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DIFFERENCE BETWEEN AN AIR BARRIER, A VAPOR BARRIER AND A WATER RESISTIVE BARRIER

BY LAVERNE DALGLEISH

Air barriers are not to be confused with vapor barriers or with water resistive barriers. Each barrier has a different function to perform in a building assembly.

A very common question in the marketplace is “What is the difference between an air barrier and a vapor barrier?” Then to add to the confusion, there is a building code requirement for a water resistive barrier. It is important to understand the differences as when you design a building you need to take into account the loads caused by air flow, heat flow and moisture flow (in both liquid and gas form).

Quite simply an air barrier reduces the flow of air, a vapor barrier reduces the flow of water vapor and a water resistive barrier reduces the flow of liquid water. Each function is completely different. The confusion comes in when one material can provide more than one function, but they have to be used in a way to actually perform that function.

Air barrier materials are any material that can be used anywhere in a building assembly to reduce the flow of air into or out of the conditioned space.

Any material that has an air leakage rate that is not greater than 0.02 L/(s·m^2) at a pressure difference of 75 Pa (0.004 cfm/ft^2 at a pressure difference of 1.56 lb/ft^2) when tested in accordance with ASTM E 2178 is an air barrier material. Now on a typical construction site, there could be hundreds of materials that meet this requirement, however the material needs to be put into a building assembly in a way that makes that assembly airtight. So air barrier materials are assembled into air barrier assemblies which are then put together into an air barrier system which is the whole building.

Vapor barrier materials are any material that is used in a building assembly to slow or reduce the movement of water vapor through a material (water vapor is also transported by air leakage but this can be resolved by installing an air barrier). Vapor barrier materials are installed on the warm side of the insulation in a building assembly. The position of the vapor barrier in a building assembly will be determined based on the climatic conditions. In warm climates, it will be on the exterior and in cold climates, it will be on the interior. Note that there are no vapor barrier assemblies, only vapor barrier materials.

Water vapor transmission is a measurement of water vapor through a material. In most cases, the results are expressed as vapor permeance. The most common test method for measuring water vapor permeance is ASTM E96. You can test using either the desiccant or water method and is typically the results are reported in the units of ng/ (Pa*s* m^2) or US Perms. This test method measures the rate that the water vapor that that is in the air passes through a material. This where the confusion comes in. The amount of water vapor going through a material is minimal compared to the amount of water vapor can be transferred by air leaking through holes in the building assembly. People see condensation in a building assembly and assume that this is because the vapor barrier was not installed properly.

What you have to keep in mind that a typical vapor barrier requirement is 1 US Perm. That is equal to 57 billionths of a gram of water for every square meter of surface for every second and for every pascal water vapor pressure difference. Now you may be trying to figure out what this is exactly, but just keep in mind that when you are measuring thing in billionths of a gram, the amount will be very small. To further complicate things, the more airtight the building assembly is the less you have to worry about the water vapor transmission rate of materials.

Water resistive barriers are any material which will resist liquid (bulk) water intrusion. They are installed on the outside of a building and are used to deflect liquid water that has leaked, penetrated or seeped past the exterior cladding Water resistive barrier materials are combined with flashing and other materials to ensure that there is a shingled effect to direct liquid water away from the exterior sheathing. The material is tested for liquid water penetration by using the hydrostatic head method (AATCC 127) which places a column of water 55 cm in height on the material and there cannot be any leaks through the material after 5 hours.

So keep in mind an air barrier handles air leakage, a vapor barrier handles water vapor transmission and a water resistive barrier handles liquid water.