

Unit 7 Review



Instructional Designs

Purpose of the Gas Free Program

- Provide a Safe Working and Living Environment for the Crew
- Provide Hazard Awareness Training of a General Nature for the Crew



GAS	ODOR	VAPOR/ DENSITY	FLAMMABILITY	LOCATION/ SOURCE
HYDROGEN SULFIDE	ROTTEN EGGS	HEAVIER	YES	ANAEROBIC DECAY CHT/AFFF
CARBON MONOXIDE	NONE	LIGHTER	YES	INCOMPLETE COMBUSTION DRYING PAINT
AMMONIA	PUNGENT	LIGHTER	YES	CLEANING GEAR/URINALS
CARBON DIOXIDE	NONE	HEAVIER	NO	COMBUSTION FF SYSTEMS
METHANE	NONE	LIGHTER	YES	AEROBIC DECAY/CHT



GFE CERT Distribution

- All Accesses to the Space
 - GFE Files (original)
 - Division Requesting Services
 - DC Central
 - Officer of the Deck (Inport or Underway)
- * Must be Kept for 1 yr Minimum



GFE

- 1 per Ship
- **E-7 or Above**
- CO's Designation Letter
- Annual CPR Verification
- Formal School
- 40 Hours Practical Work U/I (waiverable)



GFEA

- 1 per Ship
- **E-6 or Above**
- CO's Designation Letter
- Annual CPR Verification
- Formal School



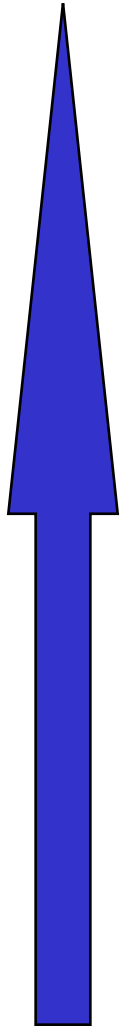
GFPEPO

- 1 per IET (minimum)
- **E-4 or above**
- CO's Designation Letter
- Annual CPR Verification
- Formal School



COMBUSTION THRESHOLDS

TEMPERATURE



**Ignition
Temperature
Is?**

Minimum temperature at which self sustained combustion occurs without an external ignition source.

**Fire Point
Is?**

Temperature at which sufficient vapors are released to support continuous combustion once ignited.

**Flash Point
Is?**

Minimum temperature at which sufficient vapors are released to form an ignitable mixture.

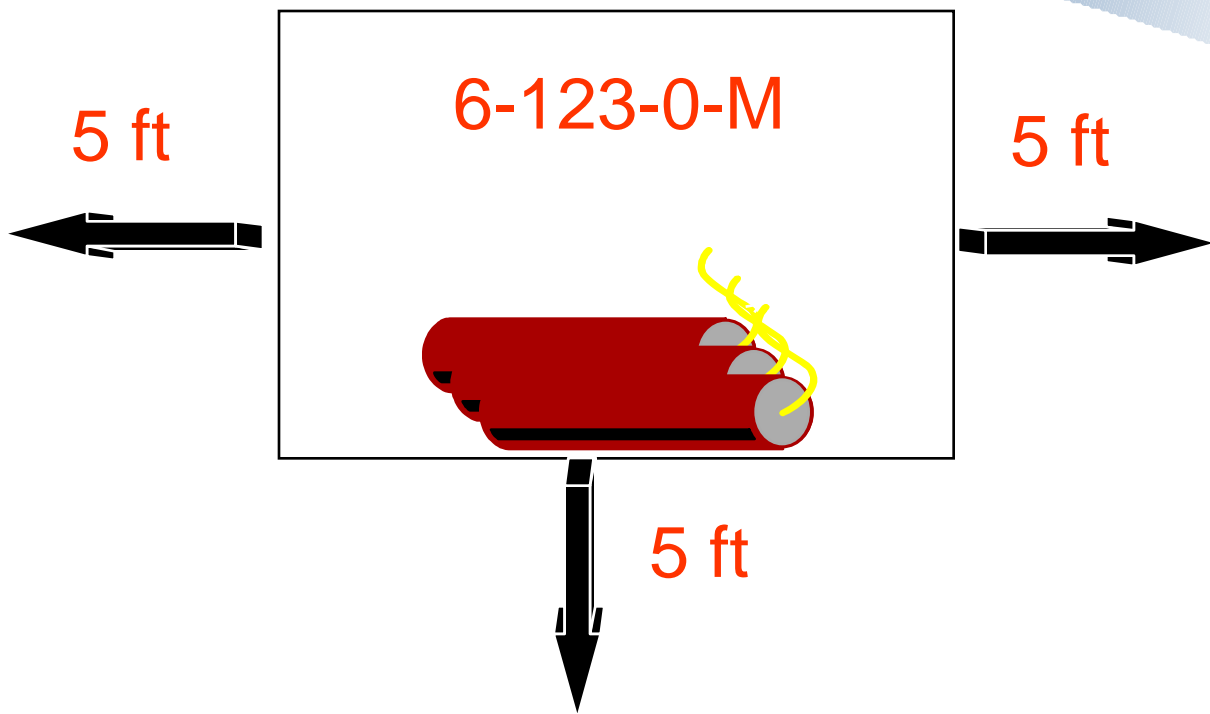


AMMUNITION AND EXPLOSIVES:

- Remove Ammunition Prior to Availability or Overhaul
- No Hot Work in Any Space Containing Ammunition
- CO Must Approve in Writing any Hot Work in Adjacent Spaces
- Apply 5 ft. Rule for Adjacent Spaces

5 FT RULE:

NO HOT WORK IS
ALLOWED IN SPACES
ABOVE , OR
WITHIN 5 FT OF A
LOADED MAGAZINE



UNITY EQUATION



“If there is **more than one toxicant product** in a space undergoing testing, the **cumulative effects** of the **two or more products** may be **above unity**, even though the PELs for any one of the products has not been exceeded.”

NSTM 074-19.11



UNITY EQUATION

$$C_1/T_1 + C_2/T_2 + \dots = 1$$



WHERE:

C is the Measured Concentrations of Toxic Substances

and

T is the Toxic Limit : PEL or TLV (whichever is lowest)

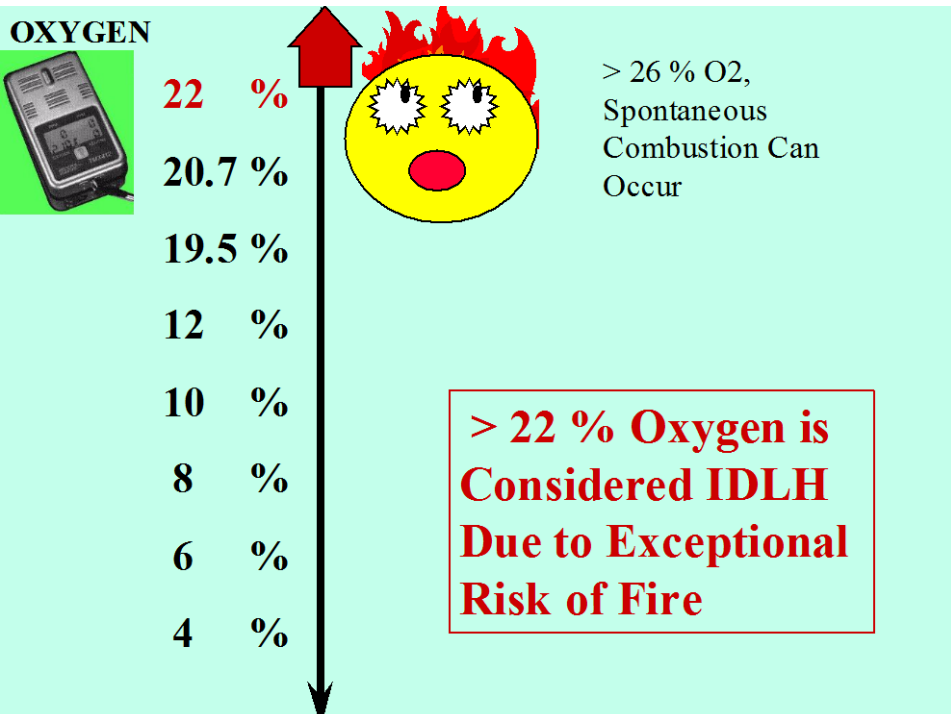


NSTMs



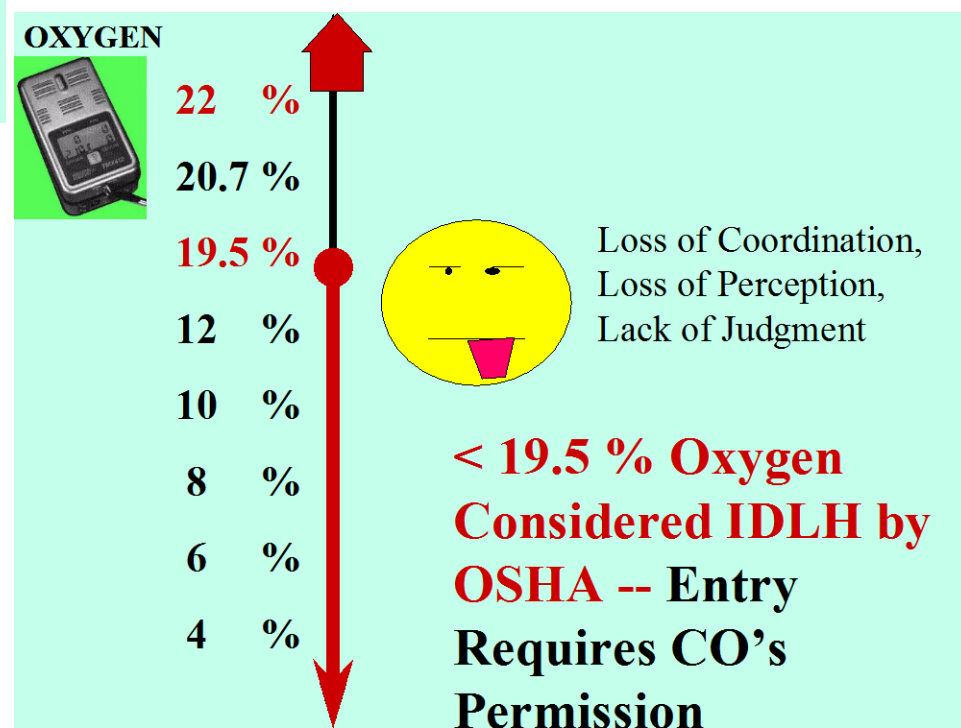
- NSTM 593: Pollution Control (Sect. 4 Sewage)
- NSTM 631: Preservation of Ships in Service (Sect. 2 Safety Information)
- NAVSEA OP 4: Ammunition Afloat (Chpt 2 General Regulations)





Too Little O₂

Too Much O₂





NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY & HEALTH (NIOSH)

- US Dept of Health & Human Services
- US Public Health Services
- Centers for Disease Control (CDC)
- Non-regulatory agency
- No enforcement authority
- Tests & approves equipment
- Similar to Underwriter's Lab (U/L)
- *Recommends toxic exposure limits to OSHA*



**Supplied Air Respirator (SAR)w/
15 minute backup Air (SCBA)
Required**

IDLH

**Respiratory Protection Mandatory
(Filter Type Respirator
or Supplied Air Respirator
as Appropriate)**

PEL

Respiratory Protection Optional

CLEANING METHODS



CHEMICAL

BUTTERWORTHING

STEAM

WATER WASH

BIOLOGICAL



STEAM CLEANING



- CANNOT BE USED ON PLASTIC OR EPOXY COATED TANKS (JP-5)
- USED TO STEAM OUT MOGAS TANKS
- TEMP MAY NOT EXCEED 230⁰F.
- APPLY 50 OR 150 PSI STEAM FOR A PERIOD OF 24 HOURS THROUGH TANK TOP CONNECTION



