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U.S. Fire Administration / National Fire Academy

Coffee Break Training

Topic: Eccentric Reducers

Learning objective: *The student shall be able to identify the correct orientation of an eccentric reducer on a fire pump suction line.*

Today's illustration shows a close-up of an outside stem and yoke valve (far left) on the suction side of stationary fire pump assembly. Between the OS&Y valve and the pump suction flange where the pressure gauge is attached is a fitting called a "tapered eccentric reducer."

The purpose of this fitting is to transition the pipe size from the incoming water supply —in this case 6 inches (152 mm) in diameter to fit the pump suction flange that is 4 inches (102 mm) in diameter. It is called "eccentric" because the center axis of the fitting is not in the same plane at either end.

This picture shows a common installation problem that the fire inspector should identify and have corrected right away. The eccentric reducer is installed upside down. The "flat" side that is parallel to the floor should be on top.

The problem with this arrangement is that air can be trapped in the upper portion of the fitting, and be drawn into the pump resulting in cavitation and serious pump damage.

When cavitation occurs, the liquid vapor released in the low pressure regions of the pump forms bubbles. These bubbles are carried into the high-pressure sections of the impeller underneath each vane, where they collapse with considerable force. This may cause pitting near the impeller vane tips.

Signs of cavitation include:
1. A rattling sound resembling gravel going through the impellers.
2. Excessive pump vibration.
3. A sudden pressure or volume loss.
4. Increasing pump speed without corresponding increase in volume or pressure.

This tapered eccentric reducer has been installed upside down. The "flat" side that is parallel to the floor should be on top. Photo courtesy Keith A. Heckler, F.P.E.

For additional information, refer to NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection.*