

Training and Education Material

FY 2019

Confined Space Entry Course Schedule and Hand-outs

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Course Schedule

8:00-8:30: Unit 1 Introduction to training

8:30-9:00: Unit 2 OSHA Confined space and permit confined space characteristics

9:00-9:10: Break!

9:10-9:40: Unit 3 Confined space hazard identification and controls. Hands-on CSE activity-divide class into groups of 2. Each group will identify hazards and controls and present their findings before the class.

9:40-10:05: Unit 4 Recognizing atmospheric hazards

10:05-10:15: Break!

10:15-10:30: Unit 5 Fire and explosion hazards

10:30-11:00: Unit 6 Testing hazardous atmospheres-divide class into groups of 2. Demonstrate start-up and calibration of gas meters. Have each trainee demonstrate start up and calibration of gas meters.

11:00-11:15: Unit 7 Introduction to non-permit, permit, and alternate entry requirements

11:15-11:25: Break!

11:25-11:40: Unit 8 Duties and responsibilities of the supervisor, attendant and entrant.

11:40-12:40: Lunch!

12:40-1:40: Hands-on CSE exercise-divide class into groups of 3. Each group will assemble and inspect the tripod, winch, ventilation unit, and don fall protection harness. Each group will start up and pump test gas meter.

Demonstrate

1:40-1:50: Break!

1:50-2:50: Hands-on CSE exercise continued.

2:50-3:00: Break!

3:00-3:45: Hands-on CSE exercise continued.

