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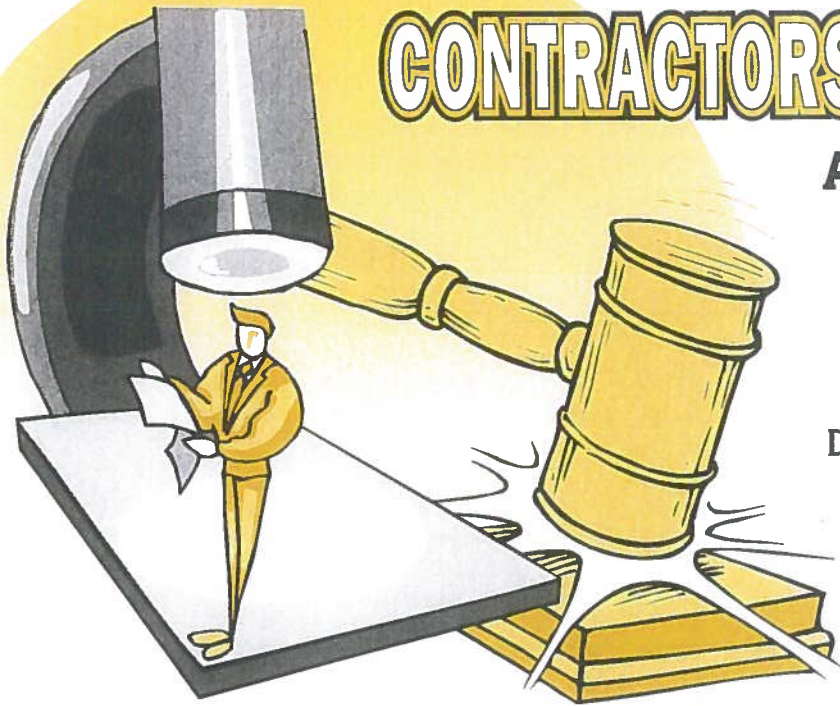
A Forensic Engineering and Legal Perspective

By

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and

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Based on recent experience in construction litigation, it appears that much confusion exists regarding written instructions used by contractors during the course of a project. A variety of written instructions are typically available, including: the applicable building code, industry standards, and manufacturers' instructions. On larger projects, plans and specifications may be prepared by an architect, engineer, or roof consultant. If the completed project becomes the subject of litigation, the written instructions are carefully reviewed and compared with the as-built conditions to determine compliance. This process is a primary element of nearly all construction litigation cases.

The first part of this article will: 1) present the methods used during a forensic engineering investigation to determine if the completed work is consistent with written instructions, 2) describe the use and interpretation of building codes, industry standards, and manufacturers' instructions, and how to resolve discrepancies that may exist between them; and 3) provide numerous examples of lessons learned from construction litigation cases.

The second part of this paper will: 1) discuss the role of the forensic consultant in construction litigation, 2) provide insight regarding the legal interpretation of various forms of written instructions, and describe their legal hierarchy, 3) describe examples of interpretations made in construction litigation cases; and 4) offer suggestions on standards of care to reduce exposure to liability.

PART I - FORENSIC ENGINEERING

Disclaimer

This paper reflects the opinions of the authors based on their professional experience and does not necessarily represent the opinions of their respective employers. The authors reserve the

right to modify their opinion should additional (factual) information be made available that is contrary to the opinions expressed herein. (Can you tell that one of the co-authors of this paper is an attorney?)

Background

It has been reported that the first set of instructions provided to a contractor were those of God's instructions to Noah regarding the construction of the ark. If Noah had failed to comply with God's instructions (and Noah resided in the United States), he would likely be named in a deficient construction lawsuit. Enter the forensic engineer – to determine who was responsible for the non-compliance and the extent of associated damages.

The scenario described above would have been easier to sort out than projects constructed in the 21st century. Today's projects are subject to instructions provided by more than one source. These instructions include, but may not always be limited to, the following:

- The building code;
- Manufacturers' instructions; and
- Industry standards.

Larger projects may also include plans and/or specifications prepared by a design professional such as an architect, engineer, or roof consultant. Additionally, contract documents may define the scope of work to be carried out by the general contractor or subcontractors. The flow chart (*Figure 1*) shown here describes the general hierarchy of the instructions available to a modern contractor.

Obviously, the construction world is not this straightforward. Discrepancies exist. A general discussion of each set of instructions is provided below.

