CITY OF BELLAIRE TEXAS

BUILDING AND STANDARDS COMMISSION

JUNE 25, 2014

Council Chamber and Council Conference Room **Workshop & Regular Session**
6:30 PM

7008 S. RICE AVENUE
BELLAIRE, TX 77401

Chairperson	**Commissioner**	
Kristin Schuster	Burt Martin	
Vice Chairperson	**Commissioner**	**Commissioner**
Laura Thurmond	Mike Baker	Danny Spencer
Commissioner	**Commissioner**	
Paul Katz	Laolu Yemitan	

Mission Statement:
The City of Bellaire is dedicated to outstanding quality service and facilities to ensure an open, progressive, and secure community.

I. WORKSHOP SESSION

A. Call to Order

B. Announcement of Quorum

C. Discussion on a Report and Recommendation to the City Council on water vapor control in residential crawlspace construction, including proposed amendments to the City of Bellaire Code of Ordinances, Chapter 9, Buildings.

D. Adjournment

i. The Building & Standards Commission reserves the right to reconvene the Workshop Session after the Regular Session has adjourned.

II. REGULAR SESSION

A. Call to Order

B. Announcement of Quourm

C. Rules for Public Comment

1. Sign up forms will be available at all Regular and Special meetings for registering the names of members of the Public who wish to either: i) speak on an agenda item, provided such items have not been the subject of a prior public hearing; or ii) make a general comment related to the Commission business. These forms will be given to the Secretary prior to the start of the meeting so that the person's name can be called to address the Commission at the appropriate time.

2. Public Comments on agenda items will be made at the time an agenda item appears in the Order of Business and before the Commission's consideration of that item.

3. Public Comments of a general nature shall be made at the time designated by the Order of Business.

4. All public comments shall be limited to six (6) minutes per speaker with extensions of two (2) minute increments as approved by a majority vote of Commission members present.

5. Public Comment at Workshop meetings will be allowed at the discretion of the Chair. Any comments will be limited as described in Article IV Sec 8.

D. Approval or Correction of the Minutes

1. Building and Standards Commission - Workshop & Regular Session - May 28, 2014 6:00 PM

E. Public Comment

F. Report from Building Official

G. Reports of Committees and Communications

1. Communications to Commission members outside of posted meetings

2. Committee Reports

3. Reports from Staff other than the Building Official

H. Old Business

1. Discussion, Consideration, and Possible Action Regarding Amendments to the City of Bellaire Code of Ordinances, Chapter 9, Buildings, Article II, Building Codes, Division 1, Generally, Sec. 9-17, Amendments to building code.

   (Requested by John McDonald, Community Development)

I. New Business

1. Discussion, consideration and possible action on a response to letters dated April 22, 2014 and May 2, 2014 from DPIS Engineers, regarding Crawl Space Air Barrier, Insulation and Moisture Control.

   (Requested by John McDonald, Community Development)

2. **The Chair shall recognize any Commissioner who wishes to bring New Business to the attention of the Commission. Consideration of New Business shall be for the limited purpose of determining whether the matter is appropriate for inclusion on a future agenda of the Commission or referral to Staff for investigation.**

J. Public Hearings

K. Announcements & Comments by Commissioners

L. Adjournment

CITY OF BELLAIRE TEXAS

BUILDING AND STANDARDS COMMISSION

MAY 28, 2014

Council Chamber and Council Conference Room **Workshop & Regular Session**
6:00 PM

7008 S. RICE AVENUE
BELLAIRE, TX 77401

I. WORKSHOP SESSION

A. Call to Order

B. Announcement of Quorum

C. Public Comment

D. Discussion and preparation of the Commission's presentation to City Council regarding the report on water vapor control in residential crawlspace construction.

E. Adjournment

II. REGULAR SESSION

A. Call to Order

Chairman Schuster called the meeting to order at 7:29 PM.

B. Announcement of Quourm

Chairman Schuster announced that a quorum was present, consisting of the following:

Attendee Name	Title	Status	Arrived
Kristin Schuster	Chairperson	Present	
Laura Thurmond	Vice Chairperson	Present	
Paul Katz	Commissioner	Present	
Burt Martin	Commissioner	Present	
Mike Baker	Commissioner	Present	
Laolu Yemitan	Commissioner	Present	
Danny Spencer	Commissioner	Present	
Ashley Parcus	Secretary	Present	
Lee Cabello	Building Official	Present	
Alton Moses	Assistant Fire Chief	Present	
Shawn Cox	Development Services Manager	Present	

C. Rules for Public Comment

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Commission business. These forms will be given to the Secretary prior to the start of the meeting so that the person's name can be called to address the Commission at the appropriate time.

2. **Public Comments on agenda items will be made at the time an agenda item appears in the Order of Business and before the Commission's consideration of that item.**

3. **Public Comments of a general nature shall be made at the time designated by the Order of Business.**

4. **All public comments shall be limited to six (6) minutes per speaker with extensions of two (2) minute increments as approved by a majority vote of Commission members present.**

5. **Public Comment at Workshop meetings will be allowed at the discretion of the Chair. Any comments will be limited as described in Article IV Sec 8.**

Chairman Schuster pointed out that the rules for public comment are listed on the agenda.

D. Approval or Correction of the Minutes

1. Building and Standards Commission - Regular Session - Apr 23, 2014 7:00 PM

RESULT:	**APPROVED [UNANIMOUS]**
MOVER:	Mike Baker, Commissioner
SECONDER:	Burt Martin, Commissioner
AYES:	Schuster, Thurmond, Katz, Martin, Baker, Yemitan, Spencer

E. Public Comment

There was no public comment.

F. Report from Building Official

i. Update on May 15, 2014 Builder's Luncheon

Lee Cabello, Building Official-Mr. Cabello informed the Commission that the City held a builder's luncheon on May 15, 2014, and that 12-13 building companies were in attendance. He stated that the topics discussed at the luncheon were:

1. Certificates of Occupancy
2. Size of plans that are submitted and ensuring that they meet IRC requirements
3. No lumber within 18 inches of the ground
4. Proposed temporary chain link fence requirement at construction sites
5. Proposed silt protection requirement at construction sites
6. Proposed metal roll-off containers at construction sites

Mr. Cabello explained that he also mentioned that the Commission has been studying thermostat requirements, attic ventilation, termite treatment requirements, and moisture control within crawlspaces.

Chairman Schuster asked if staff was planning to hold these luncheons regularly.

Mr. Cabello stated that they hope to hold them once a year.

Chairman Schuster asked if staff would extent an invitation to the Building and Standards Commission in the future.

Mr. Cabello confirmed that the Commission would get an invitation for future luncheons.

G. Reports of Committees and Communications

1. Communications to Commission members outside of posted meetings

There were no communications to report.

2. Committee Reports

There were no committee reports.

3. Reports from Staff other than the Building Official

There were no reports from staff other than the Building Official.

H. Old Business

There was no old business.

