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Grading and Drainage Problems in Residential Construction

By Matthew T. Blackmer, P. E., M.S.

Do you often have claims resulting from water problems in basements? The causes of water infiltration are numerous, but are typically related to the immediate grading and drainage around homes. Water infiltration can result in damage to structural elements of the home and health issues resulting from biological growth under structural basement floors or in the wall cavities of finished basements. Storage items could also be damaged by water exposure, resulting in property loss.

Our firm has observed numerous sites where the grading adjacent to homes was flat or negatively sloped toward the structures. This is a serious defect in regards to the numerous claims that can arise. The Uniform Building Code (UBC) states "Provisions shall be made for the control and drainage of surface water around buildings." In addition to this requirement, the UBC requires a minimum slope of 6 inches in the first 6 feet adjacent to the foundation. The UBC also requires that untreated wood be isolated from the site grading a minimum of 6 inches to help prevent decay and infestation. During construction, the grading adjacent to the home is often installed to slope away from the home, but as the backfill settles, the grading becomes flat to negative. The grading should be installed with enough slope, that even after settlement, there is still positive grading away from the home. The soils reports and the Uniform Building Code require compaction efforts to be made in the backfill. The compaction effort is to minimize settlement to tolerable limits.

One part of water control around homes, that is commonly overlooked, is the control of roof drainage. In one instance, we observed a home where the owner hired a contractor to construct an addition, along with re-roofing and gutter installation for the entire home. The original downspouts from the gutter system were tied to underground pipes that discharged away from the foundation walls. During the construction, the contractor installed one of the new downspout discharges adjacent to the basement of the original home. The finished basement flooded as a result of the improper discharge of water adjacent to the foundation wall. In addition, the grading adjacent to the home was flat, which did not provide for proper drainage away from the home. The placement of the water adjacent to the home resulted in drywall finish and carpet damage in the basement, which turned into an expensive insurance claim. The home happened to have been constructed in a relatively non-expansive soil area, otherwise more significant damage to the home could have occurred from the improper water removal and infiltration.

Wet and saturated soil adjacent to foundation walls is typically a result of several factors including:

1. Improper disposal of roof water run off
2. Poor surface drainage
3. Window well problems
4. Lawn sprinkler installation adjacent to the foundation

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5. Inadequate foundation drains
6. High water table elevation

In most cases, grading adjacent to the home is the leading cause of the problems. Grading problems and the resultant water infiltration may result in insurance claims arising from:

1. Basement slab movement and damage to the finish systems from soil expansion or consolidation
2. Biological growth and high humidity under structural floors causing possible respiratory problems for residents
3. Wood rot and structural failure of structural floors
4. Water damage to basement finish materials such as carpet and drywall
5. Inward foundation wall movement and cracks resulting from increased hydrostatic pressure on foundation walls
6. Exterior concrete flatwork (porches and sidewalk) movement (heave or settlement) as a result of water infiltration into the backfill

In order to prevent water infiltration into basements and damage from water adjacent to the foundation walls:

1. Install and maintain a good gutter and downspout system

2. Provide positive slope away from the foundation in accordance with all governing building codes and engineering recommendations

3. Keep landscape irrigation away from the foundation walls

4. Provide proper perimeter drains around the foundation walls

For a small upfront investment by the builder that allows for proper drainage, maintenance accessibility and redundancy, many damages and subsequent claims could have been avoided. Homeowners and contractors must work together to prevent water from adversely affecting the home. In the case of multi-family complexes the yearly reserve fund should be set to include maintenance of the property's drainage features.

Matthew T. Blackmer is a forensic/structural/civil engineer with Professional Investigative Engineers. His background includes 8 years of experience with construction defects and civil and structural failures. He has also provided observations and repair documents for homes damaged by expansive soils, fire and floods. Matt has a Bachelor of Science degree in Engineering-Civil Specialty from the Colorado School of Mines and a Master of Science degree in Civil Engineering from the University of Colorado.

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