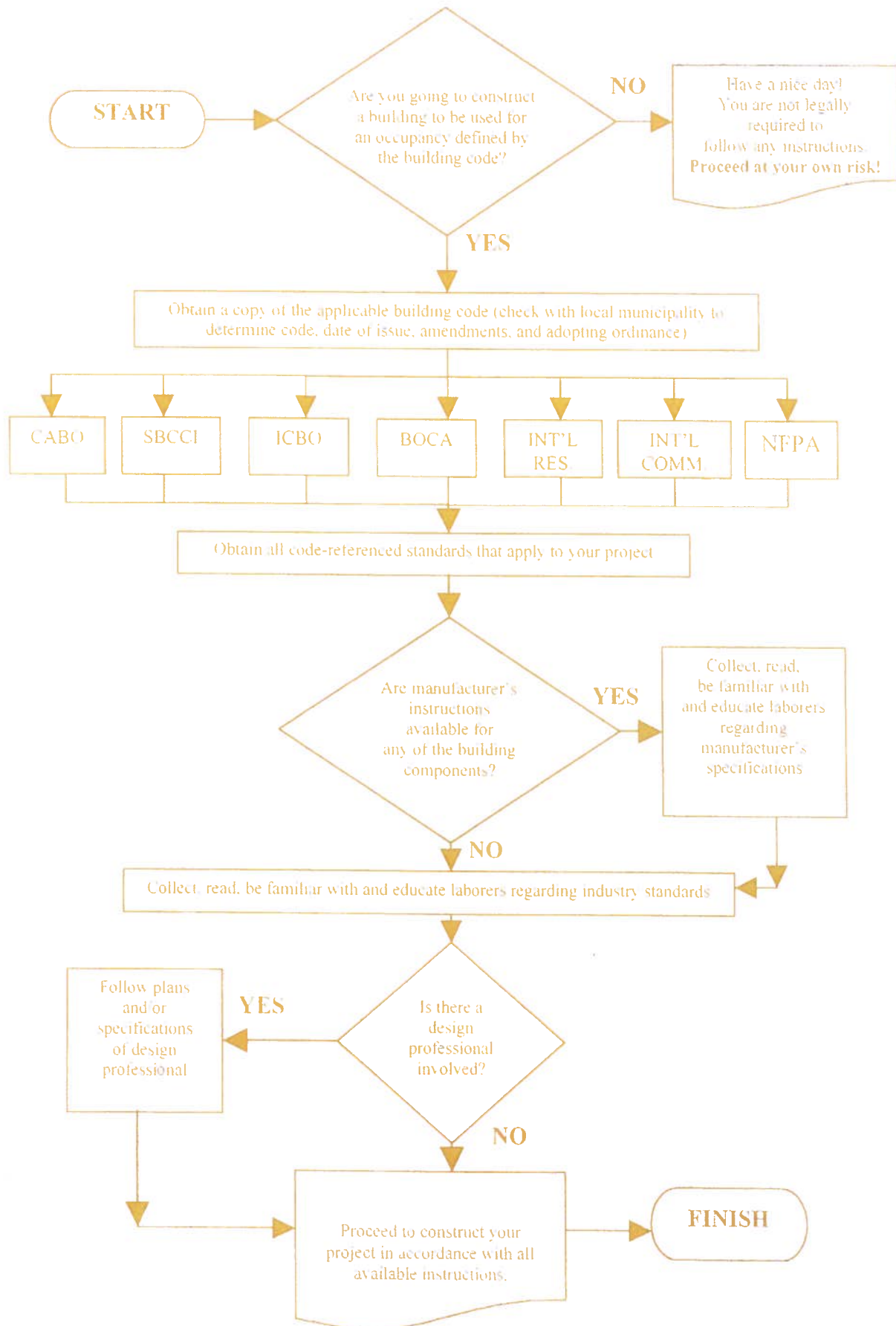


Figure 1

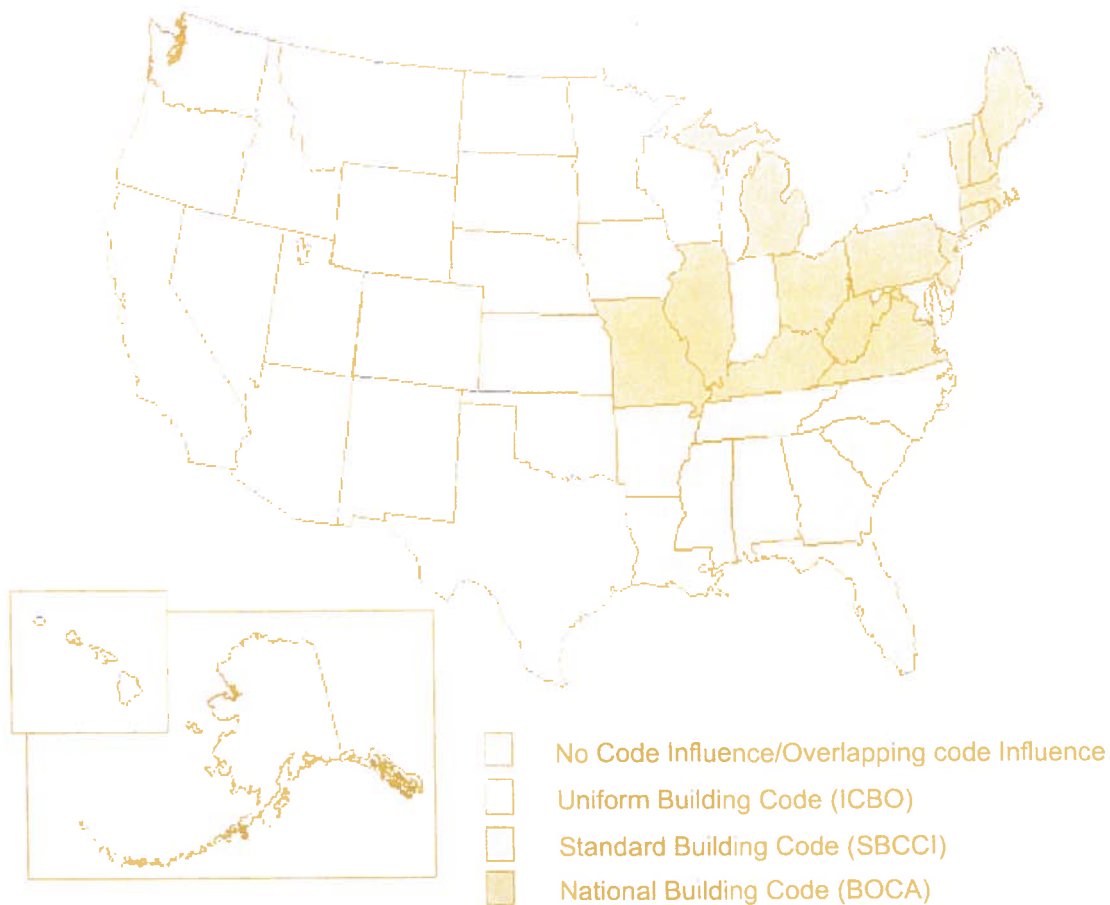


Figure 2

ing code represents a base set of instructions. The building code references numerous consensus standards that are incorporated into the code just as if they were physically contained therein. Examples of typical standards referenced by building codes include:

- 1) Other building codes (i.e., gas, mechanical, and plumbing codes, and the National Electrical Code), collectively referred to as the “technical codes”;
- 2) Material and/or installation standards [i.e., American Society for Testing and Materials (ASTM), American National Standards Institute (ANSI)]; and

- 3) Industry references [i.e., American Society of Civil Engineers (ASCE), Engineered Wood Association (APA), Cedar Shake and Shingle Bureau (CSSB), and Truss Plate Institute (TPI)].

A complete list of all reference standards is included in each building code. A contractor should be familiar with all of the standards that apply to his work.

Manufacturers' Instructions

When published instructions are available from a manufacturer, they should always be consulted. The contractor should clearly understand the instructions provided by the manufacturer. More importantly, the project supervisor and laborers employed by the contractor should have the same understanding about the instructions and be prepared to follow them during the course of the construction project.

If a design professional is involved with a project, it is important to determine if any discrepancies exist between the manufacturers' instructions and the plans and/or specifications prepared by the design professional. In most cases, the plans and specifications will supersede the manufacturers' instructions. This is particularly true when a manufacturer provides generic details and more specific detail is required from a design professional.

