

Before using a copy of this form, verify that it is an acceptable version by checking with your Experiment Review Coordinator. For assistance in completing this form, see the [ESR Form: FAQs](#). Double-click to change the state of a checkbox, or type "X" over the box, or paste this

EXPERIMENT SAFETY REVIEW FORM

REVIEW NUMBER (supplied by ERC): LS-ESR-0014

PRINCIPAL INVESTIGATOR: Leonid Flaks **Date:** 02/17/09

GROUP: Protein Macromolecular Crystallography

EXT: 2682 **E-MAIL:** flaks@bnl.gov **LIFE NUMBER:** F5864

Project Title: Sample preparation for protein macromolecular crystallography
Location(s): 1-164
Proposed Start Date and Duration: on-going

SIGNATURES:

Principal Investigator: Leonid Flaks	On file	Date:
Experiment Review Coordinators: Lori Stiegler	On file	Date:
Keith Klaus	On file	Date:
		Date:
		Date:
		Date:
		Date:
Approval Department Chairperson:		Date:
Review/Approval Comments:		
Walkthrough Signature:		Date:
Expiration Date (max 1 yr.): 02/17/10		
FUA Change Required? <input type="checkbox"/> Y <input checked="" type="checkbox"/> N	Fire Rescue Run Card Changes Required? <input type="checkbox"/> Y <input checked="" type="checkbox"/> N	
Has a NEPA Review been Performed for this Project? <input type="checkbox"/> Y <input checked="" type="checkbox"/> N <input type="checkbox"/> Don't know		
Required Approvals (i.e., IACUC, IBC):		
Project Termination Acceptance Signature:		Date:
Comments:		

I. DEFINE THE SCOPE OF EXPERIMENT

A. Description

1. *Describe the experiment purpose/scope. Identify all apparatus that will be used, and associated requirements. Describe any modifications of the facility (building) that are required. Include set-up and decommissioning phases (Work Permit process/form may better address set-up/tear-down; indicate if Work Permit will be used).*

Staff activities:

Use of hand tools, electronic equipment – oscilloscope, multimeter etc. for test, troubleshoot and fix beamline equipment. Dry nitrogen is available for regenerating air drier filter. Alcohol in small quantities is used for cleaning vacuum components. Safety glasses and gloves are available. A liquid nitrogen storage dewar (200L) is used to fill small a storage vessel (50 L) that is used for long term storage of user's crystals.

The lab has also flammable cabinet.

Ethylene Glycol is used to dilute with water and add to detector cooling system.

Occasional soldering at the lab bench using soldering station.

Oil is stored for use at the beam lines.

Users activities:

Use cryogenic equipment to transfer samples from cryo shippers to the beamline in small cryo flasks. Lab has 2 sets of cryogenic gloves and goggles. A liquid nitrogen dewar (200L) is used to fill small portable cryo dewars.

Prepare samples for experiment by transferring from trays to mounting loops. Microscope is used to locate small crystals.

Some experiments require soaking crystals in microscopic quantities of heavy atom solutions using pipettors and special crystallization tools.

All generated waste is either returned back to home institution or disposed using BNL procedures.

Lab has a sharps waste container for small broken glass parts.

2. *List equipment manuals and/or procedures that describe ESH-critical systems. Such manuals and/or procedures must be controlled following the [Document Control](#) Subject Area.*

N/A

B. Human Performance Factors

In this section consider [Human Performance Factors](#) that may effect the experiment as a whole (success, data quality, etc.), not just ESH concerns.

- *What can go wrong (what keeps you up at night)?*
- *What measures or controls are in place to prevent that from happening?*
- *Consider how do (or which of) the most important controls depend on human (or personnel) actions or behavior. Where might an error or omission impair the effectiveness of an important control?*
- *Error precursors are conditions or attitudes that increase the chances of an error during the performance of a specific task by a particular individual. Are there precursors that, if reduced or eliminated, would make the controls more likely to be effective?*

Most common problem is users leaving chemical containers they no longer need behind when they leave. It is hard to control, as they might leave during weekend or late in the evening. Those chemicals are sometimes unmarked and hard to identify. Proper training is the best way to avoid such situations. It is done through BLOSA training, but should be reminded more often for those who actively use the lab.

C. Waste Minimization/Pollution Prevention

Describe how you plan to minimize generation of the wastes described above, and identify pollution prevention opportunities.

