



# MONTHLY

News and Views from the Connecticut Association of Home Inspectors, Inc.

July 2006

## Inside this Issue

President's Corner	2
July Speaker	2
WFSB Golf Tournament	2
Referrals	5
Speaker/Article Reward	6
Contact CAHI	6

## Water Vapor Diffusion

Submitted by Dwight W. Uffer, BSCE

We as Home Inspectors visit properties almost every week in which we find deterioration to the structure by wood decay and moisture damage. Our normal course is to report the damage to the prospective buyer or other interested party who has hired us to perform a building inspection. We do not, under normal conditions, get into the cause of the condition. However, we may state in our report what we feel is the proper cure. By explaining what should be done to cure a certain problem without also explaining or documenting the cause of the failure, what we have accomplished is to allow the failure to repeat itself.

A case in point happened about 10-12 years ago in a home in Hartford County, Connecticut and the homeowner shared his inspection report with me. The home inspector inspected the home for the prospective buyer. He had noted that the home had originally been constructed during the early 1940's as temporary housing, as was the entire neighborhood, for employees of a major defense contractor at that time.

The home had originally been constructed on a shallow foundation as the home was not intended to be a permanent structure. In the ensuing years different families had owned the home. During those times someone had excavated a basement and installed partial footings and concrete block retaining walls to stabilize the earth along the perimeter of the structure. The basement floor remained as earth and some water infusion was noted along the block walls which did not have tight mortar joints. The furnace was moved at some point from the first floor living area to the basement in order to afford the occupants more living space as this home was only about 700 square feet.

As the inspector was documenting his findings, he noted exterior paint failure, rotted window jambs and sills along with wood rot at the mud sills in certain areas of the basement. His recommendation to the potential owner was to scrape and paint the siding and trim, have the window sills and jambs repaired with an epoxy, and replace the mud sills with pressure-treated material. He also advised the buyer to have the earth floor covered with plastic sheet to retard moisture.

The inspector's client purchased the home and was diligent in following the recommendations of the inspector. He scraped and sanded the exterior of the home, primed the bare wood, and painted the siding and trim with two coats of quality paint. The windows were replaced with new windows that had a vinyl exterior cladding and the mud sills were replaced as needed with pressure-treated material. The basement floor was covered with two layers of plastic sheet.

After about 3-4 years, the paint was peeling off of the home worse than it had before it had been scraped and re-painted. Some of the new windows were showing signs of deterioration (condensation on the interior glass, soft wood under the cladding), and spotting of mildew was showing along the baseboards on the north side of the home.

The owner was not happy with what was occurring and decided to have vinyl siding installed over the existing wood shakes and encapsulate all of the trim with aluminum.

(continued on page 3)

## Meeting Dates

**Jul 26** *Bulkhead doors, proper installation, sealing & what to look for – Bilco Doors*

**August** **NO MEETING**

**Sep 26** *Hangers, brackets, plates & other connections – Simpson Strong Tie*

**Holiday Inn**  
**201 Washington Ave**  
**North Haven**  
**(203) 239-6700**

## President's Corner

Bernie Caliendo

**T**here comes a time when the leadership of our fine organization has to just say thanks for your continued support and dedication to CAHI. THANKS! As membership renewals are coming in, we ask that if you have not renewed your membership yet, please send in your dues to our Treasurer or simply use your credit card on our web to renew now.

We are under way to providing another great year of continuing education with top notch speakers from local and national companies. We are always trying to add more benefits to your membership and promote CAHI around the state. Our name recognition as a leading association of home inspectors will be continually promoted to help bring clients to our members' doorsteps. Our web is receiving hundreds and hundreds of hits each month with the majority being first-time visitors.

This fall we will be promoting our association at the Channel 3 Kids Camp Celebrity Golf Tournament and promoting CAHI throughout the real estate community. As a member, after you promote your own business, promote CAHI as well.

Another bus trip is being planned in October with more details and sign-up to come. Our Holiday Party is also in the planning stage with details to follow soon.

As 2007 approaches, licensing renewal will be upon us and there is no better time to make sure you have your required continuing education credits in place. We will be sponsoring another CT Law Seminar in the beginning of January, so plan ahead now.

We have an opening on CAHI's Board of Directors. If you are willing to give some time to the association and make a difference, please contact myself or any Board member with your interest.

As we head into the summer, keep in mind we have our regular monthly meeting on July 26<sup>th</sup> and no meeting in August.

Keep cool, stay busy, take a vacation with your family, stay safe and healthy, and enjoy the summer.