THE INSTRUCTIONS

Building Code

The construction industry has been making attempts to consolidate the numerous building codes used in the United States into one code [International Building Code (IBC)]. This task is far from complete and could be the topic for an entirely different paper. This paper, however, focuses on construction litigation. Projects currently in litigation were typically completed prior to the adoption of the IBC and are most often (but not always) subject to one of the following building codes:

- Standard Building Code (SBCCI)
- National Building Code (BOCA)
- Uniform Building Code (ICBO)
- One and Two Family Dwelling Code (CABO)

The map above (Figure 2) was adapted from the *RCI Building Codes & Standards Reference Guide*. The map shown is not current; however, it serves to illustrate the geographic distribution of building code influence from an earlier date. Note that some states had not adopted a model building code at the time the map was assembled.

The building code (regardless of which one may apply) provides the bare minimum requirements that a contractor must meet. In many cases, stricter requirements may apply. The build-

Industry Standards

All contractors should be familiar with standards within their respective industry. Industry standards serve as a generic “baseline” for workmanship when more specific manufacturer instructions are not available. That is not to say that industry standards should only be referenced in those circumstances. Rather, a contractor should always follow industry standards unless more specific instructions are available.

What constitutes an industry standard? In simple terms, an industry standard should: 1) represent the industry as a whole, and 2) provide accepted and objective information regarding workmanship. Is the *NRCA Roofing and Waterproofing Manual* an industry standard? Some experts argue that it is not. The argument is based on the idea that the information is being provided by a contractor-driven organization and does not represent the roofing industry as a whole (the first requirement). While the authors have not had the opportunity to memorize all of the information in this (now four-volume) manual, we are not aware of any information that is not generally accepted and objective (the second requirement). In our experience, arguments such as these are typically made by experts with special interests. For example, someone representing a manufacturer could argue that the *NRCA Manual* does not represent an industry standard (if it is inconsistent with the manufacturer’s instructions). If one represents a contractor, this is a much more difficult argument.

Plans and/or Specifications

A design professional is often required on larger projects. For the purposes of this article, the design professional would likely be an engineer, architect, or roof consultant. The design professional may be required to produce a set of plans and/or specifications. These instructions should be consistent with all other instructions provided to the contractor, but should provide more detail where necessary. For this reason, the instructions provided by the design professional typically supersede all other instructions.

If discrepancies exist between the instructions provided to the contractor, they should be brought to the attention of the design professional for clarification. All clarifications or changes should be clearly documented in writing. A one-page letter clarifying an issue can be valuable evidence in a construction litigation case.

Contract Documents

In addition to the instructions described above, contract documents may also provide instructions to a contractor. Typically,

these contracts (such as standard AIA agreements or RCI forms) include a list of project documents (instructions) to be followed by the contractor. Contract documents also typically define the scope of the work, the project schedule, and payment schedule.

FORENSICS 101

The forensic engineer (or some other expert retained by an attorney to validate the claims of a property owner, contractor, subcontractor, manufacturer, etc.) must determine which set of instructions apply to the subject construction project. The date of the construction permit is typically used to determine the applicable building code. In the absence of the building permit, the dates of the project drawings (if available), the date of construction, and the Certificate of Occupancy (C.O.) date(s) are useful in determining the applicable building code. A quick call to the overseeing municipality should be made to verify the applicable building code and to obtain a copy of the adopting ordinance.

During the course of a comprehensive survey of the subject property, dates of manufacture should be documented (i.e., roofing products, APA-rated panels, windows, doors, etc.). These dates can help determine what (if any) instructions were available to the contractor regarding the installation or application of a particular building product. It is important to determine that these instructions [manufacturer and/or industry standard(s)] were available to the contractor on or before the date of construction.

Any other instructions, such as project plans, specifications, and contracts, should be reviewed for adequacy, completeness, and detail. The plans and specifications should be compared with as-built details (visual observations) to determine the extent of inconsistency (or compliance).

If the project instructions are not followed, the forensic engineer must determine the consequence of the non-compliance, the actions necessary to correct the situation, and the cost to perform the repairs. Unless a forensic expert has specific experience regarding construction costs, this opinion is better provided by a qualified local contractor. The results of this information can be summarized in a table similar to the sample shown in *Figure 3*.

This table provides a useful format to summarize the issues of a particular construction project. A summary such as this can also serve as a guide when answering questions in a deposition, particularly when accompanied by all of the referenced documents. Once the forensic experts have identified the issues, it is up to the construction litigation attorney to present and argue the position of his/her client.

