

Fire test scenario standard for horizontally installed water mist nozzles for light and ordinary hazard applications and occupancies.

DFL test standard No.: 80728-SW

Typical applications and occupations for the Nozzles:

This fire test scenario standard has been designed for the evaluation of minimum acceptable fire fighting performances of side wall installed water mist nozzles for fixed installation for automatic fire protection of light hazard and ordinary hazard occupancies such as to be found in: Institutions, hotels and hospital and similar applications, with moderate fire loads of class A materials also including most offices and other applications with minor fire load concentrations. The fire test scenarios has not been developed for tests of fixed installed systems for fire protection of storage rooms and storages and other occupations with high fireload concentrations or fire loads of high flammability such as hydrocarbons many plastics and similar fuel materials.

Follow up to fire tests scenario:

DFL recommends the fire test scenarios to be followed up with component tests of the nozzles.

As follow up to the fire test scenarios, the water mist nozzles should also undergo a comprehensive test scenario, of mechanical, thermal and corrosive tests and clogging test and hydraulic and pressure and release tests as described in DFL component test compendium, or component tests as described for automatic water mist nozzles in IMO Res 800A, with full concentration of impurities in water for the clogging tests, and without extra filter or strainer upstream the nozzle when conducting the clogging tests, and without reduced impurity concentration for high pressure nozzles when conducting the clogging tests.

Fire test scenarios for automatic side wall water mist nozzles for installation in wet pipe nozzle systems to be installed in light hazard and ordinary hazard 1&2 occupancies, with minimum design areas similar to that required of automatic sprinkler systems, and with requirements to water supply designs, with the exceptions of system specific minimum pressures and flows, as that of sprinkler systems for similar occupancies.

Definitions:

Automatic water side wall water mist nozzles:

A nozzle for fire protection, which are installed on walls to deliver a water mist spray from the wall and into the room where the nozzles provide fire protection.

The nozzles are automatic released to deliver water mist from heat of fire.

Water mist:

The water spray of a nozzle is defined as being water mist if 90% of the water is delivered in a spray of droplets with a size of no larger than 1mm, when measured 1m from the nozzle.

Wet pipe system:

In a wet pipe system all pipes upstream the nozzles are filled and pressurized with water. The nozzles distribute water immediately after being activated, and the system automatically provides a fire alarm as a result of the system activation. In some systems a pressure switch activates the pump systems as a result of a pressure loss in the pipe work when a nozzle operates.

Design area:

Design area is the minimum area for which a system is designed to be capable to cover with a full water mist spray of the minimum required water density and, with the minimum required water pressure on nozzles, should all nozzles in the design area be activated.

Requirements to The fire test hall, and the test laboratory:

A test room with an area of minimum 12m x 12m, and 2,5m ceiling height should be built inside a test hall of minimum 8 m height.

The test hall should be free of draft.

The test room walls should be made of wood sheets and in areas on fire the walls should be covered with 12mm±4mm thick plaster sheets, to prevent the walls from catching on fire.

Prior to start of the fire tests the temperature inside the test room should be 18°±4°

Ceilings should be flat and smooth and made of acoustical ceiling panels in non flammable materials.

The test laboratory conducting the fire tests should have the means to measure and log water flows to nozzles, water pressures acting on activated nozzles and temperatures.

The test laboratory should document the fire tests with good videos of the fuels during all test fires being conducted, and with still pictures of all damages before and after fire tests.

General tolerances:

Length:	±2%
Volume/flow:	±5%
Pressure	± 3%
Temperature	± 5%

Fuels:

The fire test scenarios involve two types of fuels which both are known from IMO Res. 800A fire test scenarios for automatic water mist systems.

The fuels are:

Sofa with two 2m x 0,8m x 0,1m thick polyether mattresses:

Sofa and mattresses are described in IMO Res. A.800 (19)

The mattress material should be made of polyether and should contain no fire retardants and have a density of 33 kg/m³. The cover should be made of cotton with no fire retardant and an area weight of 160±20 g/m². For further requirements please see IMO Res. A.800(19)

Plywood panels:

The panels should be approximately 3mm thick- The ignition time of the panel should not be more than 35s and the flame spread time at 350mm position should not be more than 100s measured in accordance with IMO Res. A.653(16).

Before and after conducting fire test scenarios

A pipe system containing two nozzles is designed in accordance with the manufacturer's guidelines. Two automatic nozzles are installed on the one wall with maximum recommended spacing between the nozzles and with half the maximum recommended spacing to the corner wall.

Each fire test is to be conducted with the nozzles installed with the maximum and the minimum recommended distance to the ceiling (t).

