



Flood Recovery Action Steps

Equipment Protection

Risk Solutions

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The following recommendations were prepared by The Hartford Steam Boiler Inspection and Insurance Company to assist persons in flood affected areas who own or operate equipment and machinery.

The Risk Does Not Recede With The Water

If your equipment, machinery or electrical systems have been exposed to flood waters, you risk their loss even when the water level has dropped. Equipment and machinery may have water, silt or other contaminants within them. Your equipment could be damaged or destroyed if you attempt to start or test it without adequate cleaning and preparation for operation. **DO NOT ATTEMPT TO OPERATE OR TEST YOUR EQUIPMENT WITHOUT PROPERLY RESTORING IT.** Even when your equipment's exterior appears normal, residual moisture and contaminants can lead to permanent damage.

Dry and Clean Before Using

The following summarizes the steps to prepare your equipment for operation. Most actions involve careful draining, drying, cleaning or lubricating of equipment before

attempting to start or energize it. Taking these precautions now can help you to avoid a major equipment failure and enable you to restore vital operations sooner.

Electrical Equipment

DO NOT ENERGIZE equipment that has been flooded until properly cleaned, dried out, and until insulation has been tested. This includes enclosures, bus ducts, conduit, and cables. Application of power to wet circuits will usually result in serious damage that will require repair or replacement. This is especially to be observed if the equipment is vitally needed and obtaining a replacement could be difficult. It is usually better to spend the necessary drying time than to risk destruction of the equipment.

- Windings in electric machinery should not be dried at temperatures exceeding the rating of its insulation system. In general, a maximum temperature of 194 degrees For 90 degrees C may be used. Check with the manufacturer for equipment specific information and recommendations.
- Dry type transformers should be cleaned and thoroughly dried as described for windings.



- Oil filled transformers should be thoroughly inspected for damage including the insulation bushing and oil samples should be drawn from the tank's top and bottom for analysis. Examine the sample for free moisture in the form of moisture droplets or a cloudy appearance. The laboratory should be instructed to include a Karl Fischer test for dissolved water content. Maximum water content for equipment rated $\geq 69\text{kv}$ is 25 ppm and equipment rated at $< 69\text{kv}$ is 35 ppm. If water is found in the oil, the oil charge must be dehydrated by a competent service firm.
- Circuit boards that have been immersed can sometimes be salvaged, provided that they were not energized at the time of immersion, and further provided that water sensitive components are not mounted to them. This can be done by carefully washing the individual boards in pure water and thoroughly drying before energizing.

Before Operating Machinery

- Contact the manufacturer for its recommendations.
- Inspect foundations for cracking, weakness, or settlement. If settlement is suspected, check and correct alignment of all shafting, and check all stationary components for level.
- Inspect all machine internals for silt accumulations and clean as needed.

- Open the cylinders of all reciprocating engines or compressors that have been immersed and remove foreign material or water.
- Drain and clean lubrication systems. Wipe oil containing elements with lint-free rags and refill with new lubricants as required. Monitor the lubricant charge during the initial hours after resuming operation for indications of water contamination and change lubricant if necessary.
- Ball and roller bearings suspected of being contaminated by water and debris should be opened, solvent cleaned, and then re-lubricated in accordance with the manufacturer's instructions.
- When cleaning, be especially careful to remove solid debris such as stone particles or metal chips.
- Carefully clean and TEST governors and controls. Many control systems are electric. Refer to recommendations for Electrical Equipment above.

Boilers

- Carefully inspect foundations and settings of boilers for settlement. DO NOT OPERATE a boiler if there is any evidence that the foundation has been undermined.
- Make sure the setting (brickwork, refractory, and insulation materials) is thoroughly dry. Use portable heaters where necessary. If the boiler has been immersed in salt or brackish water, the casing and insulation should be removed at least in wetted areas and the pressure parts should be washed with fresh water. After such washing, new dry insulation material should be applied and the casing re-installed.

- All safety appliances, such as safety and relief valves, steam gage, water column, low-water cutouts, and blow down must be cleaned and repaired as needed.
- All controls must be inspected and tested before operation, especially the water level control and low-water fuel cutoffs.
- Burners should not be fired until checked by a burner technician. An explosion may occur if the combustion controls do not function properly.
- Boilers should not be operated if proper feed water is not available. If operation is essential, and the boiler is to be run on untreated potable water, it will be necessary to blow down the boiler every eight hours and to open and clean the boiler internals at least once per week until proper water quality is re-established. In addition to frequent blow-down, and provided that clean make up water is available, it is also helpful to run with maximum makeup flow while diverting as much condensate as possible to sewer or drain until the boiler water quality returns to normal.

These recommendations are general guidelines and are not intended to be exhaustive or complete nor are they designed to replace information or instructions from the manufacturer of your equipment.