Insight: Water Damage Prevention Plans (WDPP) for Construction Projects

Introduction

Water damage on construction projects can occur from weather-related water infiltration, pipe leaks, spills and equipment failures that can lead to added costs and project delays. In many cases, these losses are preventable or can be minimized through implementing a Water Damage Prevention Plan (WDPP). To help reduce such risk, it is recommended that all construction projects develop a detailed site-specific WDPP.

This document is a reference to help assist contractors and owners with developing an effective WDPP using industry best practices that can help reduce the likelihood of water damage while mitigating impact should an incident occur. Document information can be used to help develop or improve a construction site WDPP, identify potential sources of liquid damage and their associated mitigation efforts, and, provide starting point guidance for a site project team up-front detailed risk assessment.

Creating an integrated WDPP can help reduce risk, construction costs, and project delays.

Pre-Construction Planning

From a loss control engineering perspective, the project team (i.e. owner, contractor, engineer, architect, etc.) must plan for water damage prevention during the pre-construction phase. Water intrusion controls must be considered during project design, subcontractor selection, and operation planning. Early WDPP planning, including having an operational program in place prior to delivery or installation of building materials that may sustain water or moisture damage, offers the best opportunity to effectively consider all potential liquid damage causes and their associated prevention measures.

WDPP Management

To be effective, a WDPP must also have continuous evaluation with updating as needed to meet/exceed project requirements. A key to this success is the assignment of an experienced individual (or team) to manage, implement, oversee, and update the program throughout the life of the construction project. The plan must clearly define and assign specific responsibilities for everyone involved with its implementation. This also requires participation from the entire construction team, project management, engineering, subcontractors, consultants, and the craft labor workforce.

Design Considerations

Building features that exacerbate water damage and can mitigate losses if an event occurs should be identified by the design team. And a procedure for reviewing plans and specifications to identify water infiltration exposures should be developed. Any design concerns must be brought to the attention of the project team for discussion and possible corrective action. Some examples of actions to consider in the building design analysis include the following:

Pipe Systems

- Conducting a comprehensive risk assessment of all water distribution systems.
- Review of water tanks, service risers, and pipe route locations.
- Allowance for additional isolation valves- verifying valve locations provide easy access and isolation valves are included on all renovation work.
- Providing temporary or permanent drainage points as needed.
- Identify testing, commissioning, and certification procedures.
- Including water management devices and leak detection systems in the permanent design.

HVAC systems

- Performing a review of the building HVAC systems (i.e. local climate, occupancy of the space, and mitigation of moisture build-up inside the building).
- Identifying any temporary HVAC need that may be required during construction.
- Reviewing condensate collection systems and drainage systems.
- Providing insulation on systems that may develop condensation.
- Identifying any areas not serviced by the building HVAC system. Investigate if adequate ventilation is provided.

General Material Selection

- Identifying any products that could promote mold growth such as wood, insulation, plywood, or drywall and upgrading to moisture or mold resistant products when possible.
- Identifying areas where drywall must be installed before the structure is watertight. and finishing these areas with moisture-resistant drywall.
- Reviewing project specifications and manufacturer specifications for environmental requirements including the determination of any limitations for moisture content, humidity, and temperature, during material storage and installation.

Building Envelope

- Including a detailed review of the building envelope design with specific attention to ensure a waterproof envelope with consider of roofing intersection details, curtainwall systems, window and door flashing, roof and wall penetrations, waterproofing membranes, building envelope drainage systems, vapor barriers and wall cavity drainage provisions.
- Using outside consultants to assist with design and constructability reviews which could include waterproofing, building envelope, or roofing consultants.
- Identifying any waterproofing or moisture prevention systems. Consult manufacturers to confirm the product's application and recommend standard details.
- Identifying building enclosure systems involving multiple materials or complex construction methods. Investigate the compatibility of sealants used on dissimilar materials.

Floor Slab Penetrations

- Adding permanent monolithic concrete curbing around large slab penetrations such as bus duct openings, trash chute openings, or HVAC duct openings.
- Installing pipe sleeves for smaller penetrations that extends above the concrete slab (to prevent water spread between floors).
- Using waterproof W-rated firestop sealants on vertical pipe penetrations and perimeter fire-safe Class 1 W-rating in accordance with UL 1479 (or equivalent) sealants between curtainwalls and floor slabs (to help prevent water spread between floors).