I. New Business

1. Discussion, Consideration, and Possible Action Regarding Amendments to the City of Bellaire Code of Ordinances, Chapter 9, Buildings, Article II, Building Codes, Division 1, Generally, Sec. 9-17, Amendments to building code.

   Alton Moses, Assistant Fire Chief-Chief Moses explained to the Commission the language that is currently in the ordinance, which he believes has been that way since 2000. He stated that he is proposing that "Group M" be taken out of the ordinance, leaving just "Group R3," residential. Chief Moses explained that Group R is covered under a different ordinance.

   Commissioner Yemitan asked for clarification on what the different groups are.

   Chief Moses informed the Commission that Group M refers to mercantile (strip centers) and Group R3 refers to residential housing. He then explained that currently the ordinance requires all commercial occupancies of 7,000 square feet or greater to have fire sprinklers, and that he is proposing to reduce that number to 3,000 square feet or greater. Chief Moses then showed the Commission a diagram explaining the problems that the fire department is facing with the current requirement of 7,000 square feet. He informed them that property owners are coming in and subdividing to create spaces that are under 7,000 square feet in order to circumvent the fire sprinkler requirement, resulting in only part of the building being sprinkled.

   Chairman Schuster asked what would happen if tenants then subdivided the smaller areas to less than 3,000 square feet.

   Chief Moses stated that he would then have another problem.

Chairman Schuster asked Chief Moses to explain why the proposal is not requiring all occupancies, regardless of the square footage, to install fire sprinklers.

Chief Moses did not know why the city hasn't proposed that, he explained that he hadn't thought of it that way and was simply trying to alleviate the issues that he is currently facing.

Commissioner Spencer asked what the city of Houston's requirements are.

Chief Moses explained that the City of Houston created a step program, requiring an entire building to be sprinkled by a certain year. Within the first year the property owner must present the city with a plan on how this is going to be accomplished.

Commissioner Spencer asked if fire sprinklers are required, regardless of the square footage, for every new permit that is pulled in the City of Houston.

Commissioner Thurmond stated that the City of Houston does not require sprinkling of the spaces within commercial buildings, only the exit corridors.

Chief Moses explained that by code you cannot go into a less protected area, so by sprinkling the paths of egress they are still operating under the requirements.

Chairman Schuster pointed out that regardless of the square footage threshold that the City of Bellaire proposes it will still be above and beyond what the City of Houston requires. She asked Chief Moses if he came up with the 3,000 square feet or greater proposal based on his experience.

Chief Moses confirmed that this number is based on what is currently happening within the city.

Chairman Schuster questioned whether going to an arbitrarily lower number would solve additional problems.

Chief Moses confirmed that additional problems would not arise with an even lower square footage. He also suggested that the City could go to a program requiring that any remodeled building be sprinkled within a certain time frame.

Commissioner Yemitan asked how "remodel" would be defined.

Chief Moses explained that a remodel would take place any time there is a change in occupants.

Commissioner Yemitan asked how much it would cost a property owner to install fire sprinklers in a space/building that doesn't currently have them.

Chief Moses stated that it would depend on what is already installed in the building. He explained that all buildings have a standpipe system, which is what the sprinklers would tie into.

Chairman Schuster stated that this proposal could potentially apply to strip centers built in the 70's that are currently exempt due to the square footage.

Chief Moses confirmed that.

Vice Chairman Thurmond was concerned with the fact that this proposal would require older strip centers to install an under-ground, which is very costly.

Chief Moses agreed that an under-ground is going to cost the property owner around $20,000.

Chairman Schuster asked if the specific intent of this proposal is to address spaces in two buildings that happen to be right around 3,000 square feet.

Chief Moses explained that this proposal is to address all buildings within Bellaire, as well as new buildings coming in. He reminded the Commission that the requirements are put in place not only to protect the building and its occupants, but also the fire fighters who are responding to the call. Chief Moses pointed out that with the potential redevelopment of Bellaire the city needs to get ahead of the game to ensure that all spaces are equipped with the necessary resources to provide safety to all parties involved.

Chairman Schuster mentioned that requiring a property owner to spend thousands of dollars to install fire sprinklers could potentially create a detriment to redevelopment.

Vice Chairman Thurmond agreed that people are going to go rent space in another city that does not have these requirements.

Chief Moses pointed out that it's the price of doing business sometimes.

Vice Chairman Thurmond asked Chief Moses if he would be willing to exempt existing structures.

Chief Moses stated that he would not be willing to do that. He explained that the lack of fire sprinklers within existing buildings is what lead to this proposal in the first place, so exempting those would defeat the purpose.

Commissioner Spencer pointed out that spaces would be rented more easily if the property owner took it upon himself to bring it up to code. He also mentioned that the owner could then charge a premium for doing so. Commissioner Spencer stated that the end goal is protection for all.

Chairman Schuster asked for clarification that the reason for the presentation is not to request action, but simply to inform the Commission of what is being posted for public comment.

Chief Moses confirmed this.

Commissioner Yemitan stated that reducing the threshold to 3,000 square feet could become quite onerous for the property owners involved.

Vice Chairman Thurmond explained that her concern is with the 1 story strip centers that will have to start from scratch.

Commissioner Baker felt that this proposal is necessary, and that the City would benefit from an increase in the number of buildings that are sprinkled.

Chairman Schuster stated that the way she understands the new notification process is that information regarding the proposal will be put up on the City website and any comments that the City receives within the next 60 days pertaining to those changes will be forwarded on to the Commission.

Shawn Cox, Development Services Manager-Mr. Cox confirmed this, and explained that the item will then be brought back before the Commission at their August meeting, and action will be requested at that time.

Chairman Schuster then moved on to the report and recommendation to the City Council regarding water vapor control in residential crawlspaces.

Motion: a motion was made by Chairman Schuster and seconded by Commissioner Katz to amend the date and the first paragraph of the report in the following ways:

1. Change the date from April 23, 2014 to June 2, 2014
2. Change "9 months" to "12 months"
3. Change "12 meetings" to "15 meetings"

Commissioner Baker made a friendly amendment to mention that city staff was also in attendance at each meeting and workshop held by the Commission.

The friendly amendment was accepted and Vice Chairman Schuster added "attended by staff and local builders" and struck "including a workshop with local builders to collect information and feedback."

Vote: the motion carried on a unanimous vote of 7-0.

Commissioner Baker asked if he could seek some input from the Commission's council liaison, Councilman McLaughlan.

Chairman Schuster stated that she would be fine with that.

Commissioner Baker asked Councilman McLaughlan how receptive he believed Council was going to be to this issue.

Councilman McLaughlan stated that he does not know how his fellow council members will respond to this recommendation, but felt that if the Commission is present for the meeting and comes forth with a strong presentation it will greatly benefit the outcome. He mentioned that one of the arguments of city staff is that the Commission is looking to change something that has not been reported as a problem. Councilman McLaughlan used the example of an airplane and stated that you don't wait until the wing falls off to act on a potential issue. He added that the Commission has done the research, and in his opinion, is adequately prepared to answer questions regarding the proposal.

