Achieving a High Performance Air Barrier System: Proper Design, Installation, and Field Quality Control

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Abstract

An air barrier system is somewhat different than many of the other building components making up a building. You cannot see air leakage. As a designer, you have to trust the trade contractor and his workers that they will make all the connections air tight. This is being done by an industry that some say are quick to cover everything up so you don't see the level of quality in an installation (or lack of quality). This presentation will walk you through the steps whereby you can reduce your risk in the installation of an air barrier system thereby improving the moisture and energy performance of a building. The presentation will also cover what happens if you do not get it right. Many think of air barriers as simply saving energy, but the main reason you install an air barrier system in a building is to reduce moisture problems. This is true not just in cold climates but in warm climates, as well.

Quality assurance is risk management

The problem with an air barrier system is that you cannot see the air leaks. What you may think is very airtight, can actually be very leaky and what you would expect to be very leaky may actually be very airtight. There are ways to allow you to "see" air leaks by using chemical smoke to see the leaks or you can measure the airflow rate into and out of the building. You can never make a building too tight but you do need to ventilate right. The goal for each building needs to be to make the building as tight as possible. To achieve this you need to do a risk assessment for each component or person that will be involved in the installation of the air barrier system. By determining the potential for risk and then determining the magnitude of the potential risk, you can then take the appropriate steps to mitigate the risk. You cannot rely on any one single action to remove the risks involved in installing an air barrier system in a building. Buildings work as systems and the air barrier is only effective if the air barrier works as a system. I developed a quality circle back in the late eighties that has worked well in addressing this issue.

a. Site Quality Assurance Circle

Industry research

Air barriers are a relatively new concept across the United States. The Commonwealth of Massachusetts is credited with being the first state which made an air barrier a requirement in their building code. Back in 2001, there were very few air barrier materials, fewer air barrier project specifications and minimal research focused on air barriers. At that time the connection between air barriers and reduced moisture problems in buildings had not been made. Air barriers were touted as an energy saver but even that had minimal technical support at that time for the claim that 30-40% of the energy is being used to condition the air for the buildings use.

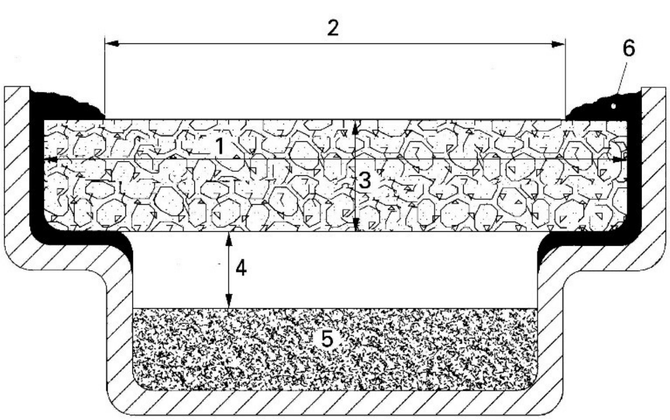
The industry had to conduct research to show that the lack of an air barriers in a building causes major problems ranging from high energy use to mold, mildew, corrosion, indoor air quality issues, comfort issues and the list goes on.

A major industry research project was undertaken in 2006, a collaboration of the Department of Energy, Oakridge National Laboratory, Air Barrier Association of America, New York State Energy Research and Development Authority and Syracuse University, to document the energy savings for installed air barrier systems. This research proved the potential for energy savings and pointed out some of the moisture issues. The National Institute of Standards and Technology, in 2005, also conducted modeling to determine the potential for energy savings through the installation of air barriers in buildings.

There is still a lot of research to be conducted. As the industry has grown and started to mature, there is a growing need to become much more detailed in the requirements for the materials and the requirements for installation.

It has also been recognized that you cannot deal with air barriers without also dealing with water resistive barriers and vapor barriers/retarders. Many materials can provide the air barrier function and also the water resistive barrier function. You need to consider the water vapor transmission rate of all air barrier materials to determine where and how they can be used in a building assembly.

b. Apparatus for testing water vapor transmission of building materials



Research needs to be done to determine the extent of moisture issues you create when you do not have a properly installed air barrier system. Research conducted to date shows a connection between a very airtight building and reduced moisture problems. This needs to be fully fleshed out to actual quantifiable numbers. The durability of the air barrier materials, especially materials that will be buried in the wall, needs to be determined and a proper protocol for the accelerated aging of the materials needs to be developed. Research is needed to show the loads imposed upon building and to show how these loads increase when the building is greater than three stories in height. The current loads in ASTM E2357 were developed for 80% of the buildings across the United States that are three stories or less.