Site Work Grading & Drainage

Verifying the following items are sufficiently addressed in the project design:

- Exterior waterproofing and foundation drainage
- Rain gutters and downspouts installed on roof and building structures
- Utility and site drainage systems
- Landscaping and irrigation systems

Quality Control- General Requirements

Quality building work in accordance with the project design specifications is critical to the prevention of water damage. The WDPP must identify any specific areas of concern that could lead to liquid damage. And verification should be made the existing project quality control program addresses the following general requirements through programs and processes:

- Strict compliance with design guidelines and manufacturers installation manuals.
- Field installations reviews for compliance with design specifications during all stages of construction.
- All contractors work in compliance with industry recognized codes.
- Inspection and certification of work performed by sub-contractors is completed throughout the project.
- Independent third-party certification of work performed by sub-contractors in addition to self-verification by the installing trade is implemented.
- Mock-ups for any moisture-critical systems of concern have mock-ups with approval from the owner, architect, and engineer before installation.
- Inspect and document work prior to closing walls.
- All piping systems are completed, tested, and documentation is provided, that no moisture or mold is present, prior to closing walls.

Pre-Activity Planning

- Hold pre-activity meetings for any installations' critical to water damage prevention such as waterproofing installation, roofing installation, curtainwall installation, pipe pressure testing, etc. The purpose of this meeting is to discuss all aspects of the installation and address any quality concerns. Special attention should be given to inspections and testing so all parties agree on how the work will be accepted.
- Ensure all parties are present at pre-activity meetings including the general contractor, owners, sub-contractors, consultants, critical suppliers, engineers, and third-party testing agencies.
- Review the material submittals, critical specifications, means & methods, testing requirements, and compatibility of all products being used.

Inspection, Testing & Verification

- Develop Inspection and Test Plans (ITP's) for any operations critical to water damage prevention that include activities such as waterproofing, roofing, window installation, curtainwall installation, and pipe installation.
- Include a list of all inspection and testing requirements relevant to each operation in the ITP that identify the materials and work to be inspected or tested, who will perform the inspection or test, the expected stage or frequency, and defined Hold and Witness Points. References to relevant standards, acceptance criteria definitions, and what records should be maintained should also be included.
- Develop a pressure testing plan for all pipe systems. A recommended best practice involves an initial air test followed by sectional hydrostatic testing to a minimum of 1.5 times the design working pressure. Following sectional tests, a full system test that includes all equipment and fittings at the designed working pressure should be carried out. All testing should be in accordance with manufacturer guidelines. Tests should be witnessed by the general contractor as well as an independent third party.
- Identify any high value or long-lead time equipment such as electrical gear that needs to be protected during hydrostatic testing.
- Identify how the building envelope will be tested for water tightness.
- Identify any field inspections or tests to be performed by 3rd party consultants.
- Determine the individual component testing requirements at manufacturer facilities, upon arrival to the site, and after installation. Determine how the entire system will be tested.
- Arrange for field water testing of curtainwall and window systems by independent testing agencies.
- Arrange for an interior and exterior inspection of the curtainwall one year after installation and just prior to the end of the warranty.

Subcontractor Selection

- Develop a pre-qualify process for selection of subcontractors that includes verification of adequate experience in the specific work being bid.
- Ensure only qualified plumbers/pipe fitters with appropriate skill sets are permitted to work on water distribution systems with verification adequate training records are available and maintained and, that plumbing, and HVAC companies are members of recognized industry associations.
- Identify any specialized contractors that will be required.
- Identify subcontractor responsibilities pertaining to water mitigation and include specific information in written contracts.
- Verify all subcontractors are aware of the WDPP prior to commencement of work and that water damage prevention is included at trade kick-off meetings.

Project Schedule

- Review and adjust the project schedule, as needed, during development of the WDPP.
- Schedule work to reduce the likelihood of damage from weather-related incidents.
- Ensure an understanding of the wet weather conditions prior to the start date of interior finish installations.
- Ideally, complete the building envelope to be watertight before moisture sensitive internal works begin.
- Identify any finish work that must be performed prior to completion of the building enclosure.
- Provide a detailed plan for protecting each area of exposure. Consider how partial building envelopes will be established to minimize water infiltration.
- Identify when site drainage, grading, and paving needs to be installed to direct water away from buildings.
- Identify when temporary or permeant roof/building drainage must be in place to discharge water from the building.
- Identify building enclosure milestones.
- Identify when sump pumps, leak detection devices, and water management devices need to be installed and activated.
- Identify when building piping systems will be activated.