Use the least hazardous chemicals available, and smallest quantities.

II. IDENTIFY AND ANALYZE HAZARDS ASSOCIATED WITH THE EXPERIMENT

In this section, indicate all potential hazards. Include all phases of the experiment, such as set up, testing, decommissioning, and ancillary tasks. For each hazard checked, there must be a control in Section III.

Physical Hazards (check all that apply)		<input type="checkbox"/> None	
<input type="checkbox"/> Noise > 85 dBA	<input type="checkbox"/> Oxygen deficient atmosphere	<input type="checkbox"/> Non-medical sharps	
<input checked="" type="checkbox"/> Cryogenics (any substance or device capable of producing temperatures \leq 170K)			
<input type="checkbox"/> Fall hazards (working >4 ft. e.g., ladders, elevated platforms, towers)			
<input type="checkbox"/> Material handling equipment (e.g., cranes, hoists, forklifts)			
<input type="checkbox"/> Machine shop or nonportable powered tools use	<input type="checkbox"/> Powered Hand Tools		
<input type="checkbox"/> Electrical hazards >50 V, >10 J (exposed conductors, capacitors, etc)			
<input type="checkbox"/> Confined space	<input type="checkbox"/> Trenching/soil excavation		
<input type="checkbox"/> Working in extreme temperature conditions	<input type="checkbox"/> Remote location		
<input checked="" type="checkbox"/> Compressed gases (lecture bottles, cylinders, gas lines)			
<input type="checkbox"/> Pressurized vessels or systems with operating pressure greater than >15 psi and/or with largest dimension (length, width or diagonal) >6 in			
<input type="checkbox"/> Vacuum chambers or systems with >100,000 J stored energy (>35 cu ft. total volume)			
<input type="checkbox"/> Autoclaves or high temperature ovens	<input checked="" type="checkbox"/> Soldering of electronic components		
<input type="checkbox"/> Open flames	<input type="checkbox"/> Welding, brazing, silver soldering >1" diameter		
<input type="checkbox"/> Flammable gases	<input checked="" type="checkbox"/> Flammable liquids		
<input type="checkbox"/> Flammable solids	<input type="checkbox"/> Other spark producing activity (grinding)		
<input type="checkbox"/> Other (specify):			
Chemical Hazards (check all that apply)		<input type="checkbox"/> None	
<input type="checkbox"/> Carcinogens	<input type="checkbox"/> Highly acute toxins	<input type="checkbox"/> Reproductive toxins	<input type="checkbox"/> Corrosives
<input checked="" type="checkbox"/> Flammable liquids	<input type="checkbox"/> Flammable solids	<input type="checkbox"/> Strong oxidizers	<input checked="" type="checkbox"/> Oils (stored)
<input type="checkbox"/> Explosives	<input type="checkbox"/> Peroxidizables	<input type="checkbox"/> Pyrophoric materials	<input type="checkbox"/> PCBs
<input type="checkbox"/> Asbestos	<input type="checkbox"/> Pesticides/herbicides	<input type="checkbox"/> Controlled substances	
<input type="checkbox"/> Perchlorates	<input type="checkbox"/> Hydrofluoric acid, any use	<input type="checkbox"/> Highly reactive materials	
<input type="checkbox"/> OSHA regulated chemicals, any use		<input type="checkbox"/> Methylene chloride, any use	
<input type="checkbox"/> Storage or use of Beryllium or Beryllium articles. Attach Beryllium Use Review Form if checked.			