Nitrogen Dioxide (NO₂)

- **DARK BROWN, PUNGENT GAS**
- **CHOKING AGENT -- Absorbed**
- **HEAVIER THAN AIR**
- **NON FLAMMABLE**

**Smoldering Polyester,
Wool & Nylon**

**Tank Pressed Up &
Heated**



INERTING, PRESSING-UP AND STEAM BLANKETING



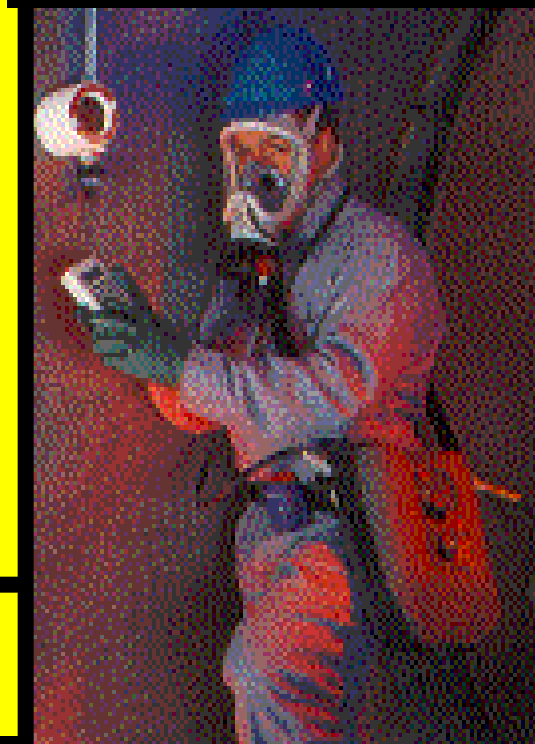
- GASES USED:
 - CO₂ (HEAVIER THAN AIR)
 - N₂ (LIGHTER THAN AIR & PREFERRED MEDIUM)
 - MAINTAIN <1% O₂ CONCENTRATION
- WORK AREA OUTSIDE SPACE SHALL BE CERTIFIED AND MAINTAINED AS "SAFE FOR HOT WORK"
- DISPOSE OF DISPLACED VAPOR AND INERTING MEDIUM SAFELY



REQUIRED EMERGENCY RESCUE EQUIPMENT

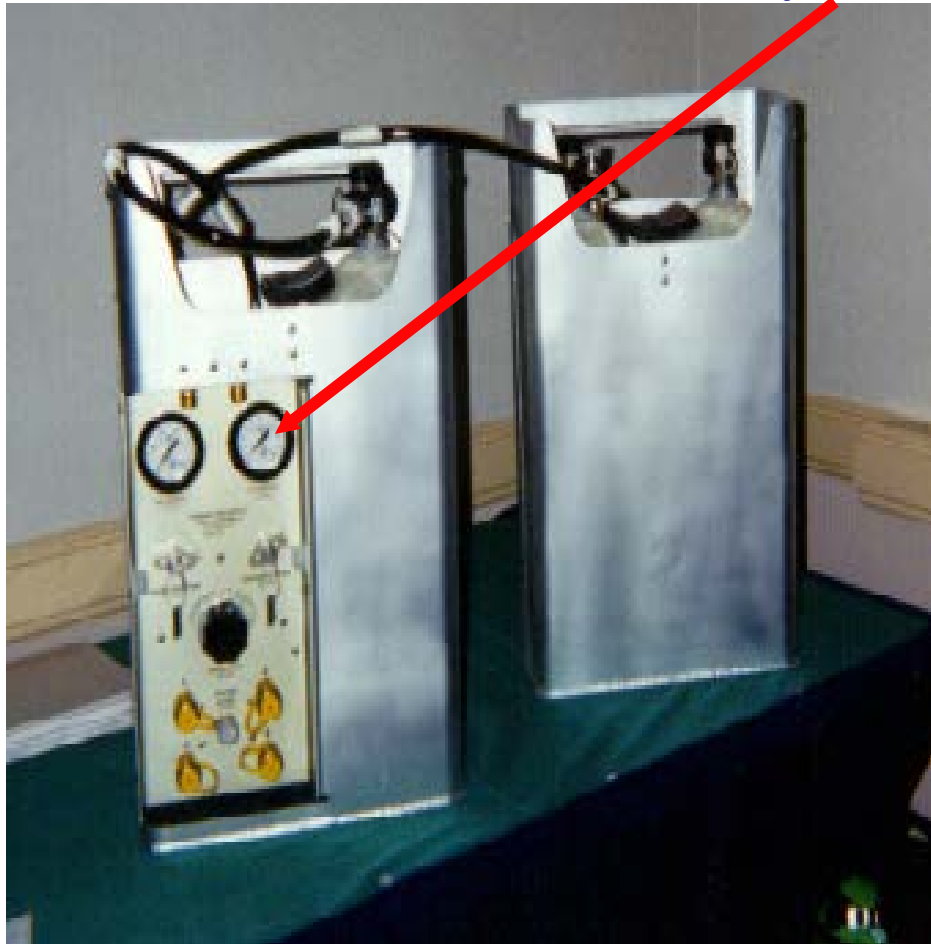


- 5 SCBAs: 2 PAsPs 5-RAsPs
55 minutes of air per PAsP (1 Bottle)
- 4 Safety Harnesses, Safety Lines
- 2 Radios or 3 S.P. headsets w/salt & pepper reel on scene.
- First Aid Kit & Stretcher
- Chain Fall
- Detection Equipment
- Explosion-Proof Flashlights, Drop Lights, or Chem Lights
- Additional PPE as required.



PASP = 55 min RASP = 110min SCBA =15 min

Control Panel Assembly (CPA) 60-80 PSI



SUPPLIED AIR RESPIRATOR WITH SCBA
(SAR WITH SCBA)

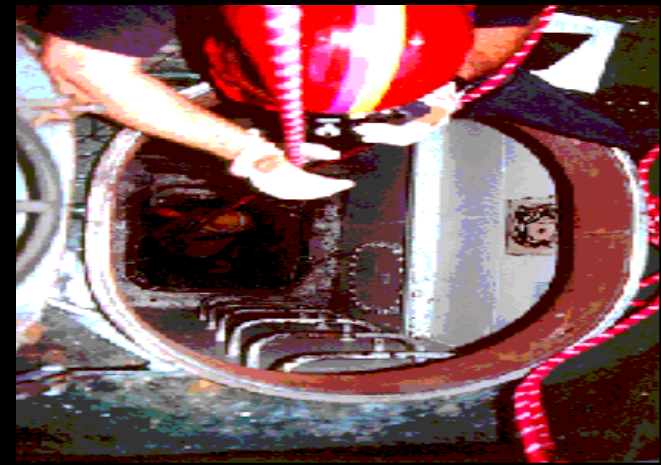
ADVANTAGES OF SAR W/ SCBA OVER OBA



- Longer stay time
- 15 minute Back-up air supply
- Pressure-demand
- No heat produced
- Compatibility with developmental fire fighting SCBA equipment



EMERGENCY RESCUE TEAMS



Primary Rescue Team

- One Investigator & One Rescuer
- Initial Contact, Assessment & Safe Removal
- Inv. has Comms

Secondary Rescue Team

- GFE Determines Number (2+1 min.)
- Don Respiratory Protection & Standby to Assist Primary Rescue Team

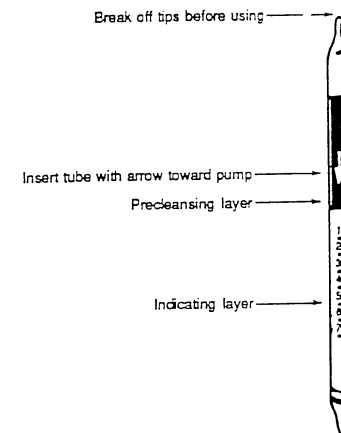
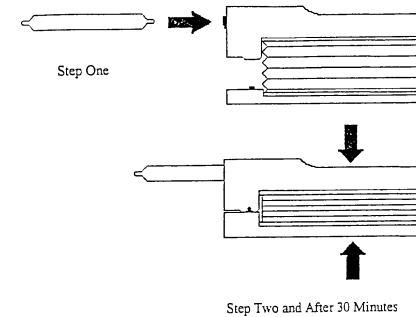
Attendants

- One Per Rescuer
- Help to Don Gear
- Tend Safety Lines & Chain Fall
- Tend SAR/SCBA Air Hoses
- Comms w/ Space

Draeger Multi-Gas Detector Operating Procedures



- Insert unbroken tube
- Squeeze bellows
- Wait 30 minutes
- Chain should still have slack
- Read instruction sheet



Draeger Multi-Gas Detector Operating Procedures



- Break off both ends of tube
- Insert tube into unit so that *arrow* points to pump
- Squeeze bellows required # of times
- Determine readings



Draeger (Model 31) Toxic Gas Detector Maintenance



- Any leaks encountered during the leak test can usually be eliminated by cleaning the valve disk.
- If the valve disk is sticky, brittle, hard or cracked, it must be replaced.
- The filter sieve must be cleaned, about every four weeks when the bellows is used frequently.



Draeger Model 31 and Accuro Pumps



If you use the 3-meter extension hose on the model 31 pump how many extra pumps are required?

None, it will just take longer for the bellows to fill.



Draeger Toxic Gas Detector Tubes

Carbon Monoxide (CO)

- Reads PPM
- Two scales
 - $n = 1$
 - $n = 10$
 - If no color change with 1 pump (n-1) pump 9 more times for $n=10$.



VOLUME EXAMPLES



- **SPACE 20 ft x 10 ft x 10 ft**
- **VOLUME IS 2000 ft³**

- **RAMFAN VOLUMETRIC FLOW RATE = 2000 ft³/min**



When is CO's Signature Required?



- Gas Freeing an IDLH Space
- Gas Freeing for Civilian Contractors
- Gas Freeing for Foreigner Overseas
- Hot Work within 5 ft of a Magazine



BLOWING AIR

- ✘ No flammables present or being generated
- ✘ No toxics present or being generated
- ✘ Only to provide clean air for breathing and comfort



VENTILATION Requirements

- Required to control the toxic and flammability hazard
- Use *dilution-type* ventilation to protect adjacent areas
 - **Ensures vapor concentrations remain below 10% of the LEL**
- Run ventilation **continuously**



GENERAL VENTILATION

- Provides uncontaminated air for breathing or general comfort
- Supply *or* Exhaust
- **ONE COMPLETE AIR CHANGE EVERY 3 MINUTES**



LOCAL EXHAUST VENTILATION

- Captures contaminants as they are generated
- Draws them through exhaust ductwork intake positioned 6-10 inches from work generating contaminants
- Effective for welding and solvent cleaning
- *Exhaust* only
- **The work zone farthest from the exhaust inlet requires airflow of 100 FPM towards the exhaust.**



DILUTION VENTILATION VOLUME FORMULA



- One complete air change every 3 minutes
- If welding, results compared to NSTM 074 VOL 3 requirements on page 21-6



Name 3 Toxicants that are associated with Sewage: H_2S , Ammonia, Methane

What Toxicant is associated with Rust?
Hydrogen

Name 2 Toxicants that can Cause a Sailor to Choke: Nitrogen Dioxide, Ammonia

What Toxicants are associated with combustion? CO and CO_2

When is Oxygen Level Considered

IDLH? **Greater than 22%, Less than 19.5%**

When are Explosives Considered

IDLH? **Greater than 10% LEL**

Name 4 Toxicants that are HEAVIER than

Air: **CO₂, H₂S, HALON, FREON**

Name 3 Toxicants which are LIGHTER than

Air: **CO, Ammonia, Hydrogen, Methane**

- What types of information are on an MSDS?