Commissioner Katz mentioned that "non-hygroscopic material" under the proposed language is redundant and suggested removing that from the report.

Commissioner Baker mentioned that he liked the idea of the Commission providing Council with suggested language, but he would also like to leave a little "wiggle room" for Council to revise it as necessary.

Chairman Schuster stated that they will still be able to tweak the language as needed.

Motion: a motion was made by Chairman Schuster and seconded by Commissioner Katz that the rest of the report be revised as follows:

1. Under **Exhibit I** Strike "for the consideration of City Staff and the City Attorney in developing a revision and add "be added."
2. Under "Recommendation" strike "direct staff to work with the Commission to develop" and add "adopts."
3. Also under "Recommendation, "Strike everything after "Refer to **Exhibit I** for suggested language."
4. Under the proposed language strike "Sections R402.1 and R402.2 of the 2012 IECC, a non-hygroscopic material" and add "the currently adopted IECC and IRC, an"

Chairman Schuster clarified for everyone watching the broadcast, that prior to the regular meeting the Commission had a very productive workshop where staff's current position on the proposal was addressed. She explained that the outcome was that this Commission remains confident in their recommendation and is ready to proceed in presenting it to Council on Monday. She pointed out that the revisions that she is proposing to the report are clarifying that the Commission is asking Council to adopt language requiring a vapor retarder on the warm side of the assembly.

Vote: the motion carried on a vote of 6-0-1, with Commission Yemitan abstaining.

Chairman Schuster asked if any Commissioners would be available to meet on Sunday to go over the presentation to Council.

Chairman Schuster, Vice Chairman Thurmond, Commissioner Martin, and Commissioner Spencer agreed to meet on Sunday, June 1st at 1:00 PM at Chairman Schuster's home on Birch Street.
(Requested by John McDonald, Community Development)

2. **The Chair shall recognize any Commissioner who wishes to bring New Business to the attention of the Commission. Consideration of New Business shall be for the limited purpose of determining whether the matter is appropriate for inclusion on a future agenda of the Commission or referral to Staff for investigation.**

There was no new business brought to the attention of the Commission.

J. Public Hearings

There were no public hearings.

K. Announcements & Comments by Commissioners

Chairman Schuster reminded the Commission that the presentation before Council is on Monday, June 2nd, and asked who planned to attend the meeting.

Chairman Schuster, Vice Chairman Thurmond, Commissioners Martin, Katz, and Spencer all stated that they would be in attendance.

L. Adjournment

Chairman Schuster adjourned the meeting at 8:31 PM.

Building and Standards Commission
Council Chamber, First Floor of City Hall
Bellaire, TX 77401

Meeting: 06/25/14 06:30 PM
Department: Community Development
Category: Amendment
Department Head: John McDonald
DOC ID: 1276

SCHEDULED
ACTION ITEM (ID # 1276)

Item Title:

Discussion, Consideration, and Possible Action Regarding Amendments to the City of Bellaire Code of Ordinances, Chapter 9, Buildings, Article II, Building Codes, Division 1, Generally, Sec. 9-17, Amendments to building code.

Background/Summary:

This item was added to the agenda at the chair's request.

ATTACHMENTS:

- 20June2014_Crawlspace report_Final (DOCX)

City of Bellaire Building and Standards Commission

Final Report to City Council regarding a recommendation for water vapor control in crawlspace construction

Introduction

This report and recommendation have developed over the course of nine months of work by the Building and Standards Commission of the City of Bellaire. During this time period 12 meetings and workshops were held to discuss the topic, including a workshop with local builders to collect information and feedback.

The intent of this recommendation by the Building and Standards Commission is to prevent mold, mildew and wood rot caused by the trapping of excessive moisture that has condensed out of hot humid air onto wood within the crawlspaces of homes in Bellaire. After significant study, the Commission recognizes that such problems may be exacerbated as the energy efficiency measures mandated by the 2012 IECC/IRC are implemented in our community.

The International Energy Conservation Code (IECC) and International Residential Code (IRC) are model codes ratified by the City of Bellaire to govern construction within the City of Bellaire. In September of 2013 the city ratified the 2012 edition of these codes, moving from the 2009 version previously ratified.

Recommendation

The Building and Standards Commission of the City of Bellaire respectfully recommends that City Council direct City Staff to work with the Commission to develop a revision to the City of Bellaire Code of Ordinances, Chapter 9, Buildings, Article II, Building Codes, Division I, Generally, Section 9.17, Amendments to the Building Code for the purpose of mandating the installation of a vapor retarder over all surfaces of the insulation facing the crawlspace in all new residential construction, and to develop a process for verifying compliance with this requirement.

Refer to **Exhibit I** for suggested language, provided by the Commission for the consideration of City Staff and City Attorneys in drafting a revision to the City Code of Ordinances, for a future recommendation to City Council.

Water vapor control in crawlspace construction

The energy efficiency measures in the recently ratified 2012 IRC and IECC, which mandate Air Barrier and Insulation requirements, will result in new houses that are built to be significantly more air-tight than homes built in previous years. With minimal air leaks in the building envelope, the HVAC (Heating, Ventilation and Air Conditioning) system will be more effective at removing humidity from the air inside of the house. As a result, the moisture in the warm humid air in the crawl space will want to migrate to the dryer environment created inside the house, in an effort to equalize vapor pressure. This is known as vapor drive. While the 2012 codes address Air Barrier (air-tightness) and Insulation (heat transfer) requirements, vapor drive through the crawlspace is not addressed.

Vapor will move from an area of high vapor pressure to low vapor pressure along the path of least resistance. The codes mandate the installation of a vapor retarder in exterior wall assemblies, but not in the floor assembly above the crawlspace. As a result, vapor will migrate through this unprotected floor assembly. In summer conditions the floor assembly will be kept cool by the AC, and when moisture begins to migrate into the dry environment inside the house it will form condensation on the floor joists. The relatively limited air circulation in the crawl space area allows the condensation to linger, which can lead to mold, mildew and wood rot. Installing a vapor retarder in the appropriate place within the floor assembly (as is required within exterior wall assemblies) will slow the rate of vapor transfer and will reduce the amount of condensation being formed to an amount that can be drawn out through evaporation.

Increasingly stringent energy codes, the hot-humid climate and flood management practices particular to Bellaire come together to set Bellaire homes up for future moisture and mold issues. This is a problem that develops over time. The decision whether or not to install a vapor retarder in the floor assembly above the crawlspace should not be left up to the builder or even the first home owner because a problem may not be recognized for many years. The burden may only fall on future owners of the building.

It is the responsibility of local jurisdictions to modify Model Codes to local conditions.