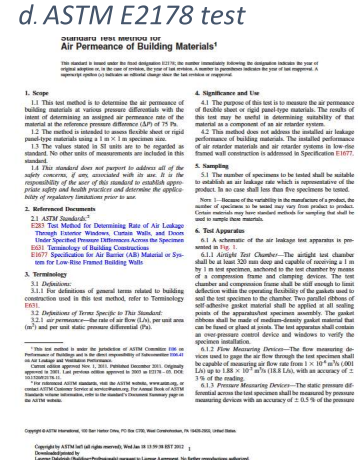
c. ASTM E2357 Test specimen

We need to understand actual field performance requirements for air barrier materials as new and different types of new air barrier materials come on the market. It is easy to say we need a certain value for the air leakage rate of air barrier materials but what other material characterizations are required to ensure that the material performs over the service life of the building. The industry needs to determine how to characterize these materials by different material properties.

Importance of standards and specifications

The original intent of the construction industry back in 2001 was to simply identify all the standards and specifications that were available at that time, bring all the information together in one place, and then to have everyone working off the same information. What we found was that this information was simply not available. In 2001 there was no air barrier industry and therefore no documents supporting the air barrier industry. When the lack of documentation was identified as an issue, the industry rolled up their sleeves and worked to develop the documentation required.

d. ASTM E2178 test



Standard Test Method for
Air Permeance of Building Materials[1]

This standard is issued under the fixed designation E2178; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method is to determine the air permeance of building materials at various pressure differentials with the intent of determining an assigned air permeance rate of the material at the reference pressure difference (ΔP) of 75 Pa.

1.2 The method is intended to assess flexible sheet or rigid panel-type materials using a 1 m × 1 m specimen size.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurements are included in this standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]
E283 Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
E631 Terminology of Building Constructions
E1677 Specification for Air Barrier (AB) Material or System for Low-Rise Framed Building Walls

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of general terms related to building construction used in this test method, refer to Terminology E631.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *air permeance*—the rate of air flow (L/s), per unit area (m^2) and per unit static pressure differential (Pa).

[1] This test method is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.41 on Air Leakage and Ventilation Performance.
Current edition approved Nov. 1, 2011. Published December 2011. Originally approved in 2001. Last previous edition approved in 2003 as E2178 – 03. DOI: 10.1520/E2178-11.
[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.

4. Significance and Use

4.1 The purpose of this test is to measure the air permeance of flexible sheet or rigid panel-type materials. The results of this test may be useful in determining suitability of that material as a component of an air retarder system.

4.2 This method does not address the installed air leakage performance of building materials. The installed performance of air retarder materials and air retarder systems in low-rise framed wall construction is addressed in Specification E1677.

5. Sampling

5.1 The number of specimens to be tested shall be suitable to establish an air leakage rate which is representative of the product. In no case shall less than five specimens be tested.

NOTE 1—Because of the variability in the manufacture of a product, the number of specimens to be tested may vary from product to product. Certain materials may have standard methods for sampling that shall be used to sample these materials.

6. Test Apparatus

6.1 A schematic of the air leakage test apparatus is presented in Fig. 1.

6.1.1 *Airtight Test Chamber*—The airtight test chamber shall be at least 320 mm deep and capable of receiving a 1 m by 1 m test specimen, anchored to the test chamber by means of a compression frame and clamping devices. The test chamber and compression frame shall be stiff enough to limit deflection within the operating flexibility of the gaskets used to seal the test specimen to the chamber. Two parallel ribbons of self-adhesive gasket material shall be applied at all sealing points of the apparatus/test specimen assembly. The gasket ribbons shall be made of medium-density gasket material that can be fused or glued at joints. The test apparatus shall contain an over-pressure control device and windows to verify the specimen installation.

6.1.2 *Flow Measuring Devices*—The flow measuring devices used to gage the air flow through the test specimen shall be capable of measuring air flow rate from 1×10^{-6} m^3/s (.001 L/s) up to 1.88×10^{-2} m^3/s (18.8 L/s), with an accuracy of ± 3 % of the reading.

