An Expert Guide to Identifying Construction Defects

By Derek Hodgin, PE, RBEC, CCCA

DISCLAIMER

As licensed design professionals, we have a legal duty to design and construct buildings to meet minimum building code requirements. This article, however, attempts to highlight positions taken in the context of litigation where minor technical deviations from the code (which have little to no consequence on the overall performance and/or safety of the building) are used to minimize or expand repair scopes in order to influence the "value" of the case.

Construction litigation is based on the identification of construction defects. The value of a case is primarily based on the cost to repair the identified defects. The cost to repair the identified defects is directly related to the scope of repair prepared by the experts retained by each party. Construction experts are typically professional engineers (PEs), registered architects (RAs), or contractors who are knowledgeable about construction issues. The scope of repair should be based on the facts of the case (the extent that defects and/or damage has been identified) and the knowledge and experience of the expert. However, in many cases, there are extreme differences between parties about the needed repair scope and the associated costs. How can this be?

The differences primarily have to do with how a defect is defined and the inappropriate advocacy position that some experts are willing to adopt to satisfy their clients' desires. Since an expert should never be an advocate (for anything other than the truth), this article will focus on how to define a defect. Specifically, it will outline what constitutes a construction defect—and just as important—what does not.

WHAT DEFINES A DEFECT?

All construction projects include a set of published documents that are known as contractor instructions.[1] Even the smallest construction projects are governed by the applicable building codes that are enforced by the authority having jurisdiction (AHJ)—typically a local municipality. The building code applies to construction projects, even when a building permit is not required. The contractor instructions for larger projects can include plans, specifications, shop drawings, manufacturer instructions, and accepted industry standards, in addition to the applicable codes.

One position to take regarding construction defects is that anything that violates the published contractor instructions represents a defect. This is simply an unreasonable position that would require perfection as a construction standard. If this were the standard that defined a defect, there would be no building on the planet that would be safe from construction defect litigation. The more reasonable position is identifying a construction defect as one or more of the following conditions:

1. A building code violation
2. Physical damage
3. A life/safety issue

Of course, it is not quite that simple. For example, the building code is not perfect, and a technical violation of the code may or may not have any effect on the overall function of the building that would warrant a repair. Additionally, physical damage can be caused by a construction defect, but could also be related to a product defect and/or maintenance issue. Life/safety issues put a person's well-being at risk. These include inadequate guardrail attachment, incomplete fire-rated assemblies, and trip and fall hazards, among other things. While the severity of conditions will vary, professional judgment is needed to determine when repairs are needed. All of these conditions are described in more detail below.

BUILDING CODE VIOLATIONS

The building code represents the minimum legal standard for construction of buildings. It represents the worst building that a contractor is allowed to build. A building that meets applicable codes is

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intended to be reasonably safe and reasonably durable. Violation of the building code represents negligence per se, also known as a breach of the standard of care. In February of 2015, the state of Nevada redefined a construction defect to exclude technical violations of building codes or ordinances. Rather, a construction defect must present "an unreasonable risk of injury to a person or property." The examples below illustrate that a technical deviation from the building code may or may not represent a construction defect that requires a repair.

Brick Veneer

The building code includes both prescriptive and performance-based requirements. A violation of a prescriptive requirement is a straightforward comparison of as-built conditions with the specific code requirement. For instance, past versions of the building code have required the air cavity behind brick veneer to be a minimum of 1 in. (i.e., 2000 IRC, Section R703.7.4.2, Air Space). Therefore, anything less would technically represent a building code violation. However, the same building code also requires the air cavity behind brick veneer to be a maximum of 1 in. (i.e., 2000 IRC, Section R703.7.4, Anchorage), leaving no tolerance for the contractor. It is unreasonable to require the air cavity behind brick to be exactly 1 in.[2] If the brick units and the building framing are allowed to have limited tolerances, the air cavity should, too. In fact, it has been determined that a cavity much less than 1 inch wide is adequate to enable a drainage plane to function.

The building code has allowed for the omission of a weather-resistive barrier (WRB) when the 1-in. air cavity is provided (i.e., 2000 IRC, Section R703.7.4.2, Air Space). This is a terrible idea that should never be followed. I have observed significant damages when no WRB is installed, even when a 1-in. air cavity exists. This is an example of when one can actually meet the building code and still have significant damage that will require repair.