- Answer:

- General Info, Physical/Chem. Characteristics, Fire/Explosion Data, Reactivity Data, Health Hazards, Precautions for Safe Handling and Control Measures



- What color indicates the “reactivity” hazard on a NFPA label
- Answer:
 - Yellow



TEST RESULTS	
TESTS CONDUCTED AS REQUIRED	INITIAL TEST
OXYGEN 19.5 <O₂<22	20 %
COMBUSTIBLE GAS LEL<10	2 %LEL
TOXIC TYPE: H2S PEL 10 IDLH 100	4 ppm
TOXIC TYPE: CO PEL 50 IDLH 1200	20 ppm
TOXIC TYPE:	
TOXIC TYPE: UNITY:	<1

EXISTING CONDITIONS	INITIAL TEST
NOT SAFE FOR PERSONNEL/ NOT SAFE FOR HOT WORK	
NOT SAFE FOR PERSONNEL WITHOUT PROTECTION/ NOT SAFE FOR HOT WORK	
SAFE FOR PERSONNEL/ NOT SAFE FOR HOT WORK	X
SAFE FOR PERSONNEL/ SAFE FOR HOT WORK	
NOT SAFE FOR PERSONNEL INSIDE/SAFE FOR HOT WORK OUTSIDE	

**SAFE FOR PERSONNEL/
NOT SAFE FOR HOTWORK**

- Toxics below PEL
- Sufficient oxygen
- Danger of explosion or excessive toxicants in presence of hot work or hot work not requested

Gas Free Engineers:

What Are You Testing For?

O E T

OXYGEN



Explosive Meters

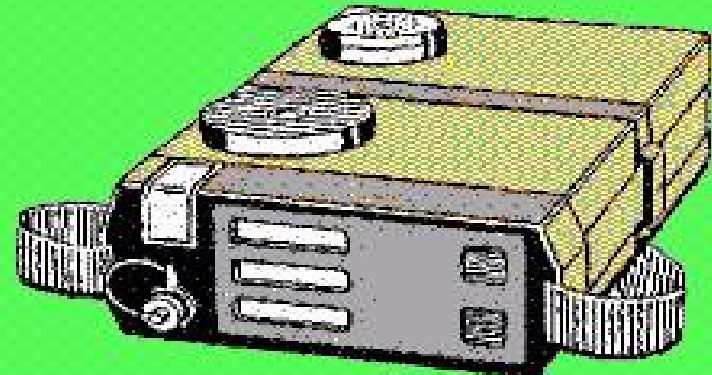


Tube type detectors



EXPLOSIVES

TOXICANTS



Four Gas Analyzer Operation/Calibration Procedures



Note: Calibration Gas Test is required
in fresh air before each days use.



Four Gas Analyzer Operation/Calibration Procedures



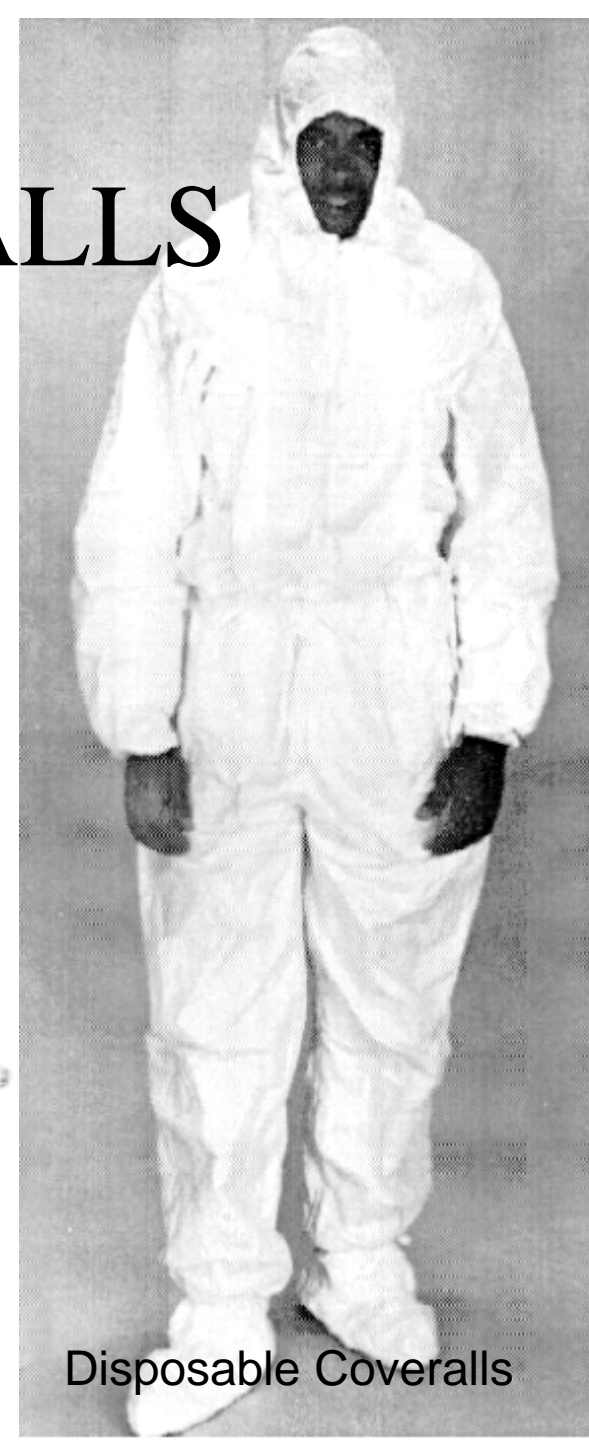
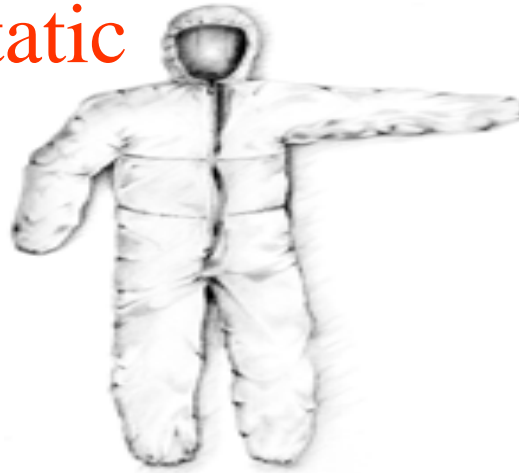
Accuracy Check ("Bump Test")

- Verify that readings are =/>> value printed on calibration cylinder label and confirm appropriate alarms are activated
- > amount must not exceed 10%



BODY PROTECTION/COVERALLS

- Should provide comfort of movement
- Selection and way it protects wearer vary from vendor to vendor
- Should not be plastic for GFE evolutions (Causes static electricity)



Disposable Coveralls

RAM FAN 2000

WATER DRIVEN BLOWER

- 1 1/2 INCH FIREMAIN INLET AND DISCHARGE CONNECTION
- 2000 CFM WITH 10 INCH VENTILATION DUCT
- WEIGHS 35 LBS
- OPERATING PRESSURE 40-180 PSI, MAX 250 PSI
- EXPLOSIONPROOF WHEN GROUNDED
 - BARE METAL
- 2 PER DCRS



FOUR GAS ANALYZER



- PHD Ultra by Biosystems NSN 3HD4240-01-467-8854
- **Detects oxygen, explosive gases, CO and H2S** alarm set points are O2 low 19.5% high 22.0%, Ex 10%, CO 35 PPM, and H2S 10 PPM
- Rechargeable NiCad battery pack provides 12 hours of use **without** the electric pump. Low voltage alarm at **3.3** volts, and it shuts down at **3.25** volts
- Unit is intrinsically safe, battery packs may be changed in hazardous atmosphere



What Toxic Tests are required to be conducted after a class "B" fire?

- Carbon Dioxide
- Carbon Monoxide
- Hydrogen Chloride
- Hydrogen Cyanide
- Hydrocarbons

As Per NSTM 555-7.10.3

NSTM 074 Vol. 3

Sections and Appendix



Section 20 = Navy Gas Free Certificates

Section 21 = Ventilation

Section 22 = Hot Work

Appendix C = Sample Gas Free Engineering Notebook

Appendix D = Navy Gas Free Certification and Test Log

**Appendix E = Shipboard Hazardous Atmospheres and
Compartments Identification Tables**

Appendix G = Chemical Names, PEL and IDLH



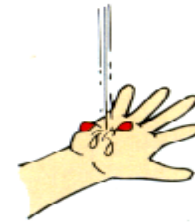
Prevent Toxicants from Getting Inside Our Bodies and Doing Harm



① Ingestion (eating, drinking)



② Absorption (touching)



③ Inhalation (breathing)



CARTRIDGE SELECTION



- Color coded for intended use

→ LISTING OF COLOR CODE:
MANUFACTURER'S CHART
NAVOSH MANUAL B-6

- Filters labeled
- Cartridge combinations



Recertification Procedures for all GF Personnel

- **Valid CPR Quals**
- **Annual Emergency Rescue**
- **Issue 10 Certificates**
 - **If Not Feasible, Perform 5 GFE Evolutions Under GFE Supervision**
 - **Or Oral/Written and Practical Exam**

ANNUAL AUDIT PROCEDURES



- Ship's Safety Officer Shall Annually Audit GFE Program (NAVOSH 5100.19 series)
- Audit Follows checklist found at NAVSEA DC website
- Evaluates the GFE Service Personnel for Recertification
- Document Crew Training Upon Reporting & Annually
- GFE Personnel Letter of Designation and Qualifications Shall be Recorded in Individual's Service Record



SHIPBOARD GFE SERVICES FOR CIVILIANS



- **NO LEGAL PROVISIONS**
 - **EXCEPTIONS:**
 - (1) EXTREME EMERGENCY**
 - (2) INCREASED POTENTIAL LIABILITY**
- **REQUIRES CO AUTHORIZATION**
- **GFE MUST PERFORM SERVICES**

When May a Civilian Gas Free for You?



- QA ONLY

- CO's Call

When May You Gas Free for a *Foreign* Contractor?



- **Outside US Territorial Waters**
- **No Shore Maritime GFE or local Competent Person or Marine Chemist...**

What is the Procedure for Military & Civilian Dual Occupancy?



- ❶ CIVILIAN CERTIFIES FOR CONTRACTORS AND GFE CERTIFIES FOR SHIP'S CREW
- ❷ GFE WILL INFORM CONTRACTOR REP OF FINDINGS
- ❸ CONTRACTOR *SHALL BE INFORMED* THAT HE RETAINS LEGAL OBLIGATION FOR SAFETY OF CONTRACTOR PERSONNEL

Closed Compartment Opening Request

- Pg C-12 or C-29
- Can be Locally Produced
- GFE Management Tool
- Initial Info and Planning for Gas Free Test
- Should be Submitted Prior to Evolution

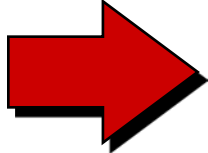


Hot Work Authorization Request

- Allows Divisions to Request Hot Work Services
- Management Tool to Optimize Use of Time, Personnel and Resources
- Hot Work Certificates:



RETESTING



- Entry or Work Delay
- Expiration (8 Hours)
- Hazards Detected
- Ship Movement
- Securing Ventilation
- New Operations or Materials
- Closing Space Or Temporary Shutdown

TEST RESULTS			
TESTS CONDUCTED AS REQUIRED	INITIAL TEST	1ST RETEST	2ND RETEST
OXYGEN 19.5% < O ₂ < 22%	20.7%	20.9%	20.8%
COMBUSTIBLE GAS < 10% LEL	0	0	0
TOXIC TYPE: CO < 35 PPM	0	0	0
TOXIC TYPE: H ₂ S < 10 PPM	0	0	0
TOXIC TYPE: N/A			
TOXIC TYPE: N/A			

EXISTING CONDITIONS	INITIAL TEST	1ST RETEST	2ND RETEST
NOT SAFE FOR PERSONNEL/ NOT SAFE FOR HOT WORK			
NOT SAFE FOR PERSONNEL WITHOUT PROTECTION/ NOT SAFE FOR HOT WORK			
SAFE FOR PERSONNEL/ NOT SAFE FOR HOT WORK	MLA	RKL	MAB
SAFE FOR PERSONNEL/ SAFE FOR HOT WORK			
NOT SAFE FOR PERSONNEL INSIDE/SAFE FOR HOT WORK OUTSIDE			

NOTE: THIS INSPECTION INDICATES THE CONDITIONS WHICH EXISTED AT THE TIME TESTS WERE CONDUCTED.

