Technical Summary of Air Barrier Technology and Benefits over the Last 10 Years

INTRODUCTION

An air barrier system is a series and combination of connected components that provide for air-tightness of the building. Most true air barriers are tested in accordance with the procedures contained in the Florida Building Code, undoubtedly one the most advanced in the USA.

Currently, there is no quantitative air leakage limit specified for the building components or the building itself. The ASHRAE Standard 90.1 Envelope Subcommittee has formed a task group to consider updating the building air leakage requirements in the standard to require a continuous air barrier system.

Despite common assumptions that air leakage is not a significant problem for commercial, institutional and governmental buildings, measurements have shown that these buildings are subject to larger air infiltration rates than commonly believed (Persily 1998, Proskiw & Phillips 2001).

Infiltration in commercial buildings can have many negative effects, including reduced thermal comfort, moisture damage of building envelope components, mold/mildew growth, increased energy consumption, degraded indoor air quality, improper functioning of mechanical equipment. For these reasons, attention has been given to methods of improving air tightness both in existing buildings and new construction.

This paper is a summary of the need for air barriers and the 48 references, available upon request, attest to the data presented here.

Keep in mind that since 1997 there have been a variety of symposia on the use of air barriers sponsored by the National Institute for Standards and Technology (NIST) and the Building Environment and

Thermal Envelope Council (BETEC). Many states have adopted air barriers as an energy saving addition to their building code.

The Texas introduction to designing a mold resistant and energy efficient frame wall construction utilizing an air barrier began in McAllen in Feb. 2002 as part of the Moisture Management Series of lectures sponsored by AIA. The presentation, “Moisture Management in Steel Stud Construction” was given by Roy Schauffele, FCSI, CCPR. This ground breaking technological AIA HSW LU has, by request, been given 63 times to over 1,350 Texas Architects.

Many have published articles on the importance of air leakage (Anis 2001, Ask 2003). However the focus has been on air barriers only, this paper deals with both air barriers and energy impacts on the building. This paper deals with the wall systems and how to make them more energy efficient, mold resistant and provide a far superior IAQ (indoor air quality) compared to historical technologies.

Materials that DO NOT Qualify as an Air Barrier (Anis 2003)

1. Perforated house wraps
2. Concrete block
3. Expanded polystyrene (bead board, EIFS board)
4. Fiberglass insulations
5. Asphalt (tar) felt
6. Wood fiberboard
7. Cellulose spray-on insulation
8. Vermiculite insulation
9. Dampproofing, traditional materials (ASTM D 1227) which crack with age and are inelastic in the wall assembly

Location of the Air Barrier

- An Air Barrier alone, not used as a Vapor Barrier/Retarder, can be placed anywhere in the wall assembly
- **If used as an Air and Vapor Barrier,** place on the drier side of the wall assembly (www.wallguardian.com or www.division7.com). It should be vapor permeable (5 to 15 perms).

ANALYSIS

1. **Cost Effectiveness**

   Emmerich, McDowell & Anis, NISTR 7238, *Investigation of the Impact of Commercial Building Envelope Airtightness on HVAC Energy Use"*

   a. Office, Schools, Retail & Governmental Buildings:
      i. The frame building air barrier is cost effective in all climates
      ii. The CMU building is cost effective in most all climates and certainly for our Texas & Oklahoma climates

2. **Energy Savings**

   NISTR 7238

   a. An air barrier alone can, in either CMU or frame wall construction, have an energy saving effect of up to 36%
   b. *"Insulate outside for Warmth Within",* Anis, Construction Specifier, August 2003 **and** "Moisture Management in Steel Stud Construction", Schauffele, AIA LU Lecture Series
      i. Traditional steel stud masonry veneer construction energy efficiency can be raised >55% by the use of a vapor permeable (vapor retarder not barrier) air barrier and 1" of extruded polystyrene, ASTM C 578 Type IV or X with both being applied over the exterior gypsum sheathing.
      ii. Stucco veneer steel stud masonry construction energy efficiency can be raised >52% by the use of a vapor permeable (vapor retarder not barrier) and 1" of untreated fiberglass faced polyisocyanurate such as Dow Quik R.
      iii. The above energy efficiencies were developed using the correction factors in ASHRAE 90.1 and the parallel method.