6.1.3 *Pressure Measuring Devices*—The static pressure differential across the test specimen shall be measured by pressure measuring devices with an accuracy of ± 0.5 % of the pressure

The first two published standards from ASTM were ASTM E2178 – *Standard test Method for Air Permeance of Building Materials* and ASTM E2357 – *Standard test Method for Determining Air*

Leakage of Air Barrier Assemblies. These two standards have been fundamental in developing acceptance criteria for air barrier materials. The industry has matured and now these standards need to be updated with new information and clarification of the existing information.

The Air Barrier Association of America (ABAA) has developed material evaluation criteria for the different types of air barrier materials and provides a listed service for air barrier and water resistive barriers. These material evaluation criteria are then proposed to ASTM to become ASTM material specification standard. Currently ASTM has not published a standard material specification for any of the air barrier materials. There is one material specification currently in development and out for voting - ASTM WK 16958 – *Standard Specification for Membrane Forming Fluid Applied Air and Water Resistive Barrier Materials.* There is also a standard practice being developed at ASTM that has just completed the voting process. It is ASTM WK 50742 – *Practice for Assessing the Durability of Membrane Forming Fluid Applied Air and Water Resistive Barriers.* This is a good step in the right direction.

e. Set up for blower door test in a building

Other ASTM standards under development are ASTM WK 7774 – *Terminology for Building Enclosure System Materials, Assemblies and Systems*, ASTM WK 40552 – *Specification for Air Barrier Materials – Medium Density Closed Cell Rigid Spray Polyurethane Foam*, and ASTM WK 35913 – *Test Method for Whole Building Compliance Enclosure Air Tightness.* There is a fairly long list of standards that still need to be developed, including materials specifications, installation standards, test methods (both new and revisions of existing test methods) and guides.

Without proper standards, you cannot compare one material to another, set a bar for the material or the installation, conduct repeatable and reproducible tests or provide guidance to the industry.

To assist the design professionals to identify key requirements for the installation of air barrier assemblies, there are master specifications for the different types of air barriers. They are available free of change and in Word format so that a design professional can customize them for a specific project (https://www.airbarrier.org/technical-information/master-specification/).

New master specifications are required as new types of materials come on the market and the existing master specifications need to be updated and improved based on the feedback received from the field and the advancements in the industry.

Design impacts on performance

The air barrier system needs to be designed correctly. If the design is improper, incomplete or the details are missing, then it will be almost impossible for the installer to properly install the air barrier materials. If you can draw it, it does not mean that you can build it and in some cases even if you can build it, it may not function properly.

f. Just because you can design it and build it does not make it right

The key to success is to achieve a continuous plane of airtightness. Easier said than done. One suggestion that has been helpful at the drawing stage, is to identify what material is identified as the air barrier material and then trace the location of the air barrier through all of the wall, roof and foundation sections of the drawings. If you can accomplish this without having to lift your pencil, that is a good sign. If you find gaps in the drawings, there will be gaps in the air barrier after they are installed.

The key areas to look for leakage are at the connections. Experience has shown that the roof/wall intersection has been neglected and in most cases is where the greatest amount of air leakage occurs. In any building, where a blower door test has not been conducted, there is a high probability that you will find that no one has made the connection between the roof and the wall. The next biggest air leakage area has shown to be the wall/window connections.

g. Window / wall interface

When designing the connections between different building assemblies and to different air barrier components, keep in mind that the movement of these materials when subjected to temperature changes and moisture content changes. As two different materials move at different rates, this has to be accommodated. An example would be an aluminum framed window set into a CMU back-up wall. The movement between the different materials will be severe.

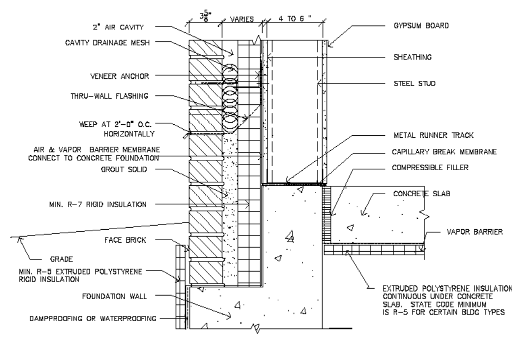
Not all the air barrier components will have been designed or manufactured to provide a flange or other means to make a connection of the air barrier material between, for example, a wall and a window. If there is no “air barrier flange” on the window, you need to consult the window manufacturer as to where the connection should be made and how to keep the window airtight when mechanically fastening the wall air barrier material to the unit, all the while keeping the joint flexible. So, the connections of the different air barrier assemblies and the air barrier components is the first place you need to look when designing the air barrier system.