Project Location

Include an overview in the WDPP of the anticipated weather-related hazards a project could face as well as how this may affect the overall scheduling and sequence of operations. Identify and incorporate the following potential exposures as applicable for the project location:

Cold weather

- Climate including levels of protection anticipated for cold weather
- Building systems or operations that may be affected by freezing conditions

Rain

- Periods of peak rainfall
- Periods of heightened flash flooding such as times of deep excavations, incomplete drainage, etc.

Flood

- The anticipated flood hazard with development of a separate Flood Emergency Response Plan if located in a documented flood zone (with additional considerations from AIG's Flood Emergency Response Checklist) including the need for any permanent or temporary flood prevention systems (with such systems installed as early as possible in the overall project schedule)
- The average measured groundwater level for the site and its potential flood hazard during excavations or below grade work

Hurricane

- The anticipated hurricane hazard with a separate Hurricane Preparation, Response & Recovery Plan developed for projects located for areas prone to hurricanes

Assign responsibly for monitoring the weather forecast and define communication expectations of adverse weather forecast to specific appropriate staff as part of the WDPP.

Monitor weather forecasts daily for upcoming inclement weather events. Develop a plan for monitoring the building during severe weather events and determining what additional labor coverage is necessary. Develop/utilize a pre-storm site inspection checklist to prepare for significant weather events.

Implement pre-event and post event checklists to document building conditions as part of the monitoring program.

Mitigation During Construction

Building Materials

Planning the delivery and storage of materials is critical to avoiding mold and future moisture problems. Take the following actions where applicable/possible:

- Identify building materials and equipment that are prone to water damage and evaluate how these items will be stored to prevent moisture damage including identifying any specific manufacturer storage recommendations.
- Identify how far in advance materials and equipment will be delivered to minimize storage time of sensitive materials.
- Identify a storage location for moisture sensitive materials including interior storage when possible.

- Keep storage elevated off the ground and away from the edge of buildings.
- Identify any protective material required for long term storage such as tarps, plastic, shipping containers, conditioned space, etc.
- Establish a procedure for the receiving material deliveries including the inspection upon delivery for pre-existing water damage and damaged packaging.
- Provide periodic inspections of lay-down yards and storage areas to verify materials are properly stored.
- Develop a procedure to reject or dry out any water-damaged material.
- Remove damaged or moldy materials from the site immediately upon discovery.

Foundations/Grading/Sitework

- Install site drainage and finish grading as early as possible.
- Develop a temporary grading plan to address collection of water.
- Verify the grade surrounding buildings will direct rain and surface water away from the foundations and building structure.
- Extend drains and downspouts away from the structure.
- Verify catch basins and curb gutters are clean and protected to prevent water from ponding.
- Identify below grade openings such as conduit or block outs and provide protection immediately after installation.
- Check that sprinklers and irrigation systems are installed so water is not directed toward the building.

Building Drainage

- Identify how roof and building drainage will be provided.
- Install roof drainage immediately after buildings are topped out.
- Develop plans for any temporary systems that must be installed prior to installation of the permeant roofing.
- Verify that temporary drainage is properly supported/braced and has similar capacity to the permeant design.
- Verify all drains are functioning prior to any significant weather events.
- Inspect and maintain roof drains regularly.
- Install sump pumps in basements and low areas as early as possible.
- Inspect and test pumps regularly. Inspect discharge hoses and their associated storm water systems regularly.

Exterior Building Penetrations

- Review the drawings for penetrations such as pipes, vents, conduit, access hatches, etc.
- Identify any penetrations through the building envelope (walls, roof, foundation, etc.) that must be left open for an extended period.
- Provide details on how the openings will be protected and what types of temporary coverings are required.
- Install sealant or flashing around penetrations through building envelopes immediately after installation with verification of water tightness.

Doors & Windows

- Ensure the timely installation of doors and windows as they are often left out for various reasons including bucket hoist access, personnel access, material handling space, missing or late deliveries, damaged material, and protection of final products.
- Develop a plan to protect unfinished openings where doors/windows are left out for an extended period.
- Keep materials on site to protect openings if door/windows are missing or damaged during construction.
- Install door/window caulking and sealant immediately after installation.

