

Fermilab/CDF Operating

Date 5-29-01

of pages including cover sheet 4

To Raja

Co./Dept. _____

Phone _____

Fax 6311

From Del Allspach

Phone 3493

Message Be sure to follow

FESHM Chapter 6020.3. Calculate

the Q (Hydrogen Equivalency) example

is on page 10. Both the dispersion
area & test area must be looked at.

An example of a CDF test is attached.

**CDF TEST ROOM GAS SYSTEM
RISK CLASS DETERMINATION
Tue, Jan 19, 1999
D. Mizicko/D. Allspach**

CENTRAL OUTER TRACKING CHAMBER

ROOM 114

We are going to move the COT Preproduction Prototype from the clean room C at IB4 to CDF clean room 114. With this letter we would like to ask for approval of the Prototype operation in the room 114.

The Prototype box is made of an aluminum frame with 10 mil thick Mylar windows. The inner volume of the box is 12"x15"x122"=12.7 SCF. The Prototype is flushing with Argon/Ethane (50:50) gas mixture with isopropanol vapors at -4 deg C. The normal flow rate is 0.3 SCFH, the flush flow rate is 2.0 SCFH. Argon Ethane will be supplied from a single low pressure cylinder containing 81 SCF of the Argon Ethane mixture. The cylinder will be placed in the room 114. Test gas will be vented outside through an exhaust manifold.

The Detector Chamber Volume is as follows: Flammable Gas

| NUMBER OF CHAMBERS | GAS MIXTURE USED | NORMAL FLOW RATE (SCFH) | FLUSH FLOW RATE (RATE) | DETECTOR VOLUME Cu. Ft. | DEVICE | ALCOHOL TEMP DEG. C |
|--------------------|------------------|-------------------------|------------------------|-------------------------|--------|---------------------|
| 1 | A/C2H6+ISO | .30 | 2 | 12.7 | COT | -4.0 |

COT CENTRAL OUTER TRACKING CHAMBER

Test Room 1 Enclosure Risk Class:

The volume of the test room 114 enclosure is 3750 ft³. The volume of Argon/Ethane gas contained within the gas source and detector in the enclosure is (1/2) 81.0 SCF = 40.5 SCF is Ethane gas, plus (1/2) 12.7 SCF = 6.35 SCF in the detector. The Hydrogen equivalent inventory is then:

$$Q = 46.85 \text{ (SCF)} \times 0.028 \text{ (M}^3 \text{/ ft}^3\text{)} \times 1.26 \text{ (kg/M}^3\text{)} \times 0.36 \text{ (H}_2 \text{ equiv. factor)}$$

$$Q = .595 \text{ Kg Hydrogen equivalent inventory}$$

If all gas source active control devices fail simultaneously, the restricting orifice would limit flow to 5 SCFH of Ethane into the enclosure. In order to establish LEL (3% Ethane in air) in the total enclosure volume, a release of (3750 ft.³ X 0.03 = 112.5 ft.³) of Ethane would be required. Since the enclosure has an air exchange of 5200 CFM, performing 82.8 volume exchanges per hour with the assembly hall volume of approximately 750,000 ft.³ which introduces 2000 CFM of outside air, it is not possible to produce an ignitable gas mixture. If the fan in the test room fails, a flammable gas detector will alarm if Ethane is detected. There are Ethane detection devices that provide an audible report at 7% of LEL & automatic shut down of Ignition sources by a shunt breaker and cessation of Argon/Ethane gas flow replaced with Nitrogen by de-energizing a three way solenoid with two gas sources valve at 20% of LEL.