Confluence of factors in Bellaire

Energy Code Requirements: The state of Texas mandates energy code requirements and sets minimum energy efficiency standards in construction. These requirements are becoming more stringent with each update of the code. Increasing energy efficiency standards are driving rapid changes in construction practices. Per the recently ratified 2012 IECC and IRC, houses must be visually inspected and tested for air-tightness. Air leakage now must not exceed 5 air changes per hour (ACH). This is a significant decrease from the 7 ACH allowed under the 2009 codes, and an increase in the verification requirements.

Refer to **Appendix I** "Building Technologies Program Air Leakage Guide" by the United States Department of Energy for information about the Air Leakage and Insulation requirements in the 2012 IECC and IRC, including a description of the blower door test.

Specific Climate Conditions: Humidity and heat are the primary climate specific factors affecting energy efficiency in buildings. Here in Bellaire, our hot/humid climate puts significant demand on building systems relative to other parts of the country. Publishers of models codes are challenged with developing standards that can address and be adapted to multiple climate zones across the country. Building and Standards Commission's recommendation is intended to tailor the code requirements to Bellaire's specific climate conditions by mandating certain additional measurements.

Refer to **Appendix II** "Insulating Raised Floors in Hot Humid Climates" by the Louisiana State University Agricultural Center for information and empirical data about crawlspace insulation and moisture management practicies in hot/humid climates.

Flood management: The Federal Emergency Management Agency (FEMA) requires the finished floor of a newly constructed or substantially remodeled structure located in the flood plain to be at or above base flood elevation (BFE). The City of Bellaire goes beyond this and requires the finished floor to be a minimum of 1' above BFE. This additional local requirement contributes to a flood insurance rate reduction all Bellaire homeowners receive through the NFIP's Community Rating System.

The city of Bellaire has adopted a 'no net-fill' ordinance in order to prevent overall fill in floodplain, and to prevent conveyance of water in neighboring properties. Bellaire does not allow lots to be filled with dirt to raise the finished floor. As a result, most homes must be built with a crawl space in order to raise the floor to an adequate height.

The preferred method nation-wide for controlling air and moisture in a crawlspace is to seal it entirely at the dirt and all walls. If a home is built in the 100 year flood plain however, crawlspaces are required to be vented for flood waters. Because the majority of Bellaire is within the flood plain, sealed crawlspaces are not a viable option in the majority of our city.

Refer to **Appendix III** for sections of the City of Bellaire Code of Ordinances pertaining to flood hazard mitigation and residential drainage requirements.

Summary

Current building science indicates that inaction by the City of Bellaire on the matter of water vapor control in crawlspace construction has the potential to set Bellaire homeowners up for long term problems in the future due to the confluence of code factors, climate conditions and flood control requirements. While there are Bellaire homeowners who have encountered mold in the crawlspace and deteriorated framing, City Staff has heard few complaints. The Building and Standards Commission recognizes that such problems may be exacerbated as energy efficiency requirements continue to increase, and cautions that a lack of reporting does not mean problems are not occurring. Crawlspace moisture problems are hidden conditions. They may exist undiscovered until a homeowner uncovers them in the course of some other investigation or there is a building system failure.

The proposed requirement for a vapor retarder sets performance criteria only. It does not mandate the use of specific building products or systems. There are in multiple low-cost ways builders can comply with the requirement if they are not already doing so. Many of the established builders in Bellaire recognize the need for water vapor control in crawlspace construction and already use construction methods that would meet the requirements of an ordinance change in keeping with the Commission's recommendation. The Building and Standards Commission found this to be the case while conducting interviews with local builders during a Workshop Session held in Council Chambers in August of 2013. The intent of the Commission's recommendation is to protect residents of homes constructed by builders who are not currently meeting the proposed standard.

The requirement of a vapor retarder in the crawlspace will raise the minimum quality of construction in the City of Bellaire and in turn contribute to the reputation of our city as a premier community in which to build and live.

Exhibit I

Building and Standards Commission suggest the following language, for the consideration of City Staff and the City Attorney in developing a revision to the City of Bellaire Code of Ordinances, Chapter 9, Buildings, Article II, Building Codes, Division I, Generally, Section 9.17, Amendments to the Building Code.

Crawl Space Air Barrier, Insulation and Moisture Control

In addition to the requirements of Sections R402.1 and R402.2 of the 2012 IECC, an air barrier and Class III Vapor Retarder shall be applied over all surfaces of the insulation facing the crawlspace, if the insulation does not effectively provide the same. No Class I or Class II Vapor Retarders shall be applied over the interior surface of the floor assembly above a crawlspace, except at shower pans and areas intended to hold water.

Building and Standards Commission
Council Chamber, First Floor of City Hall
Bellaire, TX 77401

Meeting: 06/25/14 06:30 PM
Department: Community Development
Category: Discussion
Department Head: John McDonald
DOC ID: 1277

SCHEDULED
ACTION ITEM (ID # 1277)

Item Title:

Discussion, consideration and possible action on a response to letters dated April 22, 2014 and May 2, 2014 from DPIS Engineers, regarding Crawl Space Air Barrier, Insulation and Moisture Control.

Background/Summary:

This item was added to the agenda at the chair's request.

ATTACHMENTS:

- Letter Bellaire 04-22-2014 (PDF)
- Water Management Checklist- Crawlspace (PDF)
- Water_Management_System_EPA ENERGY STAR TRAINING_ABRIDGED VERSION (PDF)
- Letter Bellaire 05-01-2014 (PDF)

DPIS Engineering, LLC
The Builder's Solution

April 22, 2014

To whom it may concern:

In response to the suggestion below:

> "Crawl Space Air Barrier, Insulation and Moisture Control
> In addition to the requirements of Sections R402.1 and R402.2 of the 2012 IECC, a non-hygroscopic material air barrier and vapor retarder shall be applied over all surfaces of the insulation facing the crawlspace if the insulation does not effectively provide the same."

I believe the intent is correct, but rather the application is flawed. Of course, no particular type of insulation product should be recommended, and each home should operate as a system. With this in mind, fiberglass batting, foam sealant, or a wide array of products could be beneficial to the homeowners if applied properly in conjunction with the other portions of the building structure / mechanical systems.

I believe to stop the moisture at the bottom of the joists is too late to achieve maximum results. My recommendation is to require a moisture barrier (<.1 perm rating) at the ground level, and to have all seams sealed or taped with a minimum of 12" lap installed contiguously from all sides of the crawlspace foundation perimeter walls. Any interruptions at posts / beams and the ground need to be sealed and secured.

This is my recommendation. Stop the moisture at the ground, NOT the floor. By the time moisture makes it to the floor system, damage has already been done to building structure components. In any case redundant moisture barriers (installed on top / bottom of floor components) will greatly increase the potential for building component failures. Stopping the moisture at the ground is the best way to prevent excessive moisture from entering building cavities.