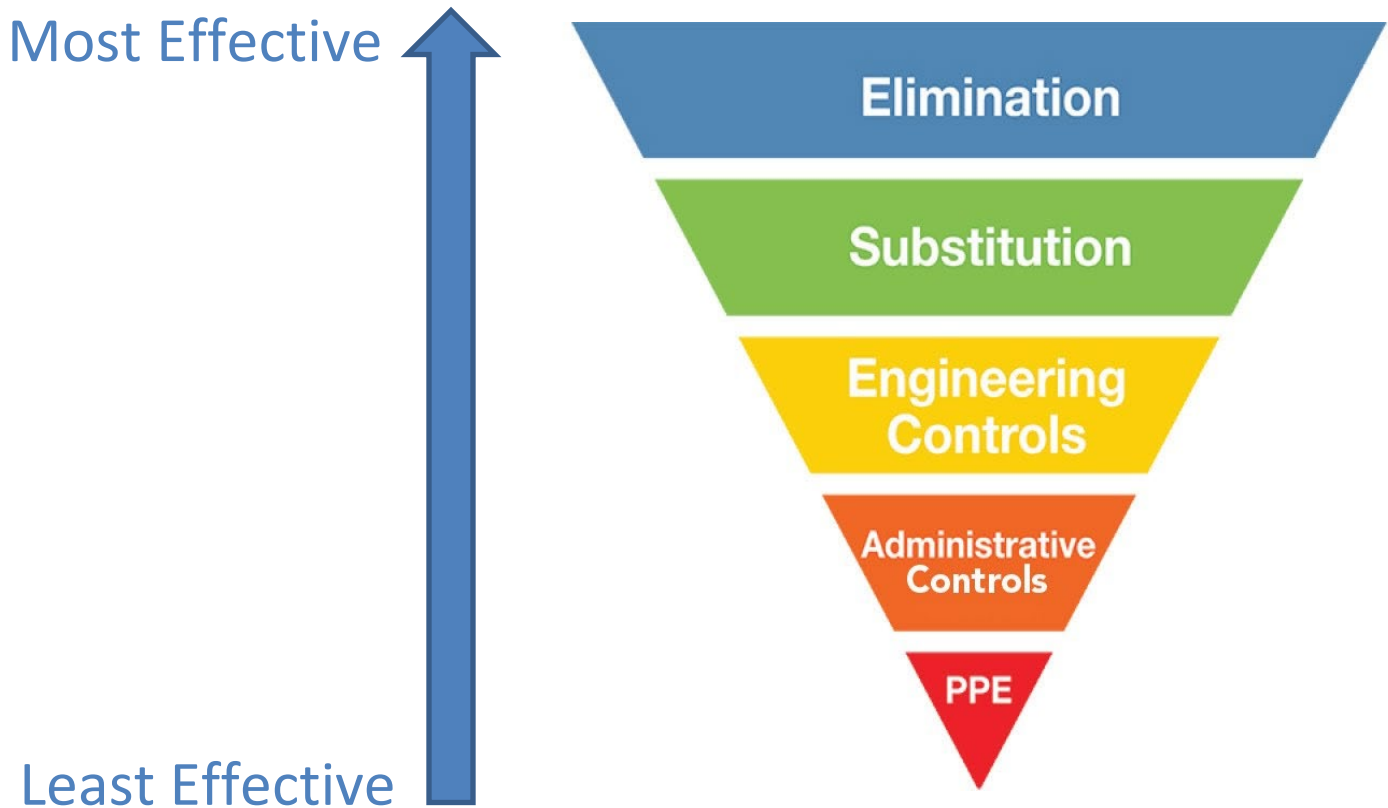
3:45-4:00: Course evaluation

Thank you for participating in this training. All trainees will receive an OSHA Susan Harwood safety training certificate.

Course completed.

HIERARCHY OF CONTROLS

Trainees: As you participate in this activity, use the hierarchy of controls and the confined space hazard assessment as your guide to identify and implement controls for each of hazard you discover.



Examples

Elimination: Avoid entry, conduct-cleaning operations from outside of tank.

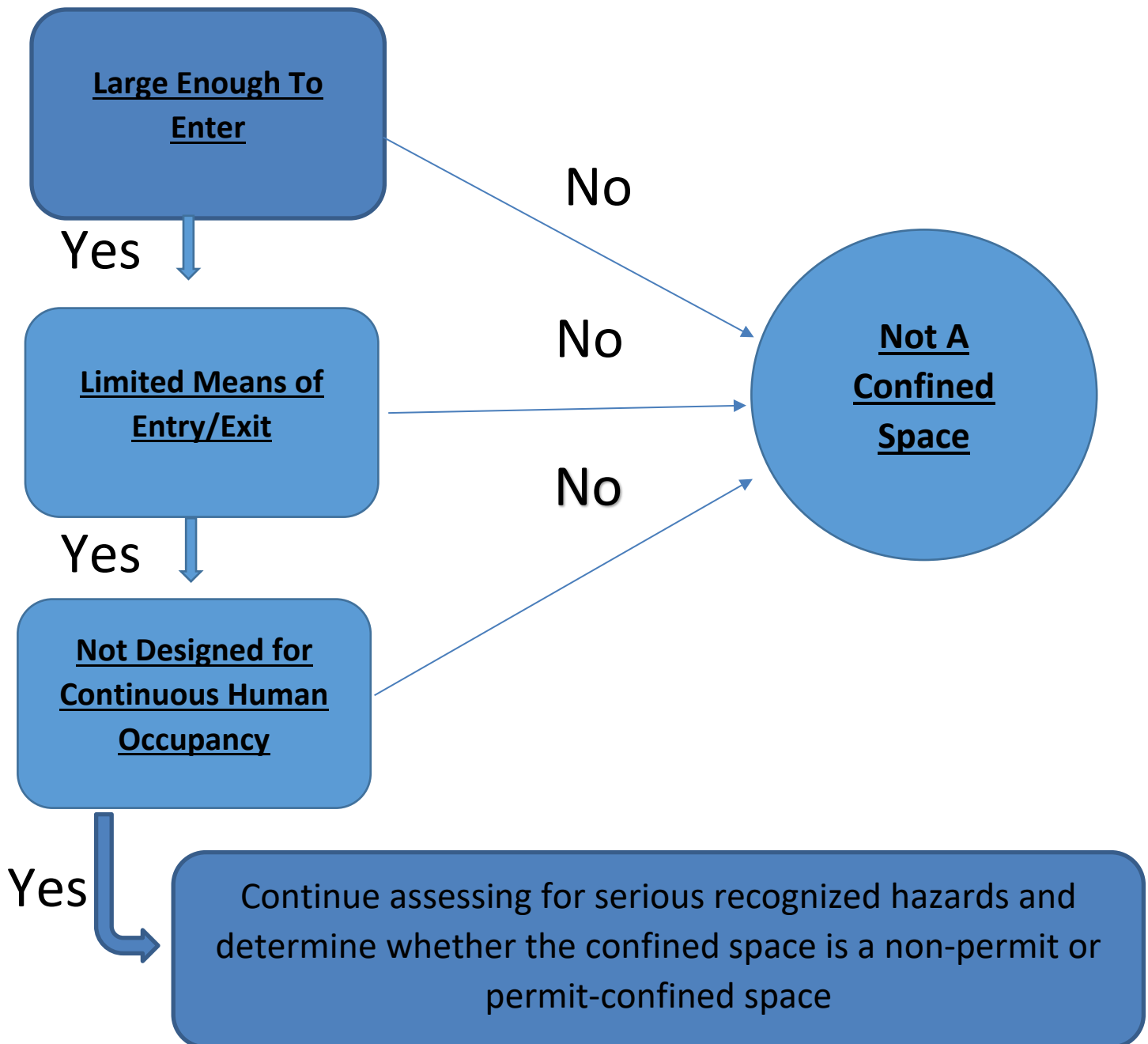
Substitution: Replace hazard with something less hazardous. Cleaning with non-flammable toxic cleaners instead of solvents and use intrinsically safe equipment (tools and lighting).

