EE11-1 THE INHERENT RISK OF GOING GREEN

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Abstract

Whether the pursuit of green homebuilding is market or regulatory-driven, changes need to be made to building processes and practices. However, with these changes comes a heightened and unknown amount of risk for builders. The risk can be present in many different forms and at different phases of the building process. Common concerns builders have included: Do green buildings come with a greater potential for building failures related to moisture and mold? Do "green" homeowners have higher expectations? Can our trade base rise to the challenge of advanced, integrated technologies? Will our trades require additional training? What is "green," and what is "green washing"? How much energy efficient is sufficient? These are valid questions that present significant challenges to builders pursuing green building. The days of fast and easy homebuilding are drawing to a close. A new level of QA/QC, documentation, testing, and commissioning will be required to build tomorrow's homes. The entire industry must come to terms with this necessary transition.

INTRODUCTION: THE HISTORY BEHIND THE CHALLENGES

Following World War II, the U.S. was rich in resources and cheap labor. Homebuilders thrived on fulfilling the American dream of homeownership at a frenzied pace. This period saw the birth of the production builder who could line up homes on a street like cars on an assembly line; speed and affordability were the driving force. Materials were so cheap that dumpsters full of leftover and miss-cut material were disposed of without thinking twice. Energy was so cheap that few paid any mind to what it cost to heat their homes.

The oil embargo of the 1970's was a wake-up call. Car manufacturers were suddenly on the hook to deploy fuel-efficient automobiles, and builders were faced with a similar demand. In a country where the term "building performance" was rarely heard, people were suddenly packing their walls with insulation and hanging plastic vapor barriers everywhere. While homes seemed to be using less energy, they were quickly and frequently falling prey to moisture damage and their occupants were becoming familiar with another new term: "sick building syndrome."

The U.S. has come a long way since then; or, has it? It has now been over 30 years since the "high performance" homebuilding movement began. How much have we really learned about moisture management, thermal performance, and ventilation? Do average builders today know the actual thermal resistance of a wall assembly? Can they explain the perm rating of each layer of a wall assembly and where in that assembly condensation is likely to occur under a given

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climatic condition? Some can, but most cannot. Nevertheless, the thrust to become a high performance builder is gaining momentum. The term "green" is permeating every industry, not just the homebuilding industry.

Nowadays, many builders are anxious to climb on board to become a part of the green movement. Personally, I have seen some builders claim to be green just because they added a programmable thermostat and flow restrictors to their faucets. It is clear that the very act of defining what it means to be green is a challenge in itself. What is the benchmark of comparison? If the benchmark is a cave with a fire pit, any home today could claim to be "high performance."

The most significant aspect of a green home is not what it is made of but how it performs. Even if a home is built out of recycled bottles and tires, it cannot claim to be green if it does not deliver a comfortable, healthy, and durable shelter with a significant reduction in energy usage. Home performance can be broken down into three categories: energy performance, building durability, and indoor air quality. And as for how green to go? The short answer is for builders to go as far as they can afford and the market can respond to.

Building to the highest level of performance within market viability is a significant challenge for every builder, but pushing toward high performance without thoroughly and strategically thinking through the process can be disastrous. Thirty years ago, the homebuilding industry learned that by simply adding insulation to a home, we could slow the flow of heat. Inadvertently, we also learned that we could reduce the drying potential of a wall to the point that it stayed wet and fell apart. And the lessons have just begun. The more we press in the direction of high performance, the greater finesse we will require to fully understand the dynamics of "systems approach building." That is another new term that has evolved out of the past several decades, along with "systems integration." Both terms are somewhat uncomfortable for many builders. The bottom line of cost may not be as great a hindrance as fear of the unknown when it comes to making the transition to becoming a green builder.

This paper is not intended to answer every question about how to achieve systems integration or how to become the greenest builder in town. Rather, it addresses how a builder can avoid repeating the mistakes made in the 70's and by thousands of builders since. It also addresses the steps a builder can take to transition from a conventional builder into a green or high performance builder without creating future disasters. From here on out, we will use the terms "green" and "high performance" synonymously.

We will also look at some of the traditional operational methods employed by builders today, especially those that that need to be addressed in order to transition to high-quality, high performance homes. The term "high quality" is particularly important to note here. While it is possible to build a high-quality home that is not a high performance home, it is not possible to build a high performance home that is not a high-quality home. There are many traditional

methodologies that have become entrenched in the homebuilding industry that must be identified and rooted out (or at least controlled) to make the transition successful.