3. **IAQ Improvement in Steel Stud Frame Wall Construction**

   "Insulate outside for Warmth Within", Anis, Construction Specifier, August 2003 **and** "Moisture Management in Steel Stud Construction", Schauffele, AIA LU Lecture Series

Definitions:

a. Vapor Barrier, perm rating of less than 1 and by IBC/IECC 2003 interpretation, should not be used on frame wall construction
b. Vapor Retarder, perm rating of greater than 1 and preferably between 10 and 15 and can be used on both CMU and frame wall construction
c. Air Barrier, <0.001 cfm/ft2 @ 10.5 lbs/ft2 for or <0.005 L/sm² @ 75 Pa to ASTM E283 (modified) 24 hrs

Uncontrolled air infiltration can wreak havoc, causing structural damage and loss of both sensible and latent energy. It can cause HVAC problems by disrupting the indoor pressure relationships designed by the mechanical engineer, as well as create indoor air quality (IAQ) and health problems by promoting mold and bacterial growth.

The non-proprietary wall assembly designs at www.wallguardian.com and www.division7.com can eliminate the IAQ problems and are now receiving wide spread use in the state of Texas. The assemblies use a combination of mold resistant gypsum sheathing, air barrier and extruded polystyrene rigid insulation with the air barrier and extruded polystyrene being applied on the outside of the steel stud frame. Mold can't grow in the absence of both a food source and moisture. The recommended assemblies and technologies remove the growth potential by denying these two critical activators to the already existing mold in the assembly.

4. IBC/IECC 2003 and The Energy Tax Policy of 2005

The use of an Air Barrier is recognized by both of the above references. The use of a frame wall system that utilizes both an air barrier and exterior rigid board insulation will allow one to achieve Tax Credits in accordance with the Energy Policy Act.

5. IBC/IECC 2006

The new IECC code requirements make it mandatory to seal the building envelope (seal all joints between construction material) (Section 502.4.3), mandatory Air Leakage control (Section 502.4) and

mandatory Moisture Control (Section 502.5). An Air Barrier System is the only technology that can do all these things.

CONCLUSION

For the last 15 years the benefits of using a true air barrier have been touted by a variety of governmental and private agencies. For instance, the DOE has mandated that all Federal Buildings must reduce energy consumption by 30% by year 2010. They have bluntly stated that one of the most cost effective ways to achieve this is by the use of air barriers. There are now, many North American groups that state the same.

Keep in mind that many products claim to be an air barrier but they are not (see page 2, Anis). There are many manufacturers of an Air/Vapor Barrier and these are all good technologies to use in certain types of wall assemblies but since they don't breathe, they should never be used for frame wall construction.

The most universally accepted, cost effective, environmentally acceptable, product technology is for an EPA VOC compliant liquid applied, seamless Air Barrier, Vapor Retarder (10 to 15 perms), The usual installed cost for this is $1.25 to $1.75 per ft^2, depending on the height of the building. The current market and technology leaders in North America are the Wall Guardian FW-100 (www.wallguardian.com) and the Henry Co., Air Bloc 31.

In Frame Wall construction the use of the liquid applied air barrier, vapor retarder technologies and either extruded polystyrene for a masonry veneer or the Dow Quik R for a stucco veneer will give you the following:

1. Far superior IAQ
2. Energy efficiency increases of >50%
3. IBC/IECC 2003 compliance
4. Compliance to all known published recommendations
5. Tax Credits, Energy Policy Act of 2005
6. Compliance to the DOE Mandate for Federal Buildings
7. MOLD Resistance
8. High Performing Schools Energy Guidelines, DOE
9. Payback period of 2.25 to 3.0 years

US DOE NSTR 7238 Report claims that **properly applied air barriers, like Wall Guardian FW-100, can reduce heating and cooling costs by as much as 36%.**

Multiple 3rd party industry publications continue to confirm the efficacy of the wall designs that are available at www.wallguardian.com. Please remember that these designs have been called **"the wall that works everywhere"**.

Now, with rising energy costs and the ability to achieve Tax Credits, and with the mold monster still looking over our shoulder, there is no reason to ignore this technology and the wall systems into which it is incorporated.

----- END OF PAPER -----

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