

Builder

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The Seven Deadly Sins of Construction Problems

Data shows builders should watch out for these most common causes of construction problems.

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Accelerated construction schedules, lack of skilled or trained labor, and poor site management can result in an increase in construction problems. Short-sighted field decisions can have a long-term yet hidden set of consequences that are not discovered until well into the life of the home. Construction defect claims can hit the books in year eight or nine. This delayed feedback makes it difficult for builders to track performance metrics over the long term.

What and where are typical construction defects most commonly found in residential buildings? Based on our analysis of hundreds of projects nationwide and the data stream generated by our quality assurance app, there appears to be no single dominant issue. Our primary research shows that three key elements contribute equally: 1) deviations from architectural plans, 2) deviations from approved materials, and 3) deviations from standard field quality. This pattern varies, however, across the many U.S. markets depending on region and building types.

These factors and findings present challenges in trying to identify the root cause of construction problems since there is not just one common source of failure. That said, we have been able to identify different failure risks and trends by building type and region. For example, we have tracked an average deficiency rate of 4% nationally for all building types, including single-family homes, townhomes/condominiums, and mid-rise/high-rise buildings. For single-family homes, however, the average deficiency rate is 3% nationally and ranges from 1.6% in California and 1.7% in Nevada to 5% in Florida and 6% in Texas.

For multifamily attached projects, the average deficiency rate is 6.5% nationally, which is close to California at 5.8%. In Arizona and Nevada, the deficiency rates increase dramatically to 12.7% and 23.1%, respectively. In effect, Arizona has twice the deficiency rate of California for multifamily projects and Nevada has four times the deficiency rate as California. Clearly, California has made good progress with process improvements. These include better and more accurate execution of design, purchasing, construction, and HOA maintenance practices; use of third-party quality assurance services; building science training initiatives; and legislative reform measures.

The Seven Deadly Sins

LJP's 25-plus years of experience as a third-party quality assurance consultant for home builders has produced substantial data and insight about defects in residential construction and enabled us to identify the more egregious and pervasive issues.

We have identified the following “seven deadly sins” as the most common causes of construction defect claims. While not necessarily deadly in terms of endangering life, these culprits’ deadliness relates to their potential damage to a structure, resulting in costly repairs and potential litigation. These “sins” require continuing surveillance during the building design, construction and maintenance life cycle.

- 1. Improperly designed and constructed roofs.** Water leakage from any source can result in unhealthy living conditions due to mold growth and damage to interiors. Clipping eaves as a design solution to save construction costs is not recommended as the eaves help protect the walls. In turn, flat roofs with decks over living spaces—functioning like a walkable roof—are a potential water intrusion disaster. While many roof installation defects can be identified, the most vulnerable are out of sight and create longer-term deterioration. These include roofing felt that is not fully covering the roof sheathing or is split, torn, or deteriorated from overexposure. That mistake can create an entry point allowing water intrusion or pigeons in the attic (yes, we have had first-hand experience of pigeons roosting in attics of newly built and homeowner-occupied

production homes). Similarly, open gaps at flashing joints and lack of storm collars on plumbing penetrations through the roofing assemblies are also water sources.



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2. Improperly installed windows and doors. Windows and doors are often the first defects noticed, primarily from water intrusion leaving telltale drywall stains. Hidden defects include improperly lapped flashing membranes; missing sheet metal head flashing; and improperly installed flashing at heads, jambs, and sills. All wall penetrations require a flashing system comparable to windows. We have also seen incompatible flashing materials, causing one to chemically melt the other. Those deeply recessed windows, currently in vogue with building designers, are particularly problematic if they lack positive sloping sills for effective drainage. Similarly, radius-topped windows need extra care from installers to assure proper lapping of the head flashing strips from bottom to top.

3. Improperly designed and built decks or balconies. Safety is a critical issue in balcony design and construction—whether for a two-story wood-frame structure in Los Angeles or a 60-story concrete/steel high-rise in Miami. Positive drainage seems to be an ever-present challenge due to lack of sufficient slope on the decks. Water intrusion may occur when a balcony or deck is framed with minimal slope or sloped toward the wall plane rather than away from the wall and structure. This can further result in moisture intrusion and wood rot problems. Similarly, improper installation of drains can be a contributing factor. Water testing of completed deck assemblies is always recommended. Ensuring that decks and balconies are structurally sound is critical.

