

## Introduction

Construction Defect Litigation has been a scourge to many aspects of the building business in the past 15 years. We are going to present a high-level overview of the events that have lead, and continue to lead us to the courthouse steps, and what can be learned from this big-picture survey of the landscape, so that our navigational skills improve with experience.

Sometimes it's best to "hide in the bushes" of a construction defect litigation, and pay as little as possible to just get out. Other times we deserve the beatings we get, so paying our fair share is the right thing to do. But we all know, "All that is necessary for the triumph of evil is that good men do nothing (Edmund Burke)," and in some cases, bullies must be faced down, and a good fight must be fought. But how do we know what to do and when? This is where knowledge of the *Construction Defect Life Cycle* comes in; it will be your map of the construction defect world.

## Program Outline

1. Introduction: Who we are, who you are, and why we're here (20 Min)
2. Construction Defect Life Cycle: An A to Z Overview (20 Min)
3. Building Design & Construction: Design, Codes, Standards, Contracting and Construction (20 Min)
4. Building Performance: Inspection & testing, analysis and defects (20 Min)
5. Risk Management: Thinking ahead. Avoid the battle. (15 Min)
6. Claims and Litigation: What do you do when you get sued? Hide in the bushes. Engaging the enemy. Fighting the good fight. What does "winning" look like?" (15 Min)
7. Conclusion (10 Min)

Total Time: 120 minutes

## Back-Up Materials

1. Common Construction Defects by Pete Fowler
2. Managing Construction Quality by PFCS
3. Managing Property Maintenance and Improvement by PFCS
4. Answering the Tough Questions by David Heemann
5. Risk Management Check-List by PFCS
6. Solving Building Problems by PFCS
7. Dangers of Mold by Pete Fowler

# Program Contents

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- C. Learning Objectives
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- E. Who are You?

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- A. Plan
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- C. Use
- D. Dispute
- E. Repair
- F. Learn

## 3. *Building Design & Construction*

- A. Building Wall Design & Construction
- B. Building Codes & Standards
- C. Contracting 101
- D. Window & Door Installation
- E. Performance Expectations
- F. Managing Construction Quality

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- A. Building Wall Inspection & Testing
- B. Investigation Standards
- C. Testing Standards
- D. Building Performance Analysis
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- A. Construction Contracts, Risks & Insurance
- B. Construction Insurance
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- A. Analyzing Construction Defects
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- G. What does “winning” look like?

## 7. *Conclusion*

- A. Our Recommendations
- B. Back Up Information
- C. Learning Objectives - Revisited

# Construction Defect Life Cycle

Pete Fowler Construction Services, Inc.  
April 2011

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1. Introduction

- A. Program Outline
- B. Who We Are
- C. Learning Objectives
- D. Social and Economic Realities
- E. Who Are You?

## 1.A Program Outline

1. Introduction
2. Construction Defect Life Cycle
3. Building Design & Construction
4. Building Performance
5. Risk Management
6. Claims and Litigation
7. Conclusion

## 1.B Who We Are

### Pete Fowler Construction Services, Inc. (PFCS)

Pete Fowler Construction Services, Inc. (PFCS) is a team of consultants with expertise in all phases of building construction including:

- Construction Claims
- Construction Defect
- Cost Estimating
- Construction Management
- Training & Education
- Expert Testimony

*“We deliver solutions for building problems.”*

1.B Who We Are



Pete Fowler

www.petefowler.com

**Pete Fowler**  
**CONSTRUCTION**  
**Services, Inc.**

Curriculum Vitae

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**Peter D. Fowler**

**Education**

California State University, Chico  
 Bachelor of Science in Construction Management  
 Minor in Management Information Systems

Burne College  
 Vocational Construction Education

**Licenses and Certifications**

California Contractors License # 711760  
 CSLB Home Improvement Certifications  
 Licensed as a general building contractor in the state of California

Oregon Contractors License # 279900  
 Pete Fowler Construction Services, Inc. is licensed as a **General Contractor - All Trades** in Oregon.  
 Certified Home Inspector (see below)

ASPE Certified Professional Estimator (CPE) # J-4-000218-0100  
 Administered by the American Society of Professional Estimators (ASPE). This certification is the highest form of professional recognition an individual estimator can receive. Through it's certification program, ASPE recognizes the estimating proficiency and ethical awareness of the CPE. The certification program consists of a professional evaluation application, a technical paper, two days of written examinations and participation in the Continuing Certification Program.