Drywall

- Identify any areas that will receive moisture/mold resistant drywall or other similar products and use in cases where drywall needs to be installed prior to the envelope being 100% complete.
- Verify concrete slabs are dry before installing insulation and or drywall.
- Maintain adequate space between the floor slab and bottom of drywall with increased spacing in moisture prone areas.
- Complete a pre-drywall inspection prior to closing any walls.
- Develop a plan to maintain ventilation and control humidity/moisture during drywall installation and finishing.
- Identify if temporary dehumidifiers, HVAC equipment or drying equipment will be necessary.

Plumbing Systems

- Perform pressure tests to verify the integrity of all pipe systems.
- Perform visual inspections on all pipe systems before pressure testing begins including verification of correct installation, all connections are tight, and all valves are in the proper position.
- Perform an initial low-pressure air test before introducing water into pipes.
- Perform hydrostatic testing per the project quality plan.
- Ensure an adequate number of employees are present during the initial filling to facilitate early leak identification and repair any leaks discovered immediately.

- Ensure Water Intrusion Response Kits are nearby when pressure testing pipe with staff training on use.
- Verify piping is installed at the center of partitions to help prevent nails from piercing pipes and install shield plates and stud guards as needed.
- Verify chilled water lines are properly insulated.
- Energize piping well before drywall installation begins. This will allow for daily inspection of these systems and verify there are no leaks.

Freezing Weather/Temporary Heat

- Develop and implement a winter weather protection plan for projects in cold weather locations should develop a winter weather protection plan.
- Identify any water systems that will be active during periods when cold weather is expected.
- Identify any piping, equipment, pumps, or tanks located in unheated or non-insulated areas that could be affected by changing temperatures.
- Outline all provisions that will prevent freezing or damage to pipes.
- Identify any needs for heat trace, insulation, temporary building heat, or regular system drain downs.
- Communicate the list of active pipe systems to security personnel who will occupy the building after hours during the cold weather season.

Building Envelope

- Identify any areas that will require temporary weather protection during construction. These areas could include roof openings, balconies, expansion joints, doors/windows, elevator shafts, stair shafts, tower crane tiebacks, trash chutes, access windows, etc.
- Develop standard practices for protecting each type of opening.
- Install any caulking, sealants, or glazing immediately after installation of precast or curtainwall systems.
- Repair any damaged building envelope components immediately upon discovery
- Identify any complex intersections or connections that could be prone to leaks.

Roofing

- Verify caulking and flashing are correctly installed.
- Complete as much work as possible at the roof level before installing final coverings.
- Limit access to the area to minimize traffic once the final roof covering is installed and install temporary roofing or protection materials where necessary.
- Provide training to any trades performing work on top of completed roof membranes for moisture critical occupancies such as hospitals or data centers.

Separate roof replacement work to limit exposure and do not remove more material than can be replaced or protected in one shift.

HVAC Systems

- Verify HVAC requirements for electrical rooms and moisture sensitive areas and, if necessary, provide temporary or permanent dehumidification equipment and devices to monitor humidity levels.
- Identify any spaces prone to mold growth and evaluate the need for temporary conditioning/dehumidification until the buildings permanent system is online.
- Follow all manufacture's recommendations for installation of HVAC systems.
- Verify drip pans and condensation lines are plumbed to active drains and these systems are inspected and tested prior to startup of equipment.
- Verify water lines and ducts that may produce condensation are properly insulated.
- Verify all duct joints are properly sealed.
- Identify any moisture-generating equipment that needs exterior ventilation.
- Verify that all exhaust fans vent to the exterior.
- Perform regular HVAC inspections and maintenance per manufacturer guidelines Once equipment is in-use.
- Check condensation/drip pans and drains for evidence of leaks, clogged drain lines, or microbiological growth.
- Install temporary ventilation as needed inside enclosed shafts, basements, or below grade areas subject to moisture collection.

Leak Detection

- Install leak detection in areas that are potentially prone to flooding including areas such as below grade spaces, HVAC rooms, sprinkler riser rooms, equipment rooms, and pits/shafts. etc.
- Monitor alarms in unattended areas by a remote monitoring system programmed to notify project personnel upon activation of the alarm.
- Remove standing water immediately upon discovery.