Engineering: Force air ventilation, isolate hazard from workers (barriers), use remotely controlled access equipment.

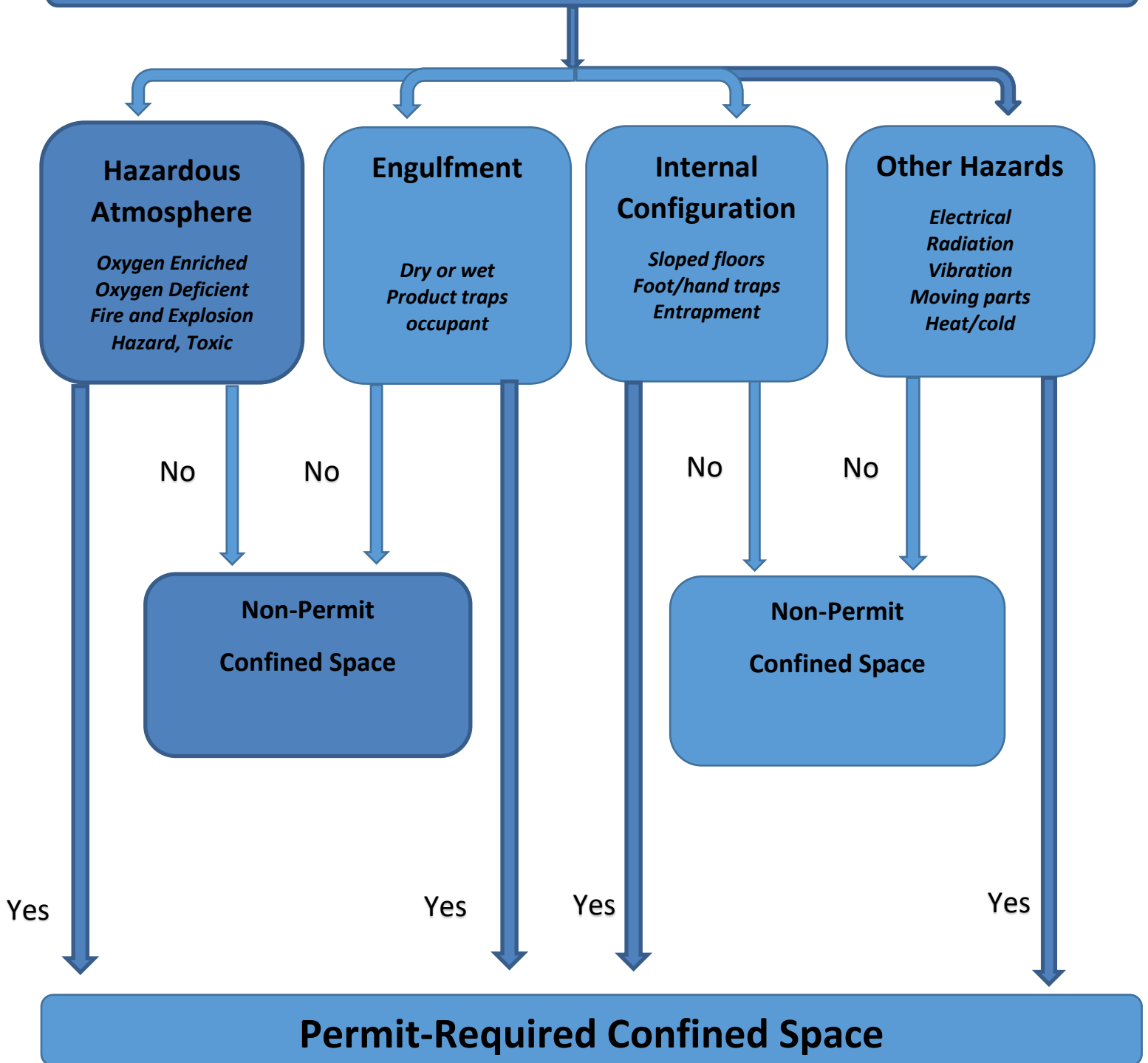
Administrative: Training, signage, respiratory fit testing, alternate workers in task, alternate task and breaks

