Introduction

- LSUHSC Policy EHS-400.02
- OSHA 1910.146
- ORM
Purpose

• Working in confined spaces can involve hazards that typically wouldn’t exist in other situations

• Hazards frequently aren’t dealt with because “there have never been any problems before.”
Goals

Understand differences b/w permit and non-permit required spaces

• Understand Permit Entry Procedure

• Understand air monitoring requirements

• Understand roles and responsibilities of all entry personnel

• Provide awareness of LSUHSC CS inventory
What is a Confined Space?

- Has limited or restricted means for entry or exit
- Is not designed for continuous employee occupancy
- Is large enough and so configured that an employee can bodily enter and perform assigned work
Examples of Confined Spaces:

- Tanks
- Manholes
- Boilers
- Furnaces
- Sewers
- Silos
- Hoppers
- Vaults
- Pipes
- Trenches
- Tunnels
- Ducts
- Bins
- Pits
Permit-Required Confined Space

Has one or more of the following characteristics:

- Contains or has the potential to contain a hazardous atmosphere;
- Contains a material that has the potential for engulfing an entrant;
- Has an internal configuration such that an entrant could become trapped or asphyxiated; or
- Contains any other serious safety or health hazard.
Non-Permmit Confined Space

A confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

If all hazards posed by a confined space can be eliminated, the space may be reclassified to a non-permit space.
Potential Hazards in Confined Spaces

**Oxygen Deficiency**
- <19.5% or >23.5% oxygen concentration

**Combustibles**
- Methane
- Hydrogen
- Acetylene
- Propane
- Gasoline fumes

**Toxic Materials**
- Carbon Monoxide
- Hydrogen Sulfide
- Welding fumes
- Corrosives

**Physical Agents**
- Heat Stress
- Radiation
## Potential Hazards in Confined Spaces

### Oxygen Deficiency

<table>
<thead>
<tr>
<th>Oxygen Content (% by volume)</th>
<th>Signs and Symptoms (at Atmospheric Pressure)</th>
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<tbody>
<tr>
<td>19.5%</td>
<td>Minimum permissible levels that work can be performed without respirators. Below this level, workers shall be required to wear supplied air respirators.</td>
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<tr>
<td>17%</td>
<td>Hypoxia symptoms, accelerated breathing and heart rate appear</td>
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<tr>
<td>14-16%</td>
<td>Accelerated breathing, increased heart rate, poor muscular coordination, fatigue, impaired perception and judgment.</td>
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<tr>
<td>12%</td>
<td>Unconsciousness without warning, poor judgment, blue lips</td>
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<td>6-10%</td>
<td>Nausea, vomiting, and unconsciousness; 8 minutes 100% fatal; 6 minutes, 50% fatal; 4-5 minutes, recovery with treatment.</td>
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<tr>
<td>&lt;6%</td>
<td>Coma in 40 seconds, spasmatic breathing, convulsions, and death</td>
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</table>
Carbon Monoxide (CO)

- Colorless, odorless gas
- Slightly lighter than air
- Chemical asphyxiate/Deadly!
- Primary source: incomplete combustion of organic material - gasoline-fueled combustion engines

Potential Hazards in Confined Spaces

Hydrogen Sulfide (H₂S)

- Sewer gas, stink gas (rotten eggs)
- Colorless, flammable gas. Strong odor BUT fatigues your senses.
- Deadly!
- Heavier than air
How do Atmospheric Hazards Occur?