R703.7.4.2 Grout fill. As an alternative to the air space required by Table R703.7.4, grout shall be permitted to fill the air space. When the air space is filled with grout, a water-resistive barrier is required over studs or sheathing. When filling the air space, replacing the sheathing and water-resistive barrier with a wire mesh and *approved* water-resistive barrier or an *approved* water-resistive barrier-backed reinforcement attached directly to the studs is permitted.

Figure 1 – Code section that allows the air cavity behind brick veneer to be filled with mortar.

The building code also allows the air cavity behind brick veneer to be filled with mortar when an approved WRB is installed (i.e., 2012 IRC, Section R703.7.4.2, Mortar or grout fill – *Figure 1*). This is another terrible idea that should never be followed. I have observed significant damage behind brick veneer when an approved WRB allowed water to pass from the saturated mortar

SECTION 1507
REQUIREMENTS FOR ROOF COVERINGS

1507.1 Scope. Roof coverings shall be applied in accordance with the applicable provisions of this section and the manufacturer's installation instructions.

Figure 2 – Code section that allows roof coverings to be installed in accordance with manufacturer instructions.

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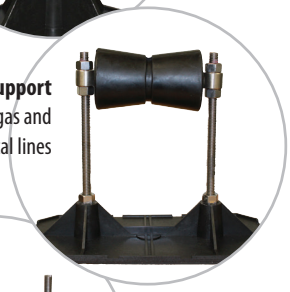

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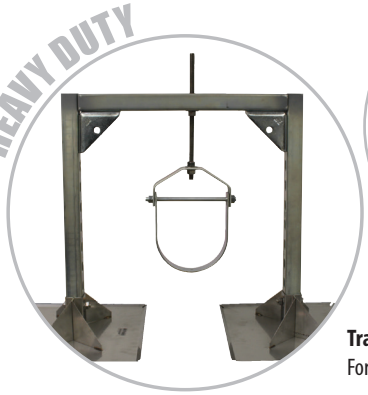

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Trapeze support
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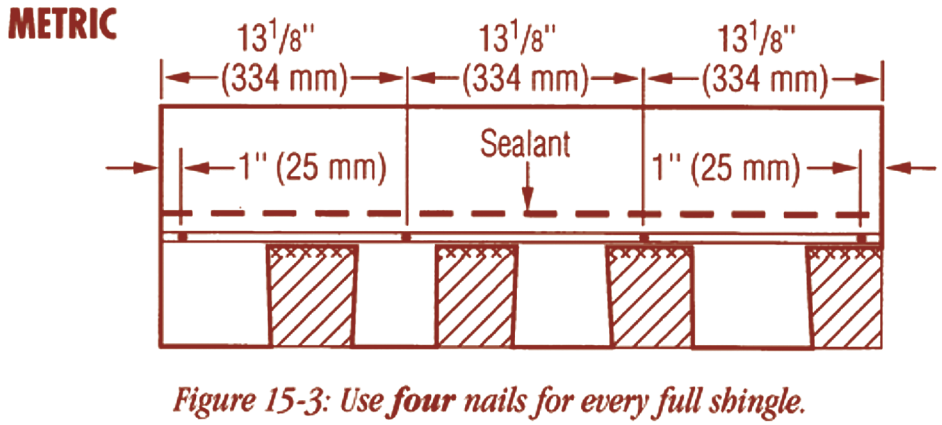

*Figure 15-3: Use **four** nails for every full shingle.*

Figure 3 – Typical manufacturer instruction showing specific placement of fasteners.

to the underlying wall sheathing, which is typically moisture-sensitive oriented strand board (OSB).

Manufacturers' Instructions

Some sections of the building code require following manufacturer instructions (i.e., 2012 IBC, Section 1507.1 – *Figure* 2). However, some manufacturers' instructions are so specific, following them exactly would be impractical. The most common deviations from manufacturers' installation instructions (identified in the context of construction litigation) are attachment details for roof shingles and exterior siding products. These instructions are so specific regarding fastener placement that deviations can be readily identified, even on the best construction projects (*Figure 3*).