Personal protective equipment: Goggles, safety glasses, safety shoes, high visible clothing, hearing protection, fall protection equipment, ladders, respiratory protection, gloves and hardhat

Confined Space Hazard Assessment



Confined Space Hazard Assessment



Classroom activity 1 Water storage tanks

Identify and list external and internal confined space hazards and Controls

Image #1



Hazards:

Controls:

1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.

Image #2



Hazards:

Controls:

1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.

Image #3



Hazards:

Controls:

1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.

Image 4



Image 5



Image 6



Hazards

Image 4

Controls

1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.

Image #5

1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.

Image #6

1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.

Classroom activity 2 Wet-wells & sewage lift stations

Identify and list external and internal confined space hazards and controls

Image #1



Hazards:

Controls:

1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.

Image 2



Hazards:

Controls:

1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.

Classroom activity 2 electrical panel stations

Image #3



Hazards:

Controls:

1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.

Image #4



Hazards:

Controls:

1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.

Classroom activity 3 Confined Spaces Trenching

Identify and list external and internal confined space hazards and controls

Image #1



Hazards:

Controls:

1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.

Image #2



Hazards

Controls

1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.

Classroom activity 4 Confined Space Fatality

Municipal Water System Operator Dies after Entering Oxygen-Deficient Valve Vault in Montana

A 35-year old male water system operator (victim) died after entering a valve vault at a municipal water plant. The victim was assigned to turn on a water supply valve serving a nearby tree farm. The valve was located at the water treatment plant inside an underground valve vault that "always had normal air." The victim entered the valve vault through a ground-level manhole without testing for fresh air in the vault. A co-worker, who had last seen the victim 1 hour earlier, checked the manhole and saw the victim lying on his back at the bottom. The victim did not respond to any calls. Other workers summoned, and a local fire department arrived on scene to ventilate the valve vault and rescue the victim. The vault atmosphere contained low amounts of oxygen. There were no witnesses to the incident, but evidence suggests that the victim lost consciousness and fell from the ladder to the bottom of the vault.



