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A BI-MONTHLY NEWSLETTER FOCUSING ON CONSTRUCTION QUALITY

LET'S TALK ABOUT... COMFORT

IF YOU ASKED HOMEOWNERS TO TALK ABOUT LOADS, ENVELOPE PERFORMANCE OR SYSTEM SIZING, THEY'D LIKELY IGNORE YOU OR CHANGE THE SUBJECT. BUT, ASK THEM WHETHER THEIR TOES ARE COLD WHEN THEY WATCH TV IN THE DEN, OR IF THEIR FIRST FLOOR IS COLD AND CLAMMY, AND YOU'RE LIKELY TO GET A FAR MORE ANIMATED RESPONSE.

Thermal comfort is subjective—one of us may like it warm in the evening, another cold. But in the design and construction of your homes, the goal is not to create the same definition of comfort for every homeowner; it's to provide a system that allows a degree of unparalleled environmental control.

Five major elements need to be addressed to provide an environment that will maintain thermal comfort: the thermal load on the building, the equipment sizing, the distribution system design, system installation, and system commissioning. The first three components require deliberate design and engineering. While larger heating and cooling equipment can overcome a multitude of sins committed in the design and construction of the house and the distributions system, simply throwing more horsepower at the problem adds expense and wastes energy, and it may also affect the ability of the cooling system to dehumidify.

Load

You can manage the thermal loads through improved envelope construction. Think of the building envelope as the primary factor that isolates the occupant from the exterior environment. In the same way that a well insulated, airtight coat keeps you comfortable on a cold day, a high performance building envelope can significantly mitigate the impact of extreme summer and winter climates on the home's occupants. Different strategies should be used for different climate zones, but regardless of where you build, a better envelope that controls the thermal loads significantly improves the comfort conditions in the house.

Sizing

Properly sized heating and cooling equipment contributes to comfort in several ways. The closer the heating and cooling equipment is sized to the load, the more frequently it will run, which helps to mix the air in the house, usually providing for more uniform temperatures. A properly sized air conditioner will run longer, reducing the indoor coil temperature and removing moisture from the air. The longer it runs, the drier the air becomes, and comfort can be achieved at higher indoor temperatures. If an air conditioner is oversized, it will reach the space temperature desired by the occupant in a very short time, creating cold air with a great deal of moisture. If taken to extreme conditions, this can result in a cold, clammy house. Properly sized equipment with longer run times also operates more efficiently, much in the way a car gets better gas mileage running at a steady 55 miles per hour rather than in stop-and-start traffic.

(Continued on page 2.)

THERMAL COMFORT

Thermal comfort, as opposed to visual or acoustic (entirely different cans of worms) is not simply a matter of temperature—it's a matter of perceived temperature, which is a combination of actual air temperature, radiant temperature of surrounding surfaces, relative humidity, the movement of air, clothing, and activity. For example, fast moving air across the skin enhances evaporation and convective heat transfer, making you feel cooler than the actual air temperature. Higher relative humidity slows down the rate of evaporation from your skin, and makes you feel warmer.

COMFORT
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Distribution System Design
Another factor that impacts comfort is the distribution system. In a forced-air system, a well-designed combination of ductwork and registers delivers designed quantities of air and mixes it well with room air, without creating drafts. Improving the envelope reduces the amount of air each room needs, allowing you to run fewer, smaller ducts to each room. A properly sized distribution system will deliver the appropriate quantity of air to each space based on the thermal loads imposed on it, which helps to reduce temperature swings. It is important that registers are selected and placed to ensure mixing with room air to minimize temperature stratification and the possibility of the occupant feeling the airflow from the register.

Installation
If quality control is not taken seriously during construction, all of the design and engineering effort that went before is worthless. Defects can arise from faulty insulation installation, inadequate airsealing, or the wrong window being delivered and installed. If the distribution system is not tightly sealed with mastic, air does not get to the space it was intended for. Your trades should be explicitly aware of the construction and installation details, and a program should be in place for the site supervisors to be continually reviewing the trades' work to verify that comfort related systems are correctly installed.