Once you have determined how to make those connections, you then need to look at how the air barrier materials are to be connected to the penetrations. These can be round penetrations, square penetrations, brick ties, penetrations that just protrude through the building assembly and penetrations that are continuous. You need to detail not only how the installer will make the gap around the penetration airtight but in most cases, the detail needs to keep the connection airtight while the penetration moves and in some cases, moves significantly. The procedure used to make the joint airtight will need to be flexible and, depending on the climate zone, may need to be flexible in either very cold climates or very hot climates.

h. Properly detailed round penetration

Finally terminations need to be designed. This occurs when one air barrier material terminates on another air barrier material. An example of this is when a wall air barrier material terminates on a poured concrete foundation. The poured concrete is the air barrier material for the foundation, so for many projects, there is no need to add an additional air barrier material over the poured concrete. Of course you need to deal with all joints in the poured concrete and install materials that will make them air tight but allow for movement. The termination may need to be mechanically fastened and a sealant may need to be installed on the edge of the air barrier material. The details will depend on the type of air barrier material that has been used.

I. Wall / foundation detail



Choosing air barrier materials

There is no "ultimate" air barrier material. All types of air barrier materials can provide a plane of airtightness. Within each type of air barrier material, you may be able to choose from numerous different materials. So there are hundreds of air barrier materials out there, so how do you choose one? Some of the decisions you will need to make for yourself. However, you do have help with choosing air barrier materials as many have been evaluated against criteria specifically design for air barriers.

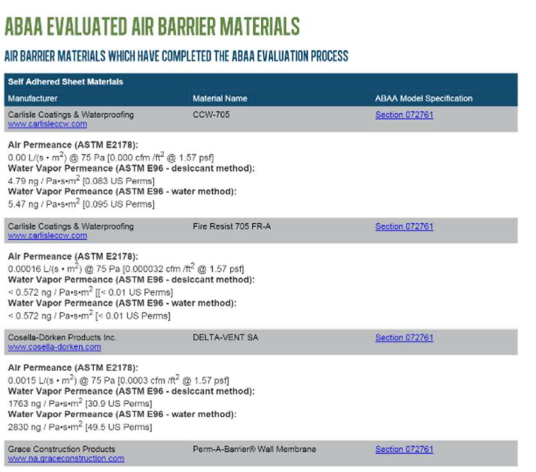
j. Bridging a joint in a wall

ABAA has developed material requirements and physical properties for different air barrier types. The requirements include the air leakage rate of the material and the air leakage rate of the material installed into a building assembly. The requirements go beyond simple air leakage tests. They include requirements which indicate if a material will perform as intended and, to some extent, that the material will be durable over the service life of the building. As many of the materials also can provide the water resistance function, tests that address water resistance are included. Each material is also tested to determine the water transmission rate and the Perm rating for the material is provided.

Now anyone can develop their own requirements for an air barrier material, determine how that property will be tested, determine the minimum/maximum requirement for that property and review each test report (which sometimes is modified from the test method) to determine whether a material is acceptable. In addition to all the time this would take, an additional down side to this is that you then take the complete responsibility for the installed performance of the material. If the material does not perform as intended, then you will be held responsible. For many design professionals, that is not a responsibility they want to take on.

Many design professionals are wary of the manufacturer's salesperson who says "trust me". It is a lot easier for the design professional to simply go to the website and choose a material where the performance criteria have already been set, the test reports have been reviewed and the material has been evaluated. Many design professionals will not consider using a material that has not been evaluated by this process.

