Why Quality Matters in Design & Construction

Andrew Merriman

The Zurich Services Corporation

abaa EDUCATION

Air Barrier Association of America (ABAA) is a Registered Provider with The American Institute of Architects Continuing Education Systems. Credit earned on completion of this program will be reported to CES Records for AIA members. Certificates of Completion for non-AIA members are available on request.

This program is registered with the AIA/CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

air barrier
abaa
association of
america

CONTINUING EDUCATION
AIA

Andrew Merriman

Risk Engineer Consultant

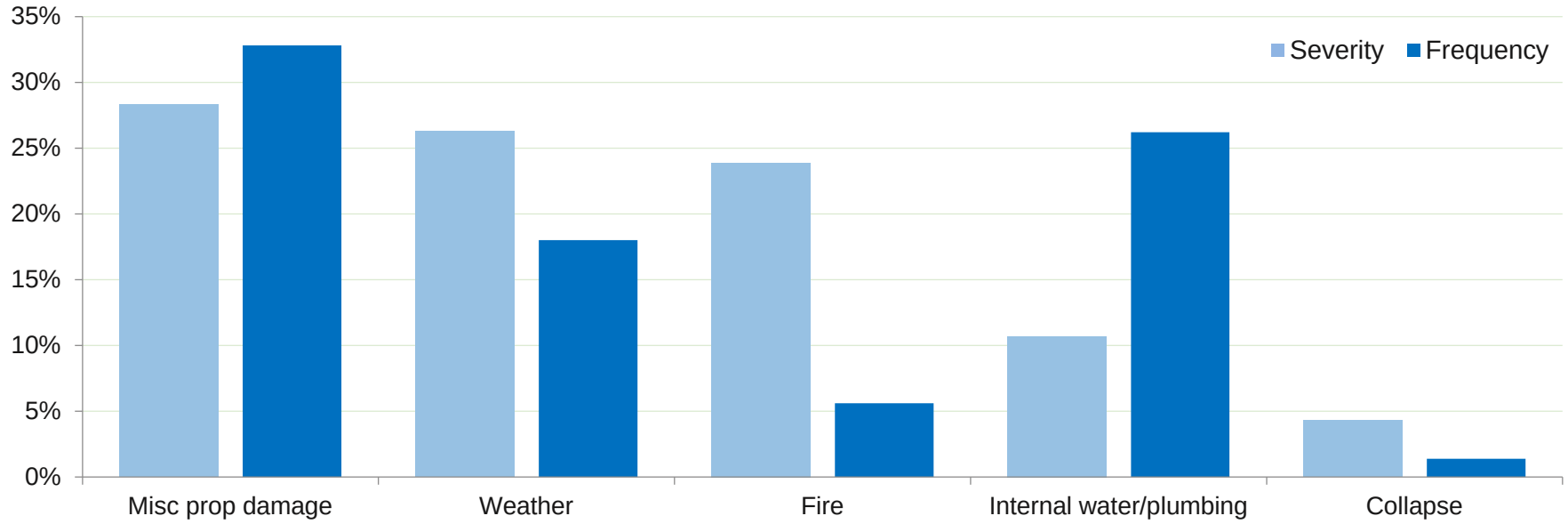
andrew.merriman@zurichna.com

913-660-6936

Insurance Claims

air barrier
abaa
association of
america

Builders risk overall losses

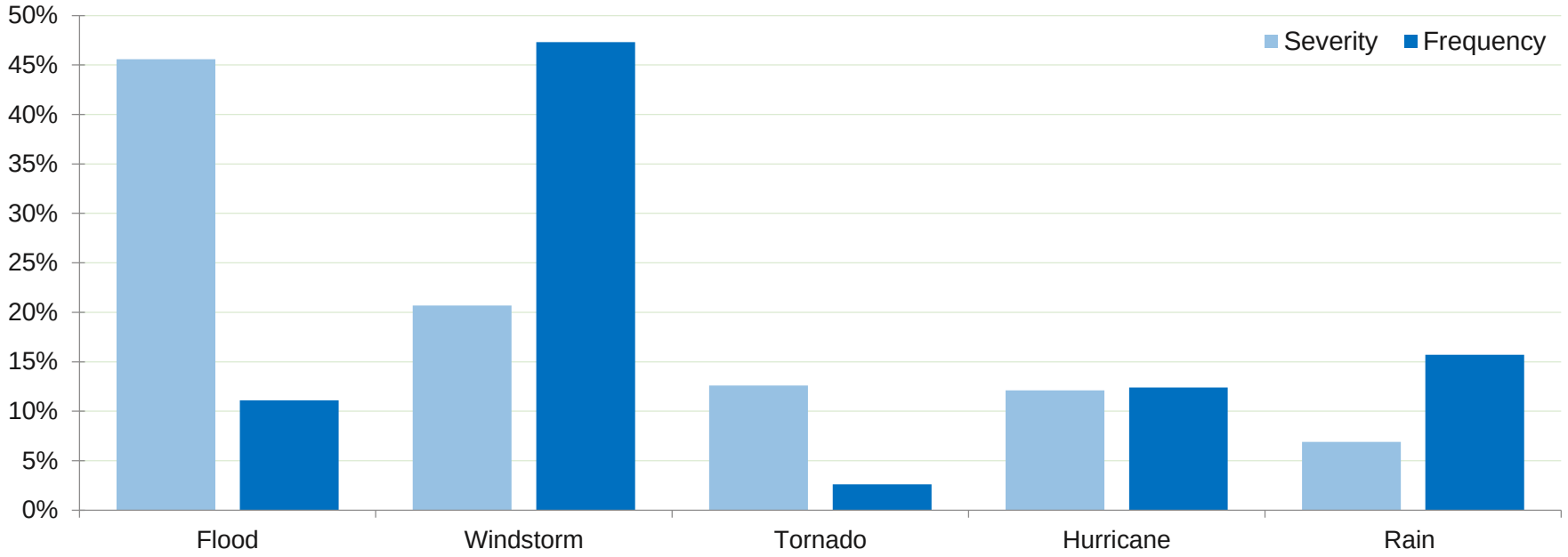


Loss leader	Severity	Frequency	Avg. Claim
Misc. Property damage	28.3%	32.8%	$288,066
Weather	**26.3%**	**18.0%**	**$487,249**
Fire	23.9%	5.6%	$1,424,396
Internal water/plumbing	**10.7%**	**26.2%**	**$136,767**
Collapse	4.3%	1.4%	$1,024,243

Data as of 3/24/2016 for Zurich U.S. construction property data for losses occurring between 1/1/2006 – 12/31/2015
Miscellaneous property damage is classified non-trending and other miscellaneous losses
