TOLEDO FIRE & RESCUE DEPARTMENT

D-4 COLD WEATHER OPERATIONS

Maintenance Manual

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Driving Procedures

From November 1 through April 1, these extra precautions shall be followed:

- Keep all pump discharge drains open.
- Circulate tank water through pump using the **wet-pump method** detailed below in Cold Weather Operations - Apparatus and Equipment Concerns.
- Purge the air brake system of moisture on tool day.
- Report hydrants used at an incident to dispatch before you leave the scene.

Be certain to give extra attention to driving for the conditions!

Apparatus and Equipment Concerns

Maintenance concerns while operating at fire scenes.

- Handling hose after use.
    - One firefighter can break, drain, and roll 2 lengths of hose without the hose freezing.
    - If reloading; break, drain, and reload one attack line at a time.
    - If hose is frozen, do not roll. Place hose in the bed of a Ladder Truck and return to the station to thaw.
- Engines not pumping (**at any fire or EMS run when the temperature is 32 degrees F or below**).

    - Engage pumps.
    - Open tank to pump valve.
    - Open tank fill valve.
    - Open drains on discharge ports.
    - Throttle to 800 RPMs.

- Engines used for pumping (November | to April | and any time the temperature drops to 32 degrees F or below).

    - After you obtain a hydrant supply, top off your booster tank if you pumped from it.

- Iced up Aerial Ladders

    - Shut down and drain the waterway **while elevated**
    - Contact the Maintenance Bureau before attempting to retract or move unless the apparatus or crew is in immediate danger.

Apparatus and Equipment Concerns-Additional

Freezing water is an apparatus! biggest enemy during cold weather operations. These additional precautionary steps are to be followed in cold weather.

- When shutting down lines, open all bleeders to drain any water that might still be in lines. Also, drain all pressure and intake relief valve drains, if so equipped.
- For monitors with drains, open the drain. If not so equipped, upright the device.
- Pump freezing can be avoided by using the volume of water stored in your water tank to your advantage. The combined pump and tank water has sufficient volume that it would take a significant amount of time to get to freezing temperature. Also, with pump re-circulation, moving water will resist freezing. Re-circulating water also creates heat. The faster the water moves, the more heat is created, a good reason for using fast idle controls.
- To make sure the pump is full when the apparatus is not in use, is sitting in quarters or driving down the highway, leave both tank valves open (tank fill and tank-to-pump). This procedure, called the **wet pump method**, induces movement through convection that will tend to equalize the temperature of the water in the pump to the water in the tank. When arriving on a fire scene, tank water will always be accessible even if the tank valve or leakage freezes because it will freeze in the open position. If the tank fill valve should freeze open, proper discharge pressure could probably still be obtained.
- The engine cooler knob mounted on the pump panel should remain in the “off” position because running with this valve open would keep the engine from heating up. In the winter, many diesel engines will not even get to operating temperature at idle. Fast idle will help keep the engine warmer.
- The biggest concern about the braking system in cold weather is water in the brake system. If ice

should form in an air brake line, the ice may block the air supply in the system. If ice blocks the supply to the air storage tanks, low-air warnings will engage and warn the driver/operator of a problem. If ice forms in the parking brake lines, there would be no low-air warning, and the parking brakes could engage without warning. If ice should block the air delivery in the service brake system (regular foot brake), the brakes may not operate on one, two, or all of the wheels without warning from any low-air warning system. This could create a situation where the only way to stop the apparatus would be to manually engage the parking brake. To help avoid these problems, make sure you purge air tanks on tool day.

- To separate frozen fittings, liquid de-icer, road flares or vehicle exhaust can be utilized.
- Apparatus will **not** be washed when the temperature is lower than 15 degrees F. Apparatus, however, may be washed at the discretion of, and under the direct supervision of, the Officer on duty. Only for the purpose of removing a buildup of salt.