Thank you,

Clayton Morris
V.P. of Energy Programs
DPIS Engineering, LLC
Residential Combination Inspector: 5247710-R5
Residential Energy Inspector/Plans Examiner: 5280560-79
RESNET Quality Assurance Designee-RTIN: 9200115

ENERGY STAR Certified Homes, Version 3 (Rev. 07)
Water Management System Builder Checklist [1,2]

Home Address: _____ City: _____ State: _____ Zip Code: _____

1. Water-Managed Site and Foundation	Must Correct	Builder Verified	Rater Verified	N/A
1.1 Patio slabs, porch slabs, walks, and driveways sloped ≥ 0.25 in. per ft. away from home to edge of surface or 10 ft., whichever is less. [3]	☐	☑	☐	☐
1.2 Back-fill has been tamped and final grade sloped ≥ 0.5 in. per ft. away from home for ≥ 10 ft. See Footnote for alternatives. [3]	☐	☑	☐	☐
1.3 Capillary break beneath all slabs (e.g., slab on grade, basement slab) except crawlspace slabs using either: ≥ 6 mil polyethylene sheeting, lapped 6-12 in., or ≥ 1 in. extruded polystyrene insulation with taped joints. [4, 5, 6]	☐	☑	☐	☐
1.4 Capillary break at all crawlspace floors using ≥ 6 mil polyethylene sheeting, lapped 6-12 in., & installed using one of the following opt's: [4, 5, 6]				
1.4.1 Placed beneath a concrete slab; OR,	☐	☐	☐	☑
1.4.2 Lapped up each wall or pier and fastened with furring strips or equivalent; OR,	☐	☐	☐	☑
1.4.3 Secured in the ground at the perimeter using stakes.	☐	☐	☐	☑
1.5 Exterior surface of below-grade walls of basements & unvented crawlspaces finished as follows: a) For poured concrete, masonry, & insulated concrete forms, finish with damp-proofing coating. [7] b) For wood framed walls, finish with polyethylene and adhesive or other equivalent waterproofing.	☐	☐	☐	☑
1.6 Class 1 vapor retarder not installed on interior side of air permeable insulation in ext. below-grade walls. [8]	☐	☐	☐	☑
1.7 Sump pump covers mechanically attached with full gasket seal or equivalent.	☐	☐	☐	☑
1.8 Drain tile installed at the exterior side of footings of basement and crawlspace walls, with the top of the drain tile pipe below the bottom of the concrete slab or crawlspace floor. Drain tile surrounded with ≥ 6 in. of ½ to ¾ in. washed or clean gravel and with gravel layer fully wrapped with fabric cloth. Drain tile level or sloped to discharge to outside grade (daylight) or to a sump pump. [9]	☐	☐	☐	☑
2. Water-Managed Wall Assembly				
2.1 Flashing at bottom of exterior walls with weep holes included for masonry veneer and weep screed for stucco cladding systems, or equivalent drainage system. [10]	☐	☑	☐	☐
2.2 Fully sealed continuous drainage plane behind exterior cladding that laps over flashing in Item 2.1 and fully sealed at all penetrations. Additional bond-break drainage plane layer provided behind all stucco and non-structural masonry cladding wall assemblies. [10, 11]	☐	☑	☐	☐
2.3 Window and door openings fully flashed. [12]	☐	☑	☐	☐
3. Water-Managed Roof Assembly				
3.1 Step and kick-out flashing at all roof-wall intersections, extending ≥ 4" on wall surface above roof deck and integrated shingle-style with drainage plane above; boot / collar flashing at all roof penetrations. [13]	☐	☑	☐	☐
3.2 For homes that don't have a slab-on-grade foundation and do have expansive or collapsible soils, gutters & downspouts provided that empty to lateral piping that discharges water on sloping final grade ≥ 5 ft. from foundation, or to underground catchment system not connected to the foundation drain system that discharges water ≥ 10 ft. from foundation. See Footnote for alternatives & exemptions. [4, 14]	☐	☐	☐	☑
3.3 Self-sealing bituminous membrane or equivalent at all valleys & roof deck penetrations. [4]	☐	☑	☐	☐
3.4 In 2009 IECC Climate Zones 5 & higher, self-sealing bituminous membrane or equivalent over sheathing at eaves from the edge of the roof line to > 2 ft. up roof deck from the interior plane of the exterior wall. [4]	☐	☐	☐	☑
4. Water-Managed Building Materials				
4.1 Wall-to-wall carpet *not* installed within 2.5 ft. of toilets, tubs, and showers.	☐	☑	☐	☐
4.2 Cement board or equivalent moisture-resistant backing material installed on all walls behind tub and shower enclosures composed of tile or panel assemblies with caulked joints. Paper-faced backerboard shall not be used. [15]	☐	☑	☐	☐
4.3 In Warm-Humid climates, Class 1 vapor retarders not installed on the interior side of air permeable insulation in above-grade walls, except at shower and tub walls. [8]	☐	☑	☐	☐
4.4 Building materials with visible signs of water damage or mold *not* installed or allowed to remain. [16]	☐	☑	☐	☐
4.5 Framing members & insulation products having high moisture content *not* enclosed (e.g., with drywall) [17]	☐	☑	☐	☐

Builder Employee: _____

Builder Signature: _____ Date: _____

Builder has completed Builder Checklist in its entirety, except for items that are checked in the Rater Verified column (if any) [2]

Rater Signature: _____ Date: _____

Notes:

1. The specifications in this Checklist are designed to help improve moisture control in new homes compared with homes built to minimum code. However, these features alone cannot prevent all moisture problems. For example, leaky pipes or overflowing sinks or baths can lead to moisture issues and negatively impact the performance of this Checklist's specified features.

ENERGY STAR Certified Homes, Version 3 (Rev. 07)
Water Management System Builder Checklist [1,2]

2. Upon completion, the builder shall return the Checklist to the Rater for review. Alternatively, at the discretion of the builder and Rater, the Rater may verify any item on this Checklist. When this occurs, the Rater shall check the box of the verified Items in the Rater Verified column. The Rater is only responsible for ensuring that the builder has completed the Builder Checklist in its entirety and for verifying the items that are checked in the Rater Verified column (if any). The Rater is not responsible for assessing the accuracy of the field verifications for items in this Checklist that are not checked in the Rater Verified column. Instead, it is the builder's exclusive responsibility to ensure the design and installation comply with the Checklist.
3. Swales or drains designed to carry water from foundation are permitted to be provided as an alternative to the slope requirements for any home, and shall be provided for a home where setbacks limit space to less than 10 ft. Also, tamping of back-fill is not required if either: proper drainage can be achieved using non-settling compact soils, as determined by a certified hydrologist, soil scientist, or engineer; OR, the builder has scheduled a site visit to provide in-fill and final grading after settling has occurred (e.g., after the first rainy season).
4. Not required in Dry (B) climates as shown in 2009 IECC Figure 301.1 and Table 301.1.
5. Not required for raised pier foundations with no walls. To earn the ENERGY STAR, EPA recommends, but does not require, that radon-resistant features be included in homes built in EPA Radon Zones 1, 2 & 3. For more information, see www.epa.gov/indoorairplus.
6. For an existing slab (e.g., in a home undergoing a gut rehabilitation), in lieu of a capillary break beneath the slab, a continuous and sealed Class I or Class II Vapor Retarder (per Footnote 8) is permitted to be installed on top of the entire slab. In such cases, up to 10% of the slab surface is permitted to be exempted from this requirement (e.g., for sill plates). In addition, for existing slabs in occupiable space, the Vapor Retarder shall be, or shall be protected by, a durable floor surface. If Class I Vapor Retarders are installed, they shall not be installed on the interior side of air permeable insulation or materials prone to moisture damage.
7. Interior surface of existing below-grade wall (e.g., in a home undergoing a gut rehab.) listed in Item 1.5a is permitted to be finished by:
   - Installing a continuous and sealed drainage plane, capillary break, Class I Vapor Retarder (per Footnote 8) and air barrier that terminates into a foundation drainage system as specified in Item 1.8; OR
   - If a drain tile is not required as specified in Footnote 9, adhering a capillary break and Class I Vapor Retarder (per Footnote 6) directly to the wall with the edges taped/sealed to make it continuous.