Commissioning
Commissioning steps should be taken to verify that your trades have given you what you paid for. Visual inspections of insulation are critical, as is a blower door test for measuring the air leakage of the thermal envelope. The duct system can also be tested for airtightness, the heating and air conditioning system should have the total and room airflows measured, and system refrigerant charge should be verified prior to authorizing final payment to your subs.

So, reduce the load, size correctly, deliver efficiently, build it right, and make sure it actually works, and you'll have a greater chance of delivering a system that provides thermal comfort for homeowners.

Quality in your Competitive Advantage

It's no secret that having a competitive advantage in your market can lead to additional sales and an enhanced reputation. But, creating a clear competitive advantage isn't just about satisfying the needs of your customers—it's about creating intangible value they can't find anywhere else. This value is created through the quality of your relationships and the effectiveness of your business processes.

Competitive advantage involves two broad areas: sticks and bricks, or the tangible aspects of home buying, and the intangibles. This intangible side includes relationships with the homeowner, employees and trades/suppliers as well as the effectiveness of the builder's strategies, systems and processes.

Differentiation: Why Buy From You? There are three general categories of the home buying process that influence the buying decision: Expected Basics; More is Better; and Above and Beyond.

Expected Basics: A prospective homeowner doesn't consciously think about these basics—until something is wrong! The wrong lighting fixture, a leaky basement, incomplete issues at closing, and lack of timely information are all examples. The builder gets no credit if these things are done right; they are only detrimental if missing or done wrong.

More is Better: These items are anticipated by homeowners through advertisements, marketing, and real estate agents. More square footage and standard options, additional landscaping, financial incentives, energy performance promises, and accessible sales/construction staff are examples. These items are top-of-mind for homebuyers, with tangibles easily replicated by competition.

Above and Beyond: Satisfying Expected Basics and More is Better will achieve good levels of customer satisfaction, but if a builder is going to truly gain competitive advantage, he's got to wow, amaze, delight, and go literally Above and Beyond the homeowner's expectations. It's in this area that a builder can achieve an unparalleled competitive advantage, taking strides that will be difficult to mimic by competitors. This includes service beyond warranty, additional buyer walks/orientations, lower maintenance, closing gifts, and excellent relationships with sales/construction/warranty staff.

Which area is easiest for competitors to copy? Anything tangible, even documents like a homeowners's manual, can be copied. But the people, process, and communications that make a builder excel in homeowner relationships are impossible to replicate without the right culture. It's the intangible things that, when done well, can create a lasting relationship with homeowners that will result in additional sales, referrals, and an enhanced builder reputation.

One highly successful national builder we've worked with explains, "Many times I've observed two of our communities with a different emphasis. One focused totally on the quality of the home itself, the other in building a good home but with an active intent from all functions on building quality relationships. The community that built a good home but intended and actively developed quality relationships would consistently receive survey scores up to 20 points higher than the community that put its sole focus on the sticks and bricks." This builder ought to know something about competitive advantage because his operating unit is nationally among the highest of his peers in profitability and customer surveys. His operation has received the highly coveted J.D. Powers award two years running.

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consider the CRAWLSPACE

BEST PRACTICES

Though homeowners rarely think about that small space under their houses, builders should give crawlspaces careful consideration. Some of the most common—and damaging—building problems stem from moisture in crawlspaces. Poorly constructed crawlspaces can contribute to mold problems, indoor air problems, and inefficient operation of the home's mechanical equipment. Carefully considering design and construction of crawlspaces, as part of an overall quality construction strategy, can reduce problems for both builders and homeowners.

Preventing Moist Crawlspaces. Moist crawlspaces can contribute to rot, mold, and fungus growth, which can damage wood floor joists and beams. Furthermore, moisture in crawlspaces can lead to health problems associated with mold, mildew, and bacterial growth. A carefully engineered moisture management strategy should be implemented to control moisture in crawlspaces. These key preventative steps are part of such a strategy:

- Install a continuous and sealed high quality 6 mil polyethylene vapor retarder on the ground in the crawlspace and protect it with a concrete scratch coat.
- Mimimize moisture during the construction process.
- Create an external sloping grade so that rain water flows away from the crawlspace.
- Install a foundation wall system that does not leak.
- Install rain gutters, extensions, and leaders to carry excess water away from the home.
- Provide a capillary break on top of footer.
- Install a footing drainage system to prevent rising groundwater from flooding the crawlspace.
- Bring conditioned air into the crawlspace.
- Insulate the exterior surface of the crawlspace wall.
- Seal the crawlspace against air leakage.

