WATER DAMAGE DURING CONSTRUCTION

A Contractor's loss prevention guide

ALLIANZ RISK CONSULTING

INTRODUCTION

Most water losses are preventable by reducing construction defects.

Water damage is a major cause of loss during construction and represents a substantial portion of Builder's Risk claims. Water damage occurs in many types of construction projects and it affects small and large projects alike. The mitigation of water damage losses can reduce Builder's Risk claims and prevent project delays, which will ultimately benefit all parties involved including the owner, the contractor and the insurer. The majority of water losses are preventable if the contractor focuses on reducing construction defects. Water damage occurs from water entering the building envelope or from internal building releases. These water releases are most costly when interior construction is completed or water sensitive equipment is installed prior to the intrusion/release. In addition to expensive repairs, rework results in project delays (preventing the contractor from focusing on new profitable projects) and results in displeased owners.

TYPICAL WATER DAMAGE CAUSES

Unsecured Building Openings
- Door and window openings
- Roof openings

Water Delivery or Drainage System Failure
- Plumbing system
- Fire protection system
- Mechanical system
- Drainage system

Subsurface Drainage Problems
- Dewatering operations issues

Material Storage Problems
- Water sensitive equipment stored improperly
- Failed just-in-time delivery results in improper storage
- Storage in low lying areas subject to water damage

Building Envelope System Deficiencies
- Door, window and exterior wall
- Roof, gutter, and window flashings
- Damp-proofing and waterproofing

Site Drainage Problems
- Improper drainage away from excavations and building structures
- Inadequate retention ponds

Foundation and Structural Element Problems
- Cracks/fissures in waterproofing structures
- Separation of building envelope elements
- Flooded/undermined excavations
- Excessive/premature loading

BEST WATER DAMAGE PREVENTION PROGRAM ATTRIBUTES

The good news is that almost all water losses are preventable using risk management best practices that are relatively easy to implement, with only a negligible impact on the project budget. Prevention should occur at the following phases of construction:

- Pre-Construction
- Active-Construction
- Project Close-out/Post Construction

Typically, there are "General Program Measures" that are established at the corporate level and "Specific Construction Measures" that are addressed at the project level.

There are several steps that the contractor can take to prevent water damage in each phase of construction.

PRE-CONSTRUCTION

General Program Measures

1. **Implement a formal Quality Assessment and Quality Control (QA/QC) design program, including a constructability review.** A constructability review prior to construction will help eliminate design problems that could lead to water damage.
2. **Perform a peer review of all plans and specifications before beginning construction work on any project.**
   a. Plan and specification review should include review of methods, materials, code compliance and compatibility with local conditions.
   b. Hire waterproofing experts to perform a review if the staff is not available or qualified for the project type considered.

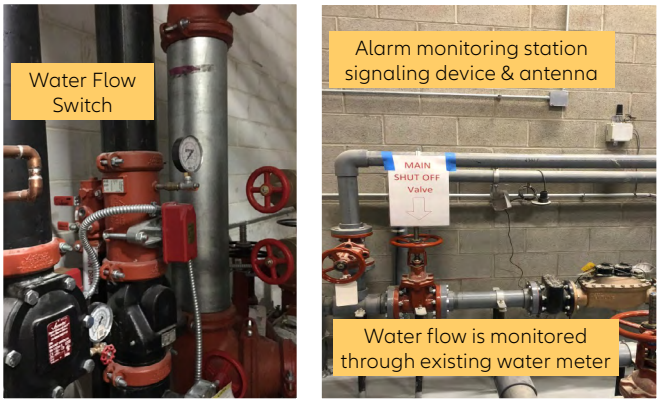
Specific Construction Measures

1. **Evaluate the contract documents** for areas of water infiltration susceptibility, prior to construction.
2. **Notify the engineer** in the form of a "Request for Information" (RFI), if an area of weakness is identified.
3. **Evaluate specified materials/systems** and how they will interrelate.
4. **Mold resistant materials.** Consider the use of mold resistant drywall and other mold resistant materials (when applicable) to minimize the potential for water damage.
5. **Evaluate the site for water drainage.** Ensure that water runoff is directed away from the structures and planned excavations when performing site planning and preparation.
6. **Schedule the installation and testing of piping systems, such as hydronic systems, as early as possible in the project.** This will help minimize damage, as the majority of finish work will not have been started.
7. **Consider redundant power sources and pumping systems** to prevent flooding in the event of a system failure when planning dewatering operations.
8. **If constructing in locations with known flood exposure,** consideration should be given to installing temporary or permanent flood barriers prior to construction and drainage systems should be installed early in the construction schedule.

