

# EMERGENCY CHECKLIST: FREEZE-UP

**Frigid temperatures can freeze production. Freeze—accompanied by plummeting temperature, fierce wind and/or heavy snow—can collapse roofs, rupture pipes, flood building perimeters and bring business to a halt.**

In areas where freeze is common, typical freeze incidents result from change within a facility—not replacing insulation after a repair, leaving a window or door open, or automated louvers not closing, freezing nearby fire sprinklers or water coils in air handling units. In regions where freeze occurs infrequently, inadequate heat in stairwells and above-suspended ceilings, inadequate insulation or an open window may result in broken water piping and water damage, or impaired fire protection sprinkler systems and sprinkler leakage.

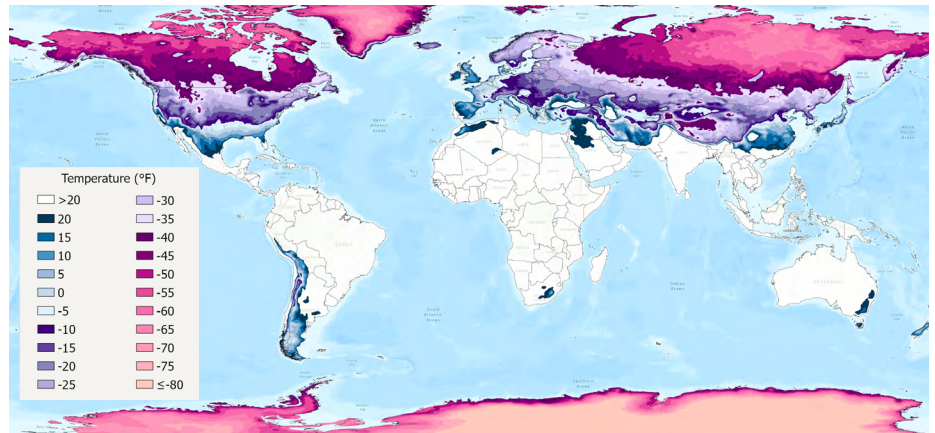
In areas such as the Gulf Coast in the United States, or southern parts of Europe, freeze is usually moderate—or not expected at all. If it does occur, frigid temperature can break sprinkler systems and other water-filled piping. It also can interrupt production processes by freezing condensation in instrument air tubing and preventing instrument signals from being transmitted, freezing outside valves, piping and open conveyors. Personnel, raw materials and emergency fuel may not be available for days due to roads being impassable.

Even a minor freeze-up can interrupt production and prove costly. Planning is the key to prevention, and this checklist helps you identify measures to take before and during cold weather.

## Before Cold Weather Hits

### GENERAL

- Designate a “weather watcher” to monitor conditions (using National Weather Service or equivalent),



- implement procedures and organize a well-trained emergency response team (ERT).
- Train your ERT how to properly remove snow from roads, equipment and roofs where applicable and safe to do so.
- Gather emergency supplies, including:
  - Extra tarpaulins for windbreaks
  - Steam hoses for thawing frozen lines
  - Portable heaters for keeping repair crews warm or instrument houses from freezing
  - Antifreeze supplies for cooling systems
  - Shovels, wheelbarrows and snow blowers
  - Warm clothing and hand protection for maintenance and operating crews
  - Anti-freeze solution for conveyor and other de-icing systems
- Prepare snow removal equipment.
- Make sure portable heaters have appropriate safety interlocks, and are fueled and operational.
- Set up priorities for steam usage to keep critical equipment in operation, and provide an adequate steam-tracing system.
- Verify the temperature monitoring system is operating properly and includes hard-to-heat areas housing vulnerable equipment. Provide additional thermometers if necessary.
- Review procedures for shutting down or curtailing operations during unusually cold weather.
- If you must leave facilities unattended, provide a supervised alarm system to monitor power supply, building temperature, low-water fuel trips on boilers, water temperature on exposed water-storage tanks, and process controls.
- For areas that are idle or have a history of past freeze-up, drain all equipment that carries water or is susceptible to condensation or freezing, including instrument air lines and the dry portion of a dry-pipe automatic sprinkler system.
- Add antifreeze to any equipment that cannot be drained.



## Buildings

- Ensure the building envelope is in good condition, and close unnecessary openings, especially doors and windows.
- Replace insulation after making repairs.
- Check heating equipment to make certain it will maintain building temperature above 40°F (4°C) at the coldest points in the building (e.g., corners at the windward end of a building, at the eaves and in spaces with no direct heat). Test freeze-stats and proper closure of dampers and operation of air handling units. Complete any repairs prior to the onset of cold weather.
- Identify any concealed space, such as the space above a suspended ceiling or a crawl space below the floor that may contain vulnerable piping. Consider providing temporary interior openings to allow heat to reach those areas.

## EQUIPMENT

- Drain idle equipment completely.
- Elevate low points or provide drain valves on condensate return lines.
- Remove low points and dead ends where possible.
- Provide steam traps on piping or equip it with drain valves.
- Install low-water fuel cutoff devices with a minimum of exposed piping.
- Consider heat-tracing lines for piping that carries water to the water glass, low-water fuel cutoff column and feedwater regulator.
- Provide alarms for important piping systems.
- For water-cooled equipment such as compressors and pumps, provide adequate heat, locate in a heated enclosure, or provide the proper antifreeze solution.
- Provide heat tracing and insulation on water-filled instrumentation and control lines.
- Use lubricant for low-temperature applications in equipment (e.g., pumps, blowers and compressors), especially in outdoor or unheated indoor installations.
- For idle air-conditioning systems, remove water from oil coolers and water jackets, and drain condensers of chilling units.