Benefits of Unvented Crawlspaces. Crawlspace vents effectively become the "determined hole" in a home. In winter, warm air exiting the attic or ceiling creates a negative pressure at the lowest openings in the home. This negative pressure causes cold air to enter through the crawlspace vents and rise through holes in the subfloor to the first floor. This phenomenon creates the "cold floor syndrome" prevalent in cold climate homes with vented crawlspaces. The cold air can also carry unwanted moisture and gases from the soil, and odors from the crawlspace into the home.

Typically, the floor above a vented crawlspace is insulated. In unvented crawlspaces, the walls, instead of the floor, should be insulated to limit heat transfer from outside to inside the crawlspace, and vice versa. When properly built, an unvented, insulated crawlspace helps to eliminate problems with comfort, odor, and health associated with mold, mildew, and bacterial growth.

However, unvented crawlspaces aren't recommended in certain locations. For example, a warm crawlspace in an extremely cold climate may eventually melt the perma-frost beneath the home, allowing the home to sink into the ground. Also, when homes are built in high water table areas (near rivers at the bottom of steep valleys, for example), it can be useful to seasonally vent the crawlspace to allow for drying after flooding.

Conditioning the Crawlspace. Once the crawlspace is insulated and unvented, it should be treated the same way as any other space in the house—supplied with a certain amount of heated or cooled air from the mechanical system. Conditioning the crawlspace can help the mechanical components that are housed in the crawlspace(the air handler, ductwork for the first floor zone, and plumbing line, for example) operate more efficiently and last longer because they are not subject to temperature and humidity extremes. Ideally, the crawlspace temperature should be about 55°F to 65°F year-round. All ducts should be well sealed with mastic to prevent unwanted air leakage. This air leakage increases energy consumption because the outside air has to be heated in the winter and cooled in the summer.

