Appendix E Review a draft/comments of PCF on Thermal Characteristics of Opaque Assemblies/Fenestration

/Doors (CCR #972, 1012 and

1018)

**Proposed Change XXX**

**Code Reference(s): NECB17 Div.B 3.2.2.**

Subject: Above-ground Components of the Building Envelope

Title: Thermal Characteristics of Opaque Assemblies/Fenestration/Doors Related Code Change Request(s): CCR XXX

**EXISTING PROVISION**

* + 1. Above-ground Components of the Building Envelope
       1. **Vestibules**
          1. Except as provided in Sentence (3), a door that separates *conditioned space* from the exterior shall be protected with an enclosed vestibule whose doors opening into and out of the vestibule are equipped with self-closing devices.
          2. Except for doors equipped with power operators in barrier-free entrances, vestibules required in Sentence (1) shall be designed so that users passing through the vestibule are not required to open the interior and exterior doors at the same time.
          3. A vestibule is not required for an exterior door that

is a revolving door,

is used primarily to facilitate vehicular movement or material handling,

is intended to be used as a service, emergency *exit*, or stairwell *exit* door only,

is intended to be used as a seasonal use door, such as a door leading to a patio,

opens directly from a *dwelling unit*,

opens directly from a retail space less than 200 m2 in area or from a space less than 150 m2 for other uses, or

is located in a *building* less than 5 *storeys* in *building height* in any area that has fewer than 3500 heating degree-days (°C) as listed in Table C-1.

* + - 1. **Thermal Characteristics of Above-ground Opaque Building Assemblies**
         1. Except as provided in Sentences (3) and (4) and in Sentence 3.2.1.3.(1), the *overall thermal transmittance* of above-ground *opaque building assemblies* shall be not more than that shown in Table 3.2.2.2. for the *building* or part thereof enclosed by the *opaque building assembly*, for the applicable heating degree-day category taken at 18°C. (See Note A-3.2.2.2.(1).)

**Table 3.2.2.2.**

**Overall Thermal Transmittance of Above -ground Opaque Building Assemblies Forming Part of Sentences 3.2.2.2.(1) and (2)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Above ground ***Opaque Building Assembly*** | Heating Degree-Days of ***Building*** Location,(1) in Celsius Degree-Days | | | | | |
| Zone 4:(2)  < 3000 | Zone 5:**(2)**  3000 to 3999 | Zone 6:**(2)**  4000 to 4999 | Zone 7A:**(2)** 5000 to 5999 | Zone 7B:**(2)** 6000 to 6999 | Zone 8:**(2)**  ≥ 7000 |
| Maximum ***Overall Thermal Transmittance***, W/(m2·K) | | | | | |
| Walls | 0.315 | 0.278 | 0.247 | 0.210 | 0.210 | 0.183 |
| Roofs | 0.193 | 0.156 | 0.156 | 0.138 | 0.138 | 0.121 |
| Floors | 0.227 | 0.183 | 0.183 | 0.162 | 0.162 | 0.142 |

**Notes to Table 3.2.2.2.:**

(1) See Sentence 1.1.4.1.(1).

(2) See Note A-Table 3.2.2.2.

* + - * 1. Except as provided in Sentences (3) and (4) and in Sentence 3.2.1.3.(1), the *overall thermal transmittance* of above-ground *opaque building assemblies* in semi-heated *buildings*, as defined in Sentence 1.2.1.2.(2), shall be not more than that shown in Table 3.2.2.2. for the *building* or part thereof enclosed by the *opaque building assembly*, for the applicable heating degree-day category taken at 15°C.
        2. The *overall thermal transmittance* of portions of a *foundation* wall that are above ground, where the top of a *foundation* wall is less than 0.4 m above the adjoining ground level, shall be not more than that shown in Table 3.2.3.1.
        3. Where radiant heating cables or heating or cooling pipes or membranes are embedded in the surface of an above-ground *opaque building assembly*, this assembly shall have an *overall thermal transmittance* no greater than 80% of that required by Sentence (1). (See Note A-3.2.2.2.(4).)
      1. **Thermal Characteristics of Fenestration**
         1. For the purposes of this Article, the term “*fenestration*” does not include doors, which are covered in Article 3.2.2.4.
         2. Except as provided in Sentences (3) and 3.2.1.3.(1), the *overall thermal transmittance* of *fenestration* shall be not more than that shown in Table 3.2.2.3. for the applicable heating degree- day category taken at 18°C, as determined in accordance with Article 3.1.1.5.
         3. Except as provided in Sentence 3.2.1.3.(1), the *overall thermal transmittance* of *fenestration* in semi-heated *buildings*, as defined in Sentence 1.2.1.2.(2), shall be not more than that shown in Table 3.2.2.3. for the applicable heating degree-day category taken at 15°C, as determined in accordance with Article 3.1.1.5.