What Was Required?	Reference(s)	What Was Observed?	What is the Consequence?	What is the Required Repair?	How Much Does it Cost?
<ul style="list-style-type: none"> • Nails spaced at 12" on center. • Nails spaced at 4" on center in high wind areas. 	<ul style="list-style-type: none"> • 1991 Standard Building Code, Section 3214.7.3.2. • <i>NRCA Roofing and Waterproofing Manual</i>, Fourth Edition. 	Metal drip edge attached with white aluminum brads at 24 to 42 inches on center in high wind area.	The metal drip edge is vulnerable to failure.	Install additional fasteners in the metal drip edge in accordance with the building code and industry standards.	See the attached repair estimate prepared by a qualified local contractor.

Figure 3: Summary of Deficiencies

PART II - LEGAL

Background

While the first set of instructions provided to a contractor may have been God's instructions to Noah regarding the construction of the ark, the instructions were probably two-fold:

1. Noah, build the ark (or how long can you tread water?).
2. Build the ark correctly and in conformity with the appropriate building codes and industry standards so that it doesn't sink and nobody drowns!

The failure to follow the first set of instructions would have simply resulted in no one left living, and, therefore, no plaintiffs. Once Noah, the contractor, undertook the construction of the ark, the duties therein arose to follow the appropriate implicit and explicit instructions dealing with the International Ark Building Code, the manufacturer's instructions dealing with the appropriate boat construction, and industry standards for ark construction (it must float for 40 days!)

Instructions

The contractor needs to both follow the instructions provided by the manufacturers and experts acquainted with the project and must give appropriate instructions to ensure compliance with industry standards and building codes for both his employees and for his subcontractors.

We have presented a flow of information, action, and reaction that will be a construction defect lawsuit. For simplicity's sake, we have designated the party that would be the plaintiff as Acme Homeowners' Association ("Association"). Acme HOA was incorporated to administer the affairs of Acme Horizontal Property Regime (Acme Condominium).

Do Construction Problems Exist?

In a typical condominium development in the state of South Carolina, the control of the board of directors passes from the developer's appointed representatives to the independently elected board of directors at some point of the developmental scheme. As soon as this homeowner-elected board of directors takes power, it has some due diligence to investigate financial and physical plant matters related to the property of the regime. The regime could easily have been in existence for many years while a phased development scheme was put in place for the project with the developer in charge of the board of directors. As such, there has been no independent authority to review the financial and physical plant issues for an extended period of time.

The Association should undertake some initial property inspection and inspect closely the records and reports of required maintenance and repairs for the Association. In the coastal region of South Carolina, there are constant problems with water penetration into structures. If the board has reason to believe that it may have construction-related deficiencies and problems, it should hire a third party expert to undertake destructive testing to try to determine the existence, scope, and nature of the construction deficiencies and associated and resulting damage that may exist. There are a number of ways in which the board of directors and independently employed management can initially discern the possible need for repair and reconstruction investigation issues.

In any event, once the board of directors and the Association have notice of issues that warrant further investigation, it is imperative that action be taken. Most states have both Statutes of Limitation and Statutes of Repose dealing with timeframe limitations in which actions can be brought for construction defects and deficiencies.

What Are the Nature and Extent of the Problems?

The expert is retained and coordinates destructive investigative testing for the property under the control of the Association. Such investigation should be widespread, and the expert should be authorized to undertake all necessary investigation to establish the existence or nonexistence of deficient construction and the resulting consequences at the project. It is imperative that a qualified expert be retained who can thoroughly support the results and findings ascertained and be prepared to testify in deposition and trial at a later date. It is most helpful when the retained expert provides detailed observations and narratives and substantiates all opinions and observations by thorough photographic support. Each opinion or observation should be supported by photographic evidence, and the expert should provide substantiation for the violation of building codes, industry standards, and the like.

The results of the investigation by the expert and his report are the blueprint and instructions by which the Association takes action against the parties responsible for the defects and deficiencies.

Now What?

The expert delivers his narrative report and professional opinion with photographic backup. What should the board do? The board of directors is imputed with the responsibility to administer the affairs of the Association for the best interests of the owners. All boards have such statutory and case law standards as may exist in a particular state that apply to eleemosynary (non-profit) corporations. Further, the board is imputed with certain fiduciary standards that would be widely applicable to most such eleemosynary corporations.

The Association hires an attorney to evaluate the Association's position. If warranted, the attorney brings an action against the principal parties involved with the development, construction, and oversight of the regime property. Here, we focus upon the contractor and his/her role in the process.

The contractor is hired by the developer to construct the project. A written contract will contain the specifics on the contractor's duties and responsibilities. Contracts will control the relationships by, between, and among the developer, the contractor, and the design professional. However, for the purposes of this discussion, our focus is on the contractor.