All fire tests are conducted with the minimum recommended water pressure acting on the activated nozzles.

All fire tests are conducted for ten minutes after the first nozzle has activated, or the test fire has been completely extinguished. Any remaining fire in the fuel package ten minutes after activation of the first nozzle should be manually extinguished. And it should be listed in the test report if the system extinguished the fire or the fire was manually extinguished. After the fire is extinguished, the damages to the fuel package are recorded and measured. And the damages as % of the seat mattress, % of the back rest mattress and % of the wooden panel are listed in the test report.

During each fire test the temperature on the ceiling surface directly above the ignition point should be recorded with a 0,5mm type K- thermocouple which are embedded in the celostic acoustic ceiling material in a small 2mm deep groove filled (casted) with dry plaster.

Fire test scenarios:

1:corner test Fire test scenario:

The purpose of the corner test fire scenario is to assess the fire fighting performance of one nozzle at half sprinkler spacing distance to closest corner wall.

The tests should be conducted at minimum water pressure acting on the nozzle.

The corner walls in full height are covered with plywood panelling 1m from the corner on the wall where the nozzles are installed, and 2m on the corner wall.

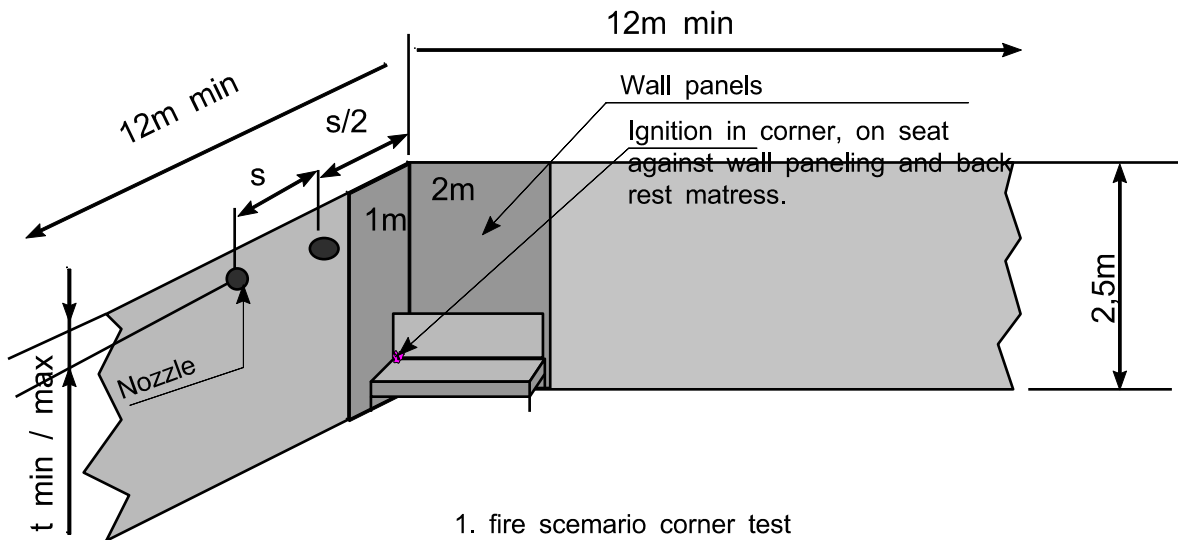
The sofa is positioned with the one end up-against the wooden panel on the nozzle wall and the backrest up against the wooden panel on the corner wall with no gaps between the mattresses and the wooden panelings. The ignition cube are positioned in the corner between the seat mattress and the back rest mattress, up against the wooden panelling on the nozzle wall.

The nozzles are pressurized with the recommended water pressure, the video are started and the ignition cube is ignited.

Acceptance criteria

Temperature: 30 sec. average Ceiling temperature over maximum 360 °C over continues 60 sec