Severity is a percent of total claim cost and frequency is a percent of total number of claims

air barrier
abaa
association of
america

Builders risk weather related losses



Loss Leader	Severity	Frequency	Avg. Claim
Flood	45.6%	11.1%	$2,005,078
Windstorm	20.7%	47.3%	$213,392
Tornado	12.6%	2.6%	$2,379,160
Hurricane	12.1%	12.4%	$476,708
Rain	6.9%	15.7%	$213,623

Data as of 3/24/2016 for Zurich U.S. construction property data for losses occurring between 1/1/2006 – 12/31/2015
Severity is a percent of total claim cost and frequency is a percent of total number of claims

air barrier
abaa
association of
america

Zurich Statistics

- Zurich's CD & Professional Liability claim team numbers over 70 employees
- They manage more than 8,000 claims/year
- Every year, Zurich pays hundreds of millions to resolve CD claims in North America
- Most construction defect claims take 18 to 36 months to resolve
- Most CD claims involve allegations of improper and/or deficient ***design***, ***materials*** and ***workmanship***

air barrier
abaa
association of
america

Top 10 CD Claims

- **Building envelope and structure**
  - Door and window, window wall, curtain wall
  - Exterior cladding (stucco, EIFs, brick/stone veneer, siding)
  - Roof
  - Damp proofing and waterproofing
  - Deck and balcony

Design?
Materials?
Workmanship?

