

Noncombustible Liquid

Recently, a batch of questions have come to the NFSA Engineering Staff through the Expert of the Day service regarding the definition of a noncombustible liquid. It is interesting how different people from different parts of the country can ask the same question on the same day. There are a number of reasons why people in the fire sprinkler industry might want to know the definition of a noncombustible liquid:

- NFPA 13 allows sprinklers to be omitted from elevator pits where the shafts do not contain combustible hydraulic fluids (see section 8.15.5.2 in the 2013 edition and there are similar sections in previous editions).
- NFPA 13 allows a plastics fabrication facility to be protected as an Ordinary Hazard Group 2 occupancy as long as the machines do not use combustible hydraulic fluid (see section A.5.3.2(19) in the 2013 edition and there are similar sections in previous editions).
- NFPA 13 will only allow antifreeze solutions in the future that are listed (see section 7.6.2.1 in the 2013 edition). The laboratories have indicated that they will not consider combustible liquids as potential solutions for listing. So what are noncombustible liquids?

So, it seems important to try and find a decent definition of “noncombustible liquid” in order to help understand the use of these sections. Unfortunately, NFPA 13 does not have a specific definition for “noncombustible liquid”, but there are other places that we can go to determine how to interpret these sections.

NFPA 30, Flammable and Combustible Liquids Code, does not define a “noncombustible liquid”, but it does define a “combustible liquid”, and it would be fair to say that a noncombustible liquid would be one that is not a combustible liquid.

A combustible liquid is defined as, “Any liquid that has a closed-cup flash point at or above 100 degrees F (37.8 degrees C) as determined by the test procedures and apparatus set forth in section 4.4”. It is important to note that there is no upper boundary on this definition. Liquids with flash points at 600 or 800 degrees F would still be considered combustible liquids. In fact canola oil, which has a flash point of about 620 degrees F is considered an extremely combustible liquid. Even though it takes a bit to heat up the oil to get it to start to burn, once it starts burning, there is sufficient energy to continue to process.

Liquids, like water, won’t have a flash point at any temperature that can be achieved by the apparatus described in section 4.4 of NFPA 30. While it is theoretically possible that some liquid might have a flash point at some greatly extended temperature and pressure greater than what the apparatus

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can test, those types of liquids would be considered noncombustible if the apparatus would be destroyed before the flash point of the liquid was found.

Rather than trying to find a specific definition for “noncombustible liquid”, it might be easier to explore each of the different places where the concept of combustible liquid was raised (as discussed above) to determine how to deal with each individual situation:

Elevators

Many years ago, when the NFPA Technical Committee on Sprinkler System Installation Criteria was writing the rules for protecting elevators, we originally wanted to write that sprinklers are required at the bottom of all hydraulic elevator shafts. But the elevator manufacturers asked us to change the language to what it currently says (as discussed in Number 1 above) because they thought that they could develop a noncombustible hydraulic fluid. They never did, as far as we know. To the best of our knowledge, all hydraulic elevator fluid is combustible. If you are in doubt, ask what the flash point of the fluid is. If the fluid has a flash point, it is combustible.

Therefore, if the elevator is hydraulic, put a sprinkler in the pit. Since the sprinkler in the pit does not need to be tied to the whole elevator control system, it should not be a big deal to put this sprinkler in the pit.

Plastics Manufacturing Machines

The discussion here is going to be similar as that for elevator protection. The concern is that the hydraulic fluid will add to the heat release rate of the fire and create a problem that ordinary hazard areas and densities cannot control.

If plastics manufacturing machines work with hydraulic fluids, it is best to consider the fluid as combustible and protect it in accordance with Extra Hazard Group 1 or higher hazard classification rules.

The only plastics manufacturing machines that should be protected using the rules of Ordinary Hazard Group 2 are those that do not operate using hydraulic fluids. Once again, the language has been written this way because the possibility exists that the industry could develop hydraulic fluids that do not have a flash point when tested in accordance with the apparatus in NFPA 30. To the best of our knowledge, this has not yet occurred, but it is possible in the future. If in doubt, ask for the flash point of the liquid. If it has one, it is combustible.

Antifreeze

While the search continues for an acceptable antifreeze solution, the discussion on which types of fluids will be permitted may work itself out.

What is likely to be a part of the listing criteria for these solutions is a standardized test where the lab sprays the liquid on a fire with a known heat release rate and measures whether the fluid (in the form of spray from a sprinkler) contributes to the heat release rate of a fire.

If the fluid contributes to the heat release rate of the fire, the liquid will probably not be listed. It is highly likely that the only fluids that do eventually get listed as acceptable antifreeze products will be those that do not contribute to the heat release rate of a fire when sprayed from a typical sprinkler onto a fire of a known heat release rate.



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