ICBO National Contractor Competency Testing Program - General Contractor  
 Administered by ICBO to provide recognized estimations and credentials for contractors. This programing allows to compare knowledge of internal roles and standards for General Contractors.

ICBO Certified Inspector # 3514477-100  
 One and Two Family Building Inspection  
 International Conference of Building Officials (ICBO)

Certified Installation Master - AIAA  
 Training and certification to qualify individuals in successfully recognized and tested window and door installations including. Administered by American Architectural Manufacturers Association. Certification requirements include verifiable experience, two days of classroom training and a closed book examination.

Certified Home Inspector CCHI # 1118 - Oregon Construction Contractors Board  
 Requires experience and education prior to which includes 1 Knowledge base in installation of Practice, Electrical, HVAC, Plumbing and Fire/Hazardous in building construction.

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1.B Who We Are



Alex Prokop

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**Pete Fowler**  
**CONSTRUCTION**  
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Curriculum Vitae

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**Alex Prokop**

**Education**

East Tennessee State University  
 Bachelor of Science, Construction Management Technology

Nashville State Technical Institute  
 Associate Degree, Architectural Engineering Technology

**Licenses and Certifications**

California Contractors License  
 Licensed as a general building contractor in the state of California, Class B # 815750

U.S. Green Building Council  
 LEED Accredited Professional  
 Certified Green Building Professional

**Experience**

April 2009 - Present: Senior Consultant, Pete Fowler Construction Services, Inc.  
 PFCS, Inc. is a general contracting, construction management and expert construction services provider. Specific services include: Construction Management, Property Inspection, Training, Assessment & Analysis, Construction Cost Estimating & Budgeting, Construction Management & General Contracting, Training, Education & System Development, and Expert Witness, Mediation & Testimony.

2005 - 2009: Director of Operations / Construction, Signature Properties  
 Responsible for all planning, estimating, oversight, execution, and personnel management from the onset of the design process through the completion and close-out of construction for residential and urban projects. Director of all aspects of Construction Operations and Architecture Operations for San Francisco, Oakland, greater Bay Area, and Sacramento markets. Initiated a company wide "Green" program and certification for multiple sites, resulting in better quality building practices, water resource conservation, energy-efficient homes, and higher indoor air quality standards.

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### 1.C Learning Objectives

- Introduction to Construction Defects (CD) and the strange world of CD Litigation.
- Examine the connections that exist throughout the building life-cycle to “Construction Defects”.
- Discuss the connection between codes, standards, performance expectations, and building and contracting practices.
- Discuss building performance standards, investigation practices, and how they relate to “Construction Defects”.
- Explore various claim philosophies, strategies and practices.

### 1.D Social & Economic Realities *(1 of 2)*

- Building construction will always be a fundamental component of human society.
- Construction constitutes nearly 10% of Gross Domestic Product (GDP).
- Consumers are expecting quality increases and price decreases in all products.
- The building industry, in general, is not keeping pace with the quality / price improvements that many industries are making.
- The building industry is not attracting the brightest young people into the industry.

### 1.D Social & Economic Realities *(2 of 2)*

- Consumers are more litigious than ever before and are becoming more and more so.
- There is a proliferation of attorneys.
- The built-environment has been altered dramatically in the last 20 years.
- Consumers are more conscious of building related health issues than ever before
- The marketplace is starved for skilled construction professionals who operate with integrity and in the client's best interest.
- We were in one of the largest economic booms in history.

### 1.E Who Are You?

- Who works for a company that has never been sued?
- Who doesn't work for a window manufacturer and what do you do?
- How many projects does your company work on per year?
- What's your sales process? Direct? Resale? Wholesale?
- Do your sales contracts have indemnity agreements?
- What's your claims process? Is it proactive or reactive?
- What is your risk management process? Who manages it?
- Are you represented by an in-house attorney?