<input type="checkbox"/> Mercury or Mercury compounds, any use	<input type="checkbox"/> Lead used in a chemical process (not as shielding)	
<input type="checkbox"/> Production or use of engineered nanomaterials that are fixed within a solid or strongly bonded to a substrate		
<input type="checkbox"/> Production or use of engineered nanomaterials that are dispersed in a liquid matrix		
<input type="checkbox"/> Production or use of engineered free particulate nanomaterials		
<input checked="" type="checkbox"/> Toxic metals (e.g., As, Ba, Be, Cd, Cr, Hg, Pb, Se, Ag)		
<input type="checkbox"/> On-site or off-site transportation of chemicals (see SBMS)		
<input type="checkbox"/> Other (specify):		
Ionizing and Non-ionizing Radiation Hazards (check all that apply) <input checked="" type="checkbox"/> None		
<input type="checkbox"/> Sealed radioactive sources	<input type="checkbox"/> Windowless radioactive sources	
<input type="checkbox"/> Dispersible radioactive materials	<input type="checkbox"/> Neutron-emitting radioactive sources	
<input type="checkbox"/> Non-fissionable radioactive materials	<input type="checkbox"/> Fissionable radionuclides	
<input type="checkbox"/> Ionizing radiation-generating devices (x-ray sources)		
<input type="checkbox"/> Any atmospheric discharge of radiological materials		
<input type="checkbox"/> On-site or off-site transportation of radiological materials (see SBMS)		
<input type="checkbox"/> Class II, IIIa, or IIIb (visible <15mW) lasers	<input type="checkbox"/> Class IIIb (nonvisible >15mW) or IV lasers	
<input type="checkbox"/> Dynamic magnetic fields >1G at 60 Hz or dynamic electric fields >1kV/m at 60 Hz		
<input type="checkbox"/> Static magnetic fields <5 G. No Exposure Form is required		
<input type="checkbox"/> Static magnetic fields >5 G and <600 G (attach exposure form)		
<input type="checkbox"/> Static magnetic fields ≥600 G (attach exposure form)		
<input type="checkbox"/> Radio frequency (RF) or Microwave sources exceeding 10 mW radiated output		
<input type="checkbox"/> Infrared sources >10 W	<input type="checkbox"/> Ultraviolet sources >1 W	
<input type="checkbox"/> Extremely low frequency (ELF) radio sources		
<input type="checkbox"/> Other (specify):		
Biological Hazards (check all that apply) <input checked="" type="checkbox"/> None		
<input type="checkbox"/> Regulated etiological agent	<input type="checkbox"/> Recombinant DNA	<input type="checkbox"/> Small Animals
<input type="checkbox"/> Nonhuman primates	<input type="checkbox"/> Human subjects	<input type="checkbox"/> Human blood/components, human tissue/body fluids
<input type="checkbox"/> Other (specify):		
Offsite Work (check appropriate box) <input checked="" type="checkbox"/> None		
<input type="checkbox"/> Reviewed or controlled by ES&H programs at the offsite location	<input type="checkbox"/> Requires additional controls (include in the next section)	
<input type="checkbox"/> Other (specify):		

Other Issues (Security, Notifications, Community, etc.)	<input checked="" type="checkbox"/> None
<input type="checkbox"/> Specify:	

Materials Used /Waste Generated

List materials to be used and wastes generated. You may use generic chemical class descriptions for commonly used materials (e.g., organic solvents, acids). However, chemicals that require additional controls should be specifically listed (e.g., HF, TCE). Use the disposal method codes below.

Materials Used & Wastes Generated	Disposal Method (below)	Estimated Quantity Used (provide units)		Comments
		Per Use	Total/Yr	
Vacuum oil	I	1 gallon	2 gallons	
Sharps	MW		0.5 lb	
Ethanol	F		500 ml	Evaporates

Disposal Method Codes:

Air Emissions	Liquid Effluents	Wastes	
P = Point Source	S = Sanitary	H = Hazardous	R = Radioactive
F = Fugitive	ST = Storm water	I = Industrial (Non-hazardous waste e.g., oils)	
	O = Other	M = Mixed (Radioactive + Hazardous)	
	RE = Recycle	MW = Medical	RM = Radioactive Medical
		T = Trash	RE = Recycle

See [Environmental Aspects and Impacts Subject Area](#) or your ECR if you need assistance completing the following table.

Significant Environmental Aspects (check all that apply)	<input type="checkbox"/> None
<input type="checkbox"/> Any amount of hazardous waste generation	
<input type="checkbox"/> Any amount of radioactive waste generation	
<input type="checkbox"/> Any amount of mixed waste generation (radioactive hazardous waste)	
<input type="checkbox"/> Any amount of transuranic waste generation	
<input checked="" type="checkbox"/> Any amount of industrial waste generation (e.g., oils, vacuum pump oil)	
<input checked="" type="checkbox"/> Any amount of Regulated Medical Waste	
<input type="checkbox"/> Production or use of, or waste containing, engineered nanomaterials	
<input type="checkbox"/> Any atmospheric discharges that require engineering controls	
<input type="checkbox"/> Any liquid discharges that require engineering controls	