**Table 3.2.2.3.**

**Overall Thermal Transmittance of Fenestration Forming Part of Sentences 3.2.2.3.(2) and (3)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Component | Heating Degree-Days of ***Building*** Location,(1) in Celsius Degree-Days | | | | | |
| Zone 4:(2)  < 3000 | Zone 5:**(2)**  3000 to 3999 | Zone 6:(2)  4000 to 4999 | Zone 7A:(2) 5000 to 5999 | Zone 7B:(2) 6000 to 6999 | Zone 8:(2)  ≥ 7000 |
| Maximum ***Overall Thermal Transmittance***, W/(m2·K) | | | | | |
| All *fenestration* | 2.1 | 1.9 | 1.9 | 1.9 | 1.9 | 1.4 |

**Notes to Table 3.2.2.3.:**

(1) See Sentence 1.1.4.1.(1).

(2) See Note A-Table 3.2.2.2.

* + - 1. **Thermal Characteristics of Doors and Access Hatches**
         1. Except as provided in Sentences (2), (3), (5) and 3.2.1.3.(1), the *overall thermal transmittance* of doors shall be not more than that shown in Table 3.2.2.4. for the applicable heating degree-day category taken at 18°C, as determined in accordance with Article 3.1.1.5.
         2. Except as provided in Sentences (3) and (5), the *overall thermal transmittance* of doors in semi-heated *buildings*, as defined in Sentence 1.2.1.2.(2), shall be not more than that shown in Table 3.2.2.4. for the applicable heating degree-day category taken at 15°C, as determined in accordance with Article 3.1.1.5.
         3. Doors need not comply with Sentence (1) or (2) where

their total area does not exceed 2% of the gross wall area calculated in accordance with Article 3.1.1.6., and

their *overall thermal transmittance* does not exceed 4.4 W/(m2·K).

* + - * 1. Access hatches that are part of a *building envelope* shall be insulated to a nominal thermal transmittance of not more than 1.3 W/(m2·K), exclusive of stiffeners or edge construction.
        2. Storm doors, automatic sliding glass doors, revolving doors, and fire shutters need not comply with Sentence (1) or (2). (See Note A-3.2.2.4.(5).)

**Table 3.2.2.4.**

**Overall Thermal Transmittance of Doors Forming Part of Sentences 3.2.2.4.(1) and (2)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Component | Heating Degree-Days of ***Building*** Location,(1) in Celsius Degree-Days | | | | | |
| Zone 4:(2)  < 3000 | Zone 5:(2)  3000 to 3999 | Zone 6:(2)  4000 to 4999 | Zone 7A:(2) 5000 to 5999 | Zone 7B:(2) 6000 to 6999 | Zone 8:(2)  ≥ 7000 |
| Maximum ***Overall Thermal Transmittance***, W/(m2·K) | | | | | |
| All doors | 2.1 | 1.9 | 1.9 | 1.9 | 1.9 | 1.4 |

**Notes to Table 3.2.2.4.:**

(1) See Sentence 1.1.4.1.(1).

(2) See Note A-Table 3.2.2.2.

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**PROPOSED CHANGE**

* + 1. **Above-ground Components of the Building Envelope**
       1. **Vestibules**
          1. Except as provided in Sentence (3), a door that separates *conditioned space* from the exterior shall be protected with an enclosed vestibule whose doors opening into and out of the vestibule are equipped with self-closing devices.
          2. Except for doors equipped with power operators in barrier-free entrances, vestibules required in Sentence (1) shall be designed so that users passing through the vestibule are not required to open the interior and exterior doors at the same time.
          3. A vestibule is not required for an exterior door that

is a revolving door,

is used primarily to facilitate vehicular movement or material handling,

is intended to be used as a service, emergency *exit*, or stairwell *exit* door only,

is intended to be used as a seasonal use door, such as a door leading to a patio,

opens directly from a *dwelling unit*,

opens directly from a retail space less than 200 m2 in area or from a space less than 150 m2 for other uses, or

is located in a *building* less than 5 *storeys* in *building height* in any area that has fewer than 3500 heating degree-days (°C) as listed in Table C-1.