# Common Construction

# Defects

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Since the early 1990s, the Southern California building industry has been engulfed in a bitter fight. Spawned by substandard construction during the region's 1980s building boom, construction defect litigation has become a full-

**by Pete Fowler**

fledged "industry," with many architects, engineers, and former building contractors now working full time at construction defect consulting. Attorneys, acting as advocates for homeowners, hire these experts in the effort to prove that shoddy workmanship is causing new homes to rapidly deteriorate. Meanwhile, the home building industry, put on the defensive, is claiming that the real problem is unscrupulous attorneys who are feeding off the media coverage and exploiting the legal system. The reality is probably somewhere in between. Regardless, residential construction in Southern California has never

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A guided tour through some of the most common errors and omissions fueling the litigation frenzy in the California building industry

**Figure 1.** Nails that miss the truss — a result of sloppy work with a pneumatic nailer — void the strength of the roof diaphragm.



been so thoroughly scrutinized.

As a licensed GC and construction consultant, I wanted to see for myself the kinds of problems that were being uncovered. After reviewing more than 20 typical repair estimates from past and current construction litigation cases, I compiled a list of the kinds of defects that appeared most often (see “Most Common Defects”). The purpose of this article is not to cover every possible defect, but to illustrate some of the most common ones that I see. In most cases, the cost of doing the job right in the first place is far less than any corrective measure. And if you happen to build in an area where defect litigation is rampant, keep in mind that a seemingly minor surface defect could — given an unhappy client — result in an inspection of your job that turns up all sorts of code violations that had previously gone unnoticed.

### Structural & Framing Defects

Once an inspection gets rolling for some other reason, framing and structural problems are almost always uncovered.

Most of Southern California is located in the most severe seismic zone, meaning most homes are designed by engineers. The builder must strictly follow the engineer’s specifications, otherwise the construction can be considered defective — even if there is no manifest damage.

### Diaphragms and Shear Walls

Failure to follow the nailing requirements for shear walls and diaphragms is a common defect. Many builders temporarily set the plywood in place with a few hand-driven nails, then return later to finish the nailing with a gun. Unfortunately, we sometimes find that the second step in the process has been forgotten and the finish materials are installed over inadequately attached plywood. Another typical mistake is the substitution of box nails or sinkers for the specified common nails, or use of a smaller size nail. Figure 1 shows an example of just plain sloppy nailing.



**Figure 2.** The plywood on this interior shear wall should have been carried all the way to the roof diaphragm.



**Figure 3.** This shear plywood falls short of the shear wall posts on the right and left, and is attached with too few nails.

A more subtle but common problem is failure to carry an interior shear wall all the way to the roof diaphragm (Figure 2). This vertical continuity is necessary for the shear wall to transfer lateral forces from the roof diaphragm down to the foundation.

Sometimes the shear plywood does not extend across the entire width of the shear wall area and thus doesn't reach the post and hold-down that make the system complete (Figure 3). Other times the plywood reaches only the bottom of the two top plates (Figure 4), interrupting vertical continuity at the critical connection between the top of the shear wall and the floor or roof diaphragm above. This can happen when the plywood is installed while walls are framed on the deck and the double top plate is not yet in place. A simple fix is to install a Simpson A35F (flat) or similar metal connector, but the process is made more difficult because finishes must be removed or the work must be performed in a tight attic space.

### Connector Problems

Another common mistake occurs when the hold-downs are attached to the wrong members, creating a shorter shear wall than the plans called for. This is important because the uplift load on the hold-downs increases exponentially as the hold-downs get closer together. When hold-downs are placed too close together, the uplift loads will exceed the hold-down's capacity, creating the potential for catastrophic failure in an earthquake or hurricane (Figure 5).

Improper installation of joist and beam hangers is also quite common (Figure 6). These metal connectors frequently have missing nails and are often found mangled and twisted out of shape, having been cut or bent to fit an application never intended by the manufacturer or structural designer.

As with most structural defects, the repair is simple if the area is accessible. Unfortunately, all too often the repair involves removing expensive finishes to access the framing.



**Figure 4.** This shear plywood should have extended to the top of the double top plate — a mistake that can be remedied with the addition of metal connectors across the two plates.