GFE PERSONNEL SIGNATURE M L Anderson LTJG

CO SIGNATURE, if required N/A

RECERTIFICATION

1ST RETEST/UPDATE

TIME: 1600 DATE: 12 MAY 98 EXPIRES: 2400

GFE PERSONNEL SIGNATURE R K LaCount DCC (SW)

GFEA

2ND RETEST/UPDATE

TIME: 0000 DATE: 13 MAY 98 EXPIRES: 0800

GFE PERSONNEL SIGNATURE MA Bowen HT1 (SW)

INITIAL CERTIFICATION		TEST RESULTS			
SHIP/UNIT/ACTIVITY: _____		TESTS CONDUCTED AS REQUIRED	INITIAL TEST	1ST RETEST	2ND RETEST
ITEM/COMPARTMENTS/SPACE: _____					
TYPE OF OPERATION TO BE CONDUCTED: _____		OXYGEN			
INITIAL DATE OF TEST: HOUR: _____ DATE: _____		COMBUSTIBLE GAS			
INITIAL EXPIRATION: HOUR: _____ DATE: _____		TOXIC TYPE:			
VENTILATION REQUIRED: YES _____ NO _____		TOXIC TYPE:			
TYPE: _____		TOXIC TYPE:			
INERTED GAS: _____ (gms)		EXISTING CONDITIONS			
OR PRESSURED UP WITH: _____ (liquid)		INITIAL TEST			
REQUIREMENTS/CONCLUSIONS/PREScribed PRECAUTIONS/INSTRUCTIONS:		1ST RETEST			
_____		2ND RETEST			
_____		NOT SAFE FOR PERSONNEL/ NOT SAFE FOR HOT WORK			
_____		NOT SAFE FOR PERSONNEL WITHOUT PROTECTION/ NOT SAFE FOR HOT WORK			
_____		SAFE FOR PERSONNEL/ NOT SAFE FOR HOT WORK			
_____		SAFE FOR PERSONNEL/ SAFE FOR HOT WORK			
_____		NOT SAFE FOR PERSONNEL INSIDE/SAFE FOR HOT WORK OUTSIDE			
NOTE: THIS INSPECTION INDICATES THE CONDITIONS WHICH EXISTED AT THE TIME TESTS WERE CONDUCTED.					
GAS FREE RELATED HOT WORK					
POS QUALIFIED FIRE WATCHES ASSIGNED					
LOCATIONS	PRINT NAME/RATE	SIGNATURE*	(EPOCH COMPLETION)		
_____	_____	_____	_____		
TIME SECURED _____					
*FINAL CHECKUP: WORK AREA AND ALL ADJACENT AREAS TO WHICH SPARKS AND HEAT MIGHT SPREAD WERE INSPECTED 30 MINUTES AFTER THE WORK WAS COMPLETED AND WERE FOUND TO BE FIRE SAFE. THE EQUIPMENT AND STRUCTURES WORKED ON WERE COOL TO THE TOUCH.					
I CERTIFY THAT I AM FAMILIAR WITH AND WILL COMPLY WITH ALL SAFETY PRECAUTIONS PERTINENT TO THIS TYPE OF WORK.					
HOT WORK OPERATOR SIGNATURE _____					
HOT WORK SUPERVISOR _____					
FIRE MARSHAL _____					
OPNAV 310016 (5-91)		SN 0107-LF-011-7400			

INITIAL CERTIFICATION		TEST RESULTS			
SHIP/UNIT/ACTIVITY: _____		TESTS CONDUCTED AS REQUIRED	INITIAL TEST	1ST RETEST	2ND RETEST
ITEM/COMPARTMENTS/SPACE: _____					
TYPE OF OPERATION TO BE CONDUCTED: _____		OXYGEN			
INITIAL DATE OF TEST: HOUR: _____ DATE: _____		COMBUSTIBLE GAS			
INITIAL EXPIRATION: HOUR: _____ DATE: _____		TOXIC TYPE:			
VENTILATION REQUIRED: YES _____ NO _____		TOXIC TYPE:			
TYPE: _____		TOXIC TYPE:			
INERTED GAS: _____ (gms)		EXISTING CONDITIONS			
OR PRESSURED UP WITH: _____ (liquid)		INITIAL TEST			
REQUIREMENTS/CONCLUSIONS/PREScribed PRECAUTIONS/INSTRUCTIONS:		1ST RETEST			
_____		2ND RETEST			
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_____		NOT SAFE FOR PERSONNEL WITHOUT PROTECTION/ NOT SAFE FOR HOT WORK			
_____		SAFE FOR PERSONNEL/ NOT SAFE FOR HOT WORK			
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GAS FREE RELATED HOT WORK					
POS QUALIFIED FIRE WATCHES ASSIGNED					
LOCATIONS	PRINT NAME/RATE	SIGNATURE*	(EPOCH COMPLETION)		
_____	_____	_____	_____		
TIME SECURED _____					
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INITIAL CERTIFICATION		TEST RESULTS			
SHIP/UNIT/ACTIVITY: _____		TESTS CONDUCTED AS REQUIRED	INITIAL TEST	1ST RETEST	2ND RETEST
ITEM/COMPARTMENTS/SPACE: _____					
TYPE OF OPERATION TO BE CONDUCTED: _____		OXYGEN			
INITIAL DATE OF TEST: HOUR: _____ DATE: _____		COMBUSTIBLE GAS			
INITIAL EXPIRATION: HOUR: _____ DATE: _____		TOXIC TYPE:			
VENTILATION REQUIRED: YES _____ NO _____		TOXIC TYPE:			
TYPE: _____		TOXIC TYPE:			
INERTED GAS: _____ (gms)		EXISTING CONDITIONS			
OR PRESSURED UP WITH: _____ (liquid)		INITIAL TEST			
REQUIREMENTS/CONCLUSIONS/PREScribed PRECAUTIONS/INSTRUCTIONS:		1ST RETEST			
_____		2ND RETEST			
_____		NOT SAFE FOR PERSONNEL/ NOT SAFE FOR HOT WORK			
_____		NOT SAFE FOR PERSONNEL WITHOUT PROTECTION/ NOT SAFE FOR HOT WORK			
_____		SAFE FOR PERSONNEL/ NOT SAFE FOR HOT WORK			
_____		SAFE FOR PERSONNEL/ SAFE FOR HOT WORK			
_____		NOT SAFE FOR PERSONNEL INSIDE/SAFE FOR HOT WORK OUTSIDE			
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GAS FREE RELATED HOT WORK					
POS QUALIFIED FIRE WATCHES ASSIGNED					
LOCATIONS	PRINT NAME/RATE	SIGNATURE*	(EPOCH COMPLETION)		
_____	_____	_____	_____		
TIME SECURED _____					
*FINAL CHECKUP: WORK AREA AND ALL ADJACENT AREAS TO WHICH SPARKS AND HEAT MIGHT SPREAD WERE INSPECTED 30 MINUTES AFTER THE WORK WAS COMPLETED AND WERE FOUND TO BE FIRE SAFE. THE EQUIPMENT AND STRUCTURES WORKED ON WERE COOL TO THE TOUCH.					
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HOT WORK SUPERVISOR _____					
FIRE MARSHAL _____					
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INITIAL CERTIFICATION		TEST RESULTS			
SHIP/UNIT/ACTIVITY: _____		TESTS CONDUCTED AS REQUIRED	INITIAL TEST	1ST RETEST	2ND RETEST
ITEM/COMPARTMENTS/SPACE: _____					
TYPE OF OPERATION TO BE CONDUCTED: _____		OXYGEN			
INITIAL DATE OF TEST: HOUR: _____ DATE: _____		COMBUSTIBLE GAS			
INITIAL EXPIRATION: HOUR: _____ DATE: _____		TOXIC TYPE:			
VENTILATION REQUIRED: YES _____ NO _____		TOXIC TYPE:			
TYPE: _____		TOXIC TYPE:			
INERTED GAS: _____ (gms)		EXISTING CONDITIONS			
OR PRESSURED UP WITH: _____ (liquid)		INITIAL TEST			
REQUIREMENTS/CONCLUSIONS/PREScribed PRECAUTIONS/INSTRUCTIONS:		1ST RETEST			
_____		2ND RETEST			
_____		NOT SAFE FOR PERSONNEL/ NOT SAFE FOR HOT WORK			
_____		NOT SAFE FOR PERSONNEL WITHOUT PROTECTION/ NOT SAFE FOR HOT WORK			
_____		SAFE FOR PERSONNEL/ NOT SAFE FOR HOT WORK			
_____		SAFE FOR PERSONNEL/ SAFE FOR HOT WORK			
_____		NOT SAFE FOR PERSONNEL INSIDE/SAFE FOR HOT WORK OUTSIDE			
NOTE: THIS INSPECTION INDICATES THE CONDITIONS WHICH EXISTED AT THE TIME TESTS WERE CONDUCTED.					
GAS FREE RELATED HOT WORK					
POS QUALIFIED FIRE WATCHES ASSIGNED					
LOCATIONS	PRINT NAME/RATE	SIGNATURE*	(EPOCH COMPLETION)		
_____	_____	_____	_____		
TIME SECURED _____					
*FINAL CHECKUP: WORK AREA AND ALL ADJACENT AREAS TO WHICH SPARKS AND HEAT MIGHT SPREAD WERE INSPECTED 30 MINUTES AFTER THE WORK WAS COMPLETED AND WERE FOUND TO BE FIRE SAFE. THE EQUIPMENT AND STRUCTURES WORKED ON WERE COOL TO THE TOUCH.					
I CERTIFY THAT I AM FAMILIAR WITH AND WILL COMPLY WITH ALL SAFETY PRECAUTIONS PERTINENT TO THIS TYPE OF WORK.					
HOT WORK OPERATOR SIGNATURE _____					
HOT WORK SUPERVISOR _____					
FIRE MARSHAL _____					
OPNAV 310016 (5-91)		SN 0107-LF-011-7400			

SERIAL # 98-00001

INITIAL CERTIFICATE

SHIP/UNIT/ACTIVITY: USS NAVIN R. JOHNSON

ITEM/COMPARTMENT/SPACE: CHAIN LOCKER (

TYPE OF OPERATION TO BE CONDUCTED: CLEAN

INITIAL DATE OF TEST: _____ HOUR: 300

INITIAL EXPIRATION: _____ HOUR: 2100

VENTILATION REQUIRED: YES

TYPE: DILUTION - 1 RAINFAN EXHAUST

THROUGH WTD 4-92-1 TO WEATHER

OPERATION WHILE PERSONNEL IN

INERTED GAS: _____

OR N/A

PRESSED UP WITH: _____

REQUIREMENTS/CONCLUSIONS/PREScribed PREC.