YES!

- **Infrastructure**
  - Drainage and compaction
  - Structural
  - Electrical and HVAC (condensation)
  - Plumbing
  - Sound, vibration, odor/vapor transmission and code compliance deficiencies (health & safety issues, ADA)

air barrier
abaa
association of
america

Teamwork = Strategy for Success

The successful team must include:

- A **designer** with a track record of providing construction documents with adequate details related to potential water entry points
- A **constructor** that uses best practices in controlling the impact of water during construction
- An **owner** that recognizes the importance of validating the building envelope by the rigorous process of thoroughly documented inspection and testing

air barrier
abaa
association of
america

Exposure Sources & Loss Scenarios

air barrier
abaa
association of
america

Exposure Sources

Let’s take a look at water intrusion from these three different aspects followed by some loss scenarios for each.

- Natural event sources
- Exterior sources
- Interior sources

air barrier
abaa
association of
america

Exposure Sources

Let’s take a look at water intrusion from these three different aspects followed by some loss scenarios for each.

- **Natural event sources**
- Exterior sources
- Interior sources

air barrier
abaa
association of
america

Natural Event Sources

- Heavy, wind driven rain
- Storms
  - Snow
  - Heavy rain
  - High Winds
  - Inland Flooding
  - Rip Currents
  - Hurricanes
  - Mudslides
  - Avalanches
  - Hail
- Freezing Temperatures
- Storm surge, water runoff and wave action

air barrier
abaa
association of
america

Exposure Sources

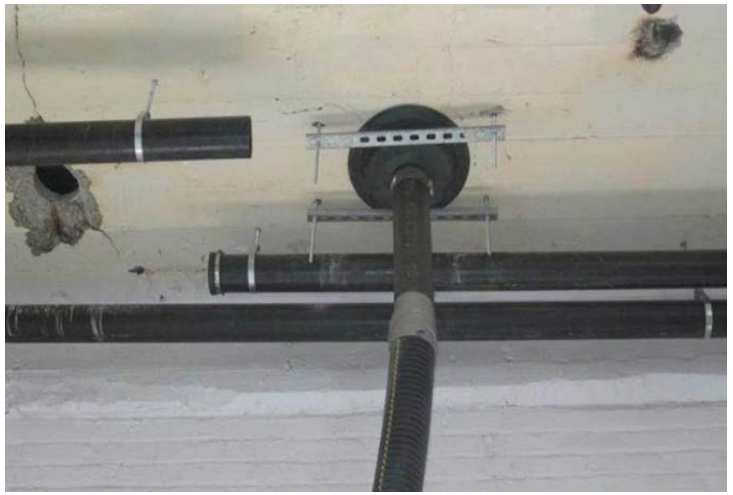
Let’s take a look at water intrusion from these three different aspects followed by some loss scenarios for each.

- Natural event sources
- **Exterior sources**
- Interior sources

air barrier
abaa
association of
america

Exterior Sources

- Rain, ice dams, flooding
- Groundwater
- Irrigation systems
- Septic Systems
- Exterior plumbing (city water supply)
- Roofs, roof penetrations, roof hatches, and roof drains
- Windows and doors
- Balconies and decks
- Siding
- Foundations
- Waterproofing
- Utility conduits



air barrier
abaa
association of
america

Exterior Sources – Loss Scenarios

- Severe rains caused building envelope water intrusion damage to two story building that resulted in significant schedule delay and over $2.0M

air barrier
abaa
association of
america

Exterior Sources – Loss Scenarios

- Excessive rains caused water to enter below grade area of building under construction - electrical vault and equipment area of building flooded twice causing approximately$6m in damage

air barrier
abaa
association of
america

Exposure Sources

Let’s take a look at water intrusion from these three different aspects followed by some loss scenarios for each.

