

9/05/12 TECHNICAL BULLETIN:

Handling Water Damaged Electrical Systems from Hurricane Isaac written by Mark Schafer

We are issuing a best practices guide for safely handling electrical issues. Safe work practices are key to assisting those dealing with electrical issues in flooded or even moist buildings. If you were affected by water damage from Hurricane Isaac or a contractor working in the region, this may be of interest to you.

Entering or inhabiting a building without the proper safeguards to the electrical system is hazardous and not recommended. If your building has been flooded or saturated from above and the electrical distribution system was wet, or if the power company, local electrical inspector or building code official has “red tagged” a facility or placed a notification stating “electrical power is off and/or unsafe” - you should never attempt to turn on the electrical power.

Restoring power to flooded homes and buildings without proper assessments, mitigation measures and restoration/refurbishment is detrimental. Risk of shock and fire to the buildings’ inhabitants or business employees is the obvious issue. Buildings that have been inundated with water pose an immediate deadly threat to anyone just by entering the space. Standing water can potentially become a source of electrocution if any live power is present. Attempts to energize the electrical circuits or power electronics or equipment can kill. Restoration of electrical systems requires a special set of skills that are only available from skilled electricians and electrically trained restoration professionals, technical specialists and engineers.

The potential for short-circuiting and electrocution from electrical power distribution systems that have been flooded or rained upon is very high. Even secondary moisture known as “high condensing levels of humidity” (which is outside of OEM specification) has had negative impacts and ongoing adverse consequences.

What to do if your facility or home has been flooded:

Power must be shut off by the utility company. Confirmation that the utility cut-outs are open and/or the meter has been pulled cannot be assumed. The building meter must be pulled to assure primary power is safely de-energized.

After confirming that utility power is off, only electrically trained persons should clear the building by first turning off the main breaker and/or removing the main fuse. Three-phase systems with medium and high voltage main breakers should be removed and un-racked. Following

standard Lock-Out/Tag-Out procedures for the electrical equipment according to OSHA guidelines is a must.



Wet industrial plant and general offices

After secondary power is confirmed off and properly tagged out, qualified and trained persons should visually inspect the wiring and distribution system for subsequent damages.



Wet residential panel board (breaker box)

Immersed appliances in homes should be unplugged and evaluated, restored and tested or replaced. Fixed and movable machinery should be isolated from electrical sources, and then capped off to ensure that, until properly serviced, accidental energy that would cause fire or failure is avoided. Properly evaluated and mitigated equipment can then be serviced. Low-end equipment should probably be replaced. High value assets and “one-off” equipment require consideration for restoration versus replacement; often needing only decontamination, motor refurbishment, control panel repair and peripheral devices replacement. Re-commissioning of this equipment should only be done by qualified persons.

Initial mitigation steps to building and control wiring recovery include gross contamination removal, dewatering and drying. Initial steps are removal of panel covers, breaker box covers, wiring trough covers allowing for exposure and drying of wiring as well as troughs, conduits, panel boxes and j- boxes. Removal and capping off and replacement of damaged devices is common. Often this work requires a building permit and/or electrical permit. Adhering to the local jurisdiction’s protocols is a must to proceed with this work. A pre-inspection or initial inspection with local code officials is always suggested after the initial drying and stabilization has been performed to explain the steps, protocol and results of mitigation prior to moving forward. Code officials who understand the scope of work often “bless the project”. When the code official is ignored it can result in “red tagging jobs,” thus “shutting the site down”. In some jurisdictions severe

electrical damage may result in condemning the entire electrical system or, worse yet, condemnation of the entire structure. Though electrical equipment and wiring can be successfully restored, skipping code inspections is the wrong way to kick off a project. This improper action could prove very costly and delay the project schedule, as well as continue to interrupt normal business activities.

Electrical equipment refurbishment with OEM intervention requires replacement of certain damaged electrical devices according to NEMA guidelines. Once enclosures and wiring have been decontaminated and dried wiring must be tested according to NETA acceptance testing standards. Only after passing appropriate testing should the necessary devices and components be replaced.

Subsequent to best practices of restoration and testing, a final electrical inspection must be conducted by local, state or any jurisdiction having authority. After approvals and inspections, the final inspection authority can grant authority to re-energize the facility back to utility power.



Flooded main gear and power distribution system in high rise building

Other life threatening caveats to consider:

- Equipment that has been wet can hold hidden pockets of water which can short circuit causing failure or even electrocuting personnel.
- Dry and wet transformers can be hazardous if re-energized resulting in explosion or fire.
- Elevator and escalator equipment areas – Exposed motors and controls contain high voltage equipment and power in these areas that can kill. In addition, moving parts are often exposed that can grab and pull a person into the equipment. Keep unauthorized persons from these areas.
- Fire Pumps – which are often fed from another power source can remain energized even if building power is off. If a room is inundated with water you can be killed by opening a metal door or stepping in the water.
- Backup Generators and Back UPS battery systems – can continue to feed a building if the main power is off. The energy can feed down line and cause

electrical shock and fires just like main utility power. If the electrical system or building is wet the generator needs to be turned off and isolated from providing power.

- Back feeding a building with a generator yourself without proper primary power isolation and disconnection from the grid can prove fatal for you or others on the system. Sizing generator, regulator and temporary cabling is a must. Never do this yourself.
- Low voltage communication control wiring and CAT 5 cables may appear impervious to water, but the water will migrate causing failure. These cables must be treated and tested or data loss and intermittent faults are inevitable and wiring will need replacement.
- Certainly just turning on the power (also called smoke testing) is never recommended when equipment is wet and should never be done. This will fail or shorten the life of all components, wiring, motors and devices. Powering wet equipment and wire will advance corrosive activity. Energizing a wet electrical system will compromise the integrity of the system and wiring and potentially damage components that could have been restored.

Untreated electrical systems are even more compromised by saltwater intrusion than by regular water, but both are a problem. The water from the hurricane (disregarding what other environmental waste may be in the rising floodwaters) is extremely corrosive and many times more aggressive than fresh water. The effects on conductors made of copper, aluminum and base metals is a galvanic reaction. Untreated equipment and wiring results in future ongoing issues: nuisance trips, premature breaker replacement and untimely failure of electrical equipment. Presently this can be attributed to the storm event but, if ignored, will result in ongoing and unscheduled maintenance issues paid for by the building owner, if not restored properly now.



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