.32.3.11.\]](#) 9.32.3.11. ([\[3\]](#) 3) [F63,F80-OS2.3]
- [\[9.32.3.11.\]](#) 9.32.3.11. ([\[4\]](#) 4) [F63-OH1.1]
- [\[9.32.3.11.\]](#) 9.32.3.11. ([\[5\]](#) 5) [F41,F82-OH1.1]
- [\[9.32.3.11.\]](#) 9.32.3.11. ([\[5\]](#) 5) [F01,F82-OS1.1]
- [\[9.32.3.11.\]](#) 9.32.3.11. ([\[6\]](#) 6) ([\[a\]](#) a),([\[b\]](#) b),([\[c\]](#) c) [F02,F03-OS1.1] ([\[a\]](#) a) [F80-OS1.1] ([\[c\]](#) c) [F82-OS1.1]
- [\[9.32.3.11.\]](#) 9.32.3.11. ([\[7\]](#) 7) [F41,F53,F80-OH1.1]
- [\[9.32.3.11.\]](#) 9.32.3.11. ([\[8\]](#) 8) [F40,F41-OH1.1]
- [\[9.32.3.11.\]](#) 9.32.3.11. ([\[8\]](#) 8) [F40,F63-OS2.3]
- [\[9.32.3.11.\]](#) 9.32.3.11. ([\[9\]](#) 9) [F40,F50,F52,F53-OH1.1]
- [\[9.32.3.11.\]](#) 9.32.3.11. ([\[9\]](#) 9) [F53-OS3.4]
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[9.32.3.11.] 9.32.3.11. ([12] 12) [F40,F50,F52,F53-OH1.1]

[9.32.3.11.] 9.32.3.11. ([12] 12) [F53-OS3.4]