ALL PERSONNEL USE RHINE AIR PU

ALLS. RE-INSPECT EVERY TWO HO

OBSERVER MAINTAIN COMMS WITH

RESCUE CONTROL POINT USING W

3 Ventilation Options:

Local Exhaust Ventilation:

Ex.: Welding,

Painting,

Using Solvents

Dilution Ventilation

Ex.: Reducing Toxins,

Controlling Flammable Vapors

General Exhaust Ventilation

*Ex.: Providing Cool Comfort Air in
a Hazard-Free Atmosphere*

SAFE FOR PERSONNEL/ SAFE FOR HOTWORK

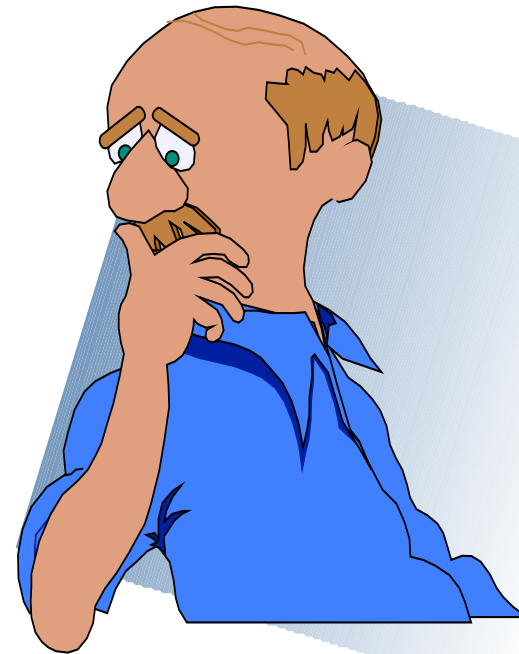
TEST RESULTS	
TESTS CONDUCTED AS REQUIRED	INITIAL TEST
OXYGEN 19.5 < O₂ < 22	20 %
COMBUSTIBLE GAS LEL < 10	0 %LEL
TOXIC TYPE: H2S PEL 10 IDLH 100	1 ppm
TOXIC TYPE: CO PEL 50 IDLH 1200	10 ppm
TOXIC TYPE:	
TOXIC TYPE: UNITY:	<1

- Oxygen between 19.5% And 22%
- Toxics below PEL
- All flammables removed
- Boundary spaces protected

EXISTING CONDITIONS	INITIAL TEST
NOT SAFE FOR PERSONNEL/ NOT SAFE FOR HOT WORK	
NOT SAFE FOR PERSONNEL WITHOUT PROTECTION/ NOT SAFE FOR HOT WORK	
SAFE FOR PERSONNEL/ NOT SAFE FOR HOT WORK	
SAFE FOR PERSONNEL/ SAFE FOR HOT WORK	X
NOT SAFE FOR PERSONNEL INSIDE/SAFE FOR HOT WORK OUTSIDE	



WHEN MAY I BLOW
AIR INTO A SPACE?



BLOWING AIR

- ⊗ No flammables present or being generated
- ⊗ No toxics present or being generated
- ⊗ Only to provide clean air for breathing and comfort

EXHAUST CONFIGURATION PREFERRED OVER SUPPLY

- Supply can produce a static charge build-up
- Supply could introduce foreign objects into space
- Supply can result in contamination of adjacent spaces

APPLICATION OF CLEANING METHODS



- OBTAIN CO PERMISSION TO ENTER IDLH SPACE
- OPEN TANK, CONDUCT DROP TEST AND VENTILATE PER NSTM 074
- CONDUCT DROP TEST, GFE ENTER TANK USING SUPPLIED AIR BREATHING APPARATUS AND CONDUCT O₂, EXPLOSIVE AND TOXIC TESTS



APPLICATION OF CLEANING METHODS

- DETERMINE VENTILATION/ PPE REQUIREMENTS FOR TANK CLEANING EVOLUTION
- ENSURE VENTILATION/ PPE REQUIREMENTS ARE MET
- PERFORM CONTINUOUS/PERIODIC ATMOSPHERIC TESTS AS NEEDED



FLOW RATES FOR DILUTION VENTILATION FOR SPRAY PAINTING



$$Q = \frac{C (100 - \text{LEL})}{\text{LEL}} \times V_v \times \frac{\text{GAL}}{\text{MIN}} \times \% \text{SOLVENT}$$

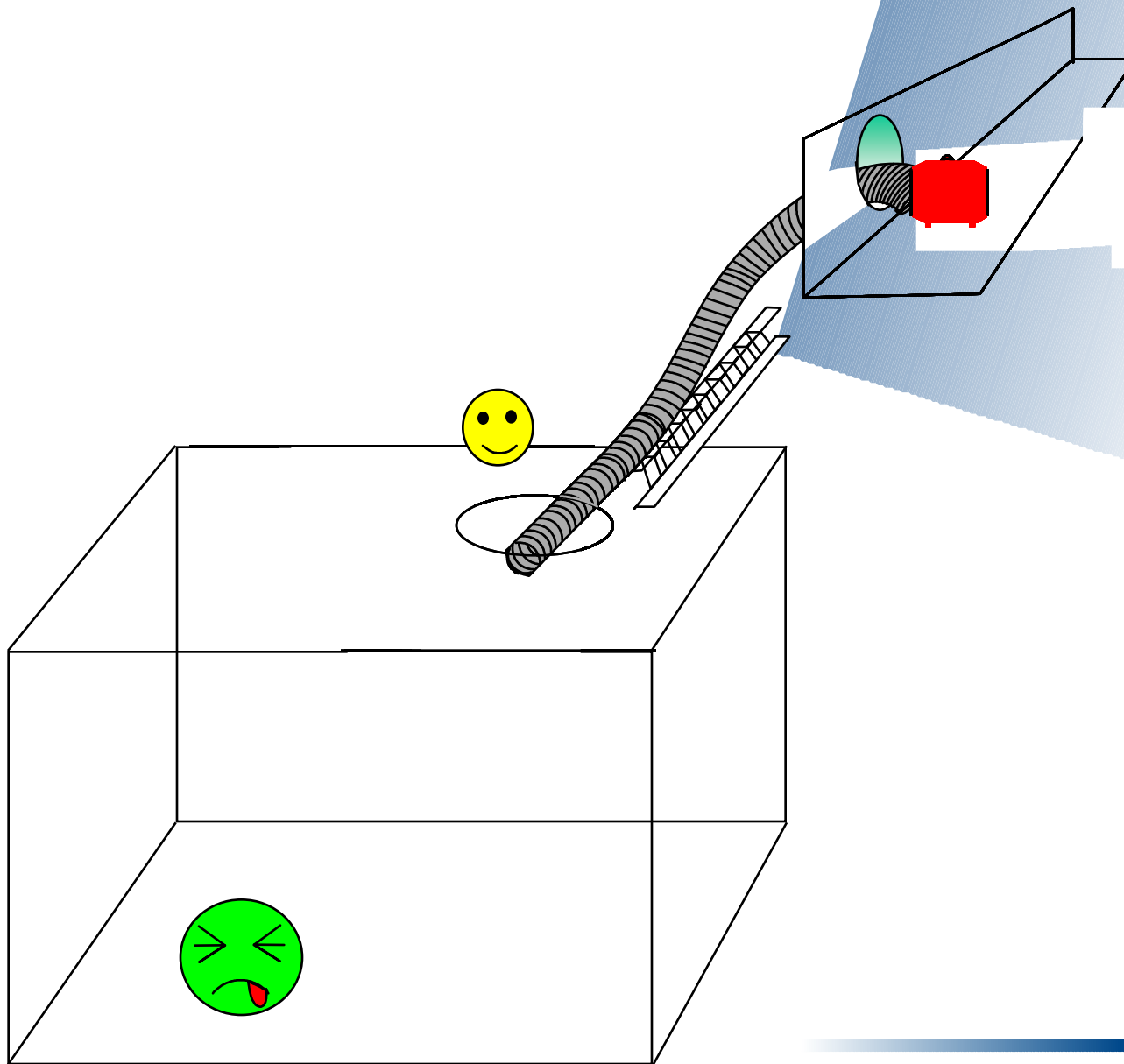
Q = VOLUMETRIC FLOW NEEDED TO
MAINTAIN 10% OF LEL

V_v = VAPOR VOLUME PER 1 GALLON
OF LIQUID

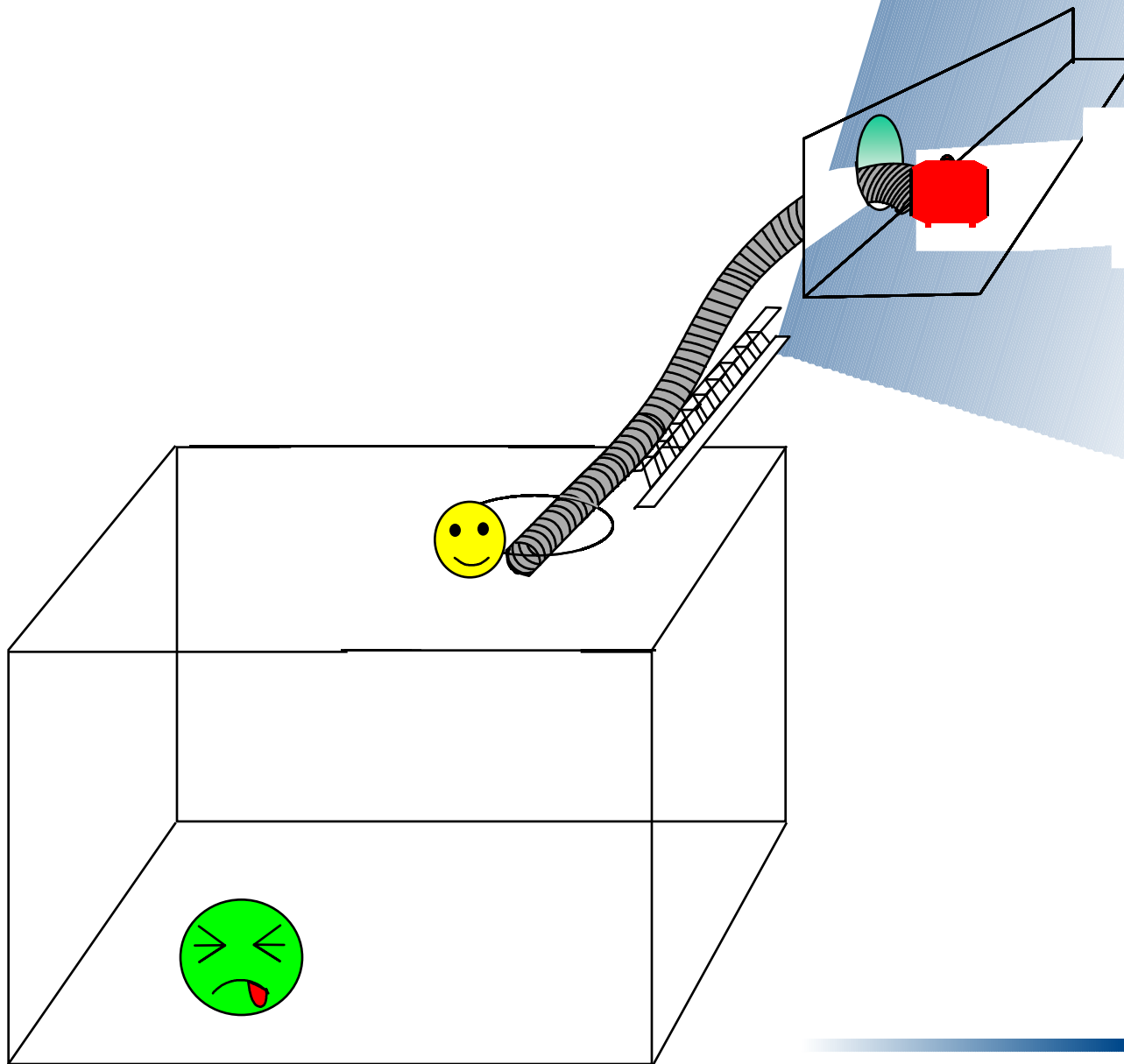
Do this for each “ingredient” in the paint