k. Air Barrier evaluated materials



ABAA EVALUATED AIR BARRIER MATERIALS

AIR BARRIER MATERIALS WHICH HAVE COMPLETED THE ABAA EVALUATION PROCESS

Self Adhered Sheet Materials		
Manufacturer	Material Name	ABAA Model Specification
Carlisle Coatings & Waterproofing www.carlisleccw.com	CCW-705	Section 072761
Air Permeance (ASTM E2178): 0.00 L/(s • m²) @ 75 Pa [0.000 cfm /ft² @ 1.57 psf] **Water Vapor Permeance (ASTM E96 - desiccant method):** 4.79 ng / Pa•s•m² [0.083 US Perms] **Water Vapor Permeance (ASTM E96 - water method):** 5.47 ng / Pa•s•m² [0.095 US Perms]		
Carlisle Coatings & Waterproofing www.carlisleccw.com	Fire Resist 705 FR-A	Section 072761
Air Permeance (ASTM E2178): 0.00016 L/(s • m²) @ 75 Pa [0.000032 cfm /ft² @ 1.57 psf] **Water Vapor Permeance (ASTM E96 - desiccant method):** < 0.572 ng / Pa•s•m² [[< 0.01 US Perms] **Water Vapor Permeance (ASTM E96 - water method):** < 0.572 ng / Pa•s•m² [< 0.01 US Perms]		
Cosella-Dörken Products Inc. www.cosella-dorken.com	DELTA-VENT SA	Section 072761
Air Permeance (ASTM E2178): 0.0015 L/(s • m²) @ 75 Pa [0.0003 cfm /ft² @ 1.57 psf] **Water Vapor Permeance (ASTM E96 - desiccant method):** 1763 ng / Pa•s•m² [30.9 US Perms] **Water Vapor Permeance (ASTM E96 - water method):** 2830 ng / Pa•s•m² [49.5 US Perms]		
Grace Construction Products www.na.graceconstruction.com	Perm-A-Barrier® Wall Membrane	Section 072761
Air Permeance (ASTM E2178):		

The design professional still needs to choose the type of material. Technical support is available to the design profession during the design process from firms and associations.

Corporations who have had their material evaluated through a site quality assurance program will normally be obligated under a written agreement in the program, to provide material with the same properties and characteristics as the material submitted for evaluation. The agreement will normally also obligate the manufacturer to work with the owner and the trade contractor to resolve any site issues including replacement of material when that is warranted.

The objective of the site quality assurance program is to resolve site issues before they go to litigation. The site quality assurance program also allows the manufacturer to take steps to correct issues without admitting anything. They simply take the position that the only reason that they are taking the action is because the site quality assurance program has directed them to do so.

Working with a General Contractor

There is a wide variety of general contractors who can have completely different philosophies. They range from really looking out for the customer's interest to slap it up, cover it up and move on.

The very first ABAA Chairman worked for a general contractor who specifically had set a goal of zero growth. When I first heard that, I was mystified. It took me a while to get my head around not going for double digit growth. However, as I examined the company and their philosophy, what I saw was a company who did very well financially, who was able to pick and choose their jobs, who was able to put their customer's interest first, charged for their work accordingly and who had a long list of repeat customers. And a lot less headaches. Rather than beating the bush for the next contract on a daily basis, they were able to focus on constant improvement and efficiencies. Not a bad way to run a construction company.

Whatever type of general contractor you end up working with, spend the time to help them understand that you want your investment in a building to be a worthwhile investment and you do not want to be constantly repairing the building. The air control layers, the liquid water control layers, the water vapor control layers along with thermal insulation all impact the building's performance.

The general contractor needs to understand that "good enough" is not good enough and that the control layers dealing with air, water and heat need attention and they need to be done right. Make sure that your construction documents set out all of your objectives and include a consequence when they are not done right.

As an example, I received a call from a general contractor who had taken on a project where there was a performance requirement for the maximum air leakage rate of the whole building. As with a lot of general contractors, he seemed to have taken the "what can be different with this requirement" attitude, having never being required before to meet a performance requirement at the end of construction. When he called, he was in a panic, as his customer wanted a check from him in an amount that would cover the increased cost for the energy used resulting from the building not meeting the project's performance requirements for airtightness for the NEXT 25 YEARS. Not a bad way of writing up a contract.

Finding a qualified sub-trade

For most building projects, it is not the general contractor who does the work. Most, if not all of the work will be completed by a specialty contractor. You want the general contractor to understand the importance of the air barrier and the water resistance barrier, but you really need the actual air barrier and water resistive barrier contractor to know their stuff. Now an air barrier contractor legally, in most cases, is an entity. This entity will have a number of employees, but the entity will sign contracts, agree to performance levels and be legally bound to provide the materials and services stipulated in the contract. The sub-contractor's workers need to have the understanding of how to execute all of the details required to make all six sides of the building airtight. In most cases you will deal with a number of people.