Item	Max loss
Sofa	Maximum 20% total.
Wooden panel	Maximum 10% of full area



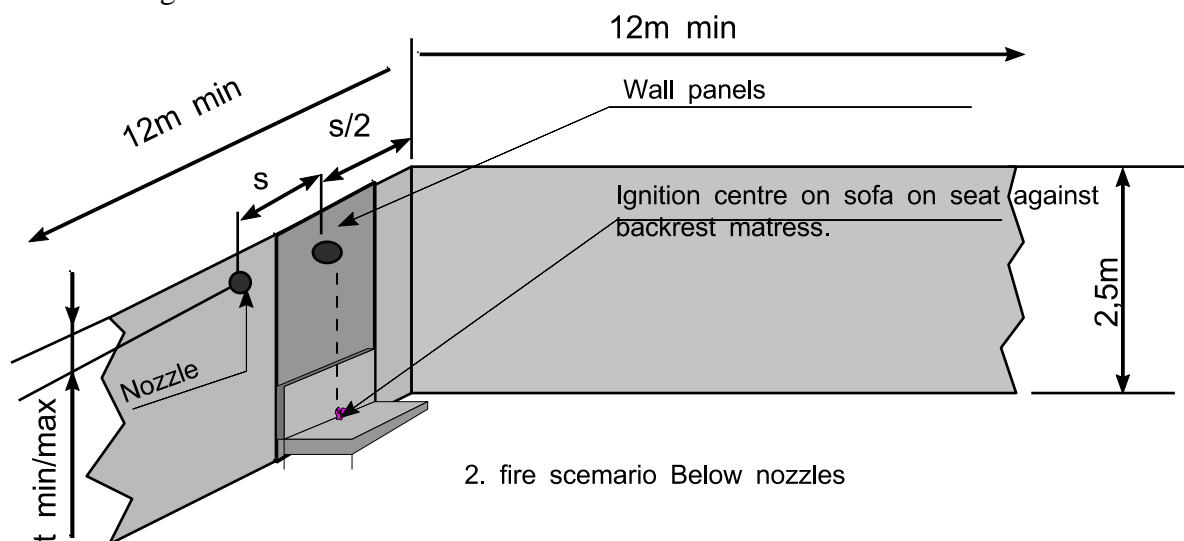
2. Fire test with sofa below one nozzle

The purpose behind this test is to show that the nozzles are cable of providing fire protection directly below the nozzle, and on the walls the nozzles are installed.

A two meter long plywood panel is installed with 1m m on both sides of the one nozzle. The other nozzle is dismantled. The sofa is positioned in centre below tke active nozzle with the backrest up against the wooden panel.

The fire is ignited with an ignition cube. Which is positioned in the centre of the seat mattress up-against the backrest.

The tests is only conducted with the active nozzle installed in maximum recommedes distance to the ceiling.



Acceptance criteria

Temperature: 30 sec. average Ceiling temperature over maximum 60 °C over continues 30 sec

Item	Max loss
Sofa	Maximum 24% total.
Wooden panel	Maximum 5% of full area, there should be minimum 5cm intact panel material along all panel edge sides.

3: Fire test with fuel package located at maximum coverage distance from nozzles.

There is two active nozzles in this test scenario.

The tests are conducted with the nozzles installed with max and min. distance (t) to ceiling and with minimum nozzle water pressure.

The purpose of the test is to test that the system is cable of controlling fires at maximum distance and preventing the fires from spreading to other fuel.

Two sofas are positioned with their back rests facing the nozzles. The backrests are positioned at the maximum recommended distance to the nozzle wall. The ignition sofa is located with its centre in front of the one nozzle. In front of the ignition sofa a 2m long and 2,5m high screen consisting of a wooden frame with plasterboards which on the one side is covered with wooden panels is positioned, so that the sofa seat mattress and the wooden panelling totch each other with no gab between the materials.

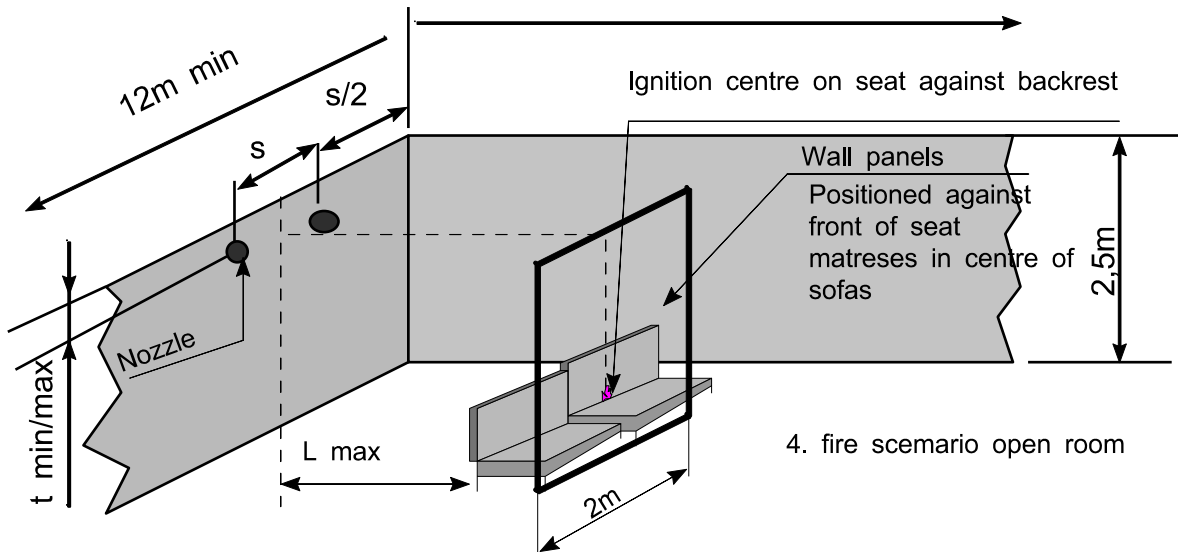
The screen reprepents a flammable wall or curtain located in a room opporsite the nozzles.

