Purpose of Test: 3M™ Air and Vapor Barrier 3015 has a water vapor transmission rate of 0.14 perms (8 ng/Pa·s·m²), as measured by ASTM E96, desiccant method. Some building professionals have expressed concerns that this value could mean that 3M 3015 could not be used as a barrier product on par with other self-adhered membranes with water vapor transmission rates around 0.05 perms. A WUFI® analysis was performed to determine if there was any difference in wall performance between materials of 0.14 and 0.05 perms.

Results: 3M Company contracted Architectural Testing, Inc. (ATI), to perform the WUFI® modeling. ATI utilized WUFI® Pro version 5.2 for the analysis. WUFI® is a program developed by the Oak Ridge National Laboratory and Fraunhofer Institute for Building Physics. It is a validated, one-dimensional moisture and heat (hygrothermal) transport software used to analyze the effects of building material selection on the thermal and moisture performance of building components. The program models behavior on an hour-by-hour basis (transient) according to interior and exterior climate conditions for a specified duration of time.

For this analysis, the wall systems were modeled over a time period of 3 years using historical weather data for Minneapolis, MN (Climate Zone 6 2009 IECC). A span of multiple years is required for the analysis to allow for construction materials to reach a static state where wall system moisture levels become repeatable over time.

The subject wall assembly for this analysis was input as follows (exterior to interior):

- 2" Extruded Polystyrene Insulation Board
- 3M™ Air and Vapor Barrier 3015
- 5/8" Gypsum board
- 6" Air Space (Steel stud cavity, uninsulated)
- 5/8" Gypsum board

In model #1, the weather resistant barrier (WRB) layer, 3M™ Air and Vapor Barrier 3015 (herein 3M 3015 WRB), was assigned a moisture perm rating of 0.14. In model #2, the 3M 3015 WRB was assigned a moisture perm rating of 0.05. The only variable changed in the analysis was the perm rating assigned to the 3M 3015 WRB material. All other properties and details remained the same.

The graphs on the following pages are plotted against time with visible peaks and valleys occurring on an annual basis. The graphs show the relationship between actual temperature and dew point temperature at critical locations within the wall system. Where the actual temperature overlaps the dew point temperature, it can be assumed that condensation will form. The greater the deviation between the two temperatures the less risk of the formation of condensation.
3M™ Air and Vapor Barrier 3015
Building Envelope Solutions
WUFI® Analysis of Wall Section

Graph 1: Dew Point Temperature - Interior face of Insulation Board, adjacent to 3M 3015 WRB (0.14 Perm Rating)

Graph 2: Dew Point Temperature - Interior face of Insulation Board, adjacent to 3M 3015 WRB (0.05 Perm Rating)
Graph 3: Dew Point Temperature - Exterior face of Exterior Gypsum Board, adjacent to 3M 3015 WRB (0.14 Perm Rating)

Graph 4: Dew Point Temperature - Exterior face of Exterior Gypsum Board, adjacent to 3M 3015 WRB (0.05 Perm Rating)
3M™ Air and Vapor Barrier 3015
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WUFI® Analysis of Wall Section

Graph 5: Dew Point Temperature - Interior face of Exterior Gypsum Board, adjacent to stud cavity (3M 3015 WRB 0.14 Perm Rating)

Graph 6: Dew Point Temperature - Interior face of Exterior Gypsum Board, adjacent to stud cavity (3M 3015 WRB 0.05 Perm Rating)
Graph 7: Dew Point Temperature - Exterior face of Interior Gypsum Board, adjacent to stud cavity (3M 3015 WRB 0.14 Perm Rating)

Graph 8: Dew Point Temperature - Exterior face of Interior Gypsum Board, adjacent to stud cavity (3M 3015 WRB 0.05 Perm Rating)
Conclusions:
The results of the analyses show that there is no significant performance difference realized by changing the moisture permeation rating (ASTM E96) of the weather resistant barrier layer from 0.14 to 0.05 in the wall system analyzed.

Note that changes in materials, assemblies, the mechanical system and its respective parameters during or after construction can change the performance of the analyzed assembly significantly. Recalculation to assess the changes may be required.

The data presented in this technical bulletin was generated by Architectural Testing, Inc., 130 Derry Court, York, PA, 17406, under ATI Job No. C5748.01-116-45.

For additional information, please contact 1-800-362-3550.

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