ACTIVE-CONSTRUCTION

General Program Measures

1. **Utilize Water Leak Detection and Monitoring** to detect leaks in the pressurized potable and fire water systems (contact your Risk Engineer regarding a preestablished detection and monitoring solution).
   a. Arrange for flow monitoring devices to be placed on the potable and fire water mains feeding the building.
   b. Develop and maintain a current emergency after hours call list.



Water Leak detection monitoring

c. Institute a monitoring service which in the event of an unexpected after-hours water flow has a full time monitoring staff who calls the site representatives to alert them of a potential leak.

2. **Temporary and permanent water supply.**

   a. Whenever possible always install and utilize a permanent water supply instead of a less reliable temporary main.

   b. When a temporary water system must be utilized it should be routed so as to minimize the potential loss in the event of a release. Don't route through finished areas, electrical, water sensitive equipment and materials storage locations, etc.

3. **Keep a full-time corporate Quality Director on staff** with authority granted by the company executives to enforce improvements and affect production (stop work if necessary), whose responsibilities include:

   a. Developing a quality manual that specifies QA/QC standards, procedures and forms.

   b. Routinely auditing ongoing projects and implementing improvements.

   c. Training field staff in best practices for quality control and risk mitigation.

   d. Reporting on issues, mitigation plans and progress.

4. **Institute a project-specific QA/QC program at the beginning of the project.** The QA/QC program must include subcontractors' work and should:

   a. Establish a no-defects policy, formalized by specific language in subcontracts and actively reinforced at meetings with subcontractors.

   b. Institute routine QC Inspections that are documented, photographed and signed.

   c. Require the preparation of mockups for critical assemblies that could be susceptible to water intrusion or damage.

   d. Provide processes and lines of authority for promptly addressing quality issues.

5. **Establish a dedicated construction defect team focused on water damage prevention issues. The team should:**

   a. Identify potential water damage issues as they arise and ensure they are addressed and tracked toward resolution.

   b. Improve practices through an organization wide formal lessons learned program.

Fractured pipe fitting

6. **Employ roofing and waterproofing consultants if internal resources for inspection are not available or the project type is outside of the company's expertise.**

   a. Consultants may be better able to identify deficient construction.

   b. Hire the most qualified inspection firm. Price should be a secondary issue.

   c. Conduct a pre-roofing installation meeting with appropriate team members, consultants and subcontractors.

7. **Properly manage subcontractors.**

   a. Select subcontractors based on past performance, experience and reputation rather than solely on price.

   b. Review subcontractors' scopes in tandem to determine if all waterproofing issues are addressed. Subcontractors may believe that waterproofing details are outside their scope. Critical waterproofing details may contractually not be in any subcontractor's scope. Quickly mitigating water damage is of critical importance in minimizing losses.

   c. Allow only licensed and qualified plumbers to work on water supply and distribution systems.

   d. Dictate that subcontractors for water systems, components and equipment must follow all manufacturer's design and installation manuals and specifications.

   e. Properly supervise subcontractor's work.

   f. Require crews to peer review and certify each other's work in writing.

8. Perform material verification.
    a. Contractor's staff should verify that material delivered matches that specified in the contract document and/or approved in a submittal.
    b. Require subcontractors to report materials delivered weekly and certify that they meet contract requirements.
    c. Perform QC checks on delivered materials.
    d. Document QC checks on delivered materials.
9. Conduct training.
    a. A budget should be established to train employees and key subcontractors pertaining to company quality procedures.
    b. Lessons learned as a result of company and industry-wide water damage losses should be taught and shared with project personnel formally in classroom training and informally during meetings.
    c. The contractor's staff should be trained to recognize and resolve water issues.