   Note that no alternative compliance option is provided for existing below-grade wood-framed walls in Item 1.5b.
8. The 2009 IRC defines Class I vapor retarders as a material or assembly with a rating of ≤ 0.1 perm, as defined using the desiccant method with Procedure A of ASTM E 96. The following materials are typically rated at ≤ 0.1 perm and therefore shall not be used on the interior side of air permeable insulation in above-grade exterior walls in warm-humid climates or below-grade exterior walls in any climate: rubber membranes, polyethylene film, glass, aluminum foil, sheet metal, foil-faced insulating sheathings, and foil-faced non-insulating sheathings. These materials can be used on the interior side of walls if air permeable insulation is not present (e.g., foil-faced rigid foam board adjacent to a below-grade concrete foundation wall is permitted).

   Note that this list is not comprehensive and other materials with a perm rating ≤ 0.1 also shall not be used. Also, if manufacturer specifications for a specific product indicate a perm rating above 0.1, then the material may be used, even if it is in this list. Also note that open-cell and closed-cell foam generally have perm ratings above this limit and may be used unless manufacturer specifications indicate a perm rating ≤ 0.1. Several exemptions to these requirements apply:
   - Class I vapor retarders, such as ceramic tile, may be used at shower and tub walls;
   - Class I vapor retarders, such as mirrors, may be used if mounted with clips or other spacers that allow air to circulate behind them.
9. Alternatively, either a drain tile that is pre-wrapped with a fabric filter or a Composite Foundation Drainage System (CFDS) that has been evaluated by ICC-ES per AC 243 are permitted to be used to meet this Item. Note that the CFDS must include a soil strip drain or another ICC-ES evaluated perimeter drainage system to be eligible for use. In an existing home (e.g, in a home undergoing a gut rehab.) a drain tile installed only on the interior side of the footings is permitted. Additionally, a drain tile is not required when a certified hydrologist, soil scientist, or engineer has determined that a crawlspace foundation, or an existing basement foundation (e.g., in a home undergoing a gut rehab.), is installed in Group I Soils (i.e. well-drained ground or sand-gravel mixture soils), as defined by 2009 IRC Table R405.1.
10. These Items not required for existing structural masonry walls (e.g., in a home undergoing a gut rehabilitation). Note this exemption does not extend to existing wall assemblies with masonry veneers.
11. Any of the following systems may be used: a monolithic weather-resistant barrier (i.e., house wrap) shingled at horizontal joints and sealed or taped at all joints; weather resistant sheathings (e.g., faced rigid insulation) fully taped at all "butt" joints; lapped shingle-style building paper or felts; or other water-resistive barrier recognized by ICC-ES or other accredited agency.
12. Apply pan flashing over the rough sill framing, inclusive of the corners of the sill framing; side flashing that extends over pan flashing; and top flashing that extends over side flashing or equivalent details for structural masonry walls.
13. Intersecting wall siding shall terminate 1 in. above the roof or higher, per manufacturer's recommendations. Continuous flashing shall be installed in place of step flashing for metal and rubber membrane roofs.
14. The assessment of whether the soil is expansive or collapsible shall be completed by a certified hydrologist, soil scientist, or engineer. As an alternative, a roof design is permitted to be used that deposits rainwater to a grade-level rock bed with a waterproof liner and a lateral drain pipe that meets discharge requirements per Item 3.2. As another alternative, a rainwater harvesting system is permitted to be used that drains overflow to meet discharge requirements per Item 3.2.
15. In addition to cement board, materials that have been evaluated by ICC-ES per AC 115 may also be used to meet this requirement. Monolithic tub and shower enclosures (e.g., fiberglass with no seams) are exempt from this backing material requirement unless required by the manufacturer. Paper-faced backerboard may only be used behind monolithic enclosures or waterproof membranes that have been evaluated by ICC-ES per AC 115, and then only if it meets ASTM mold-resistant standards ASTM D3273 or ASTM D6329.
16. If mold is present, effort should be made to remove all visible signs of mold (e.g., by damp wipe with water and detergent). If removal methods are not effective, then the material shall be replaced. However, stains that remain after damp wipe are acceptable. Lumber with "sap stain fungi" is exempt from this Item as long as the lumber is structurally intact.
17. For wet-applied insulation, follow manufacturer's drying recommendations. EPA recommends that lumber moisture content be ≤ 18%.

ENERGY STAR Qualified Homes

WATER MANAGEMENT SYSTEM BUILDER CHECKLIST [1, 2, 3]