<input type="checkbox"/> Storage or use of any chemicals or radioactive materials that require engineering controls – see Storage and Transfer of Hazardous and Nonhazardous Materials Subject Area
<input type="checkbox"/> On-site or off-site transportation of chemicals or dispersible radioactive materials
<input type="checkbox"/> Any use of once-through cooling water with a flow of 4 gpm – 24 hrs/day (10 gpm – 8 hrs/day, daily use of >15 gpm for >60 days) and discharging to the sanitary sewer
<input type="checkbox"/> Soil contamination or activation
<input type="checkbox"/> Any underground pipes/ductwork that contains chemical or radioactive material/contamination
<input type="checkbox"/> Any products or services resulting from this work that could significantly impact the environment
<input type="checkbox"/> Other environmental aspects related to your work (specify):
<input type="checkbox"/> Process Assessment Form required (determined by ECR or other qualified person)

III. DEVELOP AND IMPLEMENT HAZARD CONTROLS AND ASSESS RISK

For each hazard identified in Section II, describe how that hazard is controlled, in consultation with personnel who perform the work.

When developing controls apply the following hierarchy:

1. Elimination – Do you really need to introduce this hazard into the work?
2. Substitution – e.g. replacing one substance or activity with a less hazardous one.
3. Engineering – e.g. using a chemical fume hood, interlocks, shielding, etc.
4. Administration – policies and procedures for safe work practices.
5. Personal Protective Equipment –gloves, earplugs, etc.

Assess the Risk associated with each hazard or attach relevant Job Risk Assessments (JRAs)

Guidance for numerical assessment of Risk involved in working within this ESR.							
	Value:	1	2	3	4	5	Value
A	# Persons doing the work						≥ 1
B	Frequency – how often:	1/yr	1/mo	1/wk	1/day	>1/day	1 – 5
C	Severity of injury:	1 st Aid	Medical	Lost time	Disabled	Death	1 – 5
D	Likelihood of injury occurring:	Rare	Unlikely	Possible	Probable	Multiple	1 – 5
Risk	Calculate: A × B × C × D						

Risk Ranking and Action Criteria.

Risk	Severity	Required Action
0 – 20	Negligible	None, the controls are adequate.
21 – 40	Acceptable	None, the controls are adequate.
41 – 60	Moderate	Explain below why additional controls cannot be used to reduce the risk.
61 – 80	Substantial	The PI is required to develop and implement a remedial action program.
> 80	Intolerable	Work cannot begin or continue until controls are established that reduce the risk to < 81. If work has already begun, it must stop immediately, and an investigation into working conditions must be carried out. Special permission by the Department Chair or Division Manager is required to work in this range.

Note: Include required calibration or maintenance of controls in section(s) below.

A. Physical Hazards, Tasks, Controls and Risks

Hazard/Task	Controls (include training and PPE requirements)	A	B	C	D	Risk
Cryogenics	<p>Cryogen training <i>PPE for cryogen use:</i> Pouring small (~ 5 liters) volumes of LN2 between open containers:</p> <ul style="list-style-type: none"> • Safety Goggles • Gloves (Cryo or Heavy Leather) • Closed Shoes • Long pants • Never pour from above chest level <p>Dispensing LN2 from a pressurized line to an open dewar & Closed line LN2 or LHe transfer:</p> <ul style="list-style-type: none"> • Safety Glasses (w/side shields) or Goggles • Face Shield • Gloves (Cryo or Heavy Leather) • Closed Shoes • Long pants • Long Sleeve Shirt or Lab Coat <p>Work with experiment samples immersed in LN2 in small (~1 liter) dewars:</p> <ul style="list-style-type: none"> • Safety Goggles • Use insulated non-absorbent gloves with dexterity (cotton/nylon gloves under disposable nitrile gloves) • Closed Shoes • Long pants • Tongs should be used where possible to manipulate specimens 					
		1	3	2	2	12
Compressed gas	Compressed gas training, Cylinder secured and leak checked.	1	2	2	1	4
Soldering	Periodic wiping of soldering area as per PRM 6.2.0	1	1	1	1	1

B. Chemical Hazards, Tasks, Controls and Risks

Hazard/Task	Controls (include training and PPE requirements)	A	B	C	D	Risk
Flammable liquids	Stored in flammable cabinet, Safety glasses and nitrile gloves	1	3	2	2	12
Toxic metals	NSLS Safety training, safety glasses and nitrile gloves	1	1	1	1	1

Note: Refer to the [Working with Chemicals Subject Area](#) for requirements regarding particularly hazardous chemicals such as carcinogens, reproductive toxins, and highly acute toxins, including postings, decontamination plan, and address above.