A site quality assurance program will accredit the air barrier contractor. To accredit someone or something, it means that they have the ability to do something. The requirements can include having the qualified workers, equipment, processes, quality control, etc. The air barrier contractor can then hold themselves out as having proved that they have been reviewed by a third party and that third party has confirmed that they have everything in place to carry out the work properly. The site quality assurance will also have the accredited contractor sign an agreement that will include requirements that they use trained and certified installers, that they use the specified evaluated material and do not substitute it without prior written approval, that they will document their work, that they will conduct daily testing and inspection, that they will correct any deficiencies and that they will work with the manufacturer and the installer to resolve any site issues.

Importance of a trained and certified installer

The installer is the actual person who performs the work. That person is sometimes looked upon as being the lowest person in the chain of command. In some areas of the United States, that person could have been picked up in the morning and then made responsible for the installation of the air barrier materials and accessories without any training whatsoever. Remember you cannot see air leaks. In these cases, you should not expect the building to perform properly but you should expect the building to have moisture problems.

Decades ago, there was a good apprenticeship system for many of the trades in the construction industry. Today, much of this work of training and apprenticing installers has fallen to the groups of organized labor. A lot of the trade schools have dropped construction programs due to low enrolment.

You cannot expect the installer to do things right if they have never been trained on how to do it right. Not only do they need training on the how but also on the why. If they understand the why, then they will know how to address details they may have not seen before. Installers need training on each of the types of air barriers that they will be installing and then also on the specific brand of material they are installing. They need to understand the environmental conditions that are acceptable, the requirements for how to prepare the substrates, where and how to start the installation, how to deal with the different penetrations and terminations, where the material should be installed in the building assembly, what a good installation should look like, how to test their installation to determine if there are air leaks and how to complete documentation on their installation. They also need to be trained on how to correct defects. They need to understand why a site audit on their work is done to improve the quality of their installation by providing them with additional training, not simply to show up their mistakes.

The air barrier installation will perform or not perform depending on the knowledge skills and abilities of the installer. Well trained installers can correct, in some cases, bad designs and make the material work in a particular detail. Qualified installers are fundamental and a cornerstone to any site quality assurance program.

l. Air barrier training class

Each individual learns differently. For some classroom instruction works for them and they can translate what has been taught to real world conditions on the construction site. However, for the majority of people, they learn the best and retain what they have been taught by doing things. A good training course combines some classroom with hands on instruction. You learn the best by hearing things, seeing things and doing things.

Training without certification is meaningless. To simply attend a training program and receive a certificate does not indicate that you have been taught anything. It simply means that you were there – a warm seat in the chair. Certification is the confirmation that you have the knowledge, skills and abilities to actually do a job.

Both training and certification starts out with the Task Analysis. This is fundamental to any training program and any certification program. These Tasks are then organized into groups or Functions. Some organizations then go on to develop Learning Objectives for each of the Tasks. Developing Learning Objective is a requirement for developing a training program but I have found that it also helps in the development of the certification scheme.

For certification, you need to identify any pre-requisites that a person needs to be able to complete all of the tasks for that particular job. The Function/Task Listing outlines the work that needs to be completed. For each Task you determine whether this Task requires knowledge (K), a skill (S) or an ability (A) to accomplish it. For some Tasks it could be two of them or all three. When you have identified the K-S-As for each Task, you then develop a test instrument to confirm whether the person has the appropriate knowledge, skill or ability required.

For Tasks that require knowledge, you develop written test questions. They should always be multiple choice questions with one completely right answer and three completely wrong answers or distractors. You should not use long answer questions (too subjective), true/false questions (even if you don't know the answer, you have a 50% chance of getting the answer right) or misleading / trick questions (these do not give a proper assessment of the person). As you have the Task and you have the Learning Objective, you have a good idea of what the person needs to do to complete a Task and you then can craft questions that would confirm their knowledge.

For tasks that require skills, you still would use a written exam but you move to a problem solving methodology. As an example, a skill that could be required is to determine the number of pails of material is required for a particular job. You would give the parameters – each pail covers 100 square feet and the wall that you want to cover is 40 feet long by 12 feet high, then leave it to the installer to determine the number of pails he needs to take to the jobsite.