## WFSB Channel 3 Kids Camp

### 9th Annual Celebrity Golf Tournament

As we did last year, CAHI will again be a sponsor for this worthwhile charity golf tournament which raises funds for disadvantaged kids to spend some quality time at summer camp. The tournament is on September 9<sup>th</sup> at the Gillette Ridge Golf Club in Bloomfield, Connecticut. This is a very worthy cause and CAHI's name will be exposed to hundreds of players and sport fans from around Connecticut and surrounding states.

Our sponsorship entitles CAHI to 2 player slots in the tournament - **18 holes of golf, lunch, social hour, gourmet dinner and multiple prize raffle drawings.** In an effort to raise funds for the WFSB Channel 3 Kids Camp, CAHI is raffling off these 2 player slots.

**Raffle tickets are available for a donation of \$10.00 at the 7/26 meeting**

**OR**

Purchase your tickets via the mail.  
Send a check made payable to CAHI and mail it to:  
CAHI, P.O. Box 368, Windsor, CT 06095.

Please include your name, address and phone number.  
Your ticket stub will be mailed to you.  
Deadline for mail entry is July 20<sup>th</sup>.

2 winning tickets will be drawn at the conclusion of the July 26<sup>th</sup> meeting. Winners need not be present.

## July Keynote Speaker

**This month's meeting topic is **bulkhead doors.****

Our meeting will feature Bilco Bob from Bilco Doors. Bob will be giving us the ins and outs of bulkhead door installation, sealing, problems, defects and care.

2 hours of Continuing Education Credits

(continued from page 1)

About a year later, the owner noticed that the gable end vents and the siding were blackened with mildew and some of the windows had condensation on the inside of the home.

Deterred by what was happening to his home, along with the need to find a larger home for his growing family, he listed his home with a local real estate broker who advised him to have a home inspection performed as a marketing tool. I was contacted by the seller, who still had his original inspection report which was discussed in the above paragraphs along with an explanation of his restoration work.

The inspection was performed in May. The outside temperature was 68° F, humidity was about 40% and the weather was clear. I began my inspection on the exterior of the home and noted the mildew staining around the gable vents on both sides of the home. I also noted that the vinyl siding was covered with algae on the north exposure. There was no vegetation overhanging the home, nor was there any large shrubbery planted against the foundation. I inspected the exterior window jambs and sills and found that by putting pressure on the lower jamb with my finger, water would be evacuated from the splice in the vinyl cladding. From these observations, it was apparent that a moisture problem was occurring within the home and further analysis would be required.

We moved our inspection of the premises to the basement of the home which was accessible by a "Bilco" steel hatchway on the west side of the home. The first thing I noticed was that the headroom in the basement was about 5'10" and I am 6' tall. This was noted by my hitting my bald head on the header as I entered the basement. The air in the basement was thick, indicating high humidity levels. I took a humidity reading and found it to be in the range of 88% with the basement temperature being about 64° F. My next observation was that the insulation installed between the basement floor joists was wet and dripping water vapor in some areas, whereas in other areas of the basement it was completely dry.

I began to probe the floor joists and use my moisture meter to indicate what the moisture content of the wooden structural members was and also to map out the areas of higher moisture content. This procedure was also applied to the girder and to the mud sills. After documenting the areas of high moisture content, it was obvious that high levels of humidity were escaping the basement through the path of least resistance in the wall cavities and vacating through the attic gable vents. Other areas of the basement, the wood members, were soaking up the moisture and deterioration was occurring due to fungi. These areas were some of the same areas that had been repaired by using new pressure-treated sills and rim joists. What is required for "fungi" to grow and deteriorate wood? Moisture (high humidity), Temperature (40-100° F), Oxygen, and a Food Source (wood cellulose). If we removed any one of these components, we would stop the deterioration. We know that we can't remove the oxygen or the food source, as both of these components are needed. We can't drop the temperature below 40° F or the plumbing will freeze and it would be extremely uncomfortable in the home, nor can we afford to increase it to over 100° F. Keeping this in mind, the only component we can eliminate is the moisture (humidity).

We now have to look at the history of the home, and determine why, after standing for over 60 years, it has in the past 15 years begun to deteriorate. What has been done to the home that has contributed to its demise? For that we must document what changes have occurred to the structure in the past 15-20 years. The present owner can help us in this



(continued on page 4)

(continued from page 3)

matter, as he has owned the property for half of that time period and may know what occurred as far as any renovation that may have occurred in the past.