It is hard to argue with the idea that the more sophisticated a home becomes, the finer tuning it will require. This principle holds true at every level of building systems and performance. There must be some kind of quality management system in place to govern everything from the design process to the delivery of the home. So, next we will look at some traditional models and identify the changes that need to be made.

INITIAL DESIGN

Every architect is taught the philosophy "form follows function," but the average U.S. homebuyer tends to put form first. Trends in marketing homes have emphasized fit and finish over function and performance. Builders have tried to meet consumer demand to provide more square footage per dollar and more architectural features that do nothing for actual functionality. The mechanical features that make a home perform have seemed to become an afterthought of the design process. Try to imagine the auto industry designing a car that has the looks and comfort features buyers want and then trying to figure out where to put the engine. The U.S. is blanketed with suburbs today that are filled with homes that look nice but perform poorly.

Breaking this pattern implies that a builder must ignore what the consumer demands in order to return to the art of intelligent home design. It is true that the market will not respond to high performance homes without the form it has become accustomed to. Part of the answer is in educating the consumer; part of it is in finding a happy union between function and form and doing so affordably. In response to the oil embargo, U.S. auto manufacturers were hard pressed to develop cars that could match the fuel efficiency of import manufacturers. The result was the Pinto, the Chevette, and the Mustang II (to name a few)—all small cars with gutless engines.

In spite of our love affair with the SUV and the Ford 350 Super Duty as suburban commuters, the auto industry has learned to build cars that get better fuel efficiency than the '76 Pinto while delivering higher performance than a '72 GTO. While the auto industry is often berated for our addiction to foreign oil because it did not pursue hybrids 20 years earlier, the homes we live in are far more wasteful than the cars we drive. Home design must follow the example of the auto industry and return to form that follows function. The design should be built around the home's systems, which should function as the heart and soul of the structure.

The design community that is servicing builders has, for the most part, abdicated responsibility for overall design integration of the systems and key details associated with building performance to the trades and the builder to be worked out during purchasing and construction. Designers and builders need to understand the integrated design process and their role within it during the early design phases to accomplish the highest levels of performance at the lowest overall costs.

PLAN DETAILS

All too often, plan details are inaccurate or missing entirely from residential house plans. The thinking seems to be that "the trades know how to do the installation; this is not rocket science after all" (or commercial construction, for that matter). Sometimes, plan details are taken from collective libraries because they come close to representing a building assembly. It is not uncommon to see a row of homes built from the same plans with subtle variations in their complex frame assemblies because the plans lacked accurate detail and decisions were being rethought every time a new home was built. Some like to call this work semi-custom! While this issue may not seem too serious for architectural details, it happens very frequently with concealed assemblies as well. Often, variations to concealed assemblies can affect how the ducts should be installed and the continuity of the building envelope.

Successfully building a project on paper is the key to building it correctly onsite. Good plan details should clearly show all of the details. For example, a complex wall assembly in a high performance home may look something like the following (the layers are listed from inside to outside): 2 coats of latex paint; ½" drywall (taped and finished); 2x6 24" O.C. framing; 1" structural insulating sheathing, taped in accordance with the manufacturer's specifications; and 7/16" cementitious lap siding. The various issues in the assembly must also be addressed in the details. Examples of these potential issues include: window, door and penetration flashing; integration with the weather resistive barrier; the wall-to-roof interface; the air sealing details; and so on. Plan details should contain enough information that almost no decisions are left up to the trades.

OPTIMIZED VALUE ENGINEERING

A green home is first and foremost an energy efficient home. Secondly, it must be a material efficient home. These two necessities complement one another when it comes to the design of the building envelope. When a building envelope is designed to meet the necessary structural requirements without using excessive structural components, it leads to less waste, less labor, and more opportunity for installing insulation.

Years ago, I built affordable housing. One of my favorite plans generated a great deal of wasted lumber. I asked the architect why he designed a home with several bedrooms that were 12'-4" wide (and this dimension was perpendicular to the trusses), but he did not have an answer. Then, I asked him what width sheetrock came in. I could almost see the bulb light up over his head. In all his years as an architect, he had never really given thought to the efficient use of materials in a building's design. We ended up simply re-dimensioning the plan according to building material sizing, and the amount of waste dropped from the size of a dumpster to a wheel barrow. This is just one example of the Optimized Value Engineering (OVE) design process. By building homes

that are built according to standard material dimensions, builders can save money that can in turn be spent on high performance features.