C. Significant Environmental Aspects, Tasks, Controls and Risks

Hazard/Task	Controls (include training and PPE requirements)	A	B	C	D	Risk

D. Ionizing and Non-ionizing Radiation Hazards, Tasks, Controls and Risks

Hazard/Task	Controls (include training and PPE requirements)	A	B	C	D	Risk

--	--	--	--	--	--	--

Note: List sources/materials. Attach or refer to Radiation Work Permits.

E. Biological Hazards, Tasks, Controls and Risks

Hazard/Task	Controls (include training and PPE requirements)	A	B	C	D	Risk

Note: List additional approvals/permits/reviews required (e.g., BNL Biosafety Committee approval).

F. Off-site Work Hazards, Tasks, Controls and Risks

Hazard/Task	Controls (include training and PPE requirements)	A	B	C	D	Risk

Note: Identify off-site location, host organization, and additional controls needed.

G. Other Issues (Security, Notifications to Other Organizations, Community Involvement, etc.)

Issue	Controls/Plan	A	B	C	D	Risk

H. Exposure Monitoring – The SHSD Representative completes this section.

Indicate Industrial Hygiene monitoring for this project. The SHSD Representative determines the schedule for monitoring, if required.

Exposure Monitoring	<input checked="" type="checkbox"/> None
<input type="checkbox"/> Noise	<input type="checkbox"/> RF/Microwave
<input type="checkbox"/> Magnetic fields	<input type="checkbox"/> Ionizing radiation
<input type="checkbox"/> Ionizing radiation contamination	<input type="checkbox"/> Airborne particulates
<input type="checkbox"/> Airborne chemical exposure for (specify):	
<input type="checkbox"/> Surface wipes for Be, Pb, Cd, Hg, or other metals (specify):	
<input type="checkbox"/> Surface wipes for chemicals not listed above (specify):	
<input type="checkbox"/> Other (specify):	

Describe specific monitoring:

IV. PERFORM EXPERIMENT WITHIN CONTROLS

The PI is responsible to ensure this document is kept up-to-date, that staff have read the ESR, and work is performed within controls, including work permits, RWPs and other work planning documents. Changes in experiment scope, hazards, apparatus, materials, or procedures can often be accomplished by an addendum that explains these changes. The ERC will determine if additional review is required.

A. OSHA/DOE Required Medical Surveillance

Indicate if potential exposure is in excess of trigger levels listed. Exposure evaluation and/or medical surveillance may be required. Additional [training](#) may be required for any indicated agent. See the [SBMS](#) for additional information and controls on the hazards listed. If work meets or exceeds the Medical Surveillance Exposure Trigger level, contact OMC to update Job Assessment Form(s).

Regulated Hazard	Hazard Specific Training Trigger	Medical Surveillance Exposure Trigger
<input checked="" type="checkbox"/> None		
<input type="checkbox"/> Inorganic Arsenic	Any day above the OSHA action level (without regard to respirator use)	30 days/year above the action level (without regard to respirator use)
<input type="checkbox"/> Lead	Any day above the OSHA action level	30 or more days/year at or above the action level
<input type="checkbox"/> Cadmium	Any day above the OSHA action level	30 or more days/year at or above the action level
<input type="checkbox"/> Methylene Chloride	Any day above the OSHA action level	<ul style="list-style-type: none"> - 30 days/year at or above the action level - 10 days/year above the 8-hour TWA PEL or the STEL - Any time above the 8-hour TWA PEL or STEL for any period of time where an employee at risk from cardiac disease or other serious MC-related health condition and employee requests inclusion in the program
<input type="checkbox"/> OSHA Regulated Chemicals <i>Acrylonitrile Benzene</i> <i>Benzidine 1,3 Butadiene</i> <i>4-Dimethyl aminoazobenzene</i> <i>Ethylene oxide Ethyleneimine</i> <i>Formaldehyde Vinyl Chloride</i>	Any day above the OSHA PEL	<ul style="list-style-type: none"> - Routinely above the action level (or in the absence of an action level, the PEL) - Event such as a spill, leak or explosion results in the likelihood of a hazardous exposure
<input type="checkbox"/> Engineered Nanoparticles	Any work with nanoparticles that are either loose particulate or in solutions.	-Indicate on the JAF. Submit ESR or other documentation to OMC for review and protocol requirements.
<input type="checkbox"/> Etiologic Agent or Biological toxin	None	See Biosafety in Research Subject Area for guidance
<input type="checkbox"/> Bloodborne Pathogens	Any use	Any use
<input type="checkbox"/> Health Care Protocol	Any use	Any use
<input type="checkbox"/> Small Animal	Any use	Any use
<input type="checkbox"/> Non Human Primate	Any use	Any use
<input type="checkbox"/> Lasers	Use Class IIIb or Class IV Lasers	Use Class IIIb or Class IV Lasers
<input type="checkbox"/> Static Magnetic Fields	Worker who routinely works in magnetic field	Any exposure at ≥ 0.5 mT (5 G)
<input type="checkbox"/> Radiological bioassay	As specified in RWP	As specified in RWP or other procedure
<input type="checkbox"/> Noise	Any day above the ACGIH TLV	Any time equal or greater then 85 dBA TWA 8-hour dose