The **wind-chill factor** is the measurement of the effects of the outside temperature combined with the wind speed on bare human skin. The temperature of a piece of steel will go no lower than the outside real temperature whether the wind is blowing at 0 mph or 50 mph but the wind does affect the time it takes equipment to cool down. The higher the wind speed, the faster equipment will lose its heat. However, the temperature of the equipment will not fall below the real temperature. Apparatus are most directly affected by the wind when driven down the road, hence the concern when responding long distances. The apparatus and all its equipment (including the water in the tank) will cool down at a much faster rate at highway speed than while sitting still and should be taken into account when making cold weather decisions.

Warm Weather Operations

- Check the front side of the radiator for debris such as leaves, pine needles, mud, and dirt. If air cannot get through the radiator fins, the coolant cannot cool the motor. Apparatus with center-mounted radiators suck the air from the road. This problem is commonly overlooked.
- Check both engine temperature gauges, There is one gauge on the pump panel and one gauge on the dashboard. Watch the gauges during startup and warm-up, making sure that the motor warms up gradually to operating temperature (180 degrees F) and then maintains that temperature. Compare the gauges against each other to make sure they are within 10% of each other.
- Normal motor operating temperature is 195 degrees F. The motor (and all its components), oil, and diesel fuel, are all designed to run at 195 degrees F. This is where the horsepower curve is rated, where torque is measured, and where the least bearing and piston wear occurs. It is the optimum temperature for a diesel motor.
- Because of its design, a diesel motor will also lose power operating with an ambient (outside) air temperature of 90 degrees F. or higher. At this temperature, the diesel motor has to work even harder to perform the same, and the demands on the cooling system are even greater.
- When the temperature reaches the coolant's boiling point, all cooling ability completely disappears. Remember, there are no automatic shutdowns on fire apparatus: The motor remains running for

firefighter safety at the expense of the motor. However, with the proper coolant mixture, the boiling point is increased to approximately 230 degrees F, a point in favor of the motor. A pressurized system will also slightly raise the boiling point.

- Check the Auxiliary Cooler Valve which may also be called the Engine Cooler or the Motor Cooler. This cooler valve mounted on the panel is a very misunderstood component.
    - By leaving the motor cooler on at all times or by turning the motor cooler on before the operating temperature is reached, a delay or even motor damage (a result of improper engine warm-up) may occur.
    - Turn on the motor cooler only after the motor reaches 180 degrees F, and make sure that the motor does not overcool.

- During hot weather pumping operation, turn off all unnecessary accessories such as the A/C, emergency lights, and headlights. The alternator will now use less horsepower, thus generating less heat by the motor. Running at higher RPM will help cool the motor. This can be accomplished by increasing RPMs and controlling hose discharge pressures by gating and feathering rather than using the throttle.

- The pump also needs the same special care. Keep the water flowing; never let it churn inside the pump. During overhaul operations, when less water is flowing, let the water re-circulate, overflow the tank, open a discharge or flow water in some manner to keep the pump cool. Feeling the temperature of the steamer port is a good indication of pump temperature. If your apparatus has a pump temperature warning device, learn how to use and test it.

- Cavitation happens at higher water temperature. The magic number for incoming water temperature is **60 degrees F**. Theory says that the water will easily cavitate at above 60 degrees F, when combined with the high pump temperatures. **Keeping adequate incoming residual pressures is even more important in hot weather.**

- Drafting with warm water can pose real problems, especially if a high “pull” is needed. If you have the choice between warm pond water and cool lake water, opt for the cool lake water. When drafting, always keep the water flowing, and recirculate the water back to the source constantly so that when the lines are shut down the draft is not lost. With warm water and a warmer pump, the prime is easily lost. Sometimes getting a prime back into a hot pump is impossible.

- While driving the apparatus, watch motor temperatures in heavy traffic. The use of transmission retarders can quickly heat up transmission fluid. The instrument panel has a transmission temperature gauge for just this reason. The transmission will start overheating at 330 degrees F. and could self-destruct at 360 degrees F. or above.

With warm weather, brake pads and shoes heat up quicker and stay hot longer. The driver-operator should know the apparatus’ limitations and drive accordingly.

*Portions of these procedures have been taken from “Media for Fire Engineering” written by Terry Eckert.

See Also:

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