**Figure 5.** These shear wall hold-downs are too close together, making the shear wall practically useless in resisting overturning forces.



**Figure 6.** An inspection made through a hole cut in the ceiling reveals that the joist hanger at left is bent and missing nails.

**Figure 7.** Instead of folding down over the edge, the felt paper on this rake overhang was cut flush with the top of the sheathing, allowing rain water to wet the surface of the roof deck.



## Roofing

Along with leaky windows, roofing problems are at the root of more construction litigation in Southern California than any other defect. Every roof detail — hips, valleys, ridges, the rake, the eaves, head walls, and so forth — is a potential problem area. Leaks at penetrations are common. Often the roofing felt is not extended over the top of the base flashing in weather-board fashion or is not extended far enough. Sometimes the base flashing is installed with roofing mastic as the primary water-shedding mechanism. The mastic will usually not last for the entire life expectancy of the roof; in fact, it often fails soon after installation.

## Rake & Eaves Details

One of the most common mistakes I see is the failure of the roofer to turn down the 30-lb. felt underlayment to cover the edge of the decking at the rake. Instead, the felt is cut flush with the top edge of the roof sheathing or barge rafter. Any water that makes its way past the rake tiles has an easy path onto the wood deck (Figure 7). Unfortunately, like most roofing defects, this cannot be readily inspected on a completed roof because the rake tiles cover the edge of the roof.

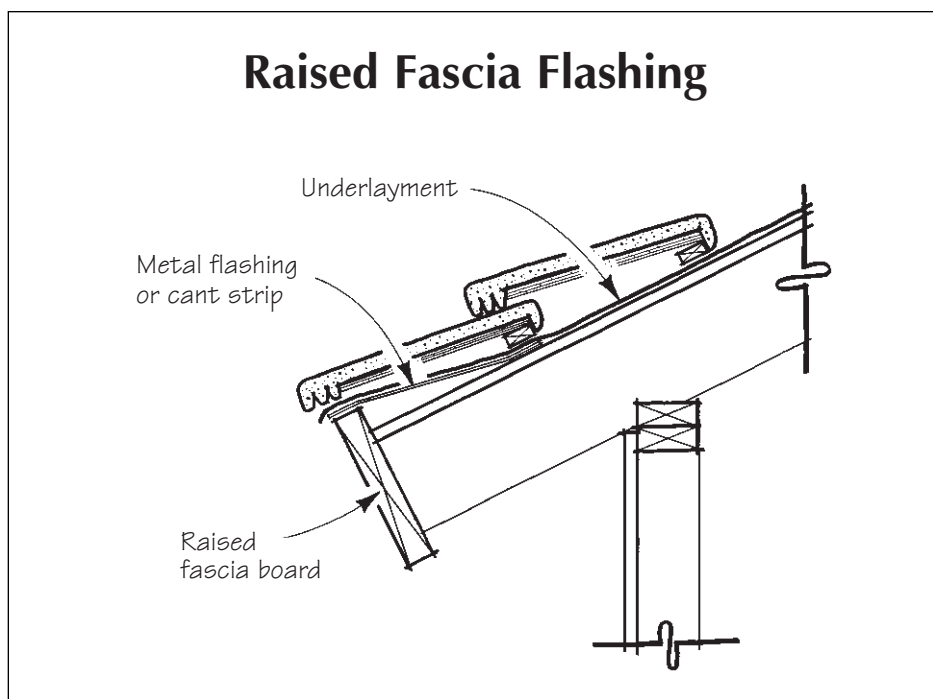
Another common mistake involves a standard tile roof detail: the raised fascia board. The detail is acceptable, but accommodation must be made for the void that is created behind the fascia board by installing a sheet metal flashing or other anti-ponding device. Many roofing contractors omit this flashing, and the underlayment soon begins to sag and pond water, which makes its way behind the fascia and into the eaves (Figure 8).

## Windows

There seems to be a problem in the minds of some window installers and other subs whose work interacts with window flashing: The fundamental concept that water runs down hill has not been firmly established. Keeping this



**Figure 8.** A raised fascia board (illustration) requires a heavy metal flashing or cant strip to ensure that runoff passes over the edge. Otherwise, water will pond, as in the photo, resulting in leaks and rot in the eaves.



theory in mind is the surest resolution to the majority of both window and roofing leaks.