For tasks that require an ability, now the installer is no longer in the classroom. They are either in the field or they are in a "mock-up" environment. The installer is provided with the requirements for this Task and they need to complete the Task without direction, guidance, or any other support of the person proctoring the exam. The pass/fail criteria for certification needs to be plainly set out ahead of time.

Now the risk involved at the installation level has dropped significantly. You do expect that a person who has been trained, who has had their knowledge, silks and abilities evaluated to be able to complete the Task.

The certification organization also needs someone to check on them. Check and make sure that the certification organization has been accredited to ISO 17024 by ANSI/SCC.

Specialized audits vs. project inspections vs surveillance audits

There are many different type of inspections/audits. Each have their purpose for conducting the inspection/audit and each has an outcome.

One of the requirements of ISO 17024 is to have surveillance audits conducted on persons who are certified. This is to confirm that the person is completing the Task properly on an ongoing basis. If only a surveillance audit is being conducted, then you restrict the audit to the person as you are only confirming the knowledge, skills and abilities of that person. As you need to treat everyone exactly the same, it has been found that conducting the certification surveillance audit in a mock-up environment may be the best. The mock-up can be constructed in a real world situation where the person can demonstrate their abilities. This can also be done on the construction site as long as there are all the details available.

Another type of inspection is project inspections. Normally this inspection is conducted by a third-party firm or individual who has the credentials for these type of inspections. Most project inspections are broad based where the inspection can include the complete building envelope as an example or in other cases, mechanical and building envelope. For an individual to be proficient in all the different types of roofs and the different roofing materials, all the different types of cladding assemblies all types of wall construction and then all types of foundations and waterproofing materials is normally more than what a single person can provide. More likely, these inspections will be conducted by a firm with individuals who specialize in the various parts of the building.

m. Site audit

Specialized inspections or audits are where you focus on a specific part of the building. Of course you cannot have blinders on and say well I'm only looking at the air barrier so I will ignore the water resistive barrier. A specialized inspection, like an air barrier audit, does focus on the details of that particular part of the building enclosure. By being a specialized activity, you have a person who has more and better knowledge of the function that is being audited and the person conducting the audit would have had more exposure to both good and bad installations. It is not unusual for a project inspection firm to in turn, hire a specialized firm/person to provide a specialized audit on their behalf.

How proper conflict resolution fits into the picture

Every site quality assurance program (QAP) needs to have a conflict resolution component. You want to identify your potential risks, take steps to mitigate these risks but at the end of the day, you will have problems on the construction site. Discussion in advance on who is doing what, who is responsible for what, and how to coordinate between trades will reduce conflicts on the jobsite, but it will not eliminate them.

n. Conflict resolution on a job site

To conduct an inspection on a project, write up a report and hand it to the owner or the owner representative and walk away, does not help anyone. In a site quality assurance program or sometimes called a site performance program, identifying the conflict and then dealing with the conflict is critical and a key component to the success of the program.

The site quality assurance program will have legally binding agreements with the manufacturer for the material and the trade contractor for the installation. There is also an agreement with the installer where they would be subject to losing their certification if they do not follow the requirements of the program. This puts the QAP organization in a position where they can dictate, if required, that corrective action is taken and what that corrective action will be.

The site quality assurance program will already have helped to keep the project on schedule as it will have provided trade contractors who know what they are doing, trained and certified installers who will do the installation right the first time, and an audit to find anything that is dropped between the cracks but can be corrected in a short period of time. The general contractor is left with a project that runs smoothly and remains on schedule and on budget.

With a conflict resolution component in a site quality assurance program, when things go wrong, there is a process in place to make the corrections in the shortest amount of time possible.

High Performance Air Barrier System Achieved

No single component by itself will provide you a high performance air barrier system. Only by having all the components and by having them work together, will you achieve your goal of a high performance air barrier system.

o. Completed air barrier project

For example, why would you have a project inspection on the air barrier system if you have never taught the installer on how to install the materials and confirmed their knowledge, skills and abilities through a certification program? How do you resolve differences if you don't have proper standards and specifications? Why would you expect a material to perform if test methods and performance levels have not been determined for that type of material? The questions just go on and on.

A complete QAP program is required to achieve a high performance air barrier system.