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Water Mist Nozzle Testing Explanation

According to the 2026 edition of NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*:

12.3.1.1 Where required by this section, sample automatic water mist nozzles shall be submitted to an approved testing laboratory acceptable to the authority having jurisdiction for functional testing.

It goes on to describe that these nozzles shall be tested 10 years (5 years if in a harsh environment) after installation and then every 5 years thereafter if they continue to be found acceptable.

NFPA 25 also describes test requirements for open nozzles as well:

12.3.2.3 Where the nature of the protected property is such that the water cannot be discharged annually...and not subject to the conditions in 12.3.2.2, open water mist nozzles that have been in service for 10 years shall be either replaced or representative samples shall be tested and then retested at 5-year intervals.

12.3.2.2 Where water mist nozzles are subject to environments with residues, including corrosive atmosphere and corrosive water supplies, they shall be either replaced or representative samples tested on a 1-year basis.

The nozzles that pass the floor level visual inspection should then be tested for sensitivity (automatic nozzles only), functionality, and K-factor.

Sensitivity

A measure of nozzle sensitivity is typically expressed as a response time index (RTI). This is a measure of how long (time, NOT temperature) the device takes to activate under certain conditions (temperature, air flow, etc.).

$$RTI = \frac{t_f * (\sqrt{\mu})}{\ln \left[\frac{(T_g - T_o)}{(T_g - T_r)} \right]}$$

RTI = Response Time Index [(m-s)^{1/2}]

t_f = Time to activate (s)

μ = Oven velocity (m/s)

T_g = Oven temperature (°C)

T_o = Ambient temperature (°C)

T_r = Temperature rating of sprinkler (°C)

Automatic nozzles should have a thermal sensitivity not less than that permitted in post-corrosion testing of new nozzles. NFPA 25 makes reference to various testing standards for further guidance. For example, FM Approvals Standard 5560, *Examination Standard for Water Mist Systems*, states these nozzles should have an RTI as follows:

Quick Response Nozzle. Generally, this is a nozzle having an RTI equal to or less than 90 (ft·s)^{1/2} [50 (m·s)^{1/2}] when the nozzle is tested in the best-case orientation (nozzle waterway axis and the plane of the frame arms are both perpendicular to the air flow, heat responsive element is upstream of the frame arms if applicable).

Standard Response Nozzle. Generally, this is a nozzle having an RTI which falls between 145 and 635 (ft·s)^{1/2} [80 and 350 (m·s)^{1/2}] when the nozzle is tested in the best-case orientation.

NOTE: Given the nature of this testing (single sample), conductivity (C-factor) is NOT included in the RTI.

Functionality

Nozzles shall fully open at their minimum operating pressure during the periodic testing.

K-Factor

The discharge coefficient, or K-factor, is a hydraulic formula that relates flow to pressure in your device (i.e. how much water will flow at a specific pressure).

$$K = Q/P^{1/2}$$

Q = Flow (gal/min)

P = Pressure (PSI)

Automatic nozzles should have a K-factor within ±10% of the value published by the manufacturer. Open nozzles should have a K-factor within ±5% of the value published by the manufacturer.