Identify and list the possible hazards of this underground vault

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

Identify and list all the missteps that took place in this fatality

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

CAUSE OF DEATH

The medical examiner listed the cause of death as asphyxia due to oxygen displacement with carbon dioxide and methane.

Classroom activity 5 Gas Meter



Monitors (or meters) are designed to provide a confined space attendant and/or supervisor with early warning and detection of potential atmospheric dangers. The most popular sensors in use today are those, which detect combustible gases, oxygen, and various toxic or poisonous gases (e.g., Carbon Monoxide and Hydrogen Sulfide).

- Oxygen sensor checks for low and high oxygen levels
- Combustible gas sensor tests for levels of flammable or explosive gases
- Toxic gas test for levels of carbon monoxide and hydrogen sulfide gas
- PID sensor test for concentrations of volatile organic compounds in the air such as gasoline, diesel and solvents.

Warning

To ensure personal safety, read the safety information first before using the detector.

The GasAlertMicro 5 PID warn of hazardous gas at levels above the user defined alarm set points. The detector is a personal safety device. It is your responsibility to respond properly to the alarm.

Review questions

1. Safe atmospheric oxygen levels for confined space is _____%.
2. What are the atmospheric oxygen levels required for safe entry into a permit confined space?
 - a. Oxygen level of 19.5% to 24%
 - b. Oxygen level of 20.9% to 24%
 - c. Oxygen level of 16% to 23.5%
 - d. Oxygen level of 19.5% to 23.5%
3. My gas meter failed a field bump test prior to testing a sewage lift station. What is my course of action?
 - a. Continue with entry, another gas meter is on its way
 - b. Continue to ventilate until you think there is enough oxygen for safe entry.
 - c. Continue with testing even though the readings are in error
 - d. Discontinue use, no entry shall be made until a functional gas meter is acquired.
4. If oxygen levels fall below 19.5% in a permit confined space, the attendant should immediately order the _____ out of the space.

5. Air monitoring is a one-time procedure done while the entrant is in permit-required confined space.
- a. True
 - b. False

Demonstration and practice

- Step one: Instructor will demonstrate start up procedures on the gas meter.
- Step two: Instructor will review confined space entry permit process.
- Step three: instructor will demonstrate testing procedures and documentation of results on confined space entry form.
- Step four: Each student demonstrates start up procedures on the gas meter
- Step five: Each student will demonstrate and document results on the confined space entry form.

Daily Inspection Checklist and Permit for Confined Space Entry

**** To be completed for all confined spaces prior to worker entry, after condition change, and prior to each shift*

Confined Space Project/Location			
Competent Person			Print
			signature
Date/Time issued			
Date/Time Expires:			
Job Site:			
Entry Supervisor:			
Confined Space Attendant:			
Authorized Entrants:			
AM	PM	N/A	Removal from Space/Rescue Plan
			1. The entry supervisor and attendant have the authority to cancel permit and remove entrants from the confined space at any time
			2. Rescue tripod, winch and harness on site, inspected and fitted for all entrants
			2. Village Public Safety Officer or Law Enforcement/Rescue informed of entry
			3. Procedures in place for non-entry extraction of non-responsive entrant
			4. Procedures established and communicated for evacuation of space in case of hazardous atmosphere alarm, or other emergency condition
AM	PM	N/A	Lockout-Tagout of Hazardous Energy
			1. Piping valves are locked out and/or blanked and tagged
			2. Electrical supplies are de-energized, locked out and tagged
			3. Barriers are erected around the opening, and traffic control is established
			4. A system is in place to monitor hazards from upstream when they cannot be blocked.
AM	PM	N/A	Hazardous Atmosphere
			1. Gas monitor is turned on 5 minutes before calibration/bump test
			2. Gas monitor is calibrated/bump tested in fresh air environment?
			3. Remotely monitor space using hose or wand for at least 3 minutes. Results recorded on permit
			4. Oxygen concentration is between 19.5% and 23.5%
			5. LEL is less than 10%
			6. H2S is less than 10 ppm
			7. CO is less than 35 ppm
			8. Continuous atmospheric monitoring of space is arranged

