# MINIMUM REQUIREMENTS AND GUIDELINES FOR THE EXTERIOR BUILDING ENVELOPE

February, 2001

## Update Number 1 (December, 2003)
## Commentary on Air Barriers/Air Retarders

July 1, 2002 adoption of the Wisconsin modifications to the International Building Code (IBC) now mandates use of air retarders (air barriers) in exterior walls. Since there is some confusion as to these requirements, this writing is an attempt to help clarify intent of the Wisconsin Building Code, guidelines for Wisconsin state-owned building projects, and good practice for other facilities in the area.

Wisconsin modifications to the IBC define an air retarder as a material or combination of materials collectively having maximum air leakage rates of 0.06 $cfm/ft.^2$ at 0.30 in. $H_2O$, when tested in accordance with ASTM E 783, installed to resist air leakage into the exterior envelope. Performance requirements are also stated. An approved durable air retarder shall be provided when a building component or assembly separates interior building conditioned space from the outdoors. Air retarders shall be located on the interior side of the wall insulation. There are two exceptions, which are not applicable for most finished buildings. A note states that although air retarders are to reduce transmission of water vapor by convection (air movement) and vapor retarders are to reduce transmission of water vapor by diffusion, these functions may be combined in a single membrane. In practice, considerably more moisture is transported by convection than by diffusion.

An air retarder is Building Code required in a typical exterior masonry cavity wall, while a vapor retarder and water-resistant barrier are not. There are no specific requirements as to how the air retarder is accomplished, so long as the performance requirements stated in the Code are achieved long-term by the system utilized. Portions of the Energy Code contain complimentary provisions that also address the building envelope and may require vapor retarders in some situations. Where stud walls with sheathing constitute the wall assembly, or stud walls are utilized as the backup, both a vapor retarder and water-resistant barrier are also Building Code required, along with an air retarder.

The Massachusetts Building Code defines an air barrier (air retarder) as the combination of interconnected materials, flexible joint systems and components of the building envelope that provide the air-tightness of the building envelope. Insulation with taped joints per se is not an adequate air barrier. Such an attempt is not considered durable and is contrary to the Wisconsin Building Code, since located on the outboard side of the wall insulation.

Good design dictates that the higher the internal moisture content and/or building pressurization, the more sophisticated the air retarder system should be. A system incorporating a fluid-applied air barrier, such as for a swimming pool enclosure, would be a good solution for such a situation. Conversely in a non-humidified commercial building, block filler and several coats of paint may suffice for the typical square foot of a single wythe concrete masonry exterior wall. Penetrations and junctures, however, still need to be sealed with transition material.

An air barrier system, by necessity, is composed of both materials selected to prevent air leakage as well as the connections between such materials. Perimeters, openings and penetrations must also be appropriately treated to create a continuous air barrier across all construction components involved. Materials should be selected not only for their initial air retarding properties, but also for their longevity and compatibility with adjacent materials. In many situations, air retarders benefit from rigid insulation properly secured to the backup, to resist damaging effects of pressure differentials across the wall system. Mechanical fastening is typically the best way of accomplishing this.

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Update Number 2 (December, 2003)
Commentary on Selection of Sealant Color

In many circumstances, the selection of sealant color has been left to the judgement of other than the designer of a building. This has frequently resulted in unsatisfactory end results.

The designer should be involved and make an aesthetic decision whether movement joints are to be prominent design features or blend into the masonry wall. For most projects, it is intended to conceal the movement joints as much as possible, rather than accent them.

If the design intent is to blend vertical movement joints in non-stack bond masonry, then sealant color should match the color of the masonry units or be slightly darker. In a typical modular brick facade, the overall color of the wall is driven by the color of the masonry units rather than the mortar joints at a ratio of approximately 80% to 20% respectively. A common mistake of the past has been to select a sealant color that matches the mortar color, with the expectation of hiding the movement joints.

Where different color fields or bands of masonry occur, then sealant color should change where appropriate. When masonry color patterns are complex, such as a diagonal pattern, it is proper to match the sealant color to the most prominent field brick color – rather than changing sealant color too often. At sealant color transitions, the joint should be tooled to look and act like one continuous sealant joint.

If the design intent is to make vertical movement joints in non-stack bond masonry stand out, then sealant color may be lighter in color than the units or a contrasting darker color used.

In stacked masonry, where mortar joints are vertically continuous, the sealant color should match the mortar color if movement joints are intended to blend into the wall.

Similar considerations could be made for horizontal movement joints such as at shelf angles. In most cases, however, the required exposed flashing with drip will predominate and the sealant color selected for such an application is not visible and thus becomes almost irrelevant.

It may be difficult to make appropriate sealant color selections in the office off of a color chart, with a small brick sample, and/or under artificial lighting. Therefore, it may be appropriate to list a sealant standard color(s) in the specification, subject to final color selection on the job site. This should be accomplished via a test joint somewhere on the project itself. This procedure gives the sealant a chance to acclimate to the environment, i.e. collect dust, be exposed to UV, etc.

For special applications, the surface of the sealant joint may be treated with sand or other substances, before the sealant skins over. This is sometimes done to texture the sealant surface in order to eliminate the gloss of new, untreated sealant. Keep in mind that different sealant materials display varying cure times and electrostatic attraction, exhibiting more or less airborne dirt.

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