EPA

Learn more at energystar.gov

WATER MANAGEMENT SYSTEM BUILDER CHECKLIST

1 WATER-MANAGED SITE AND FOUNDATION

4 CAPILLARY BREAK FOR ALL CRAWLSPACE FLOORS

ENERGY STAR

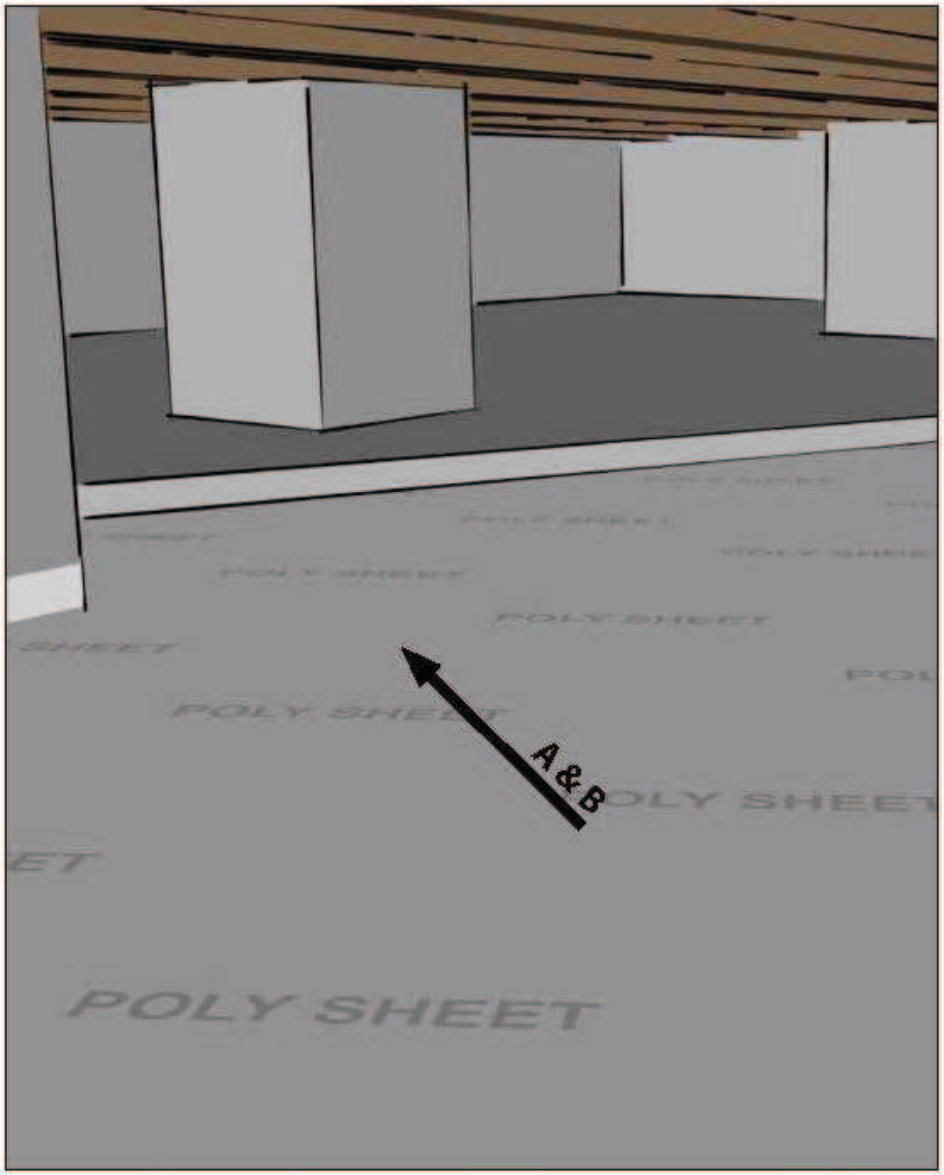
DETAIL 1.4.1 [5]

Capillary break at all crawlspace floors using ≥ 6 mil polyethylene sheeting, lapped 6-12 in., and placed beneath a concrete slab.*

A. Cover entire area with at least a 6 mil polyethylene sheeting.

B. Overlap the polyethylene sheeting at least 6-12 in.

* Only one item of DETAIL 1.4 must be met to comply with ENERGY STAR.



FOOTNOTES

5. Polyethylene sheeting is not required in Dry (B) climates as shown in 2009 IECC Figure 301.1 and Table 301.1. Polyethylene sheeting is also not required for raised pier foundations with no walls. To earn the ENERGY STAR, EPA recommends, but does not require, that radon-resistant features be included in homes built in EPA Radon Zones 1, 2 and 3. For more information, see www.epa.gov/indoorairplus.

Revision 04

1.4.1 Placed beneath a concrete slab.

A

There is no polyethylene sheeting installed in the crawlspace.

There is 6 mil polyethylene sheeting installed and sealed in the crawlspace.

WATER MANAGEMENT SYSTEM BUILDER CHECKLIST

1 WATER-MANAGED SITE AND FOUNDATION

4 CAPILLARY BREAK FOR ALL CRAWLSPACE FLOORS

ENERGY STAR

DETAIL 1.4.2 [5]

Capillary break at all crawlspace floors using ≥ 6 mil polyethylene sheeting, lapped 6-12 in., and lapped up each wall or pier and fastened with furring strips or equivalent*

A. Install furring strips or equivalent to all crawlspace walls and piers.

B. Cover entire area with at least a 6 mil polyethylene sheeting and overlap the sheeting at least 6-12 in.

C. Attach sheeting to furring strips, or equivalent, installed on all crawlspace walls and piers.

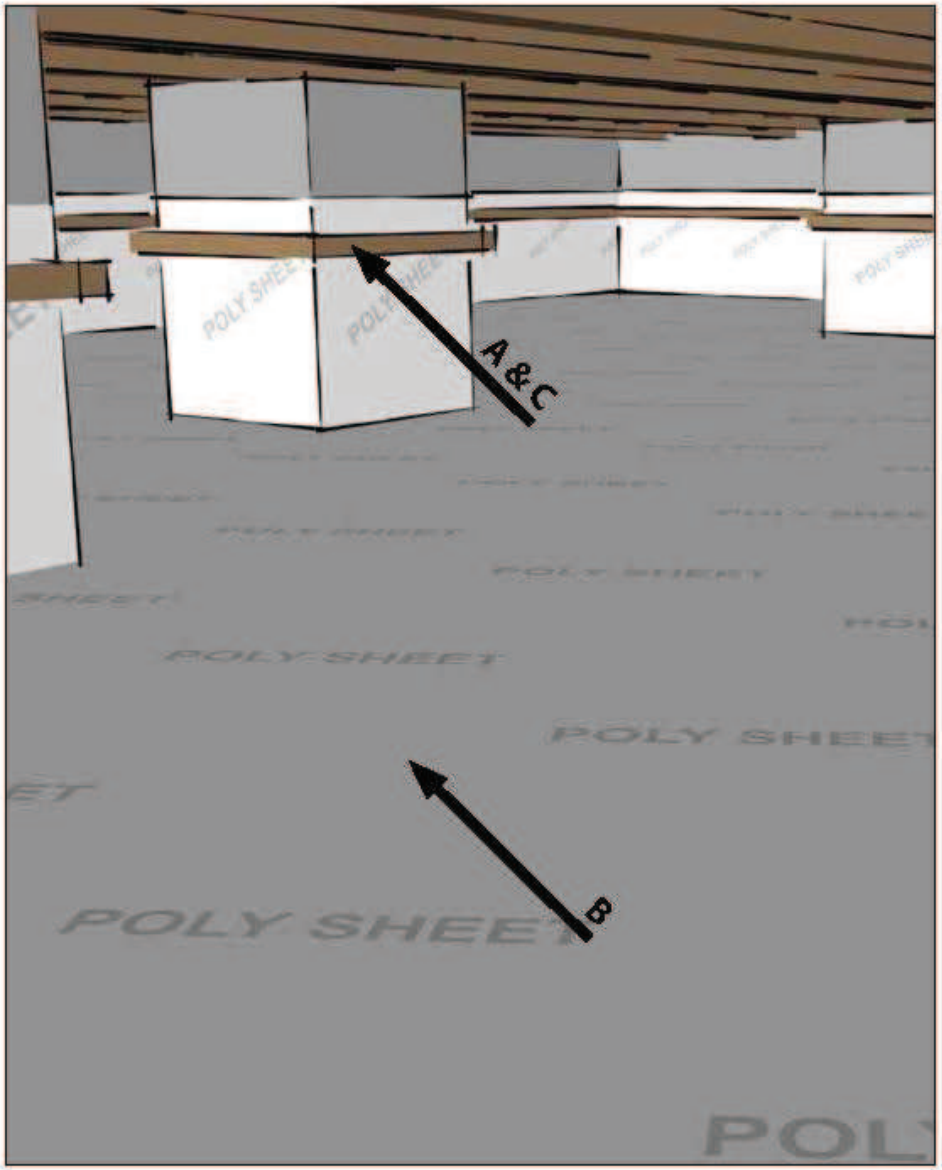
* Only one item of DETAIL 1.4 must be met to comply with ENERGY STAR.