			9. Use of compressed gasses and hot-work is not allowed in space
			10. Adequate ventilation is in place, ensuring air intake is away from sources of air contaminants such as internal combustion engines, sewer manholes
AM	PM	N/A	Requirements
			1. One entry attendant assigned with only duty to monitor the employee in the confined space, trained how to contact rescue personnel in case of emergency, and how to operate rescue tripod system
			2. Lighting using intrinsically safe lighting until the space is proven to be free of flammable or explosive atmosphere
			4. Competent person is on-site to supervise the entry
			5. RA-THA has been completed, and entry procedure reviewed with entrants?
			6. Alternate entry procedures are established in Task Hazard Analysis and communicated to crew
			7. All entrants and attendants have documented training on confined space entry

Time	Atmospheric Checklist: % O2 / %LEL / H2S ppm / CO ppm
Calibration date	
Tester Signature:	

Classroom activity 6 Tripod/ventilation/harness/gas meters

Assembly and inspection

Tripod



Specifications:

- Brand: DBI-SALA
- Trade Name: Advanced
- Product Type: Tripod System
- Cable Length: 60 ft.
- Cable Outside Diameter: 1/4 in
- Includes: 7 ft. aluminum tripod; Winch with 60 ft. galvanized steel rope; Mounting bracket; Carrying bag; RFID tracking; Swiveling snap hook
- Standards Met: ANSI Z117.1-1995, OSHA 1910.146, U.L. Classified 41Y7, Capital Safety Gen. Mfg. Req.
- Color: Silver, Black, Anodized Yellow
- Package Quantity: 1 per case

Inspection:

- Check of the braking mechanism, the cable, the device housing, labels, load indicator, and hardware like the snap hook. The device's instruction manual will give details on what to inspect and how to inspect it.
- If the inspection of the winch or self-retracting lifeline reveals any problems (details for these would be in the manual) the device is to be taken out of service. Recertification will be required before the device can be put back into service.

Classroom activity 6 Continued

Davit



Specifications 5-piece davit hoist system

- Integrated 5,000 lb. (22 kN) mast anchorage point
- Fall arrest rated in most davit offset mast positions
- Adjustable offset upper davit mast (model 8518006)
- Telescoping reach of 59.7 to 108cm
- Adjustable vertical height of 83.8 to 109.2cm
- Built-in primary and secondary pulleys
- Quick mount winch/SRL bracket
- Combine up to 2 extensions
- 33 in. (83.8 cm) lower davit mast extension (model 8518002)
- Combine up to 2 extensions
- Base width adjusts from 177.8 to 246.4 cm
- 3-piece adjustable portable base (model 8518008)
- Lightweight, corrosion resistant aluminum construction
- Combine up to 2 extensions

INSPECTION:

• **Before each installation**, inspect each system component in accordance with the individual manufacturer's instructions.

Do not use if visible signs of deterioration or damage are present.

• **Before each use**, visually inspect per the following steps:

Step 1. Inspect all structural parts for damage: dents, cracked welds, bent or crushed tubes.

Step 2. Inspect all hardware (pins, tri-screws, adjuster screws, nuts, bolts, pulleys, rollers and winch brackets) for damaged threads, bent, damaged or missing fasteners, or loose fasteners. Check all pulleys and rollers for chips,

grooves and excessive wear. Ensure that all pulleys and rollers turn freely.

Step 3. Inspect all equipment for missing, damaged or otherwise illegible warning stickers. Damaged, missing or otherwise illegible labels must be replaced before using the hoist.

Step 4. Additional equipment such as winches, self-retracting lifelines (SRLs), work positioning or fall-arrest equipment being used with your Hoist System must be installed, inspected, maintained and operated according to the manufacturer's instruction. All installations must be approved to local standards by a qualified person.

Step 5. Do not use the hoist system if inspection reveals an unsafe or defective condition. Repair or replace the system before the next use.