OVE often comes too late in the design process, if it happens at all. To do OVE correctly, the initial plan layout has to take into consideration the building footprint, windows, doors, load points, and truss layout. Applying OVE framing to an existing plan can be done with some effectiveness but at the expense of the "O" in OVE. Traditionally, a lot of waste is built into a home's design.

Typically, builders will engage in some form of "value engineering" when the direct costs come in too high and they need to lower the cost of construction. In reality, the best time to initiate OVE is from the very beginning. The following is an example of some appropriate steps to take to design a building with OVE in mind:

1. The developer and/or builder should initiate design criteria that the architect and builder must adhere to. These criteria may involve the architectural style, price range, etc. At this point, the builder must choose the type of performance certification to strive to achieve. These days, there are several programs to choose from. Energy Star, LEED for Homes, and NAHB Green Builder are some of the national programs, and many states like Colorado, California and Texas have their own green builder programs. Nearly all embrace first and foremost the value of energy performance as a significant part of the scoring process. However, some programs do this better than others. The builder can also choose to launch their own certification label. Regardless of the choice, a specification standard must be established and a method of quality control and verification must accompany the standard.
2. The architect should create initial drawings that show the plan and elevations. At this point, it is important to address OVE issues that deal with footprint dimensions, floor joist and truss options, window and door placement, and HVAC and domestic hot water (placement/centralization and delivery). Sharing the initial design with the appropriate trades at this stage is necessary no matter whether they are all in the room at once or met with separately. The traditional mindset is that unless trades show up with tools, they are costing too much money. However, every dollar spent on proper planning has saved builders much more money down the road. I have yet to hear a builder complain about plans that are too well-drawn.
3. The architect should assimilate the feedback from the trades and incorporates it into the plans. The plans are now ready for a full-scale OVE session with all of the pertinent trades (and their smartest people, of course!). The key players at this initial OVE session are the architect; builder; builder's purchasing agent; senior site superintendent; structural engineer; joist, truss, and window providers; and framing, HVAC, plumbing, and electrical trades. Everyone should come with their most cost-effective strategies and ideas on how to modify the design so it functions better, is easier to build, and saves money. Also in attendance, the energy rater/building performance specialist is there to help ensure that all of the systems can

be integrated without conflict. For example, several years ago I encountered a home that had a gourmet style kitchen with a huge, dual fan commercial range hood. Twenty feet across the great room was an unsealed combustion gas fireplace. When both systems were operating, the range hood pulled the combustion fumes from the fireplace into the living space.

4. After the first OVE session, the HVAC trade should take a set of the preliminary drawings and perform basic load calculations to determine the equipment and duct sizing and to review the duct layout for space and distribution considerations. All too often, I have seen HVAC trades step into a newly framed model home and only then take their first crack at determining how to get conditioned air to all of the rooms!
5. The architect should assimilate the agreed upon recommendations. Afterward, the OVE session group should gather one final time. This second meeting is usually more productive than the first as the team has had time (no more than two weeks) to think through the first session and arrive at more ideas.
6. Final modifications should be made in accordance with the agreed upon changes.

Without question, these steps are somewhat simplified. Learning to run an effective OVE session with the numerous egos in the room is in itself a significant undertaking. I recommend choosing a strong facilitator who is able to orchestrate the meeting so everyone can be heard and everyone can respond. Otherwise, the experience will be more like corralling jack rabbits. Even a well-orchestrated OVE session can take half a day. It is important to always keep in mind that doing this work upfront will save builders money down the line. The more times a particular plan is built, the more money it will save.

A thorough job of OVE plan development will not totally eliminate the need for redlines as the first model is built but it will drastically reduce them. It should also answer many of the questions that come up when writing the material list for the project.

PURCHASING

The specifications and details established during the OVE sessions should take most of the headaches out of the purchasing process, especially since the purchasing agent was involved. The decisions regarding the best and most cost-effective materials and equipment to be installed have already been made. If the costs are too high once the list is complete, another “mini” OVE session can be held to trim the budget. The trimming should first focus on non-system items that can be changed or dropped. Non-system items include those that do not impact the performance of the building envelope and the mechanical systems. If more serious cuts must be made, the appropriate trade can be brought in to negotiate a better price or to identify changes that will not negatively impact the overall system performance. I have seen builders eliminate the weather-resistive barrier under lap siding because the local code jurisdiction accepted OSB as a drainage plane! This is an example of a cut that negatively affects the system performance of the building envelope.

