

DUNE ND Gas Safety Meeting

2020 Jun 9, 8am CDT

Minutes

1. Understanding FESHM 6020.3:
 - a. A non-flammable gas or gas mixture (e.g., Ar, Xe, N₂, P₅...) is not subject to FESHM 6020.3.
 - b. Flammable mixtures need to follow the FESHM 6020.3 flow chart with the described Q-limit.
 - c. A gas mixture containing a flammable gas in a concentration below the LFL limit and listed as non-flammable according to bulletins 503 and 627 below, also needs to go through the flow chart but has an early exit, trivially to "Risk Class 0 (Risk of a small local flash fire)".
 - i. [Points a-c are based on discussions and a 'safe' interpretation of FESHM 6020 regulations. We include here a particularly relevant excerpt from FESHM 6020 (point 4.0): "Flammable gases may be diluted with inert gas to the point where the mixture is not flammable. This chapter does not apply to facilities using only non-flammable mixtures. The flammability of a mixture can be determined by referencing Bureau of Mines Bulletins 503 and 627 at <http://www.osti.gov/bridge/servlets/purl/7328370-wx68Fy/> and <http://www.osti.gov/bridge/servlets/purl/7355338/>."]]
 - d. Ignition source may be defined as any electrical component in an oxygen-containing environment: boundary regions (e.g. feed-throughs) can be excluded if there is sufficient flushing and purging and isolation from oxygen/air. Regions internal to the detector might be in this case (given the use of a high-pressure vessel and associated elements) excluded, too, and the presence of critical concentrations of oxygen inside the chamber avoided at all times through the implementation of protocols for filling/evacuating/pumping. Some additional details:
 - i. Cables are not a safety hazard (if properly routed and shielded, given that the detector is moving).
 - ii. Coaxial feedthroughs might be considered 'neutralized'.
 - iii. LV (single, multipin, wire) could be epoxied.

- iv. The ultimate way to mitigate the safety hazard in the boundary region would be to use a bag ('baggy') with some forced gas flow of a neutralizing agent (e.g., N₂).

2. Discussions on the facility:

- a. The issue with 'minimum facility' volume required for safety is coupled with ventilation. A ventilation scheme needs to be provided. The pump exhaust and the neutralized regions should be part of a common ventilation concept, too.
- b. Suggested to have the gas mix station on the surface building for practical access.
- c. Suggested to have gas monitors around the detector.

3. Further regulations:

- a. [awaits feedback from safety experts]
- b. However, National Fire Protection Association (NFPA) code 520, Standard on Subterranean Spaces, is likely also to be applicable. Under certain conditions 80 m³ of a flammable gas are permitted under these regulations. No mention of pressure of the gas is indicated in the regulations. Careful, expert interpretation of these regulations will be needed both separately and within the context of FESHM 6020.3.