- **Weekly:** Perform a complete visual inspection of equipment as outlined above. Clean equipment as required to thoroughly inspect all welds, labels, pins, fasteners, pulleys, rollers, brackets and parts. Record the inspection date and results in the *'Inspection and Maintenance Log'*. If any problems are found do not use. Return to authorized service center for repair.

- **Annually:** The Hoist System must be inspected by a competent person at least annually. Record the inspection date and results in the *'Inspection and Maintenance Log'*. If any problems are found do not use until equipment has been repaired by an authorized service center. Do not attempt to modify or repair this unit.

Ventilation Unit



Specifications:

- Inline Axial Fan
- Industrial Saddle Vent®
- 15 ft. duct
- 6 ft. duct
- Duct canister (holds 50 ft. of duct)
- 90° elbow for Saddle Vent
- Universal mount

Inspection:

The blower unit should be inspected for loose parts that may injure the worker. Ensure electric blowers are grounded.

Ensure operators are properly trained to use a ventilation unit.

If there is a fire and explosion hazard to use an intrinsically safe blower unit.

Assemble the blower unit according to manufacturer's instructions

Fall harness



Specifications:

- Single back D-ring
- 5-point adjustability
- Standard mating buckle leg straps
- 1 Lanyard Keeper
- 6,300 lb. heavy-duty polyester webbing

Material Specs:

- Webbing: Polyester; Min. 5,000 lbs. tensile strength
- D-Rings: Alloy Steel; Min. 5,000 lbs. tensile strength
- Buckles/Adjusters: Alloy Steel; Min. 3,375 lbs. tensile strength

Performance Specs:

- Tensile Strength: Min. 5,000 lbs.
- Max. Capacity: 425 lbs.

Inspection:

Webbing

Grasp the webbing with your hands and bend the webbing, checking both sides. This creates surface tension making damaged fibers or cuts easier to see. Webbing damage may not show up through a sight (visual) inspect

Visual and Touch Inspection

- Cuts, nicks, tears broken fibers/cracks
- Overall deterioration
- Modifications by user
- Fraying/Abrasions
- Discoloration of Material-Dependent on cause of discoloration-chemical
- Hard or shiny Spots-Indicates heat damage
- Webbing thickness Uneven-Indicates possible fall
- Mildew-Clean harness
- Missing Straps
- Undue Stretching-Indicates possible fall
- Burnt, charred or melted Fibers-Indicates heat damage
- Excessive hardness or Brittleness-Indicates heat or up damage

- Pulled stitching indicates stretching from a fall
- Stitching that is missing
- Hard or shiny Spots-Indicates heat damage
- 8 Cut stitches
- Discoloration of Stitching-Dependent on cause of discoloration

Hardware

- Visual and Touch Inspection
- Distortion (twists, bends)
- Rough or sharp edges
- Rust or corrosion
- Cracks or breaks
- Broken/distorted Grommets-Modification by users (i.e. additional holes)
- Tongue buckle should overlap the buckle frame and move freely back and forth in their socket
- Roller of tongue buckle should turn freely on frame
- Bars must be straight
- All springs must be in working condition

Tagging System

- Every harness must have a legible tag identifying the harness, model, date of manufacture, name of manufacturer, limitations and warnings.
- Check tag for date of manufacture and remove from service if past adopted service life policy tagging system is missing or not legible remove harness from service
- Check weight rating

Fall Harness Inspection Checklist/Logs

Full Body Harness

Harness Model: _____ Manufacture Date: _____

Serial Number: _____ Lot Number: _____ Purchase Date: _____

Comments: _____

General Factors

1. **Hardware:** (Includes D-rings, buckles, keepers, and back pads) Inspect for damage, distortion, sharp edges, burrs, cracks and corrosion

2. **Webbing:** Inspect for cuts, burns, tears, abrasion, frays, excessive soiling and coloration

3. **Stitching:** Inspect for pulled or cut stitches.

4. **Labels:** Inspect, make certain all labels are securely held in place and legible.

5. **Overall Disposition:**

A job well done!