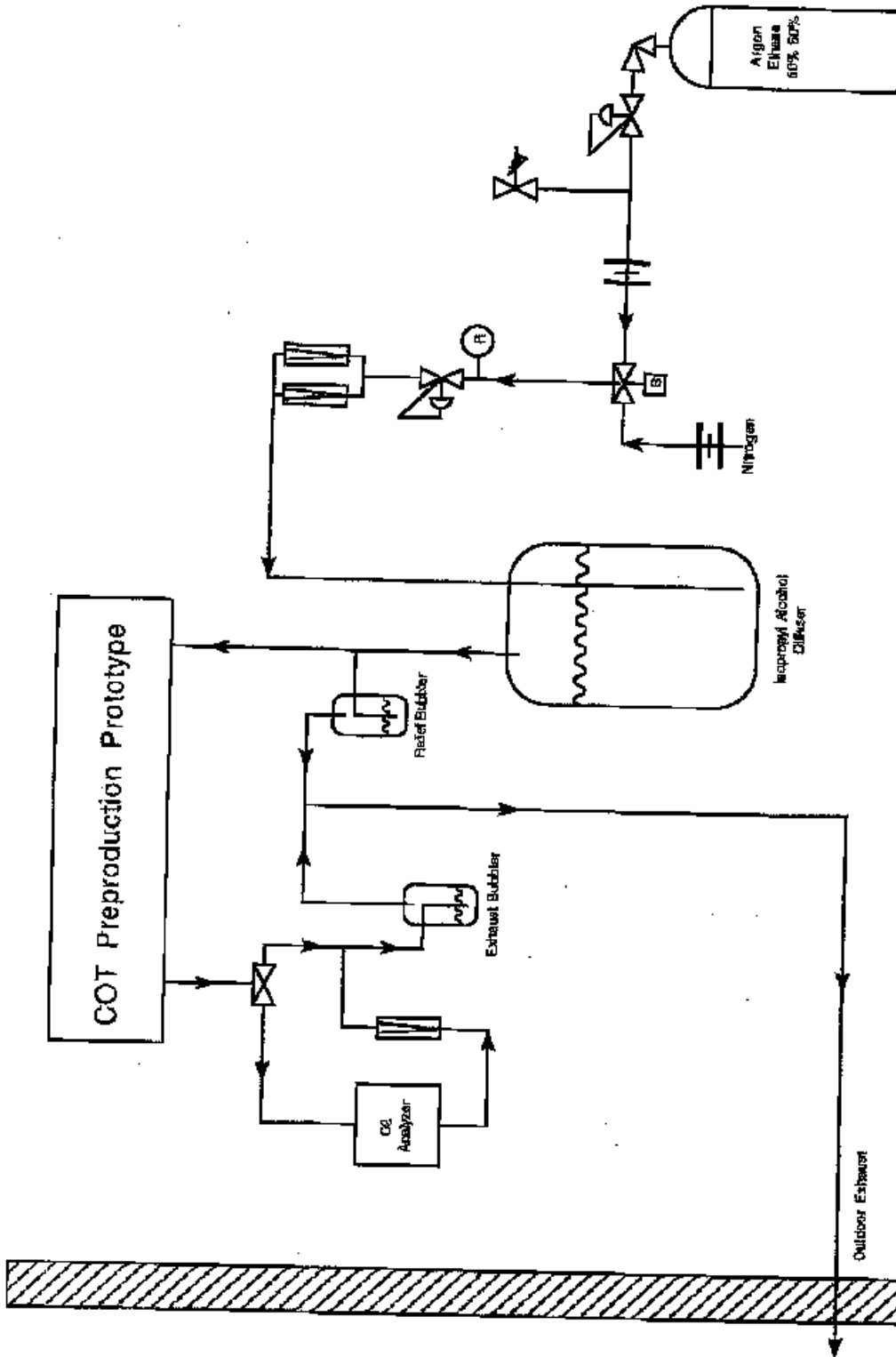
Using ES&H MANUAL 6020.3, the above calculated hydrogen equivalent inventory, and enclosure volume calculations, the test room 114 enclosure is classified as a Risk Class zero Installation.

COT Test ES&H Information

The COT test is a flammable gas risk class zero installation. Even in a risk class zero installation, several conditions must be met in order to operate safely. The specific requirements are found in Chapter 6020.3 of the Fermilab ES&H manual. The following conditions are minimum requirements for the COT Chamber testing.

A. Risk Class 0 Installations:

1. The area shall be posted "Danger-Flammable Gases, No Ignition Sources" using standard signs available from the Fermilab ES&H Section, Health and Safety Group. A list of responsible persons with their phone numbers shall also be posted.
2. Combustibles and ignition sources shall be minimized within three meters of gas handling equipment, piping or apparatus.
3. A pressure regulator appropriate for the gas and its environment shall be used.
4. An orifice, excess flow valve or other fixed means of limiting the flow to no higher than ten times the maximum operational flow rate shall be installed.
5. The gas cylinder in use shall be secured with cylinder clamps. Only one gas cylinder is allowed in the test room at any given time. Cylinders when empty shall be capped and promptly removed.
6. Leaks from experimental devices such as drift chambers shall be measured and documented prior to initial operation (with nonflammable gas, if possible). Leakage above seven liters/hour from any one chamber shall be mitigated. Recheck for leaks after major repairs or modifications, and at least every twelve months. Leakage exceeding 20% of the lower explosive limit at a distance over two inches from an identified "point" leak shall be repaired.
7. Welding permits shall not be issued for areas within ten meters of the equipment containing flammable gas unless approved in advance by the responsible Division/Section head or designee.
8. The test room fan must be ON at all times. There are no exceptions.
9. If the test room ODH or flammable gas alarms sound, exit the test room immediately.
10. Contact the Gas Systems Group if modifications to the gas piping are required.
11. For assistance or questions contact the Gas Systems Group at extension 4309, 4297 or 3493 or short-range pager 72-0410.
12. Roll-up door must be closed at all times while testing with Argon Ethane present.



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| Approved | D. Allisbach | |
| Project | COT | Page 1/1 |
| Name | DAVID KHAZINS | |
| Date | 2-9-99 | Revision Date |
| FERMILAB | Section CDF | Subject CDF Pre production Prototype |