* + - 1. **Thermal Characteristics of Above-ground Opaque Building Assemblies**
         1. Except as provided in Sentences (3) and (4) and in Sentence 3.2.1.3.(1), the *overall thermal transmittance* of above-ground *opaque building assemblies* shall be not more than that shown in Table 3.2.2.2. for the *building* or part thereof enclosed by the *opaque building assembly*, for the applicable heating degree-day category taken at 18°C. (See Note A-3.2.2.2.(1).)

**Table 3.2.2.2.**

**Overall Thermal Transmittance of Above -ground Opaque Building Assemblies Forming Part of Sentences 3.2.2.2.(1) and (2)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Above ground ***Opaque Building Assembly*** | Heating Degree-Days of ***Building*** Location,(1) in Celsius Degree-Days | | | | | |
| Zone 4:(2)  < 3000 | Zone 5:**(2)**  3000 to 3999 | Zone 6:**(2)**  4000 to 4999 | Zone 7A:**(2)** 5000 to 5999 | Zone 7B:**(2)** 6000 to 6999 | Zone 8:**(2)**  ≥ 7000 |
| Maximum ***Overall Thermal Transmittance***, W/(m2·K) | | | | | |
| Walls | 0.315[1] 0.290 | ~~0.278~~ 0.265 | ~~0.247~~ 0.240 | 0.210[2] 0.215 | ~~0.210~~ 0.190 | ~~0.183~~ 0.165 |
| Roofs | ~~0.193~~ 0.164 | ~~0.156~~ 0.156 | ~~0.156~~ 0.138 | ~~0.138~~ 0.121 | ~~0.138~~ 0.117 | ~~0.121~~ 0.110 |
| Floors | ~~0.227~~ 0.193 | ~~0.183~~ 0.175 | ~~0.183~~ 0.156 | ~~0.162~~ 0.138 | ~~0.162~~ 0.121 | ~~0.142~~ 0.117 |



**Notes to Table 3.2.2.2.:**

(1) See Sentence 1.1.4.1.(1).

(2) See Note A-Table 3.2.2.2.

* + - * 1. Except as provided in Sentences (3) and (4) and in Sentence 3.2.1.3.(1), the *overall thermal transmittance* of above-ground *opaque building assemblies* in semi-heated *buildings*, as defined in Sentence 1.2.1.2.(2), shall be not more than that shown in Table 3.2.2.2. for the *building* or part thereof enclosed by the *opaque building assembly*, for the applicable heating degree-day category taken at 15°C.
        2. The *overall thermal transmittance* of portions of a *foundation* wall that are above ground, where the top of a *foundation* wall is less than 0.4 m above the adjoining ground level, shall be not more than that shown in Table 3.2.3.1.
        3. Where radiant heating cables or heating or cooling pipes or membranes are embedded in the surface of an above-ground *opaque building assembly*, this assembly shall have an *overall thermal transmittance* no greater than 80% of that required by Sentence (1). (See Note A-3.2.2.2.(4).)
      1. **Thermal Characteristics of Fenestration**
         1. For the purposes of this Article, the term “*fenestration*” does not include doors, which are covered in Article 3.2.2.4.
         2. Except as provided in Sentences (3) and 3.2.1.3.(1), the *overall thermal transmittance* of *fenestration* shall be not more than that shown in Table 3.2.2.3. for the applicable heating degree- day category taken at 18°C, as determined in accordance with Article 3.1.1.5.
         3. Except as provided in Sentence 3.2.1.3.(1), the *overall thermal transmittance* of *fenestration* in semi-heated *buildings*, as defined in Sentence 1.2.1.2.(2), shall be not more than that shown in Table 3.2.2.3. for the applicable heating degree-day category taken at 15°C, as determined in accordance with Article 3.1.1.5.