A classic problem is the “reverse lap” at the sill flashing paper, which should lap over the building paper below. The kraft flashing paper is put on first and the building paper is then lapped over (Figure 9). This allows water to easily enter the interior of the building envelope once it passes the exterior finish. Occasionally I’ll see an instance where a worker made an effort to get the building paper under the sill flashing paper but failed to detail the corner junction correctly (Figure 10). These mistakes can be repaired only by removing the exterior finish and reinstalling the building paper to properly integrate with the window flashing paper.

### Painting Wood Windows

Wood windows are the exception in Southern California construction (most are aluminum), which may be the reason they are often not protected adequately from the harmful effects of moisture and temperature extremes. Although most wood windows come with an exterior primer from the factory, all components and all edges should be painted as soon as possible. When wood windows are not properly painted on all surfaces, the unfinished surfaces will take on moisture at a higher rate than the painted areas, creating uneven expansion and contraction and the possibility of rot (Figure 11). A common manifestation of damage is when the windows fail to operate properly, especially after swift changes in the weather.

### Poorly Flashed Penetrations in Stucco

Stucco is the most popular exterior finish in Southern California, and because of this, most water intrusion issues, with the exception of roof leaks, are inevitably associated with stucco in some way. As with window installation, the areas where another trade must interact with the stucco are the source of most of the problems.

## Most Common Defects

Rank by No. of Instances	Defect Description	Avg. % of Total Estimate
1	Structural/Rough Carpentry	14.7%
2	Roofing	8.4%
3	Windows	7.8%
4	Plumbing	5.4%
5	HVAC	2.9%
6	Lath & Plaster (Stucco)	3.5%
7	Fireplaces & Chimneys	0.9%
8	Waterproof Decks	3.4%
9	Fire-Resistive Assemblies	7.5%
10	Civil/Site Drainage/Fine Grading	5.6%

The chart lists the top ten defect items, ranked by the number of instances cited in the repair estimates reviewed by the author. The number in the right-hand column is the average percentage by item of the total estimated cost.



**Figure 9.** The building paper below a window must be tucked below the flashing paper — a detail often botched, as in the top photo. Above is a reverse lap seen from the inside of the wall cavity.

**Figure 10.** Here, the building paper is installed under the flashing paper at the bottom of the window, but not on the side — leaving a vulnerable corner where the flashing paper has been cut.



There is a remarkable shortage of detailed information regarding the flashing and intersection details that cause so many of the problems encountered in construction defect litigation. Most installation specifications and code documents make general statements about the application of plaster or proper cement mixes but do not make detailed recommendations for waterproofing penetrations other than windows, even though they plainly state that “stucco plaster should not be considered waterproof.”

A condition that frequently results in failure is where a deck handrail or cantilevered joist passes through the stucco skin to the framing below (Figure 12). These intersections are difficult to flash and the necessary coordination between the trades is usually lacking. The best idea is to avoid these protrusions altogether. Instead, frame the deck with four posts from the ground and stop the handrail shy of the building.

### Buried Weep Screed

Because a traditional stucco exterior is not “waterproof,” some accommodation must be made to allow moisture to escape. The *Uniform Building Code* mandates the installation of a galvanized steel weep screed at the base of the wall (Figure 13). The screed is nailed to the sill plate, and its upper leg is covered by the building paper. This creates a neat and clean termination for the plaster in addition to allowing the escape of moisture that has found its way behind the stucco.

Unfortunately, all too often the screed is buried behind a patio slab or concrete walk that gets installed after the stucco contractor has left — again, a problem in coordination and planning. When this happens, moisture can't escape, causing the stucco to deteriorate and frequently leading to rot in the sheathing and framing.

### Stucco Cracks

Stucco cracking is one of the most common homeowner complaints (Figure 14). In part, this is a matter of



**Figure 11.** Wood windows should be painted on all raw wood surfaces. Otherwise, they will pick up excessive moisture (as the moisture meter reading in the photo at right shows), causing them to swell or even rot.



