



Builder's Guide: Reducing Mold Risk

PIER Buildings Program

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The Problem

A common perception in the building industry is that requirements for tighter shells to reduce air infiltration in residential buildings have led to more frequent problems with mold growth. Although reduced infiltration seems a likely cause for the increasing numbers of moisture and mold problems observed, little objective research had been conducted into the primary drivers of residential mold problems.

The Solution

To better understand the problem of mold occurrence, the California Energy Commission sponsored an investigation, led by the Gas Technology Institute, into the causes of moisture intrusion. This research consisted of laboratory and field studies of structures that are designed to keep building materials dry and free of mold. One of the outcomes of this research was the publication of *A California Builder's Guide to Reducing Mold Risk*, which provides the current understanding of techniques for preventing mold problems in new residential buildings. Although the guide is geared toward builders, it also provides useful information for homeowners.

Features and Benefits

The builder's guide presents a three-part strategy for minimizing moisture intrusion and mold risk. Each part includes several recommendations to consider during the development, design, construction, and ownership of a home.

Keep water away. Making sure that water flows away from buildings automatically reduces moisture buildup and potential for mold growth. This is accomplished primarily through proper siting, grading, drainage, and other landscape decisions. For example, landscape irrigation near a building should be minimized as it can increase mold risk. The recurrent presence of water near the building's foundation, the potential for broken sprinkler heads to leak massive amounts of water near the foundation, and misdirected sprinkler heads that spray water against walls all increase the opportunity for moisture intrusion.

Keep water out. It is important to quickly and effectively drain away any water that comes into contact with the building. For example, roof overhangs should be applied where possible to prevent rainwater from flowing down the side of a building,

where it can enter through cracks (see **Figure 1**). In addition, the number of roof valleys should be minimized. Rainwater accumulates in these areas, which are also vulnerable construction joints. These create a high-risk zone for moisture intrusion. Also, two independently ship-lapped layers of building paper or housewrap should be used between stucco walls and the building sheathing. This helps to ensure that an air gap will remain behind the stucco to drain away any water that permeates it.

Limit mold growth. This can be accomplished by construction practices that prevent water leaks from spreading. For example, damage from occasional water spills in bathrooms, kitchens, and laundry rooms can be prevented by installing gypsum board with a gap of 3/8-inch to 1/2-inch at the base of the wall and sealing the gap with a water-resistant sealant. This prevents spilled water from being wicked up the walls and providing a place for mold to grow before the walls can dry out (see **Figure 2**, next page). Mold growth can also be discouraged by using materials that are less prone to moisture retention, such as breathable interior finishes, which allow framing lumber that has not been kiln-dried to dry out after it is installed.

Applications

The recommendations outlined in the builder's guide are intended for new homes in California, but they can be applied in other regions with similar climates. Many of them can also be used for existing homes.

Figure 1: Roof overhangs: Longer is better.

This simple and time-proven architectural feature can reduce the net annual water load around windows, thus reducing leaks. Notice how rain has not dampened the wall beneath the triangular overhang.

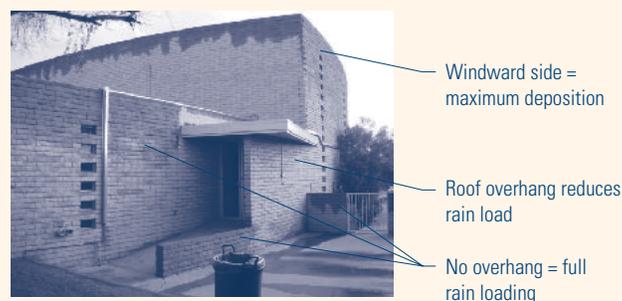
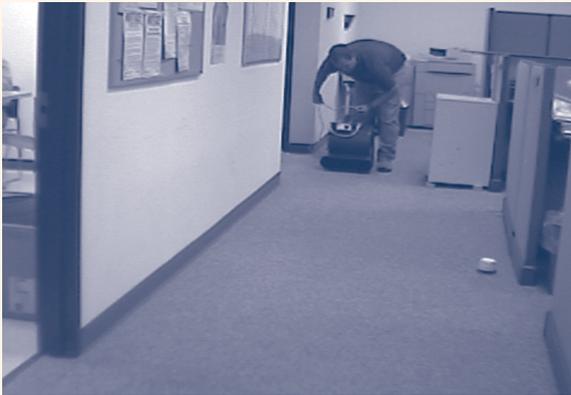


Figure 2: The importance of wall bottom gaps

This building had water damage from a spill. Because there was no gap between the floor and the gypsum at the base of the wall, water was wicked up into the wall board. Although the damage isn't obvious to the naked eye (top image), it is clear in the infrared image (bottom). The owner had a difficult choice between paying for professional drying and risking mold growth.



California Codes and Standards

The research conducted had not identified any specific linkages between Title 24 construction and increased mold risk. Further investigation of moisture and home construction parameters is needed to enable an authoritative cause analysis of moisture and mold problems.

About PIER

This project was conducted by the California Energy Commission's Public Interest Energy Research (PIER) Program. PIER supports public interest energy research and development that helps improve the quality of life in California by bringing environmentally safe, affordable, and reliable energy services and products to the marketplace.

Arnold Schwarzenegger, Governor
California Energy Commission

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What's Next

The recommendations for future research focus on three major initiatives:

- Expand field demonstration and monitoring of materials and methods with acknowledged energy efficiency, risk reduction, and performance benefits that were highlighted by builders under this project.
- Develop and evaluate laboratory and field performance test methods for wall penetrations integrated with cladding and wall assemblies.
- Collect and analyze laboratory and field data on causes and consequences of building envelope failures to identify and evaluate alternative mold risk-reduction strategies for window-wall interfaces.

Collaborators

The Gas Technology Institute and Mason-Grant Consulting worked together to produce the builder's guide.

For More Information

Reports documenting this project and providing more details may be downloaded from www.energy.ca.gov/publications/displayOneReport.php?pubNum=CEC-500-2007-036.

More PIER Technical Briefs can be found at www.energy.ca.gov/research/techbriefs.html.

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