Security

- Use on-site security guards (preferred) for projects that do not have continues occupancy.
- Implement recorded facility-wide guard rounds with electronic tracking stations that including focus on water intrusion or leaks where pipe systems are live, when buildings/sites are unoccupied.
- Train security guards on the locations of spill kits, how to manually shut down water systems where appropriate and early emergency response for water intrusion or leak scenarios.
- Keep security guards informed/updated on the status of live water systems within the building.
- Provide security guards with site drawings showing the location of all water shut-off valves.
- Identify any high-risk locations or key areas prone to water leakage.

Waterproofing

- Identify any below grade waterproofing requirements.
- Backfill these systems as soon as possible. If waterproofing must be left exposed provide a plan to protect the membrane or coating from damage
- Schedule site visits from consultants and manufacturers' representatives during initial waterproofing installation.
- Seal the edges of any membrane at the end of each shift to prevent water intrusion during membrane waterproofing over a large area.

Site Utilities

Temporary Water

- Control access to temporary water systems with lockable discharge points.
- Install temporary water systems in low traffic areas that are not prone to damage from equipment or nearby operations.
- Install the temporary water system in a part of the building least susceptible to water damage.
- Install temporary waterproofed curbs or containment around rooms with discharge points. Provide drainage to the building exterior or storm water system.
- Consider installation of temporary water systems outdoors where possible.
- Consider use of permeant supply piping in place of less reliable temporary systems.
- Insulate or heat temporary water systems in locations subject to freezing.
- Turn off and drain the temporary water services nightly.
- Provide containment around or underneath indoor equipment that requires water such as tiles saws, core drills, mixers, etc.

Domestic Water Systems

- Lock the main supply valves prior to commissioning pipe systems to prevent accidental operation of the valves.
- Identify and review incoming domestic water service management methods.
- Assign a designated employee responsible for turning off main valves and associated pumps supplying domestic water systems at the end of each day.
- Install flow alarms once the domestic water is needed to maintain the building.
- Monitor flow alarms remotely with a monitoring company, using either a temporary or permanent panel.

Fire Sprinkler Systems

- Activate these systems as early as possible to assist with fire prevention (recognizing fire sprinklers create additional exposure to water damage if not also managed).
- Install temporary waterflow alarms to monitor each fire protection system if permanent fire alarm systems are not activated.
- Prior to fire sprinkler activation verify the following is complete:
  - Valve maps are updated and posted.
  - Water Intrusion Response Kits are installed throughout the building.
  - All trades (and security) are notified sprinkler systems are activated.
  - WDPP training is updated.
  - Guards are trained on fire sprinkler systems and leak emergency response.

Water Monitoring Devices

Temporary water flow monitoring devices are recommended on domestic and fire water supplies during construction. These devices can be arranged/programmed to trigger alarms when water flow is detected in the system. For these systems:

- Connect flow monitoring devices/systems to remote listed/approved central station (CS)/alarm receiving (ARC) monitoring companies.
- Contract monitoring service for real time notification by phone calls or text messages with immediate response required by those assigned as notification contacts.
- Investigate installing water management devices that can be programed to shut down the water supply remotely or when flows exceed pre-determined parameters in addition to flow monitoring.

High Rise and Multi-Story Construction

High-rise and multi-story construction is extremely susceptible to water spread due to the nature of the stacked construction. Finish work will often begin on lower floors before the building envelope is complete on upper floors. When a project schedule does not allow for completion of the entire building envelope prior to the installation of moisture sensitive interior work, a protection plan for each area of exposure should be developed and implemented. Partial building envelopes should also be developed to isolate moisture sensitive work areas.

Specific to high rise projects, address the following topics in the plan:

- Temporary Roofs (Water Cutoff Floors)
- Floor Penetrations
- Hoist and Crane Openings

Temporary Roofs (Water Cutoff Floors)

Depending on the project schedule and number of floors, water spread can be reduced by installing temporary roofs throughout the structure. Temporary roofs are essentially water cutoff floors inside the building. This practice can isolate floors or groups of floors to minimize water spread. Take the following best practice actions, where applicable:

- Determine how often the temporary roofs are required based on the project schedule and location of moisture sensitive work/equipment.
- Ensure exterior walls are installed beyond the temporary roof floor.
- Seal all floor penetrations.
- Develop a flashing or sealant detail to waterproof the joint between the floor slab and exterior curtainwall.
- Provide temporary drains in the water cutoff floor that direct water out of the building or into the permanent storm drain system.
- Verify additional penetrations required through temporary roof floors are sealed immediately after installation.