- Make sure fuel supplies will be adequate, particularly if supplied on an “interruptible” contract, in which case a second fuel source is needed. If the back-up fuel is oil, verify the tank is full and the delivery system to the heating unit is fully operational.
- Check pressure-vessel vents, relief valves and safety valves to ensure moving parts are protected from water accumulation or vapor freezing.
- Build and install windbreaks to protect outdoor equipment, piping and instruments.
- Check dryers on instrument air systems for proper operation.

## Fire Protection Equipment

- Monitor temperatures in buildings at strategic locations — near sprinkler systems, especially those above suspended ceilings and at the top of stairwells with outside doors and dry-pipe valve rooms, for example.
- Know the location of underground water mains. Ensure adequate depth of cover is maintained, especially where construction, excavation or erosion has occurred.

## FOR DRY-PIPE SYSTEMS

- Maintain dry-pipe valve room temperature above 40°F (4°C) by insulating the enclosure and installing a safe space heater.
- Check piping pitch for drainage of condensate to low-point drains and install more drains, if necessary.
- Drain low points frequently and install more drains if necessary.
- Make sure the system is thoroughly drained after annual trip test.
- Take the air supply for the compressor from within the space protected by the sprinkler system; if moisture build-up is a problem, provide an air dryer or use compressed nitrogen.
- Repair air leaks in the piping system to keep the dry valve from tripping if compressor power is lost.

Follow *FM Global's Red Tag Permit System (P7427)* and notify your local FM Global office if sprinklers are impaired. Drain automatic sprinkler systems as a last resort.

## FOR FIRE PUMPS

- Maintain pump room temperature above 40°F (4°C).
- For diesel-engine drives, maintain a room temperature of at least 70°F (21°C).
- If pump suction is from an open reservoir, make sure the intake and pipe are below the frost level underground and deep enough in water to prevent ice obstructions.

## FOR GRAVITY AND SUCTION TANKS

- Flush circulating heaters and piping.
- Make sure heaters' circulation pumps are operating.
- Overhaul any steam traps and strainers.
- Check hydrants for tightness and repair any leaks; also check buried valves and repair any leakage.

## During Cold Weather

### GENERAL

The weather watcher should check the weather daily (using National Weather Service or equivalent) and keep the ERT informed of cold weather, snow and ice conditions. Monitor future road conditions that may cut access to the facility. Power and other utilities should be monitored for curtailments or shutoffs.

- Monitor and record temperatures in hard-to-heat areas that contain vulnerable equipment; repeat every few hours during particularly cold weather.
- Check temperatures in critical areas at night and on weekends, as well as during the day. Use an alarm connected to a security service or a continuously touring watch service.

## ROOF

- Roof collapse doesn't happen suddenly. Monitor the amount of snow on the roof and take appropriate steps identified in the snow monitoring and response plan when the predetermined trigger point is reached.
- Have an adequate number of roof drains and keep them open and free of ice.

## EQUIPMENT

- Check heat-tracing systems to make sure they are working properly.
- Drain water-cooled equipment that has not been otherwise protected.
- Drain condensed moisture from compressed air lines frequently.
- Institute emergency procedures for processes that are dependent on a steam or water supply.
- Drain piping systems that contain liquid other than water and are vulnerable to freeze-ups (e.g., solidification of a heat-process material).
- Check pressure-vessel vents and relief and safety valves for frost or ice.
- Take special care when thawing frozen piping and equipment; avoid open flames.

## FIRE PROTECTION EQUIPMENT

- Check both wet- and dry-pipe sprinkler systems regularly to make sure they are ice-free.
- Keep all fire protection-related equipment (e.g., hydrants, hose houses, pumper connections, sprinkler control valves) free of snow and ice for easy access.
- Maintain a temperature above 40°F (4°C) for the water-filled sections of sprinkler systems including rooms with dry-pipe sprinkler system valves, break tanks, pressure tanks and fire pumps, (except maintain

70°F (21°C) minimum temperature in rooms with diesel engine-driven fire pumps).

- For gravity and suction tanks, maintain water temperature above 40°F (4°C).
- Shut and drain fire protection systems only if freeze up of the piping is imminent. Follow FM Global's *Red Tag Permit System* (P7427), notify your local FM Global office, notify the fire service and post a fire watch. Do not conduct any hot work or other hazardous operations.

## IF FACILITY HEAT IS LOST

- Safely shutdown operations.
- Secure the building envelope, closing all openings to the outside: doors, windows, and louvres and dampers, including those for air-handling systems.
- Drain the equipment listed below:
  - Process piping
  - Mill-use lines
  - Heat exchangers
  - Process equipment
  - Compressors
  - Water-cooled jackets
  - Condensate piping
  - Boilers
  - Hydraulically operated devices
- Drain domestic water systems if possible or consider periodically opening faucets or leaving them open for a trickle flow if the facility will be attended.
- If safe, have members of the ERT remain on-site. Close water valves if the site will be unattended.
- When heat is restored, inspect sprinkler systems, service water and other piping systems and pumps etc., for cracks, leaks or other damage. Slowly turn each system on checking for leaks and being prepared to quickly shut the system down.

## Important FM Global Resources

- Understanding the Hazard: *Freeze* (P0148)
- *Protecting Your Facilities from Winter Storms* (P0101)
- FM Global Property Loss Prevention Data Sheet 9-18/17-18 *Prevention of Freeze-Ups*
- *Freeze Emergency Response Plan*
- FM Global Property Loss Prevention Data Sheet 10-1 *Pre-Incident and Emergency Response Planning*

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