I know of a builder who has an "open book" policy with all of their trades. The trades know what the builder is netting on a project, and the builder knows what the trades are netting on their pricing. Sounds crazy, right? It is a method of cooperation that gives everyone a sense of fairness. This is especially beneficial in a tough market condition, because people are willing to partner up and share the load when they feel there is an open, honest, and fair environment.

PLAN SETS

It is amazing how often I see "full" plan sets for homes that are missing critical elements like duct layouts and detail pages. Municipal building departments vary in what they mandate be in plans for the approval process. As with code compliance, many builders regard these mandates as the determining factor in what they provide to the trades; instead, they should view these mandates as the minimum amount of information, not the maximum. Let us face it--every page costs money. Just as with scopes of work, the expense of generating plans should be regarded as well spent. To successfully make the transition to high performance, builders need to get used to maintaining excellent documentation. Every trade should be able to find sufficient information in the plans to take out most of the guesswork in doing their part. Since decisions made in the field are largely out of the builder's control, it is essential to minimize their necessity.

SCOPES OF WORK

I have seen many examples of a builder's set of scopes. In most cases, they appear to have either been passed down through generations or downloaded from Scopes"R"Us.com. They are generic and fail to define what a builder really expects from its trade partners. Here is a critical inherent risk when going green! Generic, poorly defined scopes allow a builder to get by when the homes being built are standard fare. The trades simply do the work in the fashion they always have done it for every builder over the years, oftentimes resulting in a mediocre home that is leaky and inefficient. Thousands of homes have been constructed over the years that were prone to plenty of defects, but builders learned to acclimate their thinking to building problem homes that needed lots of warranty work to get the bugs out. It was simply part of their operating coast.

When a home is built to achieve a high standard of performance, it has a lower tolerance for many defects. A small water leak in a leaky and poorly insulated wall cavity often has an opportunity to dry out before the water does any real damage (at least during the first 10 years). In a high performance building envelope with elevated levels of insulation and air tightness, a small leak has much less opportunity to dry out and can cause serious damage, even in the first year. To clearly communicate installation specifications, the scopes need to be very specific (hence the word "specifications") about how things should be done.

Over the years, scopes of work have become tedious documents that trades feel as familiar with as the seat belt demonstration before an airplane takes off. The documents are typically signed, filed, and forgotten. However, well-designed scopes of work should be highly regarded as the primary source of information on how a builder's unique, high performance home should be built. They should include precise details that match the details provided in the house plans, even to the extent of having a copy of the graphic details from the plans. In some cases, isometric drawings can be added to highlight details that get lost in complex cutaway CAD images.

Scopes should be referenced frequently and even used as training tools for the builder's construction staff and the trade's field technicians. Builders should maintain them in a digital format that can be readily updated and sent to the trades by email. Some builders utilize an online service, such as Buzzsaw, to share plans, scopes, spec manuals, and other important documents with their trades. We are deep into the information age, so it is time to provide site superintendents with a web accessible computer in their construction trailers! Maverick "my way or the highway" superintendents must be willing to upgrade their thinking to high performance technology and methodology.

Scopes of work must be designed with thoroughness and care and treated as the guiding document in support of the building plans. They should be used as training and communication tools. Only then will they once again be effective documents serving a critical role in the building process. It is important not to underestimate the importance of excellent scopes of work when deciding to go green.

CONSTRUCTION

Over the last century, U.S. home construction has transitioned from the work of a handful of craftsmen to a production line involving hundreds of workers. To keep pace with demand, the home construction process evolved (or rather de-evolved) in several significant ways, leading to a decline in overall quality:

1. The transition of the homebuilder to becoming a home marketing company
2. The development of highly specialized trades that lacked an understanding of systems integration
3. The building code used as a standard rather than as a minimum acceptable practice
4. The wasteful and inappropriate use of building materials

The term "builder" in today's market is something of a misnomer. The builder of a home is in reality primarily a sales and marketing company with sufficient land development and project management capacity to deliver the product, in this case housing, to consumers. The actual design and construction is undertaken by subcontracted labor with the builder's staff

setting certain criteria but for the most part simply managing the work. I have met many site superintendents who were very good at scheduling and working with trades, yet they lacked a basic understanding of building performance. This presents a significant risk when it comes to building high performance homes.

In the conventional model, the builder abdicates much of the responsibility of setting quality standards to the trades. By abdicating responsibility, the builder is left with two options. The first is to accept the product that the trades offer based on industry standards. Unfortunately, the standards in the residential construction industry are loosely defined, and in many instances, are designed to protect the builder or trade against claims from the consumer, not to ensure a better performing home. As a result, design documents are created with just enough information to gain a building permit, the formal specifications are rarely written, the scopes of work let the trades define the level of performance that they will achieve, and simply passing code inspections is considered adequate enough.