- Natural event sources
- Exterior sources
- **Interior sources**

air barrier
abaa
association of
america

Interior Sources

- Water supply lines
- Faucets
- Drains
- Hoses
- Fire sprinklers/ fire pumps

air barrier
abaa
association of
america

Interior Sources

- HVAC systems
- Sump pump systems
- Sewer systems
- Water features
- Condensation
- Floor drains

air barrier
abaa
association of
america

Interior Sources – Loss Scenarios

- Water line in ceiling above mechanical room froze and burst, water ran down building damaging elevators and electrical equipment/ computer boards – approximately $2.0M

air barrier
abaa
association of
america

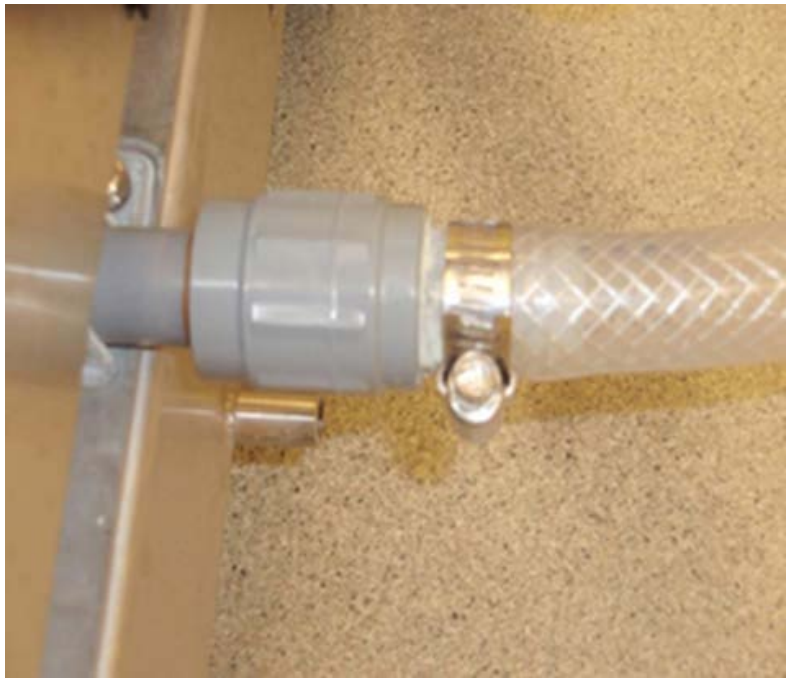
Interior Sources – Loss Scenarios

- Sprinkler main burst causing water damage throughout two floors where IT, surveillance and switch gear resides – over $400,000

air barrier
abaa
association of
america

Interior Sources – Loss Scenarios

- Medical office building near completion – loose clamp on medical equipment hose, water ran for over 10 hours flooding first floor causing approximately $400,000 loss and several months delay



air barrier
abaa
association of
america

Interior Sources – Loss Scenarios

- Domestic water pipe fitting failed on high floor of building causing approximately $3.5m

air barrier
abaa
association of
america

Exposure Controls

air barrier
abaa
association of
america

Exposure Controls

- Design Quality and Material Selection
- Written Plan
- Pre-Construction Controls
- Construction Controls
  - General
  - Exterior
  - Interior
- Daily Walk Through
- During and After Event Controls
- Post-Construction Controls

air barrier
abaa
association of
america

Exposure Controls

- Design Quality and Material Selection
- Written Plan
- Pre-Construction Controls
- Construction Controls
  - General
  - Exterior
  - Interior
- Daily Walk Through
- During and After Event Controls
- Post-Construction Controls

air barrier
abaa
association of
america

Common causes of errors in design

- No design reviews conducted
- Inadequate coordination among design disciplines
- Casual use of old “standard details”
- No dimensional controls
- Acceptance of work by subconsultants without review
- Design team leaders not trained for their roles
- Lack of oversight of all contributors to design