DETAIL 1.4.3 [5]

Capillary break at all crawlspace floors using ≥ 6 mil polyethylene sheeting, lapped 6-12 in., and secured in the ground at the perimeter using stakes*

D. Secure the sheeting in place by staking at the perimeter.

* Only one item of DETAIL 1.4 must be met to comply with ENERGY STAR.



FOOTNOTES

5. Polyethylene sheeting is not required in Dry (B) climates as shown in 2009 IECC Figure 301.1 and Table 301.1. Polyethylene sheeting is also not required for raised pier foundations with no walls. To earn the ENERGY STAR, EPA recommends, but does not require, that radon-resistant features be included in homes built in EPA Radon Zones 1, 2 and 3. For more information, see www.epa.gov/indoorairplus.

Revision 04

1.4.2

Lapped up each wall or pier and fastened with furring strips or equivalent.

B

There is no polyethylene sheeting installed in the crawlspace.

There is polyethylene sheeting installed and sealed in the crawlspace.

WATER MANAGEMENT SYSTEM BUILDER CHECKLIST

SECTION 4. WATER-MANAGED BUILDING MATERIALS

4.3 In Warm-Humid climates, Class 1 vapor retarders not installed on the interior side of air permeable insulation in above-grade walls, except at shower and tub walls [6]

ENERGY STAR

DETAIL 4.3 [6]

In Warm-Humid climates, Class 1 vapor retarders not installed on the interior side of air permeable insulation in above-grade walls, except at shower and tub walls

A. Install materials with a permeability rating of greater than 0.1 perm on the interior of all exterior walls.

B. Impermeable materials such as ceramic tile may be used at shower and tub walls.

FOOTNOTES

6. The 2009 IRC defines Class I vapor retarders as a material or assembly with a rating of ≤ 0.1 perm, as defined using the desiccant method with Procedure A of ASTM E 96. The following materials are typically rated at ≤ 0.1 perm and therefore shall not be used on the interior side of air permeable insulation in above-grade exterior walls in warm-humid climates or below-grade exterior walls in any climate: rubber membranes, polyethylene film, glass, aluminum foil, sheet metal, foil-faced insulating sheathings, and foil-faced non-insulating sheathings. These materials can be used on the interior side of walls if air permeable insulation is not present (e.g., foil-faced extruded polystyrene rigid insulation board adjacent to a below-grade concrete foundation wall is permitted).

Note that this list is not comprehensive and other materials with a perm rating ≤ 0.1 also shall not be used. Also, if manufacturer specifications for a specific product indicate a perm rating above 0.1, then the material may be used, even if it is in this list. Also note that open-cell and closed-cell foam generally have perm ratings above this limit and may be used unless manufacturer specifications indicate a perm rating ≤ 0.1.

Several exemptions to these requirements apply:

a. Class I vapor retarders, such as ceramic tile, may be used at shower and tub walls;

b. Class I vapor retarders, such as mirrors, may be used if they are mounted with clips or other spacers that allow air to circulate behind them.

SELECTING MATERIALS

The current code has the following definitions:

Class I Vapor Retarder: 0.1 perm or less

Class II Vapor Retarder: 1.0 perm or less and greater than 0.1 perm

Class III Vapor Retarder: 10 perm or less and greater than 1.0 perm

The current proposals are to define them this way:

Vapor impermeable: 0.1 perm or less

Vapor semi-impermeable: 1.0 perm or less and greater than 0.1 perm

Vapor semi-permeable: 10 perms or less and greater than 1.0 perm

Vapor permeable: greater than 10 perms

WHAT IS VAPOR PERMEABILITY?

Vapor permeability (commonly referred to as breathability) is a material's ability to allow water vapor to pass through it.

Moisture vapor transmission rate (MVTR) is the measurement referenced in building codes. This is measured in a lab using ASTM E96. The test method measures how much moisture vapor is allowed to pass through a material in a 24-hour period.

This measurement can be impacted by vapor pressure, so when manufacturers compare and test materials, they adjust the measurement for vapor pressure across the sample to get the moisture vapor permeance (MVP). The unit of measurement for MVP is perms.

The higher the number, the more moisture vapor the material will allow to pass, and the better drying the material allows.

The water vapor permeability of a material is roughly inversely proportional to its thickness—doubling the thickness halves the permeability.

DPIS Engineering, LLC
The Builder's Solution

May 02, 2014

To whom it may concern:

This is my second attempt to bring an alternative perspective to the recommendation below:

> "Crawl Space Air Barrier, Insulation and Moisture Control
> In addition to the requirements of Sections R402.1 and R402.2 of the 2012 IECC, a non-hygroscopic material air barrier and vapor retarder shall be applied over all surfaces of the insulation facing the crawlspace if the insulation does not effectively provide the same."

Moisture retarders are required by building codes, and above code programs (i.e. ENERGY STAR). The placement thereof has been thoroughly researched, and I believe it would be extremely dangerous for the City of Bellaire to bring forth regulations that are contrary to industry proven building methodologies.

The IRC / IECC and ENERGY STAR for Homes program required vapor barriers to be installed at the grade level of foundations / basements / crawlspaces. This is because moisture must be stopped at the ground level, or the degradation of building materials is inevitable.

In an effort to support the recommendations presented by the committee, as written above, one party posed this question, can you install vinyl wall paper on a wall? The answer to the question is, no, ENERGY STAR will not allow the installation of any material with ≤.1 perm rating (vinyl wall paper included) on the interior surface of exterior walls. This is because, the home would have redundant vapor retarders installed, which are known causes of: mold, mildew, wood rot, and building material degradation.

In light of this information, it is my recommendation that the building sub-committee refrain from prescriptively requiring certain building science measures be installed, which could ultimately decrease the effectiveness of the entire building system, but rather require each home to be inspected / tested / certified by a building science specialist during the course of construction.

Thank you,

Clayton Morris
V.P. of Energy Programs
DPIS Engineering, LLC
Residential Combination Inspector: 5247710-R5
Residential Energy Inspector/Plans Examiner: 5280560-79
RESNET Quality Assurance Designee-RTIN: 9200115
Green Building Residential Examiner: 5280560