

Oxygen Deficiency (ODH) Safety Review Form

(See [ES&H Manual Chapter 6540 Appendix T1 ODH Safety Review](#) for instructions)

PART 1 - PRELIMINARY ANALYSIS:

1.0 INTRODUCTION

| | | | |
|------------------------------------|---------------------------------------|--|----------|
| Task/Title: | HDice extension | Task # (If applicable) | |
| Location of Use: Bldg/Room/Area | RM 10A, Bldg 58 (TestLab) NE Annex | Effective Date: | Jan 1/13 |
| | | Expiration Date: (Not to exceed three years.) | Jan 1/16 |
| Document Owner: | A.M. Sandorfi | Division Owner: | |
| | | Department Owner: | |

2.0 PRELIMINARY INFORMATION

| | | | |
|---|--------------------------------------|-----------|----------|
| Gas to be Introduced: (List Name(s) and Source Concentration(s)) | liquid helium, 500 liquid liters max | Flammable | √ if YES |
| | | Corrosive | |
| Is gas self-contained? (In a Dewar or similar?) | Yes No | Size | Toxic |
| | X | 500 | Other |
| Attach copies of any related "Oxygen Deficiency Hazard Risk Assessments" for the building and any additional supporting documents/calculations. | | | |

ATTACH A ROOM FLOOR PLAN (Show location of ODH):

See (1) attached floor plan and (2) ODH calculation in accompanying file.

3.0 PRELIMINARY ODH CALCULATION:

| Source is INSIDE Proposed ODH Area (e.g. dewar, tank, etc.) | | OR | Source is OUTSIDE Proposed ODH Area (e.g. from a compressor, pump, etc.) | |
|---|-----------------------------------|----|--|---------------------------------------|
| Total volume of room: | V_R (ft ³) = 92,304 | | Total volume of room: | V_R (ft ³) = _____ |
| Volume of gas at room temperature and pressure | V_G (ft ³) = 13,500 | | Volumetric flow rate of gas into room at room temperature and pressure (Contact Engineering) | Q = (ft ³ /hour) = _____ |
| $\frac{21(V_R - V_G)}{V_R}$ | = 18 | | $\frac{21(V_R - Q)}{V_R} *$ | = _____ |

* Assuming minimum one fresh air change per hour (ACH). If more than one ACH is needed additional review may be required.

| If Resulting % Oxygen is: | Then: |
|---------------------------|--|
| <18 | Continue to Part Two – Additional Information . Then submit form to ODH Safety . |
| ≥18 | Submit form to ODH Safety. |

The above referenced hazard has been determined to be:

0
per attached

If resulting % oxygen is between 18 and 19.5 a second ODH Safety Reviewer approval is required.

APPROVALS

Print

Signature

Date:

ODH Safety Reviewer RICHARD J. OWEN

Richard J. Owen

1 Aug 2013

Second ODH Safety Reviewer (if required)

Since initial calculation is 18% forward to Cryo group for risk analysis

Oxygen Deficiency (ODH) Safety Review Form

Additional Approvals per Department Procedures

Department or Group Head: Sam Star 8/1/2013

Division Safety Officer: _____

Other: _____

Other: _____

Review per Department Procedures

| | Print | Signature | Date |
|---------------------|-------|-----------|-------|
| Area Safety Warden: | _____ | _____ | _____ |
| Other: | _____ | _____ | _____ |

PART 2 – ADDITIONAL INFORMATION:

| 1.0 ENGINEERING AND ADMINISTRATIVE CONTROLS (be as specific as possible, provide existing and planned) | |
|--|--|
| Engineering Controls: Example: Fume hoods, valves, critical orifice, etc. | |
| Administrative Controls: including, but not limited to: (list names, types, and document numbers) <ul style="list-style-type: none"> • Training Required • Standard Protecting Measures • Work Control Documents | |
| Attachments - list all that apply: (e.g.: Confirmation Communications, Risk Assessment, Task Hazard Analysis etc) | |

Submit: Completed form to ODH Safety for review and approval

After Approval Distribution:

Original: Document Author; **Copies:** affected area, all approvers, all reviewers, and ESH&Q Document Control.