**Figure 12.** Framing protrusions, such as handrails (left) and cantilevered joists (right), are difficult to flash properly, inevitably leading to moisture intrusion, cracked stucco, and decay in the structure below.

education: Homeowners should be told to expect minor surface cracks as the stucco shrinks. But it's also a matter of workmanship. Many cracks could be avoided by paying attention to control joints, proper attachment of lath, allowing enough time between coats, and moist curing.

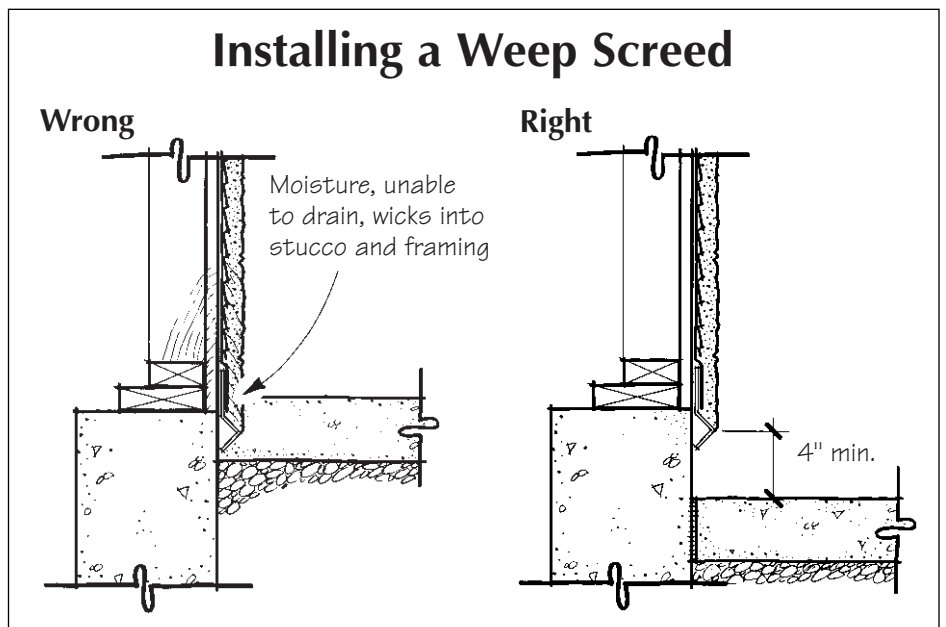
Some industry experts recommend that any cracks  $\frac{1}{32}$  inch or wider should get some type of aesthetic repair, especially in smooth finished stucco. On the other hand, NAHB's manual, *Quality Standards for the Professional Remodeler*, allows a gaping  $\frac{1}{8}$  inch. Whatever your standard, it's best to be up front with the client and establish realistic expectations early in the process.

The repairs for nonstructural stucco cracks might involve applying Thuro-lastic knife-grade filler and a stucco fog coat over the entire wall plane, using a brush-on elastomeric sealant feathered to match, or dusting in a matching color coat and allowing the moist night air to cure it.

### Waterproof Deck Problems

Waterproof decks are only eighth on the list of defects, probably because they're not found in every residence. But whenever I find them on 1980s mass-produced housing that's involved in litigation (including condos and single-family tracts), these decks seem to always have problems. Many builders have realized the practical difficulty of waterproofing this type of construction, and are now avoiding it altogether. If you continue to build waterproof decks, include as few penetrations as possible and strictly follow the decking manufacturer's installation directions.

The photo on shows a poorly flashed post penetration. The unsealed flashing acted more like a funnel, sending the water right into the framing and keeping it there, where it could do the kind of damage evident in Figure 15. Ponding of water on waterproof decks is another common problem (Figure 16), which can also lead to rot in the structure below.



**Figure 13.** The stucco at the bottom of this wall (photo, top) should have terminated with a weep screed above grade rather than being buried behind an outdoor patio slab.



**Figure 14.** Stucco cracking is one of the most common customer complaints. Tight surface cracks are normal in stucco and can usually be repaired. With quality workmanship, larger cracks can be avoided.