B. Training/Qualification

List all project personnel, indicating they are authorized and competent to perform the work described. The PI is responsible for maintaining a complete up-to-date list of personnel and their full training requirements, and for ensuring that training and qualifications are maintained.

Employee/Guest Name	Life/Guest #	Required Training Course
Leon Flaks	F5864	NSLS training, Lab Standard, HP-IND-220, Compressed

		gas training, TQ-COMPGAS1

C. Emergency Procedures

Identify any emergency actions, procedures, or equipment that must be in place to insure personnel safety and environmental protection. Include the Building Local Emergency Plan, location of emergency shutoffs, and spill control materials.

Emergency evacuation routes are described and shown to users during BLOSA training. Eye wash stations are located in immediate vicinity from the lab.

D. Transportation

Identify materials, hazards and controls for any on-site and off-site transportation of hazardous and/or radioactive materials. See relevant SBMS Subject Areas.

Will you be transporting any materials or samples onsite or to/from offsite? Yes No

N/A

E. Notifications

The PI or designee should notify building occupants of any activities that might impact them or their work, and document this here. List external personnel/organizations that require notification related to experimental activities and/or to be notified of changes (e.g., a BNL Committee for review/approval, Occupational Medicine Clinic, Fire/Rescue).

N/A

F. Termination/Decommissioning

Describe any decommissioning plan, including decontamination (radioactive, chemical, or biohazard) of the area at termination of the experiment. Identify any hazards and controls, special precautions or procedures. Include chemical and waste reconciliation. Indicate if Work Permit Form/Procedure will be used.

Decommissioning will be in accordance with BNL regulation when necessary

V. PROVIDE FEEDBACK

Discuss feedback on operational experiences that can lead to improvements:

- *Was the work accomplished with the expected results?*
- *What did you change in the course of the experiment?*
- *Is this the way this type of project should be performed in the future?*
- *What didn't go as planned; how did that affect the outcome?*
- *Were there working conditions associated with errors, flawed defenses or near misses?*
- *Were there any experiences that should be passed on to others?*

Enter text here...

VI. ATTACHMENTS

Use this section to include any supporting documents, hazard assessments, figures, tables, etc. that were not entered into the previous sections of the form.

ODH Calculation for Room 1-164

Failure Scenario #1 - Loss of Dewar Vacuum

Dewar size – 200 L (evaporates to 4943 ft³ of gaseous nitrogen)

Spill Rate – loss of vacuum failure – 12 cfm

Room volume – 30 x 12 x 15 = 5400 ft³

Room Ventilation – 6 air changes/hour assumed = 540 cfm

Using SBMS ODH Case B: the oxygen concentration at the end of the spill (approximately 7 hours) is 20.53 %. Since it did not go below 18%, no further ODH evaluation is necessary.

Failure Scenario #2 – Loss of ventilation with normal boil-off

Dewar size – 200 L

Boil-off rate – 2% /day – 4 L/day = 0.069 cfm

Room volume – 30 x 12 x 14 = 5040 ft³

Using SBMS ODH Case C: the oxygen concentration at the end of a 3 day weekend would be 19.9%. Since it did not go below 18%, no further ODH evaluation is necessary.