Poorly drawn plan details or missing saddle-flashing of cantilevered structural supports can result in rotting structural members.



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4. Improperly constructed structural components. Structural components such as framing members are the bones that support the entire building. The presence of construction defects in these systems may increase the likelihood and extent of structural damage as well as the possibility of injury to occupants. Common structural defects include a variety of issues, such as missed or improperly designed or constructed plywood or OSB shear walls; insufficient edge and field nailing; and missing or inadequately installed drag straps, hold downs, and various other connection hardware. Similarly, failure to properly design and construct the required load paths from the foundations to the walls and the roofing members is a recipe for disaster when Mother Nature's fury strikes with earthquakes, tornadoes, and hurricanes. Concrete and steel towers have additional critical assemblies, such as those that are part of below-grade parking structures, that must be fully and carefully examined. These include blindside waterproofing assemblies and sub-slab methane barriers per recommendations of the all-important geo-technical/soils reports specific to that project.

5. Improperly constructed exterior siding. Improperly constructed siding can result in construction defects and water intrusion that can also be difficult to find and

repair. If installation deficiencies allow water to enter through or behind the exterior, it is problematic for the structure's interior, causing further defects such as mold, odor, cracking, warping, and dry rot. Recent advances in building science have helped building product manufacturers develop cladding systems with vented drainage planes integral to the wall system. The water may get in, but it can still get out.

6. Defective foundations and concrete slabs. The structural integrity of a home can be compromised if foundations and concrete slabs are defective. Defects in foundations and slabs can result from either horizontal cracking and vertical displacement or from improperly mixed concrete. Too much water in the design mix, for example, can lead to weaker concrete with high porosity, which is more vulnerable to vapor transmission, and damage to structural embedments from soluble sulfates in the native soils. The physics of moisture movement due to vapor pressure differentials is an interesting scientific phenomenon that can lead to damaged interior finishes and flooring systems and can allow radon or methane to invade the home. Proper precautions should be taken to minimize these problems.

7. Improperly installed MEP, HVAC, and insulation systems. Mechanical, electrical, and plumbing (MEP) designs and installations are somewhat less prone to deficiencies because they are installed by professionals who are trained, tested, and licensed. Nevertheless, construction defects do occur and can cause life-safety issues as well as substantial monetary damage. These defects, such as improper installation of electrical wiring and plumbing, are often hidden behind walls and ceilings or under floors and are difficult to find and repair.

Equally important to heating, ventilation and air conditioning (HVAC) installation is the design of these systems for interior moisture management, especially in hot and humid regions. Without adequate attention to architectural detailing, interior moisture buildup in ceilings and attics can rot structural components as quickly and easily as exterior moisture conditions. The home building industry is constructing ever-tighter building envelopes, driven by energy conservation requirements. Prudent builders will engage architects, engineers, and designers to not only address their mechanical needs for heating and cooling but consider the adequacy of their active and passive ventilation systems. As occupant behavior also drives building performance, more diligent analysis using building science principles is finally catching on with a goal of minimizing future building system defects.

As California implements net zero energy consumption regulations for all new homes and other states across the nation plan to implement similar regulations, building homes to optimize energy efficiency will affect the construction of roofs, walls, windows, and foundations. Insulation type and insulation installation methods are now more of a focus for design teams, builders, and installing contractors. It appears that most builders are not scheduling enough time and resources to ensure that interior fiberglass batt insulation is done correctly. Faulty installation can create interior wall convective air flow loops, resulting in poor energy conservation and expense for the homeowner. Given its importance, insulation should be installed by skilled and experienced tradesmen who know the thermodynamic basics of insulated wall systems. In the face of

such practical limitations, the standards have been raised and the industry is moving toward rigid exterior insulation products.

When it comes to construction, today's builders, developers, and contractors face many issues, such as the current lack of qualified, experienced tradesmen due to the demand for these workers. In dealing with these challenges, we believe the importance of technology in the building industry will continue to grow and play a bigger role in the construction process. We also see an increased role for professionals who provide the necessary due diligence, quality assurance, and deep-dive metrics and predictive analytics to ensure that the job is done right the first time.

Don Neff is president of [LJP Construction Services](#), headquartered in Irvine, Calif. LJP provides quality assurance services on behalf of builder and insurance clients, including construction inspection data tracking with its CaptureQA app.

Side Story



Opinion

Three Labor Shortage Solutions Construction Should Adopt

by Don Neff

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