While the as-built condition may not be exactly what a manufacturer's instructions require, "close" is typically found to be good enough. However, to determine the adequacy of an as-built condition, engineering analysis and professional judgment are required (*Figure 4*)—something that some experts fail to perform or to exercise. The analysis of an as-built condition should be based on function, not technical deviations from specific requirements with no margin for error. It is not always true that deviations from manufacturers' instructions serve to compromise the integrity of the subject building component (such as a shingle roof or exterior siding) so that complete removal and replacement are required. In fact, in most cases, minor deviations have little to no consequence. Even when more significant deviations exist (particularly in siding), they can sometimes be remedied by the installation of additional fasteners, depending on the extent of other defects that may need to be addressed.[3]

Unlike shingle attachment, which only requires that fasteners penetrate the underlying roof deck (typically OSB or plywood), siding attachment instructions also require that fasteners penetrate the wall framing (i.e., vertical wall studs). While this is always a good idea, failure to hit the studs does not always result in a functional problem. In fact, when certain types of fasteners are used, missing a stud may have no consequence. Specifically, it has been determined that ring shank nails have a withdrawal resistance in OSB that is equal to a smooth shank nail that penetrates both OSB and a stud.[4] Additionally, sometimes meeting a prescriptive building code requirement (i.e., "attach siding using a 6d smooth-shank nail with a minimum penetration of 1 in. into wood framing") may violate the performance requirement of "all buildings and components thereof shall resist code-prescribed loads." Care should be taken to make sure that all code requirements (when they make sense) are met.

PHYSICAL DAMAGE

When physical damage exists—particularly early in the life of a structure—some type of defect likely exists, as well. The presence of physical damage is a clear indication that something in the constructed building is not functioning as intended. However, physical damage is not always indicative of a construction defect. Damages can also result from a design defect, a product defect, lack of maintenance, and even code-compliant construction that simply does not work (i.e., omitting a WRB behind brick with a 1-in. air cavity).

Figure 4 – Forensic investigation of shingle installation documenting fastener placement.

Whether they make sense or not, maintenance issues are typically raised as a defense in construction litigation. There are many cases in which building components have been neglected, and lack of adequate maintenance has contributed to the overall extent of damage. However, this contribution is directly proportional to the age of the building(s), the extent of the neglect, and the quality of the original construction. In other words, it may be unreasonable to suggest that minor imperfections in a sealant joint around a window

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Figures 5 and 6 – Inadequate guardrail attachment.

had a measurable contribution to damages caused by leaks associated with an improperly installed window or improperly installed WRB. Regardless of the quality of the original construction, nothing is permanent, and all buildings require maintenance and repair.

LIFE/SAFETY ISSUES

Life/safety issues are issues that, if left uncorrected, could result in significant harm to the occupant. Typically, these issues fall into one of the following categories:

1. Structural hazard
2. Fire hazard
3. Trip/slip/fall hazard

Structural Hazard

The most significant structural hazards exist when a substandard condition is exposed to code-prescribed loads (*Figures 5* and *6*). For example, an inadequate guardrail attachment could be subjected to a code-prescribed occupant load (50 pounds per linear foot along the top rail or a 200-lb. point load) at any time during its service life. The failure of the guardrail could result in significant injury or death. In contrast, an

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Figure 7 – Incomplete fire-rated wall assembly in an attic.

inadequate truss hold-down will typically require a hurricane or similar event before the defect results in a consequence. While the extent of damage resulting from such a defect could be significant (and the defect should be repaired), this damage is not considered to be imminent.

Fire Safety

Fire safety issues are commonly associated with breaches in a rated wall or ceiling assembly, improper components within a rated wall or ceiling assembly, or inadequate sealing of penetrations in a rated wall or ceiling assembly (*Figure 7*). Left uncorrected, these types of defects can result in dramatic damage and potential loss of life. A design professional has an ethical responsibility to protect the health, safety, and welfare of the public. As such, many of the life/safety issues identified in construction litigation should translate to a non-negotiable repair. It is typically wise to take a conservative approach on these issues. This is consistent with the commentary of the building code that indicates that interpretations should always be based with public safety as the highest priority.

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Trip/Slip/Fall Hazards

Trip and fall hazards are most significant when they exist along paths of building ingress and egress. The most common issue in construction litigation is inconsistent stair riser and tread dimensions. Often, the inconsistent riser dimension results from construction sequencing that causes the height of the last (or first) riser adjacent to a landing or grade to be inconsistent with the rest of the risers in a flight of stairs. Also, single steps are considered to be the most problematic, and identification (via paint, sign, or rail) is recommended.

