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C-A OPERATIONS PROCEDURES MANUAL

ATTACHMENT

9.2.7.a General Design Criteria for Experimental Flammable Gas Systems

Text Pages 2 through 5

C-A-OPM Procedures in which this Attachment is used.		
9.2.7		

Hand Processed Changes

<u>HPC No.</u>	<u>Date</u>	<u>Page Nos.</u>	<u>Initials</u>
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Approved: _____ ***Signature on File*** _____
 Collider-Accelerator Department Chairman Date

A. Etkin

1. THE DESIGN AND LOCATION OF FLAMMABLE GAS SYSTEMS

- 1.1 Shall be in accordance with the attached Tables 1 and 2 from ES&H Standard 4.11.0.
- 1.2 Storage sites and similar places where large quantities of flammable gas are installed shall be fenced off or otherwise clearly delineated. Appropriate posting shall be placed on points of access.
- 1.3 If acceptable for operational reasons, outdoor locations are often safer than indoor locations; they are particularly recommended for large storage volumes.
- 1.4 Flammable gas systems should be located at such distances and positions [see table 2] with respect to intake openings for air compressors, ventilation, air conditioning, etc., so that contamination of the air through put of such equipment is not possible.
- 1.5 Where there is a possibility of a major spill of flammable liquified gases, engineered protection measures, i.e. diking, diversion curbs, grading, etc., shall be installed to prevent accumulation of flammable liquid within 15 meters of any installation that represents a significant fire hazard, and infiltration of flammable gas that is heavier than air into space below grade.
- 1.6 Outdoor weather shelters are to be provided. They shall not be enclosed by more than two walls set at a right angle. Vent spaces shall be provided between the walls and roof.
- 1.7 The use of flammable materials within 50 feet of flammable gas storage areas shall be reviewed by the ESRC.

2. WINDOWS

- 2.1 Deviations from the following shall be approved by the ESRC:
- 2.2 Minimum thickness shall be 5 mil, with approval of the material by the ESRC.
- 2.3 The minimum strength shall be designed for 4 times the relief pressure (5 times operating) without exceeding the allowable design stress stated in ES&H Standard 1.4.2. Calculations shall be submitted to the ESRC.
- 2.4 Consideration should be given to conducting scale model pressure tests to destruction. The ESRC shall make a determination on the need for full-scale tests to destruction.
- 2.5 Leak rate and pressure testing shall be done at two times the relief value.
- 2.6 The window deflection at relief pressure shall be such that it does not come within 2.5 cm of adjacent equipment.
- 2.7 The test window shall be pressurized to 2.5 times the relief setting, and the deflection measured until it is constant for 4 hours. This window must then be cycled 30 times and the deflection test repeated.

3. PHYSICAL STRUCTURE

- 3.1 Deviation from the following shall be reviewed by the ESRC:
- 3.2 The enclosure shall be designed for a minimum pressure 50 times relief setting.
- 3.3 Only commercially available fittings and feed-throughs shall be used in the construction.
- 3.4 The design shall provide for adequate rigging, support, alignment, removal and installation of the detector or gas vessel.
- 3.5 Ports shall be provided for complete purging of the chamber. Consideration shall be given to avoid the possibility of “dead air pockets”.
- 3.6 Purge port location and flow direction shall take into consideration the gas density.

4. ROUTINE OPERATIONAL TESTING

- 4.1 The enclosure shall be leak-tight so that a point source of flammable gas leakage concentration is less than 200 ppm, at 2.5 cm from the counter surface, while the detector is pressurized at 2 times the relief setting with the operational gas. Overall leakage must be diffused by building ventilation.
- 4.2 The operational window is to be tested at 2.5 times the relief setting, cycled 3 times, with a measurement of the deflection each cycle. The deflection can be no more than 10% above the test window deflection.
- 4.3 The device must be leak-checked before each experimental cycle. It should satisfy the conditions in section 4.1 except that the check may be performed at 0.9 times the relief setting.

TABLE 1

Size of Flammable Gas System

Nature of Location	Less Than 80 Cubic Meters	80 Cubic Meters to 420 Cubic Meters	In Excess of 420 Cubic Meters
Outdoors	First Preference	First Preference	First Preference
In a Separate Building	Second Preference	Second Preference	Second Preference
In a Special Room	Third Preference	Third Preference	Normally Not Permitted
Inside buildings not in a special room and exposed to other occupancies	Fourth Preference	Normally Not Permitted	Normally Not Permitted

TABLE 2

Minimum Distance in Meters Without a Fire Wall

		Size of Flammable Gas System (m ³)		
		10 to 80	80 to 420	In Excess 420
Fire-Resistive Construction		0	0	0
Wood Frame Structures		3	8	15
Structure of Ordinary Non-Combustible Construction		0	3	8*
Wall Openings (Lighter-Than-Air Gases)	Not above any part of a system	3	3	3
	Above any part of a system	8	8	8
Wall Openings (Heavier-Than-Air Gases)	Not above any part of a system	8	8	8
	Above any part of a system	3	3	3
Flammable Liquids Above Ground	Up to 3,800 liters	3	8	8
	In excess of 3,800 liters	3	15	15
Flammable Liquids Below Ground	Up to 3,800 liters	3	3	3
	In excess of 3,800 liters	6	6	6
	Vent or fill opening of tank	8	8	8
Flammable Gas Storage	Up to 420 m ³ capacity	3	8	8
	In excess of 420 m ³ capacity	8	15	15
Oxygen Storage	Up to 340 m ³	6	6	6
	More than 340 m ³ CF	8	8	15
Fast Burning Solids, such as light lumber, excelsior, paper		15	15	15
Slow Burning Solids, such as heavy timber		3	8	15
Open Flames and Other Sources of Ignition		8	8	8
Air Compressor Intakes or Inlets to Ventilating or Air-Conditioning Equipment		15	15	15
Concentration of People**		8	8	8
Edge of Road		5	5	5

*But not less than one-half the height of adjacent side wall of the structure.

**Such as congested office areas, lunchrooms, and locker rooms.