Specific Construction Measures

1. **Establish a weekly "punchlist" to identify and resolve all water issues.** Never allow open "punchlist" items to persist while the project moves forward.
2. **Mock-up all critical waterproofing systems in advance.**
    a. Test areas of the mock-up that are prone to water infiltration and ensure deficiencies are addressed.
    b. Schedule a mock-up review meeting with project personnel to discuss potential waterproofing issues.
    c. Schedule a meeting to discuss critical building system details and inspection concerns.
    d. Include mock-up approval as an activity in the schedule.
3. **Routinely test representative portions of the building envelope.** Remember that, whether or not testing was specified in the contract, if a system fails because of faulty installation, your company will bear the responsibility for the repairs.
4. **Pay subcontractors only when all work has been inspected and waterproofing issues have been resolved.**
5. **Fully dry-in the structure before installing finish materials or water-sensitive equipment.** If this is not feasible, all necessary precautions, including at a minimum the use of tarps and the installation of temporary roofs, should be taken to prevent rainwater intrusion from damaging the finishes and installed equipment.
6. **Be prepared for dry storage of materials and equipment.** Any materials that are delivered before they are ready for installation should be stored inside buildings on pallets and completely covered with waterproof tarps or plastic sheeting. To minimize the likelihood of damage in the event of water intrusion into the storage facility, consider storing materials at an elevated floor level (i.e. remove storage from below grade parking, basement levels, or low lying areas).
7. **Test roofs thoroughly for water-tightness once the roof has been completed.** "Green" roofs and complex roofs with multiple penetrations should be tested extensively by a roof-testing professional using Electric Field Vector Mapping (EFVM) or similar testing techniques.
8. **Develop a severe weather or hurricane disaster plan** (request the Allianz Construction Site Hurricane Protection Guide *from your Allianz Risk Consultant if constructing in hurricane exposed locations)*. The plan should define processes and assign all responsibilities for securing the site and preventing water damage in the event of a weather emergency. Essential features of the plan should include:
    a. A designated person in charge responsible for taking control during an emergency and implementing the established emergency protocol. This person should also be responsible for making sure that all positions on the disaster-response team are filled and members of the team receive regular training.
    b. A checklist of action items for securing the site and structure to the greatest extent possible against water damage in advance of a forecasted storm.

    c. Maintain on site materials (plywood, netting, banding, plastic sheeting, trailer anchors and tie-downs, concrete anchor screws, sandbagging materials, pumps, generators, etc.) that can address the project emergency management needs, as this material can be difficult to procure during emergency situations.
    d. A description of all possible weather-related water damage scenarios and a specific course of action for each.
    e. Provisions for salvage and cleanup operations, with particular focus on restoring items that are essential to the timeliness and success of the project.

f. Contact information for vendors and subcontractors who can provide services or supplies.

g. Security measures that may be needed to protect the site, equipment and workers in case the weather emergency disrupts normal site security.

9. **Allow only authorized fire protection contractors to place fire protection systems into service.** Even if the fire protection systems previously passed a hydrostatic test and were then drained, have the fire protection contractor return to recharge the systems.

   a. Ensure that fire protection systems are hydrostatically tested per the requirements of the most recent edition of NFPA 13 "Standard for the Installation of Sprinkler Systems" and monitor for leakage during testing.

   b. Ensure that acceptance testing of the fire pump (if applicable) is performed in accordance with the requirements of the latest edition of NFPA 20, *"Standard for the Installation of Stationary Pumps for Fire Protection"*. The jockey pump should be tested and placed in service before the fire protection system is charged with water.

   c. Ensure all fire protection pipe openings are capped during the course of installation and fit out to prevent foreign objects from entering the system.

10. **Perform a final inspection and pressure test immediately before charging piping systems with water even if the system has previously passed a hydrostatic test.** Often subsequent subcontractors will alter/effect piping systems either knowingly or unknowingly, resulting in a water release upon charging.

    a. Assign personnel whose sole responsibility is to inspect the entire piping system and sign off on the inspection immediately prior to charging the system with liquid.

    b. Prior to charging, it is critical to apply low pressure air to the line as a final check to make sure it has not been compromised.

11. **Charge piping zone-by-zone, never with all valves open.**

    a. Monitor the system continuously for at least 24 hours after charging and be prepared to react immediately in case of a release. Have this monitoring done by personnel who are trained to discover leaks and react immediately in the event of a release.

Water damage to building under construction

    b. Do not vacate the job site after charging pipes (such as over the weekend or on a holiday) until you are certain the system is performing correctly.