WHAT IS NOT A DEFECT

There are many issues alleged to represent defects in typical construction litigation. However, in most cases, what is alleged to be a defect is simply a deviation from best practices. This can be a difficult concept to explain. As engineers and architects, we like to think that we know how to properly construct a building (above and beyond what the building code requires). However, we must not impose our forensic engineering and architectural standards on the contractor, particularly if those standards were not required at the time of original construction. The following issues are commonly alleged to be defects:

1. Not lapping WRB over flashing
2. Not installing a sill pan below a window or door
3. Not installing end dams on head flashing
4. Not protecting the rough opening of

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a window or door
5. Not installing kick-out flashing at a roof/wall intersection
6. Cracks in stucco
7. Inadequate caulk joints
8. Inadequate slope on a porch or balcony

This is just a short list; there are many other examples. Unless these details are provided in the contractor instructions (i.e., applicable building codes, plans, specifications, etc.), they are typically left to the whim of the contractor and/or subcontractor performing the work. These issues may not represent a defect if not required by the contractor instructions and no damages exist. Best practices may not be represented, but the contractor isn't required to make repairs to meet our own standards. As the saying goes, "If it ain't broke, don't fix it."

OTHER CONSIDERATIONS

Making a Defect List

There is typically at least one real problem (i.e., defect) in construction litigation; this is the problem that prompted the building owner to contact the attorney and/or forensic expert in the first place. In some cases, the one problem turns into a witch-hunt that reveals a laundry list of alleged defects—some real, some not. The lengthy list of "defects" identified by an overzealous plaintiff expert can place undue stress on the property owner. Additionally, once the plaintiff report is published, it serves as written notice to the owner that issues exist, many of which may be subject to disclosure laws if the property is sold.

Risk and Reward Relationship

Every construction project includes a risk-and-reward relationship. The more money that is spent up front on a project to utilize best practices and quality materials, the less risk is assumed for significant repairs early in the service life of the building. However, just meeting the building code results in a lower initial building cost, but more risk for significant repairs early in the service life of the building. In other words, a low-cost, code-compliant building will show signs of distress early and will require repairs; a higher-cost building built to best practices will last longer before repairs are needed. The questions are: Who spends the money, and when will it be spent?

Obviously, it is unfair to think that owners can purchase a low-cost building, perform no maintenance, sue the contractor over alleged defects, and expect the building to be repaired using best practices. The goal of construction litigation should be to address actual defects in the original construction, not to provide a new building to neglectful owners. Also, if an owner did not pay for a building that incorporated best practices during original construction, why should an owner expect best practices to be provided later at no cost? If you deserved a "best practices" building, you should have paid for it the first time. The bottom line should be: "You get what you pay for—at the time that you pay for it." Contractors are not required to comply with best practices imposed by forensic experts unless they are clearly incorporated into the contract documents used for original construction.

On the other hand, sometimes significant damages exist that warrant significant repairs. Complete roof replacement, total exterior decladding/recladding, window and/or door replacement can be needed in some cases. As previously stated, each case must be evaluated on its own merits and a repair scope developed accordingly. While plaintiff and defense repair scopes can represent extreme positions, the truth typically lies somewhere in between.

SUMMARY

In summary, each case that an expert (plaintiff or defense) examines must include a careful evaluation of all of the facts without prejudice for what the client would like to hear. As professionals, we are called to uphold a stringent code of ethics that require an honest assessment of all relevant information. How can this assessment be performed in the absence of all the facts? The expert should serve as the purveyor of all facts (regardless of which side has retained the expert's services) so that the triers of fact can be adequately informed to provide an unbiased and reasonable resolution.

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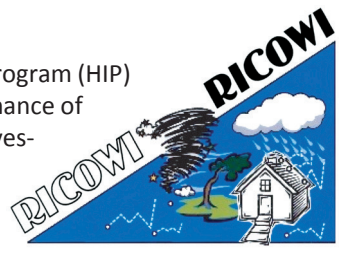
Derek Hodgin, a licensed professional engineer in 21 states, has over 20 years of experience as an engineering consultant. He performs facility condition inspections, failure analysis, damage assessments, and forensic engineering investigations. Many of his projects have included analysis of deficient construction cases, including assessment of damages related to construction, design, and product failures throughout the Southeastern U.S. and Caribbean.

RICOWI Deploys HIP Team

The Roofing Industry Committee on Weather Issues (RICOWI) deployed its Hail Investigation Program (HIP) research team to the Dallas/Fort Worth area May 2-6. The HIP team investigates the field performance of roofing assemblies after major hailstorms and then publishes a report on its findings. RICOWI investigated this area in 2011 and studied over 100 hail-damaged roofs at that time. For more information on the HIP program, contact HIP Chair John Gimple at 303-423-4402 or gimpleroof@qwestoffice.net or RICOWI Executive Director Joan Cook at 330-671-4569 or jcook@ricowi.com.



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