TRAINING

If builders desire to achieve a higher level of performance, then they must accept much of the responsibility for assessing the current competency of the trades and help train them in the new methods, systems, materials, and techniques necessary to meet the new performance standards. Doing so could entail a significant resource drain on the builder, and in many cases, it is enough of an impediment to prevent builders from considering raising the performance standards of their homes.

Training trades is not a role the typical builder is equipped to tackle. Trades are already challenged to provide adequate training in an environment where employee turnover, communication barriers, and entrenched bad habits are common. Providing field mechanics is difficult enough, so equipping them with the knowledge to understand the dynamic interactions between various systems can seem out of range. Therefore, any builder who aggressively pursues high performance homebuilding must be prepared to support their trades through training.

Before builders can tackle training, they must first have the tools necessary to do the job. As mentioned earlier, the scopes of work can be designed to serve this need. Since the scopes should be designed with sufficient information to guide field staff through the unique specifications of the installations, they should also be sufficient enough to educate the trades as well.

Nowadays, there are also excellent resources available online to help educate the builder's field staff and trades. BuildIQ.com is an educational resource that can provide background information in building science and systems integration. A well-established energy rating

provider can also help with training. Imagine what it would be like as a builder to have the entire construction staff educated and empowered with a basic building performance background, to have people who can run construction schedules, as well as quickly identify potential performance defects on a home under construction. Add to this the image of trades that have a better understanding of how their installations affect other systems in the home and how to ensure they perform in harmony. Is this utopia? No, it has been done before, and for any builder who wants to excel in high performance home building, it must be done.

QUALITY STANDARDS

Quality standards vary greatly from one builder to the next; however, most builders tend to regard national building codes as the standard to achieve, rather than as a minimum acceptable performance level to surpass. So, builders have to impose a higher quality standard on their own.

For most builders, the market is the driving force behind determining what they build, but the public lacks the education to know what to look for in the way of home performance. Green builders must be prepared to reevaluate every standard that has become their benchmark. And going above and beyond does not always cost more money. For instance, two different insulation installation trades could insulate the same house plan for the same price. One company may have lax standards and leave voids and compressions in the wall cavities. The other company may have a better training program for its employees and complete a stellar installation. In many such cases, higher performance is achieved by simply holding trades accountable to the scopes of work they agree to comply with. The scopes of work should always be governed by a set of performance standards that a builder has created or adopted. Performance standards set the bar for the level of quality and performance every home should have. In different communities with different styles of homes, the scopes can vary based on the types of installations, but the standards that define how the installations should perform remain the same (or be periodically upgraded).

QUALITY CONTROL

As stated before, the quality of every installation becomes accentuated in high performance homes. These homes have less tolerance for defects; however, when done correctly, the result is a far more durable product than most conventional homes. This is because of the emphasis on controlling the elements--the flow of heat, air, and moisture. To ensure quality, builders must have more than a well-trained staff and trade base; they must have a quality control system in place. Builders can employ a third-party QA provider, but they are better off using the provider in a supplemental manner. An internal QA system will usually provide far greater contact time with the homes during construction than otherwise seen with a third-party provider.

An internal QA program does not place all of the responsibility on the site superintendent; rather, the load should be shared with every trade as well. The National Housing Quality (NHQ) Certification program promotes the use of "Job Ready" and "Job Complete" checklist forms. These are designed according to a builder's quality standards and scopes of work. A Job Ready form ensures that before a given trade begins to work on a project, all of the prerequisite criteria have been fulfilled and that trade is ready to take responsibility for the project. For example, any trade that installs a cladding on a home must first verify that all of the necessary openings and penetrations are installed correctly. Obviously, exceptions will occur for valid reasons, but the idea is to limit them as much as possible. While one could not expect drywall installers to adequately inspect all of the framing, rough mechanicals, plumbing, and electrical installations, they could verify that the Job Complete forms for all four trades have been approved as part of their Job Ready form. Job Complete forms are pretty self explanatory; the job is complete when the trade has fulfilled all of the requirements stated in the scope of work.

Using forms like these drive trades to do a better job of truly completing the task, instead of allowing loose ends to linger for a future date. When trades embrace the idea that a job must be completed and inspected to get paid, they tend to make sure they have everything on the truck to do the job. Fewer site visits mean less labor, so it is for their benefit, as well as the builder's. Getting a trade's buy-in on the mutual value of the idea is recommended. The fact that trades must have some form of accountability for their field staff is another selling point.