Floor Penetrations

Protecting floor penetrations can help to prevent water spread throughout multiple floors. To prevent water spread, ensure the WDPP addresses how penetrations will be protected. Take the following best practice actions, where applicable:

- Install over-height pipe sleeves through floor slabs (if extended above concrete, pipe sleeves will act as a dam during construction to prevent water spread).
- Seal openings between pipes and slab penetrations.
- Seal core drilled penetrations regularly.
- Install temporary curbs for larger penetrations with waterproofing around slab openings and consider adding concrete curbs into the permanent design.
- Install temporary roofs with waterproofing over elevator shaft openings and tie the waterproofing into the protection curb to direct water towards the temporary drain system.
- Install similar curbing where openings such as stairwells must remain clear for egress.
- Install temporary walls or bulkheads where allowable.
- Utilize gutters and downspouts to direct water toward temporary drainage systems.

Hoist & Crane Openings

Most high-rise projects utilize tower cranes and material hoists. This equipment often remains in place during the installation of the building enclosure. Many areas of the exterior walls must be left out to accommodate access to doorways, tiebacks, and supports. Take the following best practice actions, where applicable:

- Review the schedule and determine how many hoist openings will be left in place after curtainwall installation.

- Develop a plan for weather protection during operation and removal including temporary curbs, walls, weatherproof doors, etc.
- Determine if building finishes must be left out and for how long.
- Identify how crane block-outs and tie back openings will be protected.
- Ensure protection around cranes does not prohibit the crane from moving or prevent the operator from performing inspections.

Water Damage Emergency Response

Water Intrusion Response Kit

Having the proper tools and materials in known and clearly identified locations can save valuable time when responding to water intrusion events, leaks, or spills. Water intrusion kits can reduce the response time and limit the magnitude of water damage. It is important to identify what tools and materials will be needed and to verify they are on-site and readily accessible. Water intrusion kits should be prepared in advance and placed throughout the project. Include the following in the Water Damage Prevention Plan (WDPP) planning:

- Determine the number of water intrusion kits required and where they will be located with consideration for ease-of-access in emergencies. and communication of locations as well as use to all personnel on site.
- Consider using large rolling trash bins or wheeled totes / containers that can be easily moved throughout the building.
- Large totes / containers can double as containment that can be positioned under a leaking pipe.
- Develop a list of items to include in water intrusion kits including the following:
  - Copies of the emergency contact list, valve maps, and complete WDPP.
  - An assortment of basic hand tools such as adjustable wrenches, screwdrivers, hammer, plyers, pry bars, utility knives and pipe wrenches etc.
  - Any special tools that are required for the specific plumbing systems such as crimping tools, press-fit tools, or special valve wrenches.
  - Basic pipe repair kit containing common fittings, plugs, caps, valves, etc.
  - Wet/Dry vacuums. Verify all necessary attachments are present.
  - Portable puddle pumps (low level pump) or submersible dewatering pumps.
  - Extra hoses, fittings, and adapters for pumps.
  - Extension cords and cord connected GFCI attachment plugs.
  - Brooms, squeegees, mops, and mop bucket.
  - Tarps, plastic sheeting, trash bags, duct tape, zip ties, rope, and tie wire.
  - Absorbent pads, socks, or pillows. Material that can be used to create dams or contain spills.
  - Any site-specific PPE such as rubber gloves, face shields, muck boots, rain gear, etc.
  - Sprinkler shutoff devices to stop water flow from a damaged sprinkler.

- Develop a checklist for the water intrusion kit. The kits should be inspected regularly to verify they are properly stocked and accessible.

Incident Response Procedures

Extensive damage can occur when water intrusion, leaks, or spills go un-noticed for an extended period. Immediate response is critical to reduce the magnitude of damage and prevent water from spreading throughout buildings. Include an emergency response procedure in the plan that can be activated upon discovery of water intrusion, leaks, or spills.

