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## Proposed Change 1664

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<b>Code Reference(s):</b>	<b>NBC20 Div.B 9.36.2.11. (first printing)</b>
Subject:	Building Envelope - General
Title:	Option for Insulation Under Ducts (Factory-Constructed Buildings)
Description:	The proposed change updates Sentence 9.36.2.11.(6) to provide an alternative to the existing effective thermal resistance requirement for insulation under trunk ducts installed below insulated floor framing in factory-constructed buildings.
Related Code Change Request(s):	CCR 811

This change could potentially affect the following topic areas:

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| <input type="checkbox"/> Division A                                | <input checked="" type="checkbox"/> Division B             |
| <input type="checkbox"/> Division C                                | <input type="checkbox"/> Design and Construction           |
| <input type="checkbox"/> Building operations                       | <input checked="" type="checkbox"/> Housing                |
| <input checked="" 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 checked="" type="checkbox"/> Building Envelope              | <input checked="" type="checkbox"/> Energy Efficiency      |
| <input type="checkbox"/> Heating, Ventilating and Air Conditioning | <input type="checkbox"/> Plumbing                          |
|  | <input type="checkbox"/> Construction and Demolition Sites |

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### Problem

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NBC Sentence 9.36.2.5.(8) requires that the insulation under ducts have an effective thermal resistance (RSI) not less than 2.78 (R15.78). This requirement is problematic for trunk ducts in some factory-constructed buildings due to the dimensional limitations specified in transportation regulations. Sentence 9.36.2.5.(8) refers to Article 9.36.2.11. as an alternative to compliance with the prescriptive RSI value of 2.78 (R15.78).

In developing the trade-off calculations, the limits on the acceptable reduction in effective thermal resistance were not considered. According to Sentence 9.36.2.11.(6), the acceptable reduction in effective thermal resistance of floor assemblies must result

in an RSI value not less than 60% of the RSI value required in Article 9.36.2.6., i.e., RSI 2.80 (R15.9) for Zones 4 to 6 and RSI 3.01 (R17.09) for Zones 7A to 8. Given these limits, the trade-offs provide no relief from the prescriptive requirement.

For the general case, Clause 9.36.3.2.(3)(b) requires that ducts installed outside the plane of insulation in the building envelope be insulated to not less than the level required for exterior walls. Sentence 9.36.3.2.(5) allows the level of insulation under ducts installed under floor framing to be reduced to not less than RSI 2.11, provided that additional insulation is installed on the sides of the duct to maintain the required level of performance.

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## Justification

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The proposed change does not compromise the minimum required level of energy performance.

The change is intended to allow reduced levels of insulation under trunk ducts installed under insulated floor framing and will make the permitted reduction consistent with what is allowed when the duct is installed outside the building envelope.

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## PROPOSED CHANGE

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### **[9.36.2.11.] 9.36.2.11. Trade-off Options for Above-ground Building Envelope Components and Assemblies**

**(See Note A-9.36.2.11.)**

- [1] 1)** Subject to the limitations stated in Sentences (6) to (8), the trade-off options described in Sentences (2) to (4) apply only to above-ground *building* envelope components and assemblies, or portions thereof, of a single *building*.
- [2] 2)** The effective thermal resistance of one or more above-ground opaque *building* envelope assemblies is permitted to be less than that required in Article 9.36.2.6., provided
  - [a] a) the total areas of all proposed and reference assemblies are equal,
  - [b] b) the effective thermal resistance of one or more other proposed above-ground opaque *building* envelope assembly areas is increased to more than that required by Article 9.36.2.6., and
  - [c] c) the sum of the areas of all traded above-ground opaque *building* envelope assemblies divided by their respective effective thermal resistance is less than or equal to what it would be if all assemblies complied with Article 9.36.2.6.(See Notes A-9.36.2.11.(2) and A-9.36.2.11.(2) and (3).)
- [3] 3)** The effective thermal resistance of one or more windows, as calculated in accordance with Sentence (5), is permitted to be less than that required

in Article 9.36.2.7., provided

- [a] a) the total areas of all traded windows are equal,
- [b] b) the traded windows are located in the same orientation,
- [c] c) the effective thermal resistance of one or more other windows is increased to more than that required by Article 9.36.2.7., and
- [d] d) the sum of the areas of all traded windows divided by their respective effective thermal resistance is less than or equal to what it would be if all windows complied with Article 9.36.2.7.