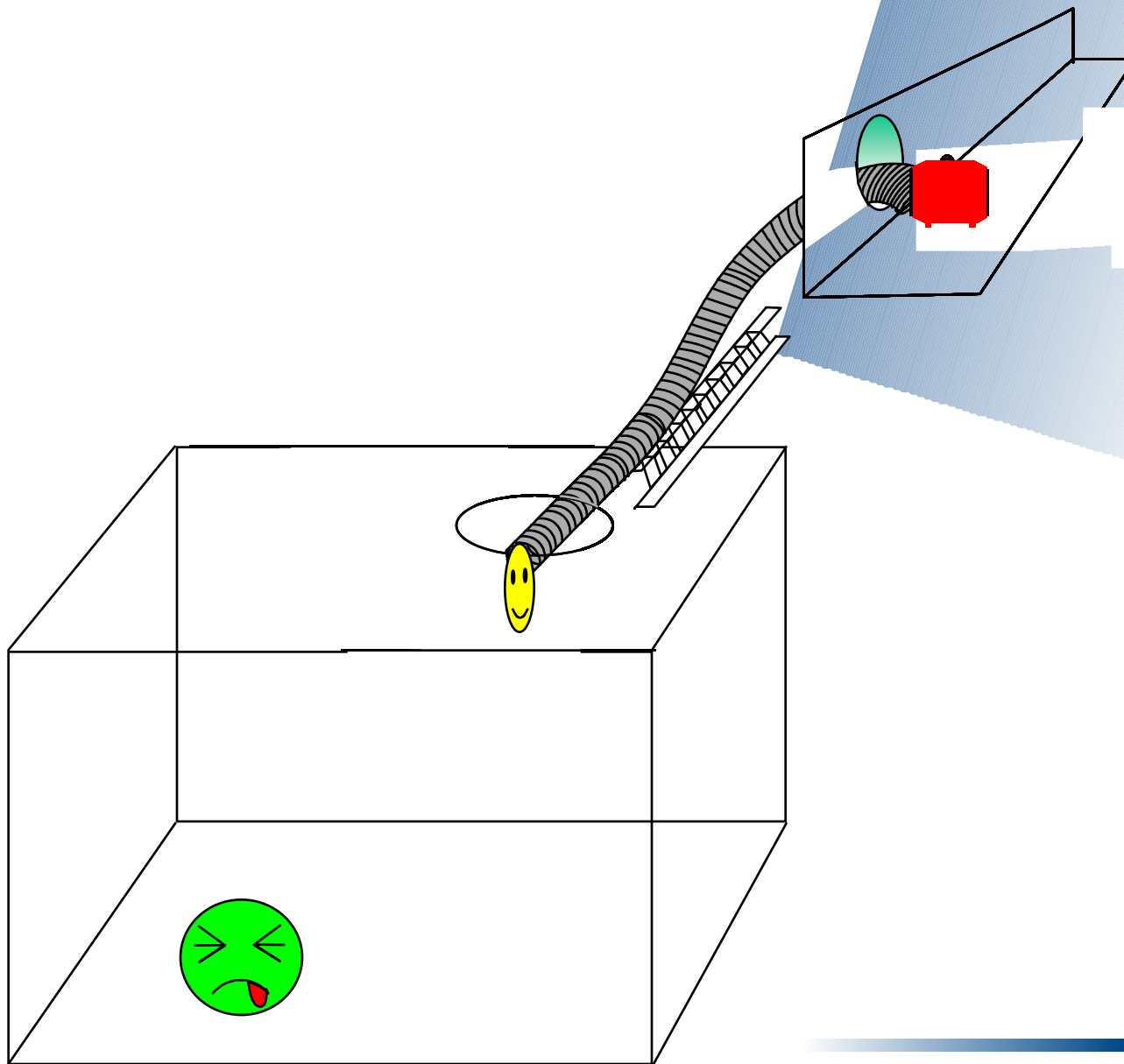
SHORT CIRCUITING



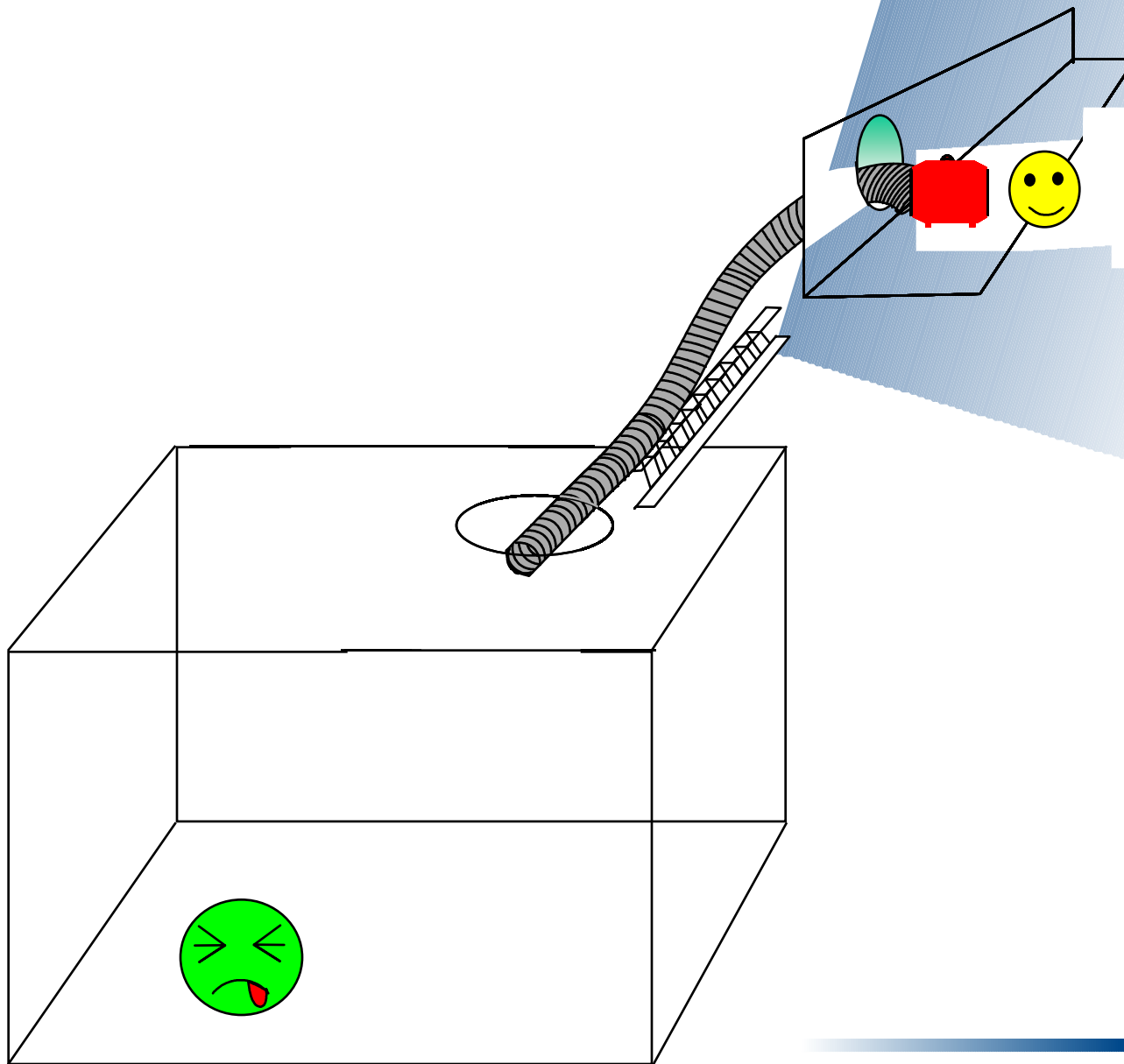
SHORT CIRCUITING



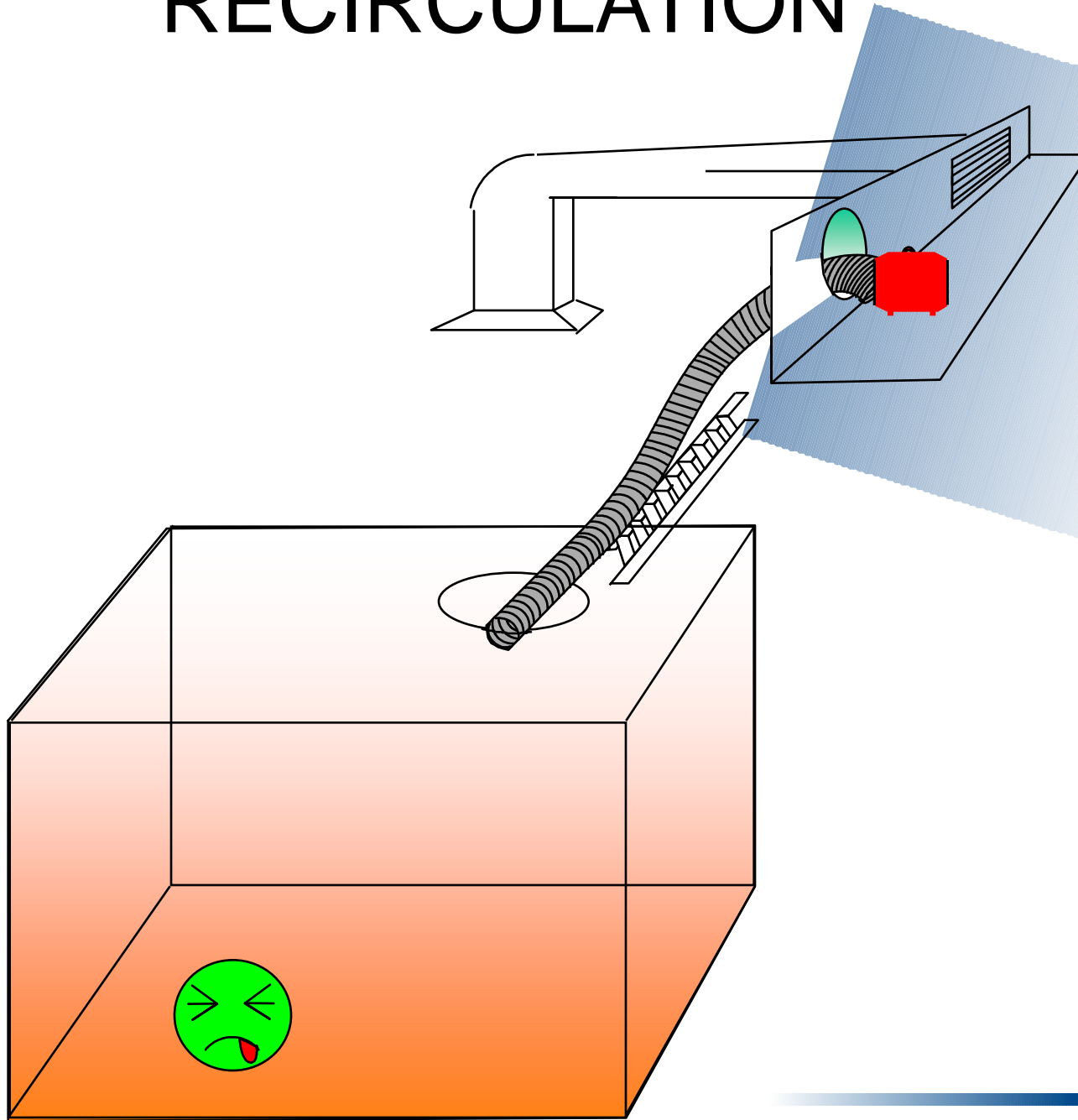
SHORT CIRCUITING



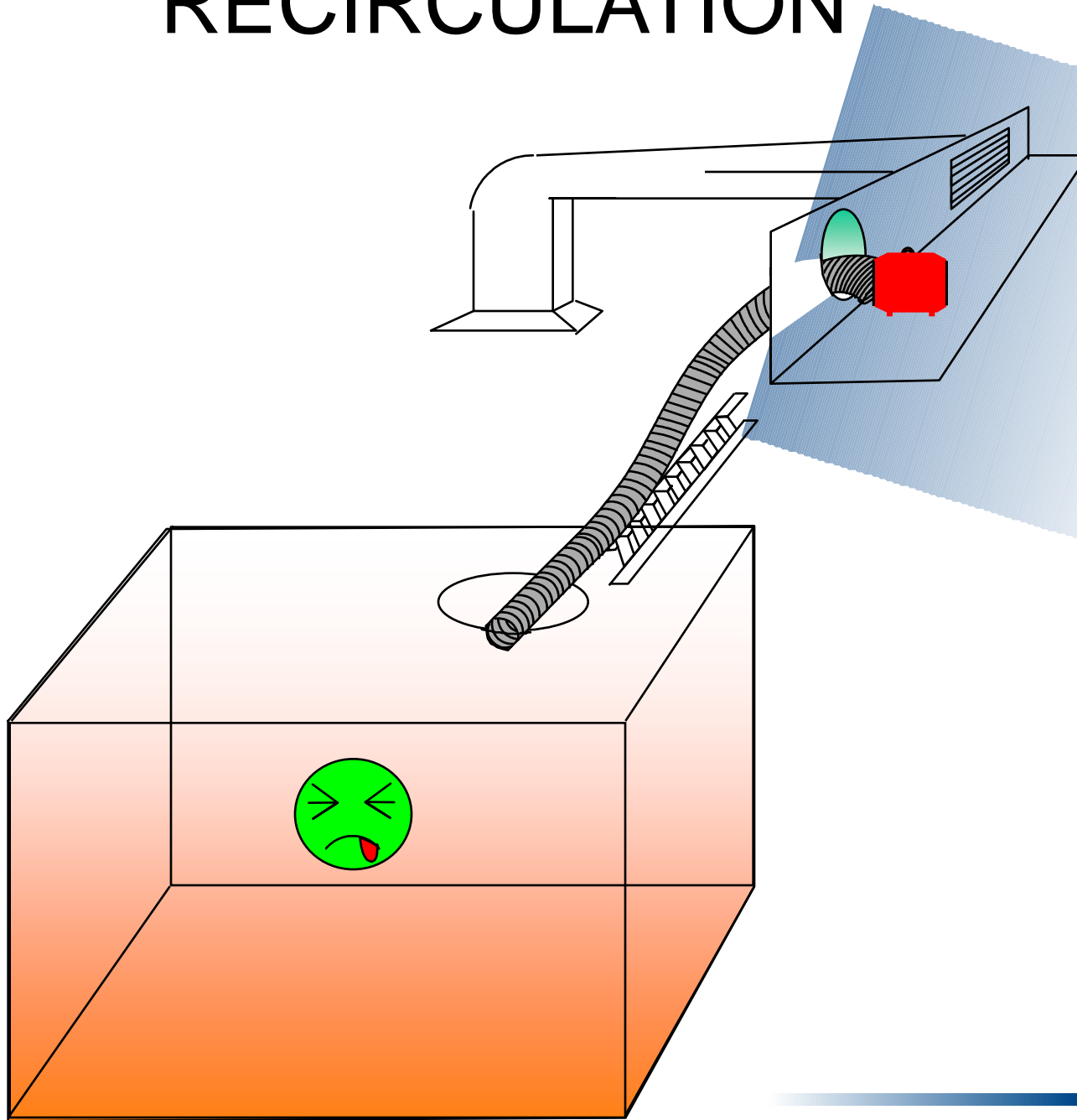
SHORT CIRCUITING



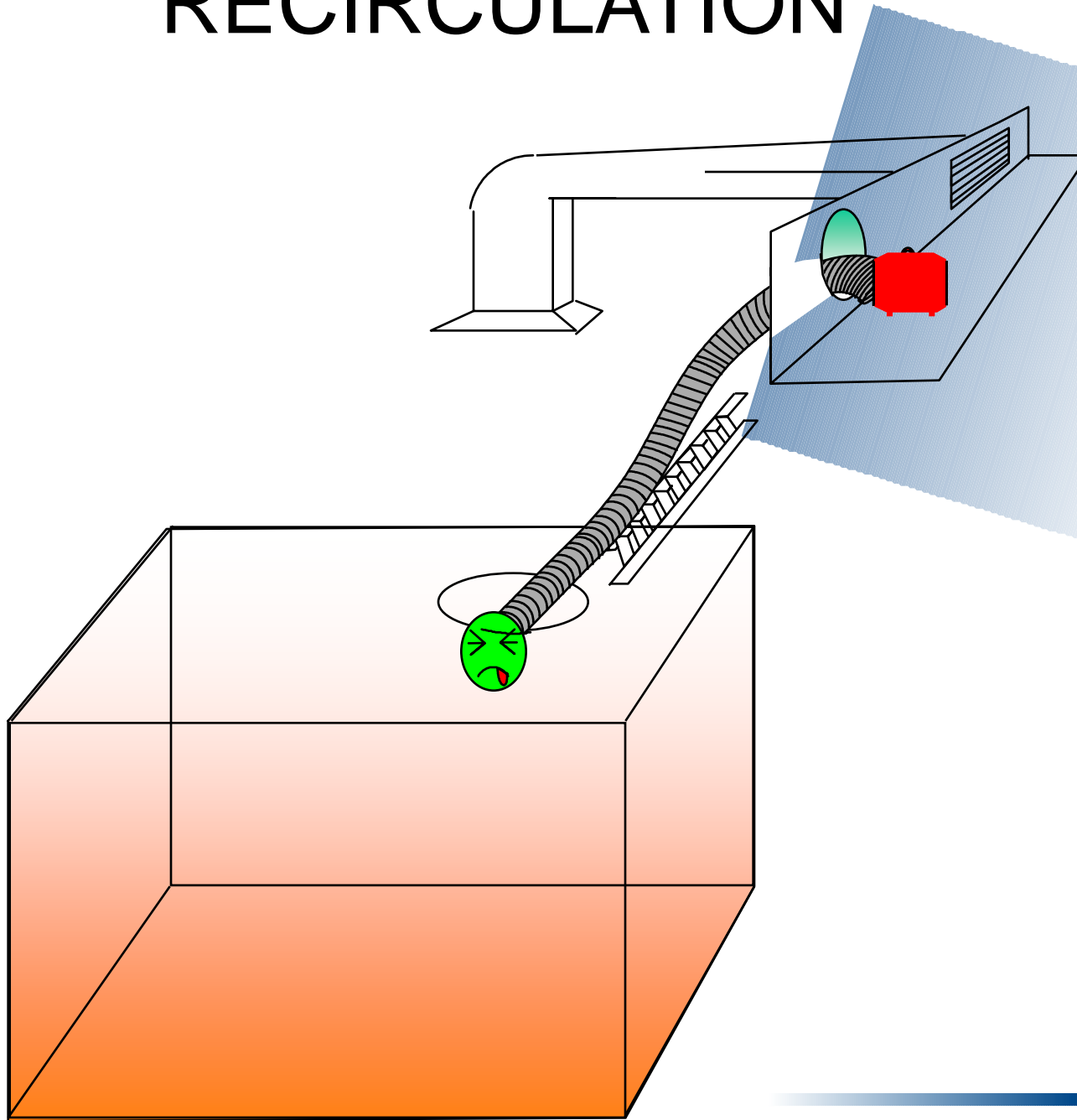
RECIRCULATION



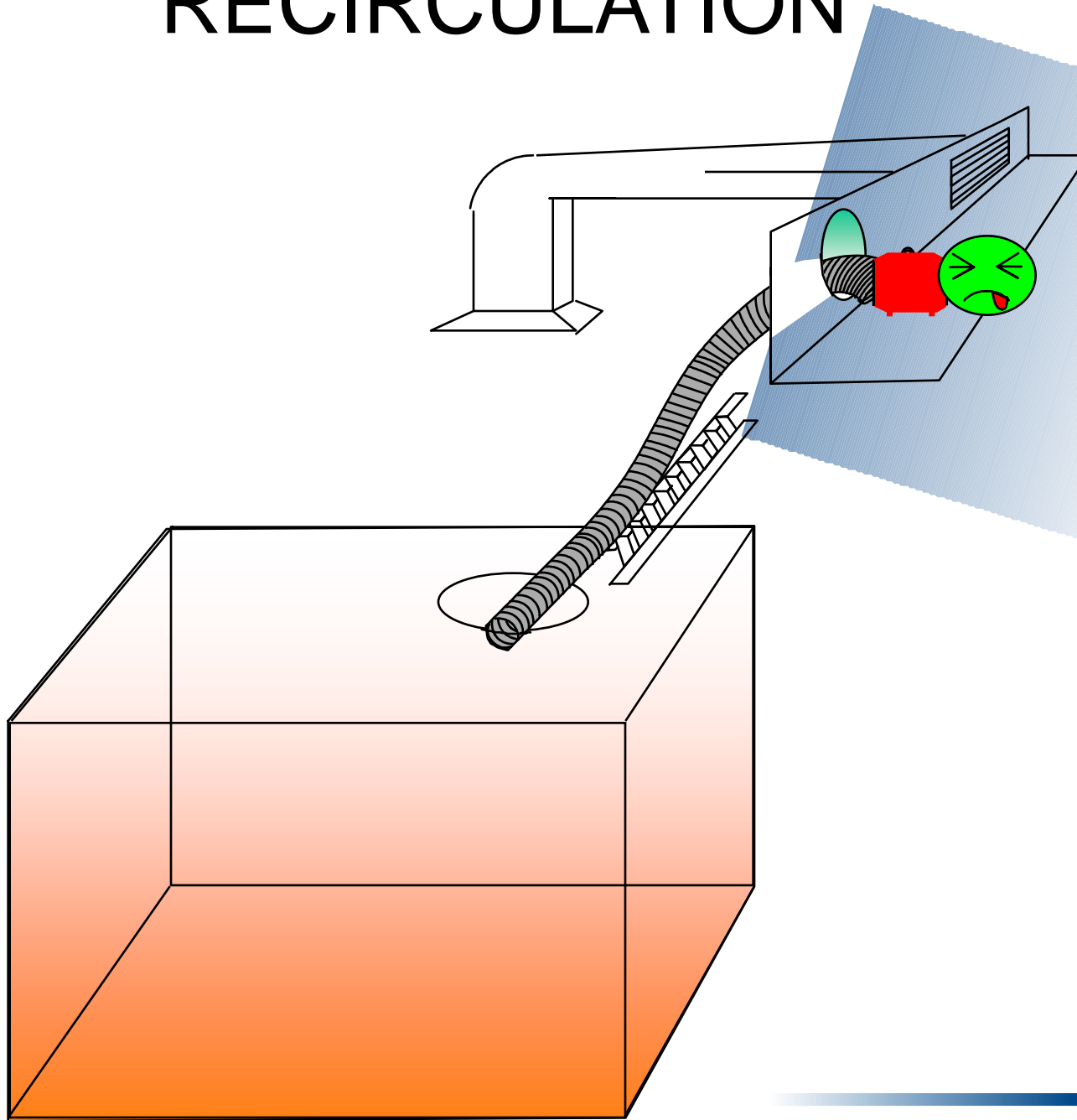
RECIRCULATION



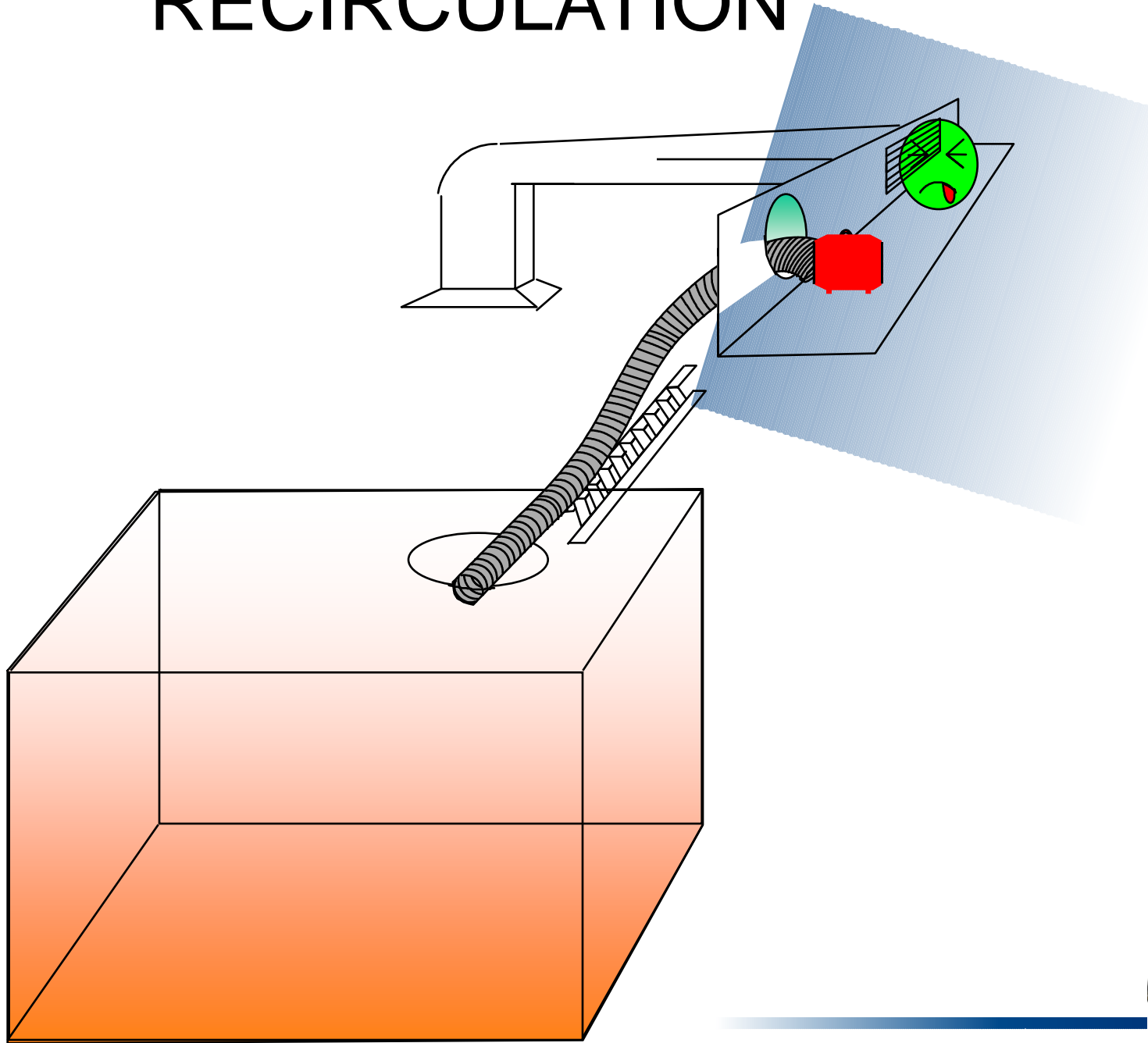