Suggested General Procedures:

- Identify an incident response team that includes everyone required to properly contain, evaluate, document, and mitigate damage following an event.
- Include in the team a variety of project personnel who are familiar with the project layout, the mechanical systems, building access, and site logistics.
- Provide updated contact information for everyone on the incident response team.
- Include a list of additional project personnel to be notified upon discovery of the incident based upon the type and location of the event (i.e. project management, superintendents, quality control, safety, owners, security guard services, etc.).
- Include contact information for critical subcontractors such as plumbers, sprinkler contractors, mechanical contractors, electricians, remediation contractors etc.
- Set up prearranged agreements with equipment rental companies for supply of drying equipment such as fans, blowers, dehumidifiers, generators, pumps etc.
- Set up prearranged agreements with water cleanup/restoration specialists, certified industrial hygienists and mold remediation specialists that may be called upon to assist with water intrusion events.
- Consider adding response times and backup agreements if the area is subject to frequent storms.
- Include emergency after hours contact information for all suppliers and contractors.
- Identify a trained individual who can shut off the electrical service if necessary and include contact information for local utility service companies.
- Identify the responsibility of all parties as the plan is put into action.
- Verify that the incident response team has access to all utility controls and keys for valves that are locked or located in access-restricted areas.
- Provide the location of any special tools required to shut down utility systems.

Initial Response

Initial immediate and coordinated response to water leakage events is critical. The following should be part of this planning as applicable:

- Immediate assembly on-site of the incident response team upon discovery of an event.

- Activation of the WDPP with immediate notification to all appropriate parties including property management, construction team, response team and security personnel as listed in the plan based upon the type and location of the event.
- Identification and elimination/shut down of leak water sources.
- Inclusion of liquid isolation procedures for various events that could occur such as water intrusion, pipe failures, or spills.
- Identification any actions required to protect vulnerable materials, stock, goods, equipment or other assets including the removal of exposed items or application of protective coverings, spill control, water damming set-ups, and temporary drain measures.
- Identification of major systems and equipment that must be protected as a first priority such as elevator shafts, electrical equipment, and IT equipment.
- Ensuring that the response plan addresses restoration responsibilities and procedures once the water intrusion event has ended or is mitigated.

Damage Evaluation

A developed procedure to evaluate the extent of the leakage or intrusion and to identify any water-damaged material should incorporate moisture content testing and be in accordance with the project design

Specifications including the following:

- Investigation to ensure that mold has not been established on water-damaged materials.
- Use of qualified consultants to assist with damage assessments, development of remediation plans, and to perform clearance testing.
- Provided criteria for when notification of pre-arranged restoration and recovery mitigation firms should be contacted. Contact approved vendors to support cleanup and restoration activities.
- Included documentation procedures that must be followed. Assure that a member of the incident response team is assigned and equipped to take photographs or video of the areas damaged and evidence of mitigation and restoration.
- Included copies of building floor plans to identify the areas damaged.

Reporting

- Report all incidents of water intrusion or leaks immediately after discovery.
- Establish an incident reporting procedure for any water damage, leaks, spills or water intrusion.
- Fully investigate and document all incidents should be.
- Develop “lessons learned” reports to train the project team and prevent a reoccurrence.

Additional Tools and Plan Elements

Valve Maps

Immediate response to pipe system leaks and failures can minimize water spread and damage to building materials. Properly communicating the location of pipe system valves can help eliminate the water source as quickly as possible. Incorporate the following into response:

- Include valve maps for all building pipe systems in the plan.
- Develop site drawings showing the location of all pipe system shut-off valves.
- Identify the area of the building or floors that each valve services.
- Include additional map information such as the location of sewer clean-outs, storm sewer inlets, and floor drains designated for use in case of a leak.
- Include any applicable emergency response contact information on the map.
- Include pictures where valve locations are not easily recognizable.
- Identify any access restrictions such as panels, hatches, locked doors etc.
- Identify any special tools needed for shut down such as ladders, wrenches, keys etc.
- Include any specific shut down instructions for domestic water pumps.
- Include the location of Water Intrusion Response Kits.
- Provide signage throughout the job identifying any critical valve locations.
- Provide training to project employees on system shut down and emergency response procedures.
- Post valve maps in centralized high traffic locations.

Inspections & Checklists

The WDPP should include several inspections and checklists.

- Create unique checklists for each project to address site specific hazards.
- Assign an employee or team of employees to be responsible for completing each checklist.
- Define the frequency of inspection. Determine the inspection frequency based on the potential for water intrusion and the severity of damage that could occur.