air barrier
abaa
association of
america

Common causes of errors in design

- Inadequate design budgets
- Unrealistic deadlines for document release
- Use of incorrect codes
- Design team member licenses not kept current, to include continuing education
- Design team members not experienced in complex designs or new materials and methods

air barrier
abaa
association of
america

Exposure Controls

- Design Quality and Material Selection
- **Written Plan**
- Pre-Construction Controls
- Construction Controls
  - General
  - Exterior
  - Interior
- Daily Walk Through
- During and After Event Controls
- Post-Construction Controls

air barrier
abaa
association of
america

Written Plan

Components of a project specific written weather and water intrusion management program for natural events, exterior sources and interior sources should include:

- Pre-construction controls
- Construction controls
- During and after an event controls
- Post-construction controls
- Hurricane controls (if applicable)

air barrier
abaa
association of
america

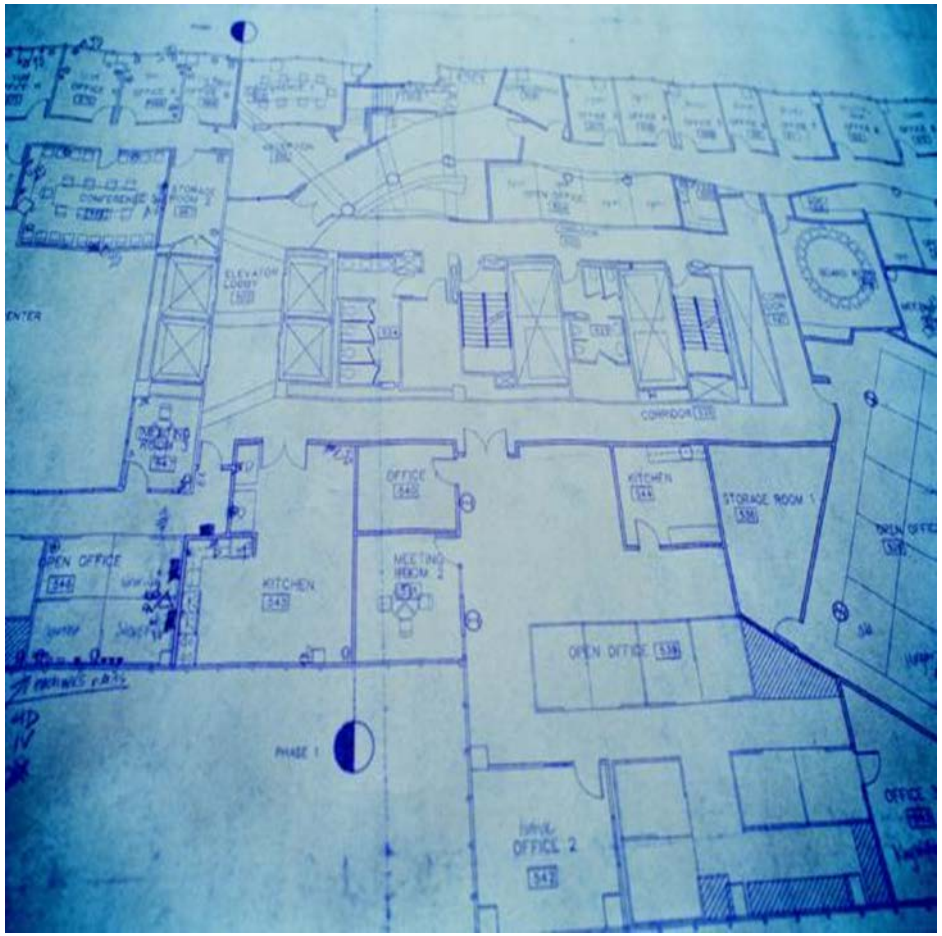
Exposure Controls

- Design Quality and Material Selection
- Written Plan
- **Pre-Construction Controls**
- Construction Controls
  - General
  - Exterior
  - Interior
- Daily Walk Through
- During and After Event Controls
- Post-Construction Controls