What we find is that the prior owner moved the furnace from the first floor to the basement area and installed metal duct work in the basement to supply heat to each of the 4 rooms on the first floor. Originally the furnace was in a closet and had one heating register and one return. The present owner also made the following improvements: (1) Bathroom was enlarged and renovated. (2) Kitchen was renovated. (3) New "Thermo Pane" windows were installed along with metal insulated doors. (4) New roof installed. (5) New natural gas hot water heater moved to the basement of the home. (6) Electrical service was upgraded to 100 amperes from 60 amperes and incorporation of circuit breakers. (7) Vinyl siding and trim.

What can be observed from these renovations and modifications to the original structure? The moving of the heating system (furnace) to the basement area increased the temperature of the basement as air leakage from the duct work was noted, and the natural convection of heat from the system along with the flue pipe would raise the temperature. Insulation was added to the exterior walls of the bathroom and kitchen when renovations were performed. Installation of high-efficiency windows and doors discouraged air movement. Installation of the gas hot water heater in the basement was another source of heat in the basement. To top it off, fiberglass insulation was installed in the basement between the floor joists.

## VAPOR DIFFUSION

Water vapor moves in and out of a building basically in three ways: with air currents, by heat transfer, and by diffusion through materials. Of these three, air movement is the dominant force because, like most fluids, air naturally moves from a high pressure area to a lower one by the easiest path possible. This is generally accomplished through any available hole or crevice in the building envelope. Moisture transfer by air currents is extremely rapid (in a range of several hundred cubic feet of air per minute) and amounts for more than 98% of all water vapor movement in building cavities. Thus it is very important that unintended paths that it may follow be carefully and permanently sealed. The other two driving forces are much slower processes and most building materials slow moisture diffusion to a large degree, although never stop it completely.

In decades past, buildings did not need to restrict the flow of airborne moisture, since when the building cavities got wet they also generally dried quickly due to

the leaky construction methods that allowed air to move freely through the building envelope. So the water vapor movement really didn't matter much until the introduction of thermal insulation. When insulation is added, the temperature of the water vapor can drop very quickly since its being isolated from the heat of the building (Winter) or from the outdoors in the summer if the building is air conditioned.

Whether from indoor or outdoor, airborne water vapor entering the envelope of the building through holes around plumbing pipes, ductwork, wiring and electrical outlets are some of the less obvious, yet important, points where air can move in and out of the thermal envelope. During the winter, any warm air entering the walls from the house cools and condenses its water vapor inside the building cavities and the wood decay process begins.

The law of physics governs how moist air reacts within various temperature conditions. This behavior is technically referred to as "psychrometrics." A psychrometric chart is used by professionals to determine at what temperature and moisture concentration water vapor begins to condense. This is called "dew point." By understanding how to find dew point, you will better understand how to explain how to avoid moisture problems within your client's home or building. (*US Dept. of Energy May 1999*)

What can be observed in our inspection is that warm moist air is being drawn up into the wall cavities and other voids in the exterior of the home, and the water vapor is condensing when it is slowed down by the thermal insulation in the wall cavities. In areas in which there is no insulation, the moist air rapidly rises and is expelled through the gable vents and other openings. Where the owner had renovated the bathroom and kitchen is the area in which damage to the sills occurred and also the area in which the clad windows were found to be deteriorated. Wood decay was not observed in areas in which this older home had not been insulated.

In order to confirm these findings as well as to rectify a warranty claim made to the window manufacturer, the owner of the home volunteered to remove two of the windows in his home for us to evaluate. This was conducted by myself and a field representative from "Anderson Window and Door Corporation." We decided to remove one of the deteriorated windows at the north side of the home and one from the south side (weather side). The deteriorated window was removed and it was immediately noted that the lower jamb on both sides of

(continued on page 5)

(continued from page 4)

the window was rotted along with the right and left corners of the pine sill. We removed sections of the cladding along the lower jambs and sill and found additional deterioration. We also found evidence of mold and mildew along the paper of the interior sheetrock wall. We then removed the window on the south side of the home and found that the window was in perfect condition. The wall matrix at the south side was wallboard and plaster and was also in good condition.

The windows that were deteriorated did not fall into the category of being defective and the report was written that the cause of deterioration was due to high humidity levels in the home and poor ventilation. (The representative did replace the windows as part of a technical evaluation that would be used in their training program.)