(See Notes A-9.36.2.11.(3) and A-9.36.2.11.(2) and (3).)

- [4] 4)** The effective thermal resistance of one or more portions of floor insulation or ceiling insulation in attics under sloped roofs in *buildings* that are one *storey in building height* is permitted to be less than that required in Article 9.36.2.6., provided

- [a] a) the total area of fenestration, excluding skylights, and doors does not exceed 15% of the above-ground gross wall area as calculated in accordance with Article 9.36.2.3.,
- [b] b) the floor-to-ceiling height measured from the top of the subfloor to the underside of the finished ceiling of the *storey* does not exceed 2.34 m,
- [c] c) the distance measured from the top of the subfloor to the underside of the bottom chord of the truss or joist of the roof is not more than 2.39 m, and
- [d] d) the difference between the sum of the proposed areas of ceilings or floors divided by their respective proposed effective thermal resistance and the sum of the reference areas of ceilings or floors divided by their respective thermal resistance required in Article 9.36.2.6. is not more than the difference between 17% fenestration and door area and the proposed fenestration and door areas divided by the required effective thermal resistance values for windows and doors in Article 9.36.2.7.

(See Notes A-9.36.2.11.(4) and A-9.36.2.11.(2) and (3).)

- [5] 5)** The effective thermal resistance of windows shall be determined as  $RSI = 1/U$ -value.

- [6] 6)** The reduction in effective thermal resistance of above-ground opaque *building* envelope assemblies permitted by Sentences (2) and (4) shall result in an RSI value that ~~is not less than~~

[a] --) conforms to Sentence 9.36.3.2.(5), or

[b] a) ~~is not less than 55% of that required in Article 9.36.2.6. for above-ground walls and joist-type roofs (see Note A-9.36.2.11.(6)(a)), and~~

[i] --) 55% of that required in Article 9.36.2.6. for above-ground walls and joist-type roofs (see Note A-9.36.2.11.(6)(b)(i)), and

[ii] --) 60% of that required in Article 9.36.2.6. for other opaque assemblies.

[c] b) ~~60% of that required in Article 9.36.2.6. for other opaque~~

~~assemblies.~~

- [7] 7)** The effective thermal resistances of above-ground opaque assemblies with embedded heating cables, pipes or membranes are not permitted to be traded.
- [8] 8)** The effective thermal resistances of doors and access hatches described in Sentences 9.36.2.7.(3) to (7) are not permitted to be traded.

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## Impact analysis

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This trade-off option will provide a significant benefit for factory-constructed buildings where transportation regulations impose stringent height limits.

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## Enforcement implications

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This proposed change can be enforced by the existing infrastructure without additional resources.

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## Who is affected

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Designers, engineers, architects, building officials and manufacturers/suppliers.

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## OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISIONS

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**[9.36.2.11.] 9.36.2.11. ([1] 1) no attributions**

**[9.36.2.11.] 9.36.2.11. ([2] 2) [F92-OE1.1]**

**[9.36.2.11.] 9.36.2.11. ([2] 2) no attributions**

**[9.36.2.11.] 9.36.2.11. ([3] 3) [F92-OE1.1]**

**[9.36.2.11.] 9.36.2.11. ([3] 3) no attributions**

**[9.36.2.11.] 9.36.2.11. ([4] 4) [F92-OE1.1]**

**[9.36.2.11.] 9.36.2.11. ([5] 5) [F92-OE1.1]**

**[9.36.2.11.] 9.36.2.11. ([6] 6) [F92-OE1.1]**

**[9.36.2.11.] 9.36.2.11. ([7] 7) [F92-OE1.1]**

**[9.36.2.11.] 9.36.2.11. ([8] 8) [F92-OE1.1]**