air barrier
abaa
association of
america

Pre-Construction Controls

- Identify exposures
- Engage consultants
- Involve Manufacturers’
- Review design details
- Construct functional mock-ups
- Assess existing structures
- Identify material storage
- Scheduling



air barrier
abaa
association of
america

Various Mock-Ups

air barrier
abaa
association of
america

Exposure Controls

- Design Quality and Material Selection
- Written Plan
- Pre-Construction Controls
- **Construction Controls**
  - **General**
  - Exterior
  - Interior
- Daily Walk Through
- During and After Event Controls
- Post-Construction Controls

air barrier
abaa
association of
america

Construction Controls – General

- Material delivery & inspection
- Weather watch and monitoring
- Water release response
- Systems testing
- Daily inspections
- Security involvement
- Employee and subcontractor training
- Photo documentation
- Drones

air barrier
abaa
association of
america

Exposure Controls

- Design Quality and Material Selection
- Written Plan
- Pre-Construction Controls
- **Construction Controls**
  - General
  - **Exterior**
  - Interior
- Daily Walk Through
- During and After Event Controls
- Post-Construction Controls

air barrier
abaa
association of
america

Exterior Controls

- Material storage & protection
- Site grading & drainage
- Below grade water proofing and backfill
- Building temporary protection
- Roof drains & drain piping

air barrier
abaa
association of
america

Exterior Controls

- Building penetration leaks
- Sealant compatibility
- Wall and window system testing

air barrier
abaa
association of
america

Exposure Controls

- Design Quality and Material Selection
- Written Plan
- Pre-Construction Controls
- **Construction Controls**
  - General
  - Exterior
  - **Interior**
- Daily Walk Through
- During and After Event Controls
- Post-Construction Controls

air barrier
abaa
association of
america

Interior Controls

- Material storage & protection
- Installed material / equipment protection
- Temporary roofs
- Install conditions

air barrier
abaa
association of america

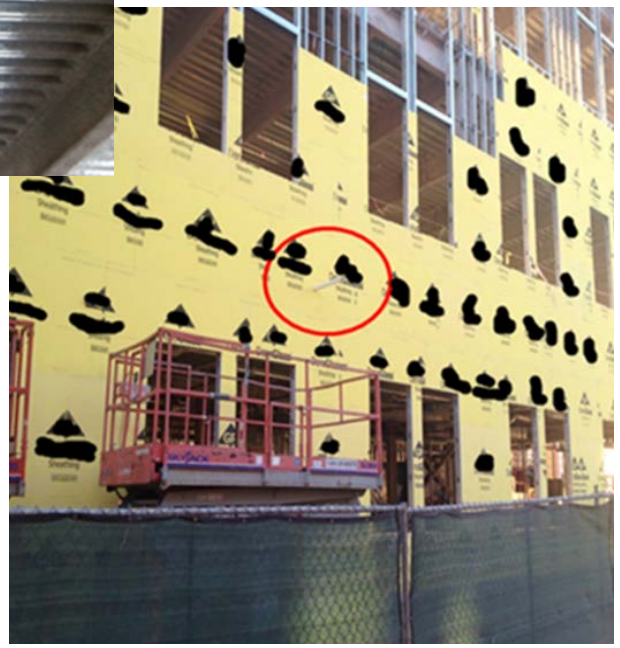
Interior Controls

- Faucets
- Hoses
- Ventilate attics, crawlspaces and enclosed areas
- Condensation control / ventilation

air barrier
abaa
association of
america

Interior Controls

- Floor drains and drainage systems
- Water features / pools
- Water, mold and mildew resistant gyp board for priority walls



air barrier
abaa
association of
america

Interior Controls

- Water supply systems monitoring
- Fire sprinklers/fire pumps monitoring
- Sump pump systems power source and monitoring