**Table 3.2.2.3.**

**Overall Thermal Transmittance of Fenestration Forming Part of Sentences 3.2.2.3.(2) and (3)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Component | Heating Degree-Days of ***Building*** Location,(1) in Celsius Degree-Days | | | | | |
| Zone 4:(2)  < 3000 | Zone 5:**(2)**  3000 to 3999 | Zone 6:(2)  4000 to 4999 | Zone 7A:(2) 5000 to 5999 | Zone 7B:(2) 6000 to 6999 | Zone 8:(2)  ≥ 7000 |
| Maximum ***Overall Thermal Transmittance***, W/(m2·K) | | | | | |
| All *fenestration* | ~~2.1~~ 1.9 | ~~1.9~~ 1.8 | ~~1.9~~ 1.7 | ~~1.9~~ 1.5 | ~~1.9~~ 1.4 | ~~1.4~~ 1.3 |

**Notes to Table 3.2.2.3.:**

(1) See Sentence 1.1.4.1.(1).

(2) See Note A-Table 3.2.2.2.

* + - 1. **Thermal Characteristics of Doors and Access Hatches**
         1. Except as provided in Sentences (2), (3), (5) and 3.2.1.3.(1), the *overall thermal transmittance* of doors shall be not more than that shown in Table 3.2.2.4. for the applicable heating degree-day category taken at 18°C, as determined in accordance with Article 3.1.1.5.
         2. Except as provided in Sentences (3) and (5), the *overall thermal transmittance* of doors in semi-heated *buildings*, as defined in Sentence 1.2.1.2.(2), shall be not more than that shown in Table 3.2.2.4. for the applicable heating degree-day category taken at 15°C, as determined in accordance with Article 3.1.1.5.
         3. Doors need not comply with Sentence (1) or (2) where

their total area does not exceed 2% of the gross wall area calculated in accordance with Article 3.1.1.6., and

their *overall thermal transmittance* does not exceed 4.4 W/(m2·K).

* + - * 1. Access hatches that are part of a *building envelope* shall be insulated to a nominal thermal transmittance of not more than 1.3 W/(m2·K), exclusive of stiffeners or edge construction.
        2. Storm doors, automatic sliding glass doors, revolving doors, and fire shutters need not comply with Sentence (1) or (2). (See Note A-3.2.2.4.(5).)

**Table 3.2.2.4.**

**Overall Thermal Transmittance of Doors**

**Forming Part of Sentences 3.2.2.4.(1) and (2)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Component | Heating Degree-Days of ***Building*** Location,(1) in Celsius Degree-Days | | | | | |
| Zone 4:(2)  < 3000 | Zone 5:(2)  3000 to 3999 | Zone 6:(2)  4000 to 4999 | Zone 7A:(2) 5000 to 5999 | Zone 7B:(2) 6000 to 6999 | Zone 8:(2)  ≥ 7000 |
| Maximum ***Overall Thermal Transmittance***, W/(m2·K) | | | | | |
| All doors | ~~2.1~~ 1.9 | ~~1.9~~ 1.8 | ~~1.9~~ 1.7 | ~~1.9~~ 1.5 | ~~1.9~~ 1.4 | ~~1.4~~ 1.3 |

**Notes to Table 3.2.2.4.:**

(1) See Sentence 1.1.4.1.(1).

(2) See Note A-Table 3.2.2.2.

**DESCRIPTION**

This PCF reduces the heat loss through above- ground building envelope components.

RATIONALE

**Problem**

pe

|  |  |  |
| --- | --- | --- |
| Above- ground components of the b~~B~~uilding e~~E~~nvelope have the largest surface area of building envelo | | |
| components which contribute to the excessive loss of energy. As such | [3] | , they significantly contribute to |

the energy use of the building. By reducing the U-Value of these components, you reduce the energy lost through these components.

Justification - Explanation

By[4] reducing the U-Value of above ground components of the building envelope, you:

Limit the amount of uncontrolled thermal transfer through system components.

Limit the unnecessary demand and/or consumption of energy for heating and cooling

Limit the inefficiency of systems

Impact analysis

**Enforcement implications**

|  |  |
| --- | --- |
| **OBJECTIVE-BASED ANALYSIS OF NEW OR CHANGED PROVISION** | |
| **Provision:** | **Analysis:** |
| **Attributions** |  |
| **Objective** |  |
| **Application** |  |
| **Intent(s)** |  |