General Water Intrusion Site Inspection

- Perform regular inspections during construction to identify conditions that can promote water damage.
- At a minimum include the following areas in the checklist
  - Drainage/Grading and area surrounding area
  - Exterior building envelope and building façade
  - Doors & windows
  - Roof systems
  - Temporary enclosures, covers, or protection systems

- Below grade spaces or areas that can collect water
- Plumbing systems
- HVAC systems
- Material storage

Pre-Storm Site Inspection

- To help determine if the job site is adequately prepared for inclement weather, complete a pre-weather event survey of the building when severe wind, rain, snow, hail, etc. is forecast.

Post-Storm Site Inspection

- To help determine if any water intrusion has occurred, complete a post weather event survey of the building after any significant weather event.
- Focus on areas where standing water could accumulate including basements, stairwells, elevator shafts, flat roofs, open excavations, etc.

Water Intrusion Evaluation Checklist

- Develop a checklist to help evaluate and document water damage events.
- In the checklist, identify what information needs to be collected following a water intrusion event and help determine what type of corrective action is needed.
- Investigate each incident to determine the root cause and provide lessons learned.

Pre-Drywall installation checklist

- Develop a checklist to document the existing conditions before walls are closed or covered up.
- At a minimum address/verify the following concerns in the checklist:
  - The area is/ will remain dry and the proper environmental conditions are in place.
  - All MEP systems are complete with proper documentation.
  - Moisture/mold is not present prior to covering up/closing walls.

Water Intrusion Response Kit checklist

Develop a checklist for inspection of the water intrusion response kits conducted on a regular basis that verify kits are adequately stocked, accessible, and remain in the correct location.

Daily Inspections

- Develop a list of critical daily inspections for water damage detection and prevention.
- Assign individuals responsible for completing the daily checks.
- Include the following, at the minimum, in site inspections:
  - Building tours at the end of each day.
  - Roof and building exteriors (for obvious open penetrations).
  - Doors/windows (in the closed/locked position before the site is secured during off hours).
  - Permeant and temporary water sources (being properly turned off).
  - All issued wet work permits (for closed out verification).

Wet Work Permit

Wet work can be described as any operation that introduces liquid inside a building envelope or has the potential to result in liquid damage. Typical wet work operations include but are not limited to pressure testing pipe, initial filling of pipe systems, leak testing, tie-ins to existing pipe systems, and modifications to existing piping systems.

The Wet Work Permit acts as a formal checklist and provides documentation of the controls that should be implemented to prevent liquid damage during wet work operations.

Include a wet work permit procedure in the plan. Wet Work Permits should be completed by any employee, contractor, or maintenance personnel performing wet work. The permit must be fully completed and signed by the appropriate personnel before the work can commence. The permit should be issued by designated management personnel who are trained and qualified to supervise the wet work. Management should complete initial risk assessments of the wet work area before issuing permits.

AIG can provide Wet Work Permits and Tags. Ask your risk engineer for these documents.

WDPP Communication

- Discuss the WDPP at trade or subcontractor kick-off meetings prior to the start of any work ensuring all parties are aware of their mandatory responsibilities regarding water damage prevention.
- Revisit the WDPP at regularly held foreman and superintendent meetings throughout the length of the project.
- Notify all project personnel when water systems are turned on in a building. Review the status and location of water systems regularly to keep individual trades informed when systems are filled, tested or commissioned.
- Identify tasks with potential for water damage during daily safety meetings and task hazard analyses procedures.
- Post emergency contact information at main control valve locations and in high traffic locations.

Training & Development

- Train the project management staff and the craft workforce on topics related to the prevention, recognition, and response to water intrusion.
- Communicate the importance of the WDPP to the entire project's staff.
- Develop "toolbox talks" and formal training for various sections of the WDPP including discussing water damage prevention with the labor force on a scheduled basis to reinforce the understanding of the plan.
- Provide task specific training for employees performing wet work, installing waterproofing products, or working on tasks critical to water damage prevention.

Resources / Standards

The references are:

- AIG Water Intrusion Insight Document
- AIG Flood Emergency Response Checklist
- AIG Wet Work Permit and Tag
- AIG Water Intrusion Assessment Checklist for Construction Projects

If you need further assistance or want to discuss a job site in greater detail and additional information, including assistance with vetted WDPP equipment vendors, contact your local AIG Risk Engineer.