air barrier
abaa
association of america

Exposure Controls

- Design Quality and Material Selection
- Written Plan
- Pre-Construction Controls
- Construction Controls
  - General
  - Exterior
  - Interior
- **Daily Walk Through**
- During and After Event Controls
- Post-Construction Controls

air barrier
abaa
association of
america

Daily Walk Through

Wet Work/Project Daily Walk Through		
Project		
Date		
Part 1 – Outstanding Wet Work Permits		
Are there any Wet Work Permits ongoing?	☐ Yes	☐ No
Work by: ☐ Contractor – name :_____		
Work Area Inspected for Compliance to Permit	☐ Yes	☐ No
	☐ Yes	☐ No
Part 2 – Daily Walk Through		
Are all hose bibbs shut off and all hoses drained?	☐ Yes	☐ No
All windows closed or covered?	☐ Yes	☐ No
All doors closed or covered?	☐ Yes	☐ No
All roof hatches closed?	☐ Yes	☐ No
All sink faucets in the off position?	☐ Yes	☐ No
Any leaking observed?	☐ Yes	☐ No
Is there a storm forecast?	☐ Yes	☐ No
If yes, have storm procedures been implemented?	☐ Yes	☐ No
Are sump pumps functioning properly?	☐ Yes	☐ No
Is there a backup energy source for sump pumps if required?	☐ Yes	☐ No
Is water diverted from the construction area on the site to eliminate water backing up into door or building openings?	☐ Yes	☐ No
Are water and/or sprinkler lines protected from freezing?	☐ Yes	☐ No
Sinks are not clogged?	☐ Yes	☐ No
Toilets are not clogged?	☐ Yes	☐ No
Roof drains are not covered or clogged?	☐ Yes	☐ No
Floor drains are not covered or clogged?	☐ Yes	☐ Yes
Stored materials are stored off the floor?	☐ Yes	☐ No
Are there on-going dewatering operations?	☐ Yes	☐ No
Are there back-up systems for the dewatering?	☐ Yes	☐ No
Are pressure gauges installed during construction to ensure no loss of pressure? Pressure checked?	☐ Yes	☐ No
Temporary roof drain connections/clamps installed and functioning properly?	☐ Yes	☐ No
Countertops are free of debris, tools, materials, etc.? (may trip automatic faucet sensors)	☐ Yes	☐ No
	☐ Yes	☐ No
	☐ Yes	☐ No
	☐ Yes	☐ No
	☐ Yes	☐ No
Part 3 – Daily Walkthrough Sign-off		
Time walk through ended: ____:____ am/pm ☐ All areas have been inspected with no signs of leaking ☐ Action has been taken for any non-compliant issues Inspector's name (print): _____ Date: _____ Time: _____ Inspector's Signature: _____ Position: _____		