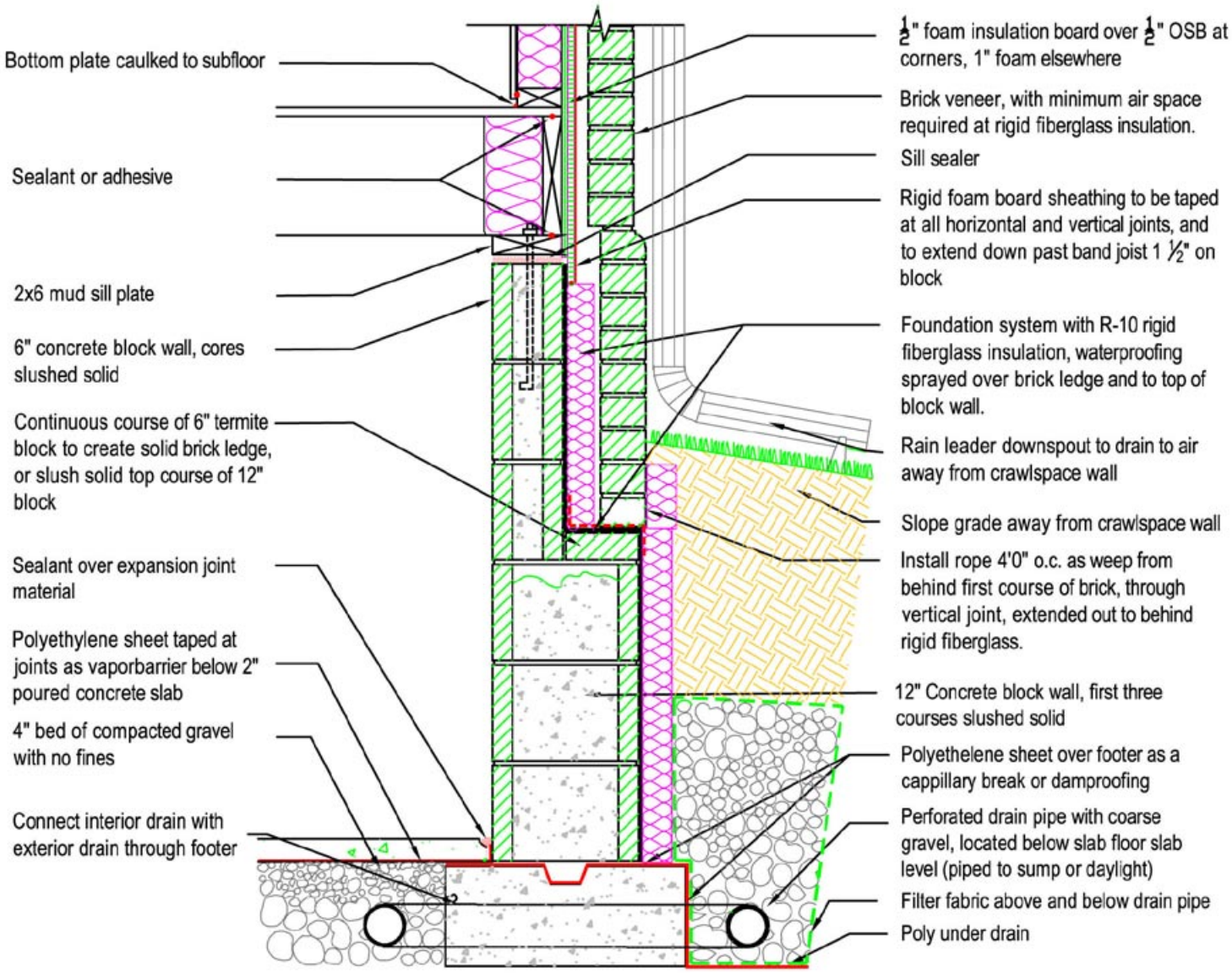
THE BOTTOM LINE

Will these improvements increase construction costs? Probably not. You can save money when replacing under-floor insulation with wall insulation, because the square footage of crawlspace walls is typically significantly less than the square footage of the first floor. The required insulation R-value is generally lower for crawlspace walls than what is required for floors. Treating the crawlspace as an unvented conditioned space also eliminates the cost of insulating ductwork and water lines.

While this type of approach may not currently be allowed by the letter of the code in many areas, the 2000 International Building Code allows unvented conditioned crawlspaces (see section 1202.3.2, # 4). Many builders have gotten permission by showing their code officials that what they are proposing isn't actually a crawlspace—it is just a really short basement!

NON-VENTED

Crawlspace Foundation System



THIS DETAIL SHOWS THE BEST PRACTICE FOR NONVENTED CRAWLSPACE FOUNDATION SYSTEMS.

BUILDING FOR PERFORMANCE

A HOME'S PERFORMANCE IN TERMS OF OCCUPANT HEALTH AND SAFETY, DURABILITY, COMFORT, AND EFFICIENCY DIRECTLY INFLUENCES HOMEOWNER SATISFACTION, AS WELL AS HOMEBUILDER PROFITABILITY AND GROWTH POTENTIAL.

What is it?

Building performance describes everything a building should do. Examples of performance issues and problems include everything from drywall cracks and leaky roofs to mold growth and erratic utility costs.

Why care?

Homebuyers invest a considerable amount of money and energy into building a new home. They have definite expectations about how quickly the home should be built, and how it should perform now and in the future. Homes that don't perform to customer expectations adversely affect the homebuilder by causing problems, including:

- Increased re-work during construction
- Increased service and warranty claims
- Lower customer satisfaction, which leads to fewer referrals
- Damage to the builder's reputation
- Increased possibility for lawsuits

In the short-term, building performance issues reduce the homebuilder's profitability on homes that are under construction or covered under warranty. In the long-term, performance issues hurt the homebuilder's chances for retaining customers and gaining new ones.

In spite of improvements in materials and technology, the number and severity of building performance issues is increasing because of new challenges in the industry.

The definition of performance remains the same; however, new challenges abound. The homes of yesterday were often drafty, too hot in the summer, too cold in the winter, and leaky. Construction materials and technology have greatly improved, enabling homes to be built that meet homeowner expectations for safety, health, durability, comfort, and affordability. Despite these improvements, building performance issues are increasing because of the combined impact of increasingly complex home designs, new construction materials, increased use of specialty contractors, and the general lack of understanding the industry has about how the materials work together.