Along the ignition sofa a target sofa is positioned with a 250mm gab between the two sofas.

Acceptance criteria

Temperature: 30 sec. average Ceiling temperature over maximum 360 °C over continues 120 sec

Item	Maximum losses
Iognition Sofa	Maximum 60% total.
Target sofa:	Maximum 35%
Wooden panel	Maximum 10% of full area,

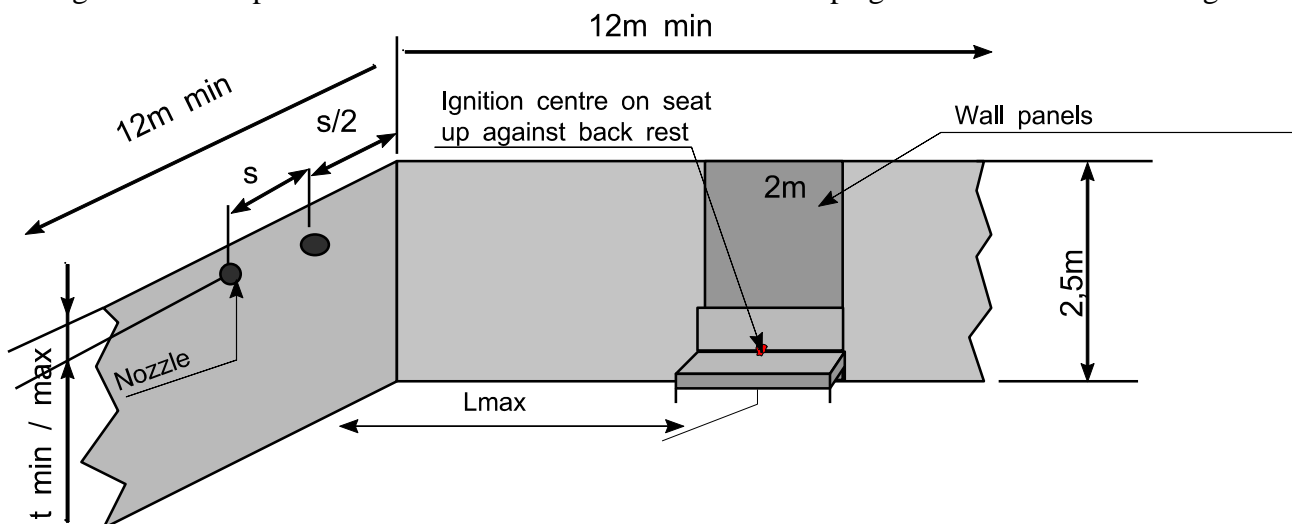


4 Fire test with fuel package located along corner wall at maximum distance from the nozzles.

The purpose of this test to evaluate the fire fighting performance at the very limits of the nozzle coverage area. The fire has a chance to grow high, and to spread beyond the maximum recommended length of the nozzle. The tests is conducted with the nozzle installed in it's maksimal and minimal spacing to the ceiling.

The one nozzle is dismountred in this fire tests. Only the nozzle closest to the corner wall is active. A 2m long wooden panel section is fitted the corner wall in full height so that the center of the wooden panel is located at maximum recommended distance to the nozzle. A sofa is positioned with its backrest up-against the wooden panel. The centre of the sofa has the maximum recommended distance to (1) to the nozzle wall.

The igniter cube is positioned in the centre of the seat mattress up against the back rest. And ignited.



Ignition Cube:

60mmx60mmx75mm cube made of porous fibreboard material soaked in 120ml heptane and wrapped in thin plastic foil.

Acceptance criterias:

Temperature: 30 sec. average Ceiling temperature over maximum 360 °C over continues 120 sec

Item	Maximum losses
Sofa	Maximum 65% total.
Wooden panel	Maximum 80% of full area,