I believe that the lesson learned in inspecting a home with indications of numerous areas of wood decay or other abnormal problems would be to have a company or individual with the proper credentials assess the cause of the problem before we suggest a cure that may not work. It takes a lot of time, proper instrumentation and experience to properly assess problems that occur within the building infra-structure. These are referred to as "Forensic Building Inspections" and should not be a part of a normal home inspection.

Articles published in the CAHI Monthly are the sole opinion of the author. CAHI does not endorse or state a position for or against the content of said articles.

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## Referrals – Good or Bad Idea

By Bernie Caliendo

When an issue of concern is identified during an inspection, your recommendation should only be to refer your client to the appropriate type of contractor or expert. Advise your client to do their homework in regards to finding a qualified, licensed/registered, and insured contractor or expert. It is advisable that you do not recommend a specific contractor or firm. Don't forget that any relationship you have with a particular contractor or expert who you refer could create a conflict or damage your reputation when situations, out of your control, go south with your client and the person or company you recommended. Let alone something gets legal and you become a part of it for being a nice guy. Agents always have a list of contractors, let them do the specific recommendation of who to use. This is not something you are required to do, and something you should shy away from. You are not doing a disservice to your client by not making specific recommendations to a particular contractor or tradesperson. You're making a wise business decision.

Having been a contractor for over 20 years, I used a few licensed sub-contractors from various trades. I had my favorites and enjoyed a good working relationship with them, strictly in a professional, business manner. Also I knew who my competition was in my fields of expertise and the degree of quality they produced or lack there of. Now that I am no longer doing any contracting, I will not refer any of my former competitors (much of the work I saw was below my standards of quality and rumors I'd heard didn't bode well for their reputation), and I abstain from giving any referrals of former subs since I no longer work with them. It's just not good business savvy to refer anyone.

The best recommendation you should make is that any and all recommendations for further inspecting, evaluating and/or work to be done, be done by qualified, licensed, insured and registered contractors. Advise them that any and all required permits, CO's and inspections by local town building officials be obtained. Registered and licensed contractors can obtain permits and other required documents, but it is the ultimate responsibility of the homeowner that these requirements are followed.

Let your clients know that contractors in Connecticut are required to use a written contract which should include: names and addresses of all parties involved, registration or license number, total price along with any down payment and payment schedule, description of work to be done (and it helps if it states what type/quality of materials to be used), start and completion dates are required and most importantly a "3-day-right-to-cancel" clause with appropriate contact information where written cancellation notice must be sent. In Connecticut, Saturday is considered a business day. Any cancellation notice executed in the 3 business days reserves the customers right that any deposit given to the contractor

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be returned in full by the contractor. If said contractor is hired, any work order changes by contractor or client should always be in writing including any reduction or increase in cost.

Let your client know that home improvement contractors are only registered in Connecticut and are not required to have any formal training, continuing education, insurance or pass any exams. A registered contractor could be anyone who installs wallpaper to someone who could construct an addition on your house, and everyone in between. They should ask for references from any potential contractor, call their references and ask the questions they need to know in order to make an informed decision. Contact the DCP to see if the contractor is registered and if any complaints have been filed. Get more than one quote and don't chase a contractor if they don't return your call before you hire them. Imagine what it will be like once they have your money and fail to show up to perform the work. Recommendations like these are far more beneficial to your client than any contractor's name.



**Guest Speaker  
or  
Newsletter Article**

CAHI will pay \$25.00 to any member who provides us with a guest speaker for one of our monthly meetings or for any article that is submitted and used in the monthly newsletter.

Your guest speaker's name and contact number should be given to Woody Dawson (203) 272-7400 or Barry Small (860) 655-6383 (barrysmall@yahoo.com).

Articles must be e-mailed to Rich Kobylenski (rkoblenski023@earthlink.net) and should be a PDF or Word document. Articles should pertain to our industry.

We will review articles for content and reserve the right to edit, use and/or refuse them.

**Contact CAHI**

18 Garden Place  
Derby, CT 06418

E-mail: [ctinspect@yahoo.com](mailto:ctinspect@yahoo.com)  
Web: [www.ctinspect.com](http://www.ctinspect.com)

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Publications  
[Artemis13@bigfoot.com](mailto:Artemis13@bigfoot.com)

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The Licensing Board meetings are held at 9:30 am, Department of Consumer Protection, Room 117, 165 Capitol Avenue, Hartford.

*The public is always welcome.*

E-mail Bernie Caliendo for the latest meeting schedule at [bsurehomeinspect@juno.com](mailto:bsurehomeinspect@juno.com)