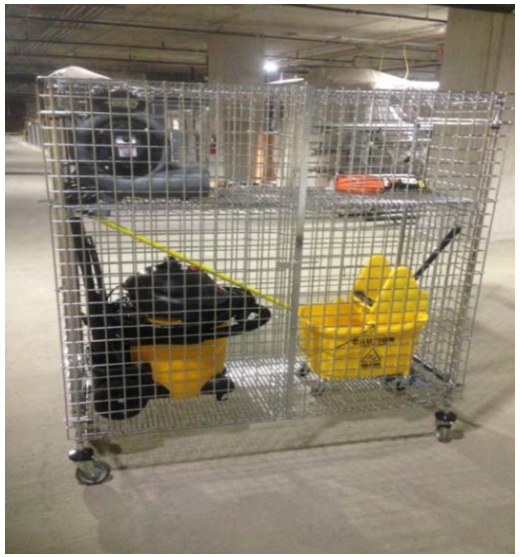
air barrier
abaa
association of
america

Exposure Controls

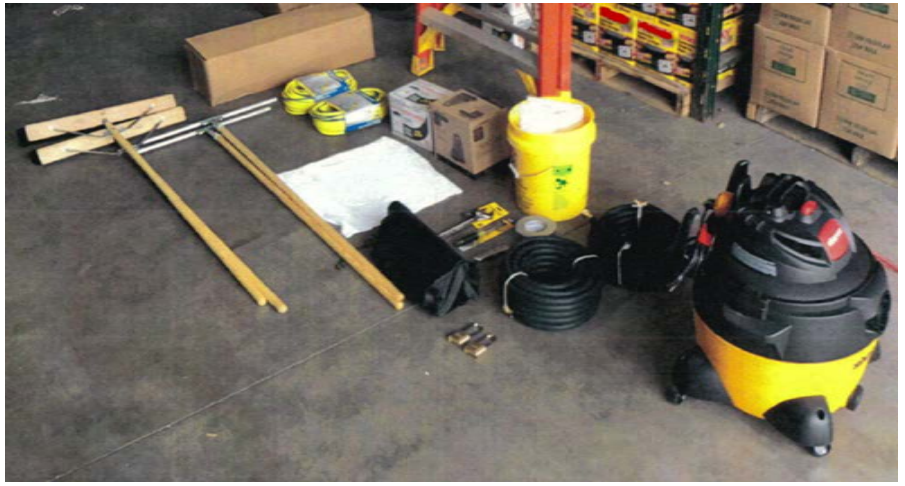
- Design Quality and Material Selection
- Written Plan
- Pre-Construction Controls
- Construction Controls
  - General
  - Exterior
  - Interior
- Daily Walk Through
- **During and After Event Controls**
- Post-Construction Controls

air barrier
abaa
association of
america

Water Intrusion Response Cart



- Plastic Sheets and rags
- Duct tape, zip ties, channel locks, screwdrivers, retractable knife, extension cords, GFI plug adapter
- Plastic bags
- Wet vacuums, mops, buckets, squeegees, brooms
- Portable pump(s) and hose
- Water displacing solvents for electrical equipment (contact cleaner, LPS 1)
- Absorbent socks
- Pipe clamps or pipe repair kit
- Diagrams of piping systems with valve locations highlighted
- Dehumidifiers and fans (or rental source)
- Portable dikes
- Fire sprinkler head Shutgun™ or similar device



air barrier
abaa
association of
america

After Event Controls

- Response team
- Remediation company
- Document with photographs
- Schedule and project oversight
- Loss Lessons / Root cause investigation

air barrier
abaa
association of
america

Exposure Controls

- Design Quality and Material Selection
- Written Plan
- Pre-Construction Controls
- Construction Controls
  - General
  - Exterior
  - Interior
- Daily Walk Through
- During and After Event Controls
- **Post-Construction Controls**

air barrier
abaa
association of
america

Post Construction Controls

- Warranty inspections
- Repair leaks promptly
- Watch for condensation and wet spots
- Prevent moisture due to condensation
- Keep HVAC drip pans clean and draining properly
- Vent moisture-generating equipment to the outside
- Maintain low indoor humidity

air barrier
abaa
association of
america

Post Construction Controls

- Perform regular inspections and maintenance
- Install and maintain proper air filters
- Clean and dry wet or damp spots
- Promptly remove water-damaged material
- Move water away from the foundation
- Ensure envelope penetrations are properly sealed.
- Ensure irrigation system does not spray building

air barrier
abaa
association of
america

Conclusion

- Weather and Water continue to be leading cause of loss for Zurich construction customers
- Some exposures and preventive measures may seem obvious, but many aren't
- Understand the weather and water intrusion exposures for your company and projects
- Establish a PROJECT SPECIFIC water intrusion program
- A TEAM approach between the **designer**, **constructor** and **owner** is necessary in guarding against water intrusion and construction defect!

air barrier
abaa
association of
america

Thank you

air barrier
abaa
association of
america