Form Revision Summary

Revision 0 - ###/###/### – New content.

| ISSUING AUTHORITY | FORM TECHNICAL POINT-OF-CONTACT | APPROVAL DATE | EXPIRATION DATE | REV. |
|-------------------|---------------------------------|---------------|-----------------|------|
| ESH&Q Division | Richard Owen | 01/17/12 | 01/17/2017 | 0 |

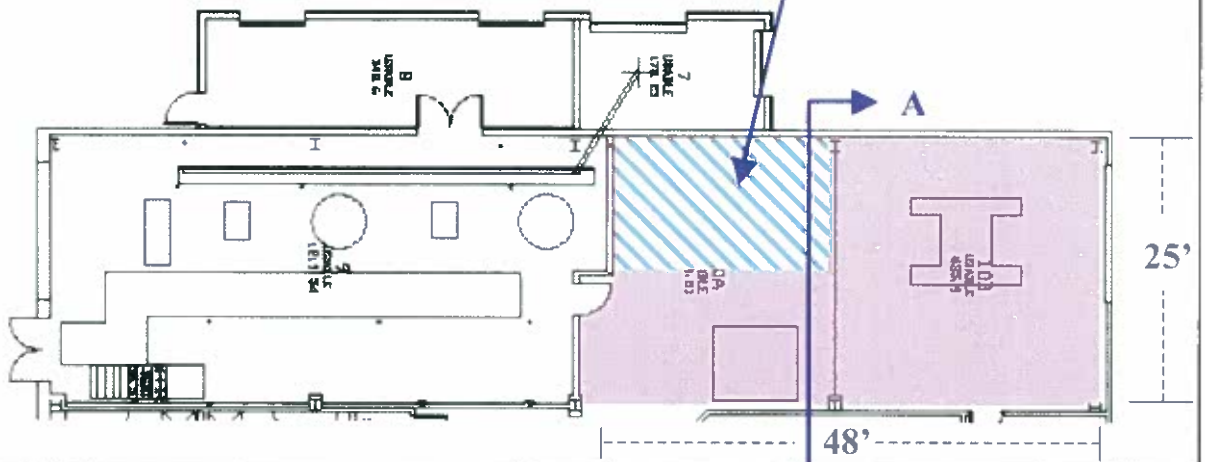
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ODH considerations for proposed HDice extension in to the NE side of the TestLab Annex (bldg 58, rm 10A on the floor plan of May, 2010).

- HDice now occupies the NW side of the TestLab Annex High-Bay area. A extensive ODH monitoring system is in place there.
- HDice proposes to expand into one quarter of the NE side of the High-bay Annex; liquid helium (LHe) and liquid nitrogen (LN2) could be used to keep small cryostats cold in this new area. The equipment cryostats have volumes of about 20 LHe and present a negligible ODH concern. The only potential hazard comes from commercial 500 L cryogenic dewars used to supply LHe to the small cryostats.
- The NE side of the Annex high-bay has a 27' ceiling and is adjacent and open to a second floor equipment storage area. The open connection begins 14' above the ground floor and the second floor area has a 13' ceiling. (see attached layout)
 - volume of NE side of the Annex high-bay = $25' \times 48' \times 27' = 32,400$ cu ft;
 - volume of the adjoining equipment storage area = $48' \times 96' \times 13' = 59,900$ cu ft.
- A maximum of one 500 dewar of liquid liters would be kept in this new area, and two 110 liters tanks of LN2.
- In a worse case accident scenario, 500 LHe expands to occupy 500×27 cu ft at STP = 13,500 cu ft, immediately rising to the highest point.
 - the volume of the expanding He would occupy $(25 \times 48 + 48 \times 96) \times H = 13,500$
 - => the STP He would rise to the top $H = 2.3$ ft, well above the height of anyone standing on the second equipment level (with a ceiling height of 13') and thus not creating any ODH conditions.
 - => considering these limits, the extension should be classified **ODH 0**.
- we suggest one additional oxygen sensor be installed above the proposed HDice extension area and tied into the existing HDice ODH monitoring system. In case of a catastrophic loss of insulating vacuum in a commercial dewar, the sensor could trigger fans to exhaust the He gas that would tend to be trapped near the ceiling.
- we suggest a second oxygen sensor be installed near the floor in the HDice extension area to sniff for excessive N2 boil off. This too could be tied into the existing HDice ODH alarm system.

Proposed HDice extension area in Bldg 58

First floor of TestLab Annex with 27' ceiling:



TestLab Annex 2nd floor, open to 1st level for top 13':