**Figure 15.** Because waterproof decks are difficult to detail properly, rotting substructure is a common defect.

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**Figure 16.** Besides ruining the finish surface, ponding on waterproof decks also leads to deterioration of the framing below.

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**Figure 17.** If hidden by finish surfaces, a leaky toilet connection can go undetected until structural decay sets in.

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## Plumbing Defects

Many of the defects discussed thus far involve exterior water sources. Plumbing defects bring that water source inside the house, with equally serious consequences. Some of the plumbing defects I see are more in the way of nuisance or code violations, like water hammer, excessive water pressure, or loose shower arms. These typically don't involve structural damage from leaks.

A common source for a plumbing leak is a poorly installed toilet (Figure 17). The connection to the closet flange is important because the toilet receives so much use, which includes supporting the entire body weight of the user. If the toilet has not been set level, or if the flange is too high or low in relation to the finish floor, it's only a matter of time before a leak develops. A leaky toilet often goes unnoticed for some time, since the water may leak under the finish flooring directly into the framing.

## Chipped Sinks

This is a manufacturing defect plain and simple — and one that tends to be highly visible and irritating to owners (Figure 18). Although it's not a structural concern, if condo owners or tract house dwellers notice this in one another's homes, it can help start the defect litigation ball rolling. The chipping is normally located at the spot welds in the sinks. The enamel doesn't stick well to the welds and easily chips away, sometimes in a pattern. The solution is not to buy cheap sinks from manufacturers you have not heard of.

## Ponding in Bath Tubs

Ponding in a tub may be a manufacturing problem but more often stems from improper installation (Figure 19). The builder needs to take the time to check the framing, and shim and level the tub as necessary. Otherwise, water will collect and may stain the unit. Again, this is not a life or death issue, but it's one that homeowners will easily see. The cure for this defect, some might argue, is more painful than the disease:



Remove the tub and reinstall it correctly — which usually involves removal and replacement of ceramic tile surrounds.

### Hvac Issues

As with plumbing, many of the hvac defects cited in a typical defect case are nuisance and code issues that are easy to correct, like construction debris in the return air plenum, unsecured units, and no trap vent on the condensate drain. These issues rarely cause serious owner dissatisfaction. Pinched or crushed ducts are another common problem (Figure 20), which can cause uneven heating or cooling and result in owner discomfort. The cause may be sloppy installation or damage by a subsequent trade. The repair is as simple as unpinching the duct or replacing any short sections that have been permanently damaged.

### Flues Too Close to Combustibles

This is a real life safety issue that can cause fires (Figure 21, page 66). It's something the municipal inspector should catch, but it often seems to be missed. Different types of flue vents have different distance requirements from combustibles. Generally, a single-wall vent must maintain 6 to 18 inches or more clearance, while a double-wall (B, BW, or L type) needs anywhere from 1 to 9 inches, depending on the rating of the appliance it is venting. Many vents have clearance guidelines printed directly on the pipe. The stick in the spokes for builders is that many materials we normally think of as not being combustible are considered so by the fire safety section of the code. For example, drywall is considered a combustible material by this code definition.

Sometimes the repair for a problem with distance to combustibles is a simple matter of exchanging a single-wall vent with a double-wall, thus decreasing the required distance. Sometimes it might require reframing the area. The best way to avoid problems such as these is to remember that all flue pipes carrying products of combustion require some separation from com-



**Figure 18.** The chipped enamel in this cheap lavatory sink is the kind of defect that will send condo or tract homeowners ballistic — especially when they see it in every home on the block.

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**Figure 19.** Ponding in the bottom of a tub unit — the result of an out-of-level installation — is not structurally serious but is obvious to any homeowner.

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**Figure 20.** A pinched duct can result in uneven temperatures. It's easy to fix if it's accessible, but easier still to avoid.

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**Figure 21.** As a matter of life safety, combustion appliance vent pipes must have proper clearance to combustibles. The guidelines are usually stamped right on the appliance itself.



bustible materials and to follow the manufacturer's installation instructions, which will usually state this requirement very clearly. If you purchase the device and the flue separately, always use the flue recommended by the manufacturer of the appliance.

