FS120-18

IBC: 1404.3.1, TABLE 1404.3.1 (New), 1404.3.2

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2018 International Building Code

Revise as follows:

1404.3.1 Class I and II vapor retarders. Class I and II vapor retarders shall not be provided on the interior side of frame walls in Zones 1 and 2. Class I vapor retarders shall not be provided on the interior side of frame walls in Zones 3 and 4 other than Marine 4. Class I or II vapor retarders shall be provided on the interior side of frame walls in Zones 5, 6, 7, 8 and Marine 4. Where a Class II vapor retarder is used in combination with foam plastic insulating sheathing installed as continuous insulation on the exterior side of frame walls, the continuous insulation shall comply with Table 1404.3.1. Use of a Class I interior vapor retarder in frame walls with a Class I vapor retarder on the exterior side shall require an approved design. The appropriate zone shall be selected in accordance with Chapter 3 [CE] of the International Energy Conservation Code-Commercial Provisions.

Exceptions:

1. Basement walls.
2. Below-grade portion of any wall.
3. Construction where moisture or its freezing will not damage the materials.
4. Conditions where Class III vapor retarders are ~~required~~ permitted in Section 1404.3.2.

Add new text as follows:

TABLE 1404.3.1
CONTINUOUS INSULATION WITH CLASS II VAPOR RETARDER

CLIMATE ZONE	PERMITTED CONDITIONS[a]
3	Continuous insulation with R-value ≥2.
4, 5, and 6	Continuous insulation with R-value ≥ 3 over 2x4 wall. Continuous insulation with R-value ≥ 5 over 2x6 wall.
7	Continuous insulation with R-value ≥ 5 over 2x4 wall. Continuous insulation with R-value ≥ 7.5 over 2x6 wall.
8	Continuous insulation with R-value ≥ 7.5 over 2x4 wall. Continuous insulation with R-value ≥ 10 over 2x6 wall.

a. In addition to the vapor retarder, spray foam with a maximum permeance of 1.5 perms at the installed thickness, applied to the interior cavity side of wood structural panels, fiberboard, insulating sheathing or gypsum is deemed to comply with the continuous insulation requirement only for the moisture control purposes of this table where the spray foam R-value plus any continuous insulation R-value provided equals or exceeds the specified continuous insulation R-value.

Revise as follows:

1404.3.2 Class III vapor retarders. Class III vapor retarders shall be permitted where any one of the conditions in Table 1404.3.2 is met. ~~Only Class III vapor retarders shall be used on the interior side of frame walls where foam plastic insulating sheathing with a perm rating of less than 1 is applied in accordance with Table 1404.3.2 on the exterior side of the frame wall.~~

Reason:
As its primary objective, this proposal restores the ability to appropriately use a Class II interior vapor retarder where foam plastic insulating sheathing is used as continuous insulation on the exterior of buildings. This was permitted in earlier editions of the IBC, but not with appropriate requirements as now included in this proposal. This proposal has two practical benefits. First, it will better coordinate the requirements for vapor retarders with typical insulation requirements found in the International Energy Conservation Code for frame wall assemblies. Second, the proposed requirements in Table 1404.3.1 are identical to the format used in in existing Table 1404.3.2 for ease of use and compliance. They provide assurance that an adequate amount of continuous insulation is used together with a Class II interior vapor retarder to keep the interior of walls sufficiently warm (temperature moderated) to control the risk of condensation and moisture accumulation.

The continuous insulation requirements of proposed Table 1404.3.1 are based on more than 20-years of successful experience in the National Building Code of Canada as well as an extensive review of research, field data, analyses, and code requirements in the U.S. and Canada (ABTG, 2015; Crandell 2017); refer to the bibliography.

Use of a Class II interior vapor retarder with foam sheathing on the exterior has been shown to provide a very stable and dry wall assembly. In addition to the research and experience mentioned above, this has been more recently confirmed in a DOE and industry sponsored research project where various wall assemblies in 22 buildings across the colder climate zones of the U.S. were monitored for moisture performance (Shah and Kochkin, 2017). Regarding the use of Class II (e.g., Kraft paper) vapor retarders, the report found "very stable moisture content levels" and that their use "does not seem to alter the ability of walls with exterior foam sheathing to dry out." Consequently, the report recommends the "combination of exterior insulation and a Class II vapor retarder show promise as a technology for increased R-value with minimal changes in construction practices."

Finally, while there is adequate experience in the colder climates of the U.S. and Canada to justify use of a Class I interior vapor retarder (e.g., 4 mil poly) with foam plastic insulating sheathing on the exterior side of an assembly, this proposal requires an approved design for the case of a double vapor barrier assembly (e.g., materials classified as a Class I vapor retarder are used on both sides of the assembly). The National Building Code of Canada does permit the use of a Class I interior vapor retarder with low-perm foam plastic exterior insulation and requires provisions similar to those provided in proposed Table 1404.3.1. Furthermore, the study mentioned above also demonstrates that use of a Class I interior vapor retarder on walls with or without exterior insulation "show stable low moisture content levels" (Shah and Kochkin, 2017). But, due to concerns with low drying potential, it is generally cautioned that walls using a double vapor barrier (Class I vapor retarder on both sides) be "accompanied with air sealing details and drainage plane details to avoid or minimize the potential for water leaks or moisture accumulation" (Shah and Kochkin, 2017). Thus, while known to work favorably in appropriate conditions of use, the use of a double vapor barrier assembly may require some additional considerations to ensure performance and this should be a matter of design as required in this proposal.

Bibliography:
Assessment of Water Vapor Control Methods for Modern Insulated Light-Frame Wall Assemblies, ABTG Research Report No. 1410-03, 2015, Applied Building Technology Group LLC, https://www.appliedbuildingtech.com/rr/1410-03

Assessment of Hygrothermal Performance and Design Guidance for Modern Light-Frame Wall Assemblies, ASTM STP 1599, Crandell, J.H., 2017, https://www.astm.org/DIGITAL_LIBRARY/STP/PAGES/STP159920160097.htm

Moisture Performance of High-R Wall Systems, Prepared for US DOE & NAHB by Home Innovation Research Labs, Kochkin, V. and Shah, N., 2017 (pending publication)

Cost Impact
The code change proposal will decrease the cost of construction .

Including the option to use a Class II vapor retarder with foam plastic insulating sheathing (or a Class I vapor retarder

with an approved design) will decrease cost and better enable cost-effective compliance with energy code requirements while maintaining good moisture performance.

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