

## Post-Disaster Equipment Inspection and Testing

---

When disasters like fires, floods and earthquakes occur, they can create abnormal conditions and hazards that are detrimental to normal equipment operations. There have been many incidents where equipment, presumably untouched by an initial event, has broken down because it was returned to operation before a thorough inspection. Contaminants from disasters can enter air ducts, intakes, support equipment, production equipment, and electrical distribution equipment, which may result in equipment failure. Systematically inspecting and testing this equipment prior to returning it to service can help ensure operations resume safely and reduce the risk of equipment breakdowns.

### Safety First

After the event has occurred, and the location has been deemed safe to enter, all applicable safety precautions should be taken prior to operating any equipment. These safety precautions may include, but not be limited, to:

- Carefully reviewing safety precautions in the equipment owner's manual.
- De-energizing equipment as applicable.
- The lock-out and tag-out of all energy sources.
- Required personal protective equipment (such as goggles, dust masks, and/or respirators).
- Proper ventilation considerations.

### Electrical Restoration

Reestablishing power to the facility is a critical step in returning to normal operations. Power availability is required to restore critical building functions, such as lighting, ventilation, and necessary power outlets. It is important to properly clean and inspect electrical distribution equipment before re-energizing the system. A phased approach should be considered when bringing the facility back to normal operations. This should include essential loads necessary for further restoration first, and then major loads, such as production and process equipment, after a complete evaluation of the equipment has been performed.

Electrical maintenance and cleaning may be hazardous and should only be performed by an electrical contractor, a licensed electrician, or a qualified staff electrician with access to the manufacturer's maintenance and operation guidelines.

Important steps in the process to restore electrical service include:

- Switchgear, switchboards, and panel boards should be de-energized, locked-out, and tagged out.
- Visual inspection of incoming electrical distribution equipment not owned by the utility should include checking transformers, outdoor cabinets, and cables and bus duct to main switchgears for damage or abnormal conditions.
- Switches, breakers, and fuses on main switchgear and subpanels should be visually inspected for damage, corrosion, and other contaminants that may have entered the equipment.
- The switchgear, switchboards, and subpanels should be cleaned appropriately in accordance with approved manufacturer methods.
- Perform insulation resistance testing on electrical distribution equipment.
- Electrician(s) should restore essential load and distribution equipment slowly to prevent damage to electrical systems and closely monitor loads that have been restored.
- Infrared inspections can be an excellent tool when restoring electrical loads and distribution, providing immediate results and an indication of electrical concerns that may be present.

## Post-Disaster Equipment Inspection and Testing

---

### Equipment Cleaning and Inspection

After electrical restoration of essential loads, a thorough cleaning and inspection of the facility's equipment is paramount. This can assist with assessing damage that may have occurred during the event and any abnormal conditions that were not previously present. Visual inspections are not the only checks required and may not alone be adequate, depending on the equipment.

Visual Inspections: These are important, non-invasive checks allowing for a quick evaluation of your equipment. This includes looking at the equipment with or without the aid of tools such as mirrors, cameras, borescopes, magnifying lenses, etc. Visual inspections should include checking:

- Equipment housings for physical integrity and damage while verifying mounting brackets and bolts are secure.
- For damage, cracks, corrosion, or other contaminants that may have entered the equipment during the event.
- All moving and stationary parts to ensure areas are free of debris and no blockages exist.
- Seals, gaskets, filters, and hoses for leakage and proper connections.
- Piping and connections for leaks, damage, and proper insulation.
- Electrical cabling and conductors for damage, pinched or frayed wiring, and loose connections.

Cleaning Equipment: Equipment should be properly cleaned of dirt, dust, debris, and any other contaminants that may be present. There are many methods of cleaning equipment including compressed air, vacuuming, and the use of solvents. The original equipment manufacturer should be consulted for applicable cleaning methods and should be performed by a qualified technician.

### Equipment Restoration

The necessary steps to restore equipment to normal service following an event can depend on a variety of factors such as shutdown duration, type of event, how the equipment was affected and equipment age. Once thoroughly cleaned and inspected, equipment should be restored slowly and systematically in conjunction with the electrical restoration process. The original equipment manufacturer should be consulted for guidance before initial startup or returning equipment to service. Equipment restoration steps should include:

- Ensuring all required and upcoming maintenance items are completed. This downtime presents an excellent opportunity to complete these maintenance items which may help reduce unnecessary equipment shutdown after restoration.
- Performing electrical insulation testing and other nondestructive examination on equipment as applicable prior to startup. These tests may help identify areas of concern that could lead to equipment failure.
- Developing checklists for your equipment restoration process, including verifying proper fluid levels and lubrication as well as ensuring moving parts are free and unobstructed.
- Creating a startup procedure to be followed, which may help to prevent missing key steps during restoration.
- Replacing lubricants and cooling fluids as necessary. Some of the fluids and lubricants may have become contaminated during the event.
- Consulting the manufacturer's guidelines for startup and break-in-periods. Most equipment should not be operated at full capacity immediately upon restart.
- Testing installed safeguards, controls, and interlocks as applicable during the restoration process.
- For close-tolerance machinery, conducting calibration and alignment checks may be needed to help ensure sensors and measuring devices are functioning properly.

## Post-Disaster Equipment Inspection and Testing

---

- Continuously monitoring operating parameters for proper operation (fluid levels, oil pressure, temperature, etc.).
- Increasing the inspection frequency following restoration.

A thermographic survey of electrical equipment is advisable once the equipment has been cleaned and returned to normal operations.

### Other Considerations

While the focus of the restoration process will be to return the facility to normal operation, support equipment and emergency equipment should also be cleaned and inspected, tested and restored. Some of this equipment includes heating and cooling equipment, backup water sources, alternate fuel sources, emergency generators, etc..



---

[boilerre.com](http://boilerre.com)

The Travelers Indemnity Company and its property casualty affiliates. One Tower Square, Hartford, CT 06183

The information provided in this document is intended for use as a guideline and is not intended as, nor does it constitute, legal or professional advice. Travelers does not warrant that adherence to, or compliance with, any recommendations, best practices, checklists, or guidelines will result in a particular outcome. In no event will Travelers or any of its subsidiaries or affiliates be liable in tort or in contract to anyone who has access to or uses this information. Travelers does not warrant that the information in this document constitutes a complete and finite list of each and every item or procedure related to the topics or issues referenced herein. Furthermore, federal, state or local laws, regulations, standards or codes may change from time to time and the reader should always refer to the most current requirements. This material does not amend, or otherwise affect, the provisions or coverages of any insurance policy or bond issued by Travelers, nor is it a representation that coverage does or does not exist for any particular claim or loss under any such policy or bond. Coverage depends on the facts and circumstances involved in the claim or loss, all applicable policy or bond provisions, and any applicable law.

© 2021 The Travelers Indemnity Company. All rights reserved. Travelers and the Travelers Umbrella logo are registered trademarks of The Travelers Indemnity Company in the U.S. and other countries. 907-bre