### Breaches in Firestops


With a mechanical firebox, a firestop must be installed at each ceiling level where the flue passes on its way to the roof. Firestops work the same way fire-blocking does to prevent fire from traveling from floor to floor, as in balloon framing. Specialty subcontractors often install fireboxes and firestops, and sometimes the installation goes into an opening that was not properly framed. Instead of calling for the framer to reframe the opening, which would cost the fireplace installer and the framer time and money, the sub often completes the installation anyway, thinking that unless there is a fire, no one is likely to ever know of the improper installation. Gaps in firestops are a definite code violation and a life safety issue (Figure 22).



**Figure 22.** Firestops are an important safety requirement. Unfortunately, if a gap is missed by the inspector, all too often it will be permanently concealed from view.

### Unsealed Gas Line Penetration in Firebox

Mechanical fireboxes are very common in moderately priced Southern California residential construction. An unsealed gas line penetration at the mechanical firebox is one of the most common construction defects we see (Figure 23). It's a problem because fire that is supposed to be contained within the mechanical firebox could spread to the wood framing behind the box. Lucky for builders, it's also easy to recognize and easy to fix.

There's no removal of expensive finishes needed. The repair is a simple application of fireproof grout to seal around the penetration. 

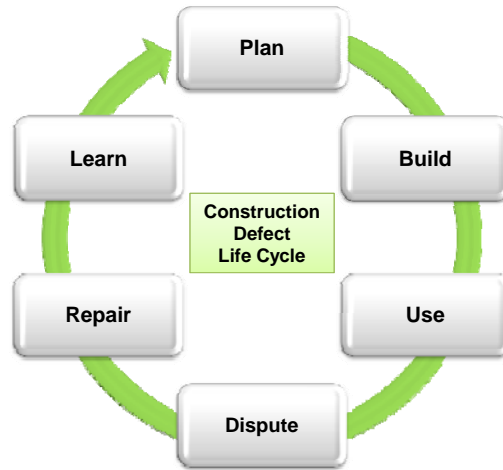
**Figure 23.** The pipe penetration into a gas fireplace must be properly sealed with a firestop material — a defect that's easy to spot and easy to fix with fireproof grout.



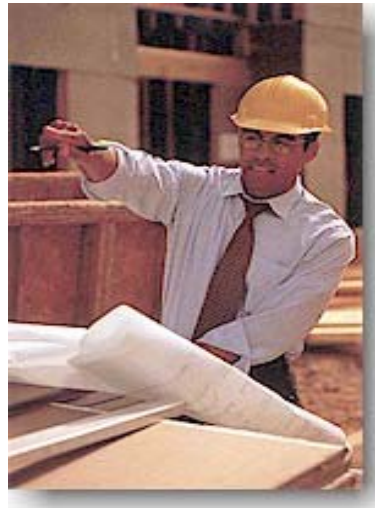
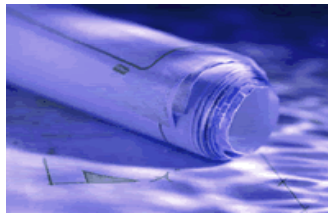
*Pete Fowler is a general contractor and construction consultant in Southern California. Thanks to Kevin McCoy, C.E., for his assistance with the structural sections of this article.*

## 2. Construction Defect Life Cycle

- A. Plan
- B. Build
- C. Use
- D. Dispute
- E. Repair
- F. Learn



### 2.A Plan



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### PROJECT SCOPE AND QUALITY

Project definition is essential if the Owner and the Architect/ Builder are to understand what the Project is all about.

### MARKET RESEARCH

For some projects the program is dictated by the Marketplace. To secure the sales or rental levels possible in the Market place a general level or "Value profile" has to be set.

### SITE REQUIREMENTS

Site analysis requires both a program and a site. Analysis affect project budgeting and financial feasibility by identifying opportunities and constraints that have a direct affect on the cost of construction.

## 2.A Plan

### *Construction Documents (1 of 2)*

- **Construction Documents** - all the written and graphic documents prepared or assembled by the Architect for communicating the design of the Project and administrating the contract for the Project's construction.
- Construction Documents consist of 2 major groups of documents:
  - Bidding Requirements
  - Contract Documents