INDEPENDENT ELECTRICAL CONTRACTORS

IEC Webinar Recap: Repair, Recondition, or Replace? A Safety-Driven Guide to Water-Exposed Electrical Equipment

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Why Water-Exposed Electrical Equipment Matters

Water damage remains a significant electrical safety concern following:

- Hurricanes and storm surge events
- River flooding
- Excessive rainfall
- Firefighting operations
- Plumbing failures
- Sewer backups
- High humidity and condensation
- Industrial liquid spills

Case Study: The Funtown Pier fire in New Jersey occurred one year after Superstorm Sandy. Saltwater-damaged electrical systems were not properly evaluated before re-energization, contributing to a catastrophic fire that destroyed approximately 50 buildings and over 1,000 feet of boardwalk.

Key Takeaway: Water damage can create long-term hidden hazards that remain even after equipment appears dry.

NEMA's Safety Hierarchy

1. **Prevention:** The preferred approach is preventing water exposure through proper design and installation.
    - Examples:
        - Elevating equipment above flood levels
        - Selecting proper enclosure ratings
        - Following building and flood-resistance standards
        - Using physical barriers where appropriate

2. **Resilience:** When prevention is not possible, equipment should be designed or installed to withstand expected environmental conditions.

3. **Replacement** (Preferred After Exposure): If equipment has been significantly exposed to water, replacement is generally the safest option.

4. **Reconditioning:** Reconditioning may be acceptable for certain types of equipment under specific conditions, but it cannot guarantee original factory performance.

Key Takeaway: When uncertainty exists, replacement is usually the safest course of action.

How Water Damages Electrical Equipment

Corrosion

- Degrades metallic components
- Reduces equipment life expectancy
- Can impair safety devices such as GFCIs and AFCIs

Loss of Lubrication

- Affects moving mechanical components
- May delay operation of protective devices

Foreign Particle Contamination

- Floodwater often leaves debris, sediment, and mineral deposits

- Can interfere with switches, breakers, and disconnecting means

Insulation Breakdown

- Water can degrade dielectric materials
- May cause current leakage, faults, or fire hazards

Mechanical and Structural Failure

- Corrosion can weaken mounting hardware
- Structural degradation may occur months or years after exposure

Potential Consequences

- Electrical shock
- Electrocution
- Arc flash incidents
- Fire

Prevention and Code Considerations

- Although the National Electrical Code (NEC) addresses wet locations and equipment suitability, flood protection often requires looking beyond the NEC.
- Important references include:
  - FEMA flood mitigation guidance
  - ASCE 24 (Flood Resistant Design and Construction)
  - International Building Code (IBC)
  - International Residential Code (IRC)
  - Manufacturer environmental ratings
  - Local ordinances and floodplain regulations
- Many jurisdictions require electrical equipment to be installed above designated flood elevations and may impose additional elevation requirements ("freeboard").

Five-Step Process for Evaluating Water-Exposed Equipment

Step 1: Identify the Water Source

- Determine the:
  - Type of liquid
  - Duration of exposure
  - Degree of immersion
  - Presence of contaminants
- Examples: Rainwater, fresh floodwater, saltwater, fire suppression waster, sewer backups, condensation, or industrial liquids
- The type of water significantly affects restoration options.

Step 2: Conduct an Evaluation

Evaluation methods include:

- **Visual Inspection**
  - Look for: corrosion, discoloration, oxidation, water stains, debris deposits, or material deterioration
- **Functional Inspection**
  - Check: Switch operation, mechanical movement, friction, binding, and connection quality
- **Performance Testing**
  - Use de-energized testing methods and NFPA 70B maintenance procedures to determine whether equipment performance has been compromised.
  - **Important:** Equipment should not be energized until evaluation is complete.

Step 3: Contact the Manufacturer

- Manufacturers can provide: Product-specific guidance, approved repair or reconditioning procedures, replacement recommendations, and replacement component information
- If the original manufacturer no longer exists, NEMA can help identify successor companies or provide historical product information.

Step 4: Consult NEMA Guidance

NEMA's primary reference document is NEMA CS 70006 (Formally GD 1)
This guide identifies:

- Equipment that must be replaced
- Equipment that may be reconditioned
- Product-specific limitations and requirements

Examples:

- NM cable exposed to significant water damage generally requires replacement.
- Some wet-rated conductors may be suitable for reconditioning under specific conditions.

Step 5: Recondition or Replace

Any reconditioning should:

- Be performed by qualified personnel
- Follow manufacturer requirements
- Comply with NEMA and NEC guidance
- Use approved methods and components

Reconditioning Considerations

- Reconditioning is different from maintenance or routine repair.
- Not all equipment is suitable for reconditioning.
- Unauthorized cleaning chemicals may damage equipment further.
- Generic restoration products should not be used unless specifically approved by manufacturers or standards.
- Relevant guidance documents include:
  - NEMA CS 70011 (Reconditioning Guide)
  - NEMA Water-Damaged Equipment Evaluation Guide
  - NEMA Cleaning and Disinfecting Guidance

Final Takeaways

- Water-exposed electrical equipment should never be assumed safe simply because it appears dry.
- Replacement is generally the safest option when significant water exposure has occurred.
- Identifying the water source, exposure duration, and contamination level is critical.
- Manufacturers and NEMA guidance should be consulted before re-energizing equipment.
- Proper evaluation helps prevent secondary disasters such as fires, electrical failures, and shock hazards.
- Prevention and resilient design measures remain the most effective long-term strategy for protecting electrical systems from water damage.
- **Bottom Line:** Safety decisions regarding water-exposed electrical equipment should be based on a systematic evaluation process, manufacturer guidance, and applicable codes and standards rather than visual appearance alone.