

# DuPont™ FE-25™

fire extinguishing agent

## Safety in Use of DuPont™ FE-25™

DuPont™ FE-25™ is a very effective replacement for Halon 1301 in existing systems. Its attractiveness as a retrofit option is driven by the similarity in physical properties between FE-25™ and Halon 1301. As a result, piping networks installed for Halon 1301 use have the potential of being retrofitted with FE-25™. Since most Halon 1301 systems protect spaces where people are normally present, it is essential that FE-25™ is safe for people in the event they are exposed to it during a system discharge. This brief will clarify why DuPont™ FE-25™ *CAN BE USED* for the protection of assets *WHERE PEOPLE ARE NORMALLY PRESENT*.

### What Is Cardiac Sensitization?

For most of the chemical agents commercially used in fire protection today, a toxicological effect called cardiac sensitization is the first potential “egress impairing effect” on people exposed to high concentrations of extinguishant for a short period of time. Cardiac sensitization is a potentially fatal condition where the heart becomes overly sensitive to a biologically active molecule (adrenaline) normally produced in the body. The toxicity test conducted to evaluate cardiac sensitization potential is aimed at determining the cardiac sensitization No Observed Adverse Effect Level (NOAEL) and the cardiac sensitization Lowest Observed Adverse Effect Level (LOAEL). The NOAEL is the test exposure concentration that resulted in no cardiac sensitization, whereas the LOAEL is the lowest test exposure concentration producing any cardiac sensitization in laboratory animals predisposed to cardiac sensitization.

### International Standards

The internationally recognized standards, such as NFPA 2001 Standard and the ISO 14520 Standard have detailed the results of the cardiac sensitization toxicity testing with the various alternatives to the Halon products. In practical terms, it is essential that the level of exposure and time duration for that exposure be understood to set the maximum concentration of extinguishing agent allowable for areas where people are present (normally occupied spaces).

### Design Concentration for Halon

In the past, when determining how an alternative to Halon could be used in normally occupied spaces the limit for the design concentration of a system was capped at the NOAEL. In other words, if the concentration of agent required to extinguish a fire of a specific asset was above the NOAEL, then that extinguishant could not be used to protect that asset when people were present. Such an approach to setting extinguishing limits did not incorporate the element of time for the exposure and was inconsistent with more than 30 years experience gained with the use of Halon 1301 (where many systems were designed at concentrations above its NOAEL).



## Current Science

During the late 1990's, United States EPA and Department of Defense (DoD) toxicologists began to study extinguishing agents and worked to incorporate the time of the exposure into their analysis. The scientists demonstrated that each chemical accumulates differently in the blood and this would impact selection of extinguishant concentrations acceptable for use in normally occupied spaces. Refinement and extension of this work resulted in a biologically based model that could be used to keep track of the fire extinguishant concentration inside the human body during the time that a person was exposed. Because this model was based on actual human physiology, it is often referred to as a physiologically based pharmacokinetic (PBPK) human model. The model is uniquely capable of providing decision makers with the information they need to design fire extinguishing systems at concentrations that put out the fire as quickly as possible, while providing for an acceptable margin of safety for the people who may be exposed for very short periods of time (5 minutes or less). The PBPK modeling approach is endorsed by the US EPA, NFPA and is included as part of the new ISO 14520 Standard.

## DuPont™ FE-25™ Can Be Used Safely In Normally Occupied Spaces

For FE-25™, the typical design concentration for a Class-A asset (plastics, wood, etc.) is either 8.0% (NFPA) or 8.7% (ISO). Using the PBPK model to relate exposure concentration information to the concentration of extinguishant in the body that corresponds to an acceptably safe level, one would allow for a design concentration of up to 11.5% for a five minute exposure. Based on the extinguishing concentration being almost 50% below the allowable exposure concentration, there is no question that FE-25™ can be safely used in areas where people are normally present.

In conclusion, like most technologies, toxicological modeling and methodologies continue to advance. As we learn more about how chemicals interact in our bodies, we can make better decisions on how to safely use them. The latest and best science around fire extinguishing agents clearly shows that DuPont™ FE-25™ CAN be USED SAFELY in NORMALLY OCCUPIED SPACES for the protection of Class-A assets.

## DuPont ... A Tradition in Safety

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