Many of the general theories of negligence and breaches of implied warranties that could be applicable to the contractor arise out of the alleged failure to follow instructions, be that explicit instructions by the manufacturer and/or explicit or implicit instructions that relate to building codes and industry standards. Some general allegations are as follows:

1. In failing to provide for the proper construction of the project.
2. By deviating from the plans and specifications as designed.

3. In failing to employ practices and methods of construction and construction oversight conforming to normal, customary, and ordinary standards of the construction industry.
4. By allowing the installation of, or installing materials and products not in accordance with the project's plans and specifications.
5. In failing to provide for proper supervision and oversight of employees, agents, and subcontractors and/or trades in order to ensure that all work proceeds and is completed in accordance with the project plans and specifications and also in conformity with customary and ordinary industry standards, code requirements, and good construction practices.

The complaint initiates that action by the Association to address the construction deficiencies and defects arising out of – among other items – the contractor's failure to follow instructions or standards.

Development of the Case

As the lawsuit progresses, additional investigative work and destructive testing will be undertaken by the retained expert to further substantiate and corroborate the positions taken by the expert at the initiation of the process. The other parties in the action will retain experts who will review all presented materials of the Association's expert and find alternatives for repair within the scope of industry standards and building codes. This process includes the ongoing exchange of written materials between counsel for the various parties, as well as depositions for specific review of not only the position of the expert for the Association, but also the positions of the experts for all other parties in the action, including the contractor.

The instructions and standards for the contractor will be intensely debated by the various parties in that there are not always hard and fast rules, but there are also somewhat flexible instructions and standards. This portion of a lawsuit takes many months and elicits every prospective position possible from the various experts retained by the parties as to the proper methods used in the construction of the project. Once all discovery has been completed, the case moves toward a resolution.

How Does It End?

A construction defect case will generally end by resolution through mediation, arbitration, or a trial of the case. It will only reach this point for a prospective favorable resolution with solid facts and strong experts. Mediation involves all parties sitting down with the aid of a mediator who attempts to bring parties to a point of resolution with compromises by all those who have involvement in the case. In that there is no perfect position, the parties must be willing to compromise and understand the strengths and weaknesses of all positions presented. By so doing, the mediator can draw parties toward some point of resolution where no one is fully happy and no one is fully mad. Mediation is just that; it is the art of compromise to reach a resolution based on a complete understanding of the strengths and weaknesses of the case.

Arbitration is the second alternative for case resolution. An arbitrator hears a case much as a judge would and renders a decision based on the presentation of evidence and material. The

conduct of an arbitration is much like the trial of the case, with looser evidentiary rulings and no jury. Generally, an arbitrator's award is final in the case, and no appeal can be made.

If other methods are unsuccessful, the case may go to a trial, which in the state of South Carolina would be in the Circuit Court. At the conclusion of the case, the decision as to its outcome would, of course, be in the hands of a jury.

Lessons to be Learned

Follow the instructions, including industry standards and building codes, and the workmanship should not be subject to an action for construction deficiencies (or it should at least be easily defended). Do not follow the instructions, and more often than not, the parties aggrieved by the failure to follow those will bring action and seek financial recovery to cure the defects.

The choice is clear. The contractor should closely review the job and submit contract proposals that allow for adherence to instructions and standards. If the contract is underbid, the contractor inevitably must try to cut corners. Instructions are not followed and standards not adhered to and problems and deficiencies are discerned. The result: a lawsuit is filed. Do it right (follow the instructions) the first time! ■

Editor's Note: This article was originally presented as a paper at the RCI 18th International Convention & Trade Show in Tampa, Florida, in March 2003.

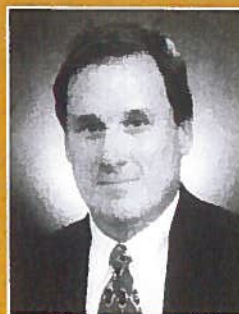
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Derek Hodgin, PE, RRC, RRO, CDT, is a forensic engineer who specializes in failure investigation of building envelopes and roof systems. He has investigated numerous types of roof failures resulting from hurricanes, tornadoes, hail, fire, ice, and deficient construction. Hodgin is a licensed professional engineer in 14 states, an RRC, and a certified Third Party EIFS Inspector and Moisture Analyst with the Exterior Design Institute (EDI).

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