12. **Emergency after hours call list** Provide on-site security personnel with a list of who to contact 24 / 7 in the event of a water release. Guard duties should include checking for a water release.

13. **Verify that the piping installed on the project is that specified.** Never use structural tubing or pipe with a thinner wall than that specified by the engineer.

14. **If freezing conditions are forecasted, drain water or maintain heat on piping systems to prevent piping failures.** Be especially aware of freezing when the exterior of a building is opened for access or repair work.

15. **Protect excavations from the accumulation of water which can potentially infiltrate the structure, alter the moisture content of affected soils and/or undermine the foundations.** Excavations can be protected by:

    a. Grading surrounding soils.

    b. Placing sandbags.

    c. Providing drainage.

    d. Backfilling exposed areas as quickly as possible.

16. **Contact the structural and geotechnical engineer for advice immediately if structural failures occur.** Indications of failures include cracks or fissures due to differential settlement or displacement. Avoid making merely cosmetic fixes as they can lead to more serious water issues.

17. **Maintain a roof free of debris and ensure that low spots are quickly addressed.** Clogged roof drainage, blocked scuppers and low spots in the roofing system, even if temporary, can cause water to accumulate, which can easily infiltrate the building and may even lead to structural failure.

Water damage throughout elevator

18. **Prevent the accumulations of snow and ice to avoid overloading an incomplete structure.** Snow loads that accumulate during the construction process, especially when structural systems are not fully established, can result in structural failures and infiltration of water.
19. **Maintain backup storage plans for water-sensitive materials and equipment.** Even if you are relying on just-in-time delivery scheduling, it is rare to have everything proceed according to plan. Develop a backup dry storage plan in case the structure is not yet ready for safe installation of materials when delivered.
20. **Identify and placard water shutoff valves on every floor for potable and fire water systems.** In the event of a leak, time is critical to shut off the flow of water and prevent damage. Shutoff valves should be placarded and their location discussed routinely during safety meetings. Note that pipes and valves should be labeled as installed and not at the end of the project.
21. **Mark low hanging pipes and sprinkler heads with caution tape.** Impact to low hanging pipes by equipment may result in a water release.
22. **Utilize only high pressure hoses and never leave them charged.**
    a. Always insist that all hoses utilized are high pressure hoses, rated well in excess of the maximum delivered line pressure.
    b. Direct and enforce that hoses shall not to be left under pressure when not in use and never allow them to remain pressurized overnight or during non-working hours.

PROJECT CLOSE-OUT/POST CONSTRUCTION

General Program Measures

1. **Dedicate a "punchlist" team.** Company policy should dictate that all projects maintain a dedicated "punchlist" team.
2. **Establish a "punchlist" reserve.** Company policy should require a reserve be established at project initiation for the proper disposition of "punchlist" items.
3. **Address construction defects in good faith.** Make it company policy that water related construction defects are addressed in "good faith."

Specific Construction Measures

1. **Address "punchlist" items weekly.** Putting punch list items off until later can increase the likelihood of water infiltration, resulting in the accumulation and compounding of difficult and expensive problems that could otherwise have been prevented.
2. **Maintain a quick-response team for warranty issues.** Any water issues should be resolved within a maximum of 48 hours or sooner, if possible.
3. **Maintain a "punchlist" reserve.** Keep extra resources on hand so that punch list repairs can be made without delay.
4. **If water damage is discovered, take every action necessary to resolve the problem and prevent further damage.**

Builder's risk insurance experience has shown that most water damage could have been prevented with minor mitigation efforts and due diligence at the pre-construction, active and post-construction phases. It actually costs very little to prevent water damage and primarily requires a focus on quality, planning and testing throughout the construction process. When investigating most water losses it becomes evident that minor efforts and diligence during the construction processes would have prevented the loss. Water damage losses can include property damage, debris removal, rework, delay costs, lost profits and reputational damage. Our construction experience indicates that review and adherence to the points discussed in this document are imperative to the prevention of water damage losses.

For more information contact:

Jay M. Siegel, P.E., CPCU
Sr. Team Leader, Engineering, Construction All Risks
Office Phone: +1.770.558.6844
jay.siegel@agcs.allianz.com

Design: AGCS Graphic Design Centre