Technical Note #1

Air Barriers

Abstract: This Technical Note defines the air barrier, explains the function of the air barrier and offers some history into the evolution of air barriers.

Air Barrier

An "air barrier" is a combination of materials designed and installed in such a manner in order to drastically reduce or even stop the flow of air into and through the building enclosure. The air barrier of a building is an "air barrier system". The air barrier system is comprised of "air barrier assemblies". Air barrier assemblies are comprised of "air barrier materials" and "air barrier accessories".

Definitions

air barrier, n, a designed "plane" of reduced air flow.

air barrier material, n, a primary element that provides a continuous barrier to the movement of air.

air barrier accessory material, n, a transitional component of the air barrier that provides continuity.

air barrier assembly, n, the air barrier materials and accessories that provide a continuous barrier to the movement of air through portions of the building enclosure assembly.

air barrier system, n, a combination of air barrier assemblies that provide a continuous barrier to the movement of air through portions of the building enclosure assembly.

Function

The air barriers control both infiltration and exfiltration of air through the building enclosure assembly. Opponents of air barriers incorrectly assume that air flow through the building enclosure assembly is needed in order for the building enclosure assembly to dry out. Past and present building codes required that building exterior walls "breathe". Proponents of air barriers recognize that air has the ability to transport exponentially more moisture into and through the building enclosure assembly than occurs through vapor migration and diffusion. They also recognize that unconditioned air that leaks into a building can negatively affect the designed or intended interior environment thus causing HVAC systems to run longer and/or more cycles than would be necessary if the building enclosure had an air barrier system. Lastly, they recognize that conditioned air that leaks out of a building through the building enclosure assembly will cause HVAC

systems to run longer and/or more cycles than would be necessary if the building enclosure had an air barrier system.

The inclusion of air barrier systems in building enclosure assemblies results in better performing building enclosure assemblies as they relate to moisture management. Referring to the dew point calculator in Figure A, exterior air that is 85˚ and 75% relative humidity has dew point temperature of 76˚. If this air is allowed to leak into a building enclosure assembly of a building that is being cooled to 74˚, it will get cooled below its dew point temperature within the building enclosure assembly thus resulting in condensation forming in the building enclosure assembly. If the interior air in a building is 70˚ and has a relative humidity of 40%, the dew point temperature of this air is 44˚. If this air leaks out through the building enclosure and it is 40˚ degrees outside, this air will be cooled below its dew point temperature within the building enclosure assembly thus resulting in condensation forming in the building enclosure assembly.

Air Temp °F	% Relative Humidity																		
	100	95	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10
110	110	108	106	104	102	100	98	95	93	90	87	84	80	76	72	65	60	51	41
105	105	103	101	99	97	95	93	91	88	85	83	80	76	72	67	62	55	47	37
100	100	99	97	95	93	91	89	86	84	81	78	75	71	67	63	58	52	44	32
95	95	93	92	90	88	86	84	81	79	76	73	70	67	63	59	54	48	40	32
90	90	88	87	85	83	81	79	76	74	71	68	65	62	59	54	49	43	36	32
85	85	83	81	80	78	76	74	72	69	67	64	61	58	54	50	45	38	32	
80	80	78	77	75	73	71	69	67	65	62	59	56	53	50	45	40	35	32	
75	75	73	72	70	68	66	64	62	60	58	55	52	49	45	41	36	32		
70	70	68	67	65	63	61	59	57	55	53	50	47	44	40	37	32			
65	65	63	62	60	59	57	55	53	50	48	45	42	40	36	32				
60	60	58	57	55	53	52	50	48	45	43	41	38	35	32					
55	55	53	52	50	49	47	45	43	40	38	36	33	32						
50	50	48	46	45	44	42	40	38	36	34	32								
45	45	43	42	40	39	37	35	33	32										
40	40	39	37	35	34	32													
35	35	34	32																
32	32																		

Air barriers substantially reduce and even eliminate this wetting mechanism in building enclosure assemblies.

The top reason for litigation in the building construction industry is moisture related problems in buildings. The inclusion of air barriers in building enclosure assemblies will reduce the amount of litigation in the industry due to these problems.

Buildings with air barriers are also more energy efficient than buildings that do not have air barriers. The Air Barrier Association of America has an online calculator that calculates the energy savings of a building based on the air tightness of the building

enclosure assembly. The calculator was developed by Oakridge National Laboratory. The link for calculator is:

http://www.airbarrier.org/technical-information/energy-savings-and-moisture-transport-calculator/

Controlling the infiltration and exfiltration of air through the building enclosure assembly also increases occupant comfort by controlling drafts that cause discomfort as well as the infiltration of particulate matter that can irritate building occupants.

History

Air barriers have been included in building enclosure assemblies, intended or not, since the inception of building construction. In North America, air barriers were gained popularity in Canada in the 1970's. It became a building code requirement in the 1980. Performance requirements were added in 1985. In the United States of America, Wisconsin was the first state to require air barriers in their building codes in 2001. Wisconsin was followed by Massachusetts in that year. This code change brought about the formation of the Air Barrier Association of America in that year in Massachusetts. AHSRAE 90.1 added air barrier requirements in the 2009 version. Finally, the International Energy Code added air barrier requirements in the 2012 version. Prior to the inclusion of code requirements, many building owners and designers recognized the benefits of including air barriers in the building enclosure assembly and did so.

Summary

This Technical Note contains information about the air barriers. This information may be used to design and construct building enclosure assemblies.

The information and suggestions contained in this Technical Note are based on the available data and the experience of the Technical Committee of the Air Barrier Association of America and is for guidance only. Please check with local authority having jurisdiction. The information contained herein must be used in conjunction with good technical judgment and a basic understanding of the properties of air barriers. Final decisions on the use of the information contained in this Technical Notes are not within the purview of the Air Barrier Association of America and must rest with project owners, architects, engineers, consultants and contractors.