RECIRCULATION



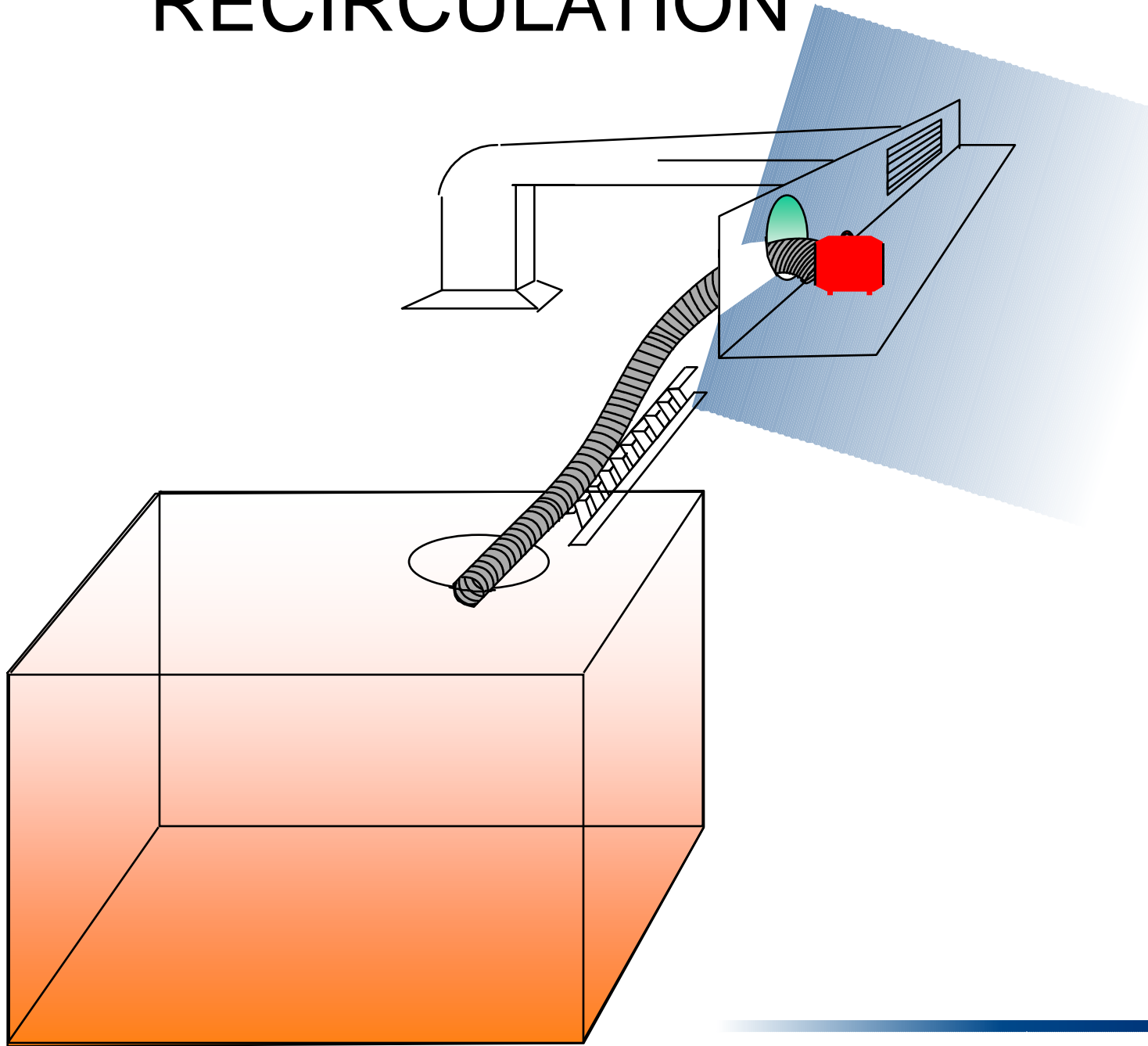
RECIRCULATION



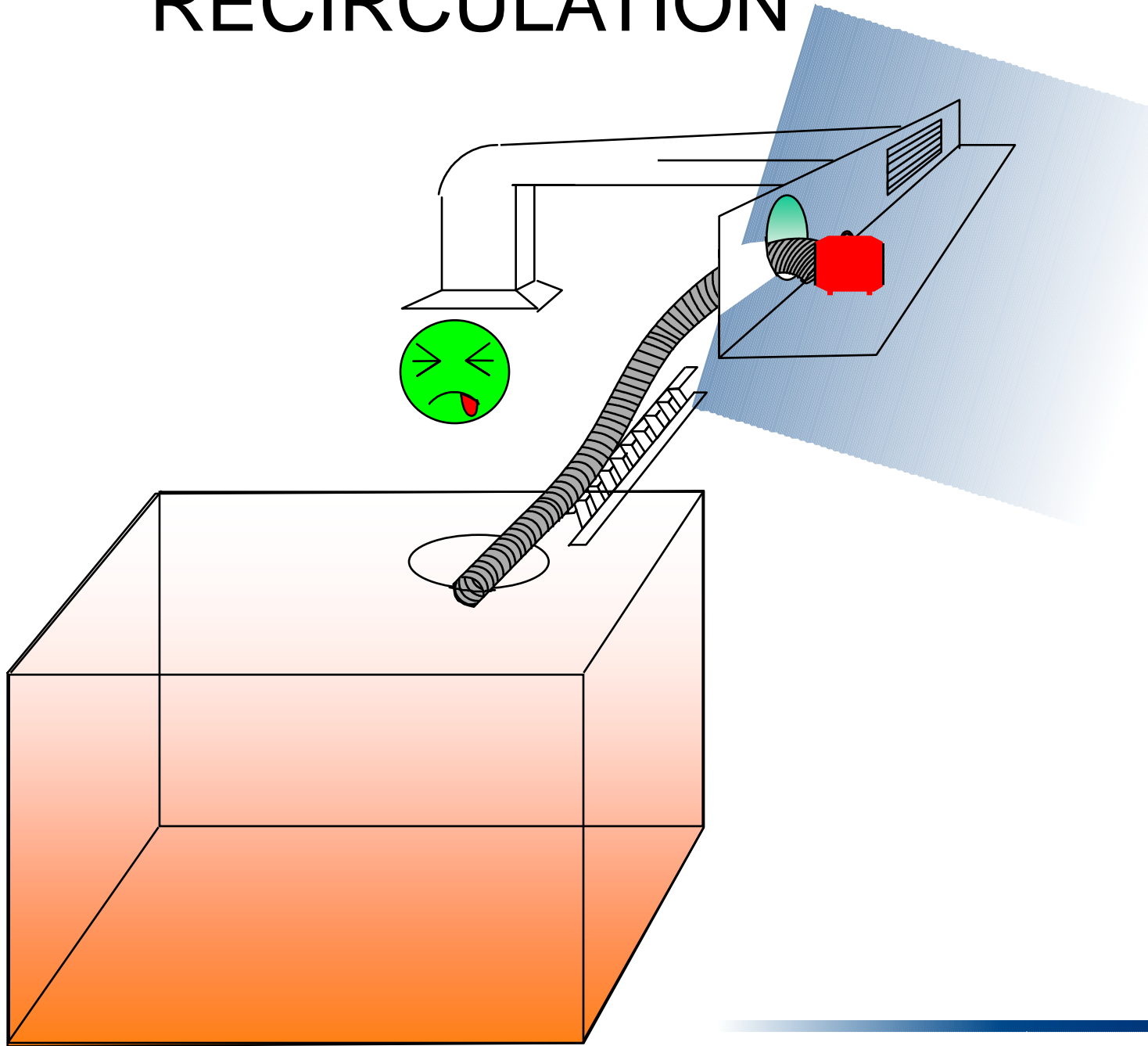
RECIRCULATION



RECIRCULATION



RECIRCULATION





DCA



RESPONSIBILITIES

- Train & supervise ship's DC teams in combating spills of Hazmat
 - Conduct at least one spill response drill annually per DC team
 - Provide training to divisions regarding reporting, initial handling and clean-up procedures
 - Maintain HM Spill Response Kits
- **AEL 2-550024007**

INPORT

- Pierside, all waste and soil drains to tank, then to pier riser



MODES OF OPERATIONS

TRANSIT

- Within 3 nm of coast:
- All Black Water diverted to tank
- Grey Water below W/L - to tank
- Grey Water above W/L - overboard



AT SEA

- Beyond 3 nm:
 - all Grey Water and Black Water overboard





Questions?