Increasingly complex home designs and new construction materials. Driven by homebuyer demand, the complexity of home design is increasing. More intricate floor plans, multifaceted rooflines, two-story interior spaces, and other features are becoming more popular. Construction materials and methods have changed drastically, too. Changes in building codes, improved manufacturing capabilities, greater emphasis on labor efficiencies, demand for less expensive materials, and shrinking availability of natural resources have driven these changes. These new design requirements and new materials create new construction challenges for homebuilders.

What to do?

To reduce the number of building performance issues we're experiencing today, homebuilders need to more fully understand the new technologies available and the challenges that come with them. Then, focus on the environmental forces that impact a home—gravity, wind, water, air, heat, and occupants—and begin thinking of the home as a system that needs to respond to and withstand these forces. (For more information, see Sidebar.)

Information and education are the keys. The benefit is better-performing homes that are less expensive for the homebuilder to service and warranty, and less expensive for the customer to maintain, operate, and live in long-term.

FYI: This article was excerpted from the Building for Performance online course, published by BuildIQ, an online training company providing education in best practices to builders around the nation. For information, send mail to "info@buildiq.com".

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FORCES

Gravity

To control effects from gravity, the home's floors and roof must be sturdy enough to support all loads and transfer them to the walls and foundation. Using the right amount of framing is important. Overall building performance is higher when a home has just the right amount of framing to support the loads, but is not over-framed.

Water

Water can cause some of the most common and most expensive building performance issues, including structural damage to foundations and framing members, and toxic mold growth. Minimize the areas of the home that get wet by providing foundation drainage, creating capillary breaks between porous materials, sealing air leaks in the building envelope, creating an effective drainage plane, and managing water vapor diffusion.

Heat

A goal of good home design and construction is to minimize the amount of heat that transfers through the building envelope. Uncontrolled heat gain and loss is a performance issue that makes the inside environment uncomfortable and results in high heating and cooling costs.

Use construction materials with a relatively high R-value that are difficult for heat to move through. Focus on insulation in wall cavities and the windows. Ensure insulation material is just solid enough to limit convection, but not solid enough to encourage conduction. Consider orientation of the home and window position and sizes.

More information on wind, gravity, and occupant impact on home performance can be found in BuildIQ's online course...

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ABOUT US:

Since 1991, IBACOS has worked in the field to enable builders to consistently design and build homes to higher standards of performance, and in the lab to define and develop the process and system technologies to achieve this goal. We provide the tools and resources necessary to build better homes. For more information on our services or research initiatives, contact our Marketing Director, Stacy Hunt, at 412.325.1523 or shunt@ibacos.com.

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DON'T LET MOLD LITIGATION GROW ON YOUR BUSINESS

The prospect of mold and mildew growing in homes constructed by builders presents an inviting target for plaintiffs' class action attorneys and others with special interest agendas. This is a financial risk, as well as a risk to a builder's reputation that must be intelligently managed at multiple levels, including:

1. **Identifying and following best design and construction practices for moisture management; effectively communicating your design and quality objectives to your field staff; and providing training programs as necessary to reinforce the importance of this issue**
2. **Closely managing supplier and trade contractor relationships to ensure communication of your design and quality expectations, and drafting contracts which define their responsibilities and your expectations, and which include appropriate warranty and indemnification provisions**
3. **Managing customer relationships so that buyers have realistic expectations, understand their maintenance responsibilities, and have meaningful, but appropriately qualified, warranties**
4. **Identifying and resolving problems proactively to create goodwill and to identify patterns reflecting possible high exposure problems**
5. **Reviewing the adequacy of your insurance coverage, and, where appropriate, spreading risk to supplier and trade contractor insurers**
6. **Reviewing how you document the quality control process, procedures, and inspections both in design and in the field.**

There are no guarantees to prevent a lawsuit. Yesterday it was exterior insulation and finish systems. Today the problem is mold and mildew. Tomorrow it will undoubtedly be something else. But consistently using best practices and implementing an effective quality control system will result in fewer, isolated problems and less likelihood of exposing your company to undue risk and the hassles associated with defending against litigation.

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