nozzles are believed to be ineffective in the protection of equipment in cable tunnels and other similarly situated equipment and occupied areas. It is believed that in the presence of a fire in certain equipment and/or occupied areas, the generated mist from total flooding nozzle heads are not sufficient to cool the surrounding environment or control the fire within desired limits. It is believed that a likely cause for the performance deficiency is that the droplets in the total flooding, homogenous mist lose their velocity shortly after leaving the nozzle heads. The low velocity droplets tend to get pushed away from the fire by the air currents. Thus for certain applications, it is believed that the total flooding mist does not actively or directly impinge the fire and instead only cools the upper gas layer above the fire.

Disclosure of the Invention

[0004] Preferred embodiments of a water mist nozzle device generate a mist that provides a mixture of droplet sizes for both indirect impingement mist protection (total flooding) and additionally direct impingement mist and/or spray protection to address a fire. The preferred devices include a main body with multiple orifice nozzles or orifice inserts secured to the body. Differently configured orifice inserts are used to provide the varying spray patterns and mist from a single device. In preferred embodiments of the device, one type of orifice insert discharges a mist that includes a droplet size that is larger the droplet size of a mist discharged from the another type of orifice insert of the device.

[0004a] According to one aspect, a water mist nozzle comprises a body having a central bore extending along a central longitudinal nozzle axis, the body including a plurality of sockets formed about the central bore, each socket including a lateral bore extending between the socket and the central bore along a lateral axis. The water mist nozzle also comprises a plurality of orifice inserts, each orifice insert having at least one inlet, at least one outlet and an internal

chamber disposed along a central insert axis for fluid communication with the at least one inlet and the at least one outlet, each orifice insert being disposed in one of the plurality of sockets so as to axially align the insert axis with the lateral bore of the socket obliquely intersecting the central longitudinal nozzle axis, the plurality of orifice inserts including indirect impingement orifice inserts and at least one direct impingement orifice insert.

[0004b] According to another aspect, a water mist nozzle comprises a body having a central bore extending along a central longitudinal nozzle axis, the body including a plurality of sockets formed about the central bore, each socket including a lateral bore extending between the socket and the central bore along a lateral axis. The water mist nozzle also comprises a plurality of orifice inserts, each orifice insert having at least one inlet, at least one outlet and an internal chamber extending axially between the at least one inlet and the at least one outlet along a central insert axis, each orifice insert being disposed in one of the plurality of sockets so as to axially align the insert axis with the lateral bore of the socket obliquely intersecting the central longitudinal nozzle axis, the plurality of orifice inserts including orifice inserts of a first type and orifice inserts of at least a second type different than the first type, the at least one inlet of the first type of orifice insert including a plurality of inlets having a portion extending transversely with respect to the insert axis, the at least one inlet of the second type of orifice being coaxially aligned with the insert axis.

[0004c] According to another aspect, a water mist nozzle comprises a body having a central bore extending along a central longitudinal nozzle axis. The water mist nozzle also comprises a plurality of orifice inserts disposed about the central bore, each orifice insert having at least one inlet, at least one outlet and an internal chamber extending axially between the inlet and the at least one outlet along a central insert axis, the plurality of orifice inserts including orifice inserts

of a first type and orifice inserts of at least a second type, the at least one outlet of the first type of orifice insert being axially aligned along the insert axis, the at least one outlet of the second type of orifice insert including a plurality of outlets surrounding the insert axis, each extending obliquely with respect to the insert axis.

[0004d] According to another aspect, a water mist nozzle comprises a body having a central bore extending along a central longitudinal nozzle axis. The water mist nozzle also comprises a plurality of nozzles disposed about the central bore including a plurality of indirect impingement nozzles and at least one direct impingement nozzle.

[0005] One preferred embodiment of a water mist nozzle includes a body having a central bore extending along a central longitudinal nozzle axis. The body includes a plurality of sockets formed about the central bore. Each socket includes a lateral bore extending between the socket and the central bore. The nozzle also includes a plurality of orifice inserts. Each orifice insert has at least one inlet, at least one outlet and an internal chamber disposed along a central insert

axis for fluid communication with the at least one inlet and the at least one outlet. Among the plurality of orifice inserts are indirect impingement orifice inserts and at least one direct impingement orifice insert. The preferred mist nozzle can be configured as normally open for immediate discharge upon system operation; or alternatively configured for automatic operation in which fluid discharge from the nozzle upon actuation of a thermally responsive trigger. Preferred embodiments of a direct impingement orifice insert include an inlet coaxially aligned with the insert axis and a plurality of outlets surrounding the insert axis. Preferably, each of the plurality of outlets extend obliquely with respect to the insert axis to define an included angle ranging from 20°-25°. Moreover, the plurality of outlets of the second type of orifice insert include four outlets.

[0006] Embodiments of the water mist nozzle device provide a method of water mist nozzle protection that includes generating a first type of fluid mist from a first type of orifice insert disposed in one of a plurality of sockets formed in a nozzle body into which a firefighting fluid is introduced and generating a second type of fluid mist from a second type of orifice insert disposed in another one of the plurality of sockets formed in the nozzle body. The second type of fluid mist has a droplet size that is greater than the first type of fluid mist to directly impinge a fire, while the first type of fluid mist provides total flooding protection.

[0007] Another method of water mist nozzle protection includes installing at least two water mist nozzles above a ground to protect an area or object where each nozzle has a plurality of orifice inserts about a nozzle axis with at least one orifice insert configured for generating a first mist to address a fire with indirect impingement and at least one orifice insert configured for generating a mist to address a fire with direct impingement. The at least one direct impingement orifice insert is oriented to face the floor. The method includes orienting each nozzle so that the nozzle axes of the at least two nozzles define an included angle ranging from 5°-20° with respect