Keeping a close eye on a project is critical for every site superintendent. It amazing how often superintendents I have met only walk their projects to open up or lock up at the end of the day. When superintendents have adequate training on what to look for to identify construction defects and solid knowledge of the detailed scopes of work, their eyes become better trained at what to look for. Simply giving them a checklist of possible issues to watch out for can be more time consuming and limit their ability to keep an eye out for issues not on the list. Instead, if they can simply verify each Job Complete form with a visual inspection each day and keep their eyes open for other issues, superintendents will catch most potential defects.

I have received conflicting opinions on the use of gathering digital images of homes under construction. Nevertheless, I am a firm believer in good photograph documentation. Some feel that photos of issues can be used against them. But by the same token, photos can be used in builders' favors just as easily. Photos can verify that just because one home experienced a particular failure, that failure is not in all of the homes, and there are photos to prove it.

Digital photos are a fast way to capture a lot of data. A house file with lots of construction photos can provide useful information about assemblies that are covered up should an issue come up on a warranty claim. But mostly, they can be used to verify whether installations

were installed correctly. A little training is advised here, so photos of correct installations do not capture background information that may be detrimental.

Photos are also very useful in sharing defect issues to trade partners. I am a strong advocate of using email to communicate with trades. A photo attached to an email that describes a defect issue with an address of the home is very effective at getting their attention. When such photos are taken, I highly recommend that another photo be taken of the same assembly after the defect has been corrected.

THIRD PARTY ASSESSMENTS

My opinion regarding third-party, day-by-day inspections varies according to the size and circumstances of the builder. However, I think all builders should have periodic risk assessments. In a risk assessment, the inspection takes a very thorough snapshot of a day in the life of a builder's homes that are under construction. This snapshot is a valuable tool to evaluate the effectiveness of an internal QA program in striving for higher quality. This also gives builders a tool to measure their progress every six months. A good risk assessment should include a presentation and available training for staff and trades to help address any issues that were discovered.

THIRD PARTY ENERGY RATERS

All of the current programs today for high performance or green certification require the verification of a third-party energy rating provider. This verification is not only necessary to be certified, it is also a huge component in reducing the inherent risk of going green. A good energy rating provider can be extremely helpful in training staff and trades. The provider is another set of eyes on the project to watch out for potential issues related to energy use and comfort. The really good providers will also help with moisture management issues.

While many certification programs allow for either a prescriptive or performance path, most builders agree that it is better and more cost effective to follow a performance path. The prescriptive path simply models the home in a worst case setting and orientation and mandates that all of the components be installed to ensure the home passes the requirements, no matter the orientation. Raters are required only to test a certain percentage of the homes of a single plan type. With a performance path, every home is treated individually, and every home is inspected and tested for building air tightness and for some programs, duct tightness as well.

SUMMARY

Before builders decide to make the transition to becoming high performance homebuilder, they must first ask themselves: “Am I a high-quality homebuilder?” The great risk in going green is in trying to do so without having a quality managed process, where the focus is on ensuring a home is built correctly and to the highest standards. The nature of high performance homes is that they have a low tolerance for poor quality installations. Builders must take all of the steps necessary to ensure that a home design starts with function, not form. They must properly do the OVE work, keeping all of the key trades involved. Every specification and detail must be clearly defined and communicated to the trades and provide training support when needed. High expectations for quality must become the company mantra, and managing quality throughout the construction process must be carefully documented.

The big difference between a high quality, high performance builder and a standard quality builder is that the high performance builder goes through all of the pain in the beginning of the process and ends up with a product that delivers high satisfaction and a sense of pride. The latter type of builder suffers all of the pain after the home is closed and it is a pain that continues down the road.

The transition to a high performance builder must come from the highest level of the organization and be driven into the hearts and minds of every member of the company. It is crucial that everyone be onboard that it is time to change the way things are done, that it is time to create a new kind of product. As the transition period passes, the rewards are worth all of the pain. There are no promises that becoming a high quality, high performance builder will guarantee success in the market. We have all seen exceptional companies collapse during the recession. The rewards come from knowing a builder has provided a family with a high quality product that has a reduced environmental impact. It comes from knowing the family has a healthy, comfortable refuge to nurture their growth. It comes from knowing a builder has been instrumental in making a change in an industry that is long overdue.

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