- Previously stored chemicals/products
- Leaks/spills
- Infiltration
- Chemical reactions
- Operations conducted within the space
- Inerting with nonflammable products

- Employees are not to enter spaces with uncontrolled hazardous atmospheres.
Electrical Hazards

• Adverse consequences – burns, involuntary muscle contractions, ventricular fibrillation (irregular heartbeat), cardiac and/or pulmonary arrest

• High voltage - ~> 600 Volts

• Electrical conductors and generators, electrical powered tools

• Commonly controlled through LOTO; equipment inspection, proper grounding
Potential Hazards in Confined Spaces

**Mechanical Hazards**

**Fixed** - blenders, stirrers, mixers, agitators; commonly controlled through LOTO

**Portable** – drills, chipping hammers, grinders, high pressure pneumatic tools; commonly controlled through PPE or securing lines.
Welding and Cutting

- Can produce a wide range of atmospheric, physical and safety hazards

- Continuous ventilation must be provided in the confined space during welding/cutting operations.

- EH&S must be contacted prior to performing welding work in confined spaces in order to consult on procedures
Personal Protective Equipment (PPE)

- Full-body harness and lifeline
- Respirator (half-mask, PAPR, Air-line Respirator, etc.)
- Tyvek Suit
- Gloves (Nitrile, Welding, etc.)
- Safety Glasses/Goggles
- Hearing protection
Identification and Assessment

EH&S, in coordination with FS, shall identify, evaluate, classify, and maintain an inventory

• Permit-required confined spaces - EH&S shall provide a report of the hazard assessment evaluation.

• “DANGER — PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER”
Confined Space Entry Participants
Confined Space Entry Participants

ENTRANT

The employee who will physically enter the confined space to perform the work.
Entrant Responsibilities

- know that the space has been made safe for entry
- be familiar with the work to be performed
- immediately exit a space, upon word of the attendant
- follow all safety rules and procedures that apply to the job.
- be familiar with and use the appropriate PPE whenever necessary
Confined Space Entry Participants

ATTENDANT

The employee who remains outside the confined space and monitors the entry to help ensure safe completion of the operation.
Confined Space Entry Participants

Attendant Responsibilities

- monitors, communicates with and accounts for all entrants
  *may not abandon his post for any reason while personnel are in the space unless relieved by another qualified attendant.
- assesses all hazards in and around the space, and takes action to control as needed.
- orders entrants to exit upon identification of non-permitted conditions
- controls access to the confined space.
- summons emergency assistance as needed – make non-entry rescue efforts
Confined Space Entry Participants

Entry Supervisor

The employee responsible for coordinating the entry into the confined space.
Confined Space Entry Participants

Supervisor Responsibilities

• verify that personnel are aware of hazards associated with the space (tailgate).
• ensure adequate PPE is provided and used
• ensure use of adequate hazard controls
• designate attendant
• verify, prior to entry, that rescue services are available
• complete permit
• verify that all personnel have exited prior to closing the space.
• close out the entry permit and maintain all necessary documentation
• designated by FS
Permit-Required Confined Space Entry Procedure

- Procedure Review
- Space Preparation
  - Isolate the space
- Test the atmosphere
  - Ventilate the space
- Complete permit
- Conduct “Tailgate” meeting
- Enter the space
Written Procedures

- For each permit space, a written procedure must be in place to identify hazards and how to enter safely.
- Completed procedures will be used with the permit or reclassification certificate. Post both at entry point.
Entry Procedure

Space Preparation

- Make the space as clean as possible prior to entry. The goal is to minimize the need for PPE.
- If the purpose of the entry is to clean the space, take whatever measures available to minimize hazards and need for PPE.
Entry Procedure

Space Preparation - Isolate the space from all hazards

- Close Valves
  - Double block & bleed, or blank flange
- Empty the Space
  - Depressurize, vent & drain
- Lockout/Tagout Equipment
  - Electrical sources
  - Rotating/reciprocating parts
  - Hazardous materials
Entry Procedure

Protecting Openings to Confined Spaces

• When opening is in a public walkway, barricades must be set up to protect the pedestrian traffic from all directions.
• Barricades must be lit during hours of darkness.
Entry Procedure

Atmospheric Testing Shall Be Performed:

- Prior to every entry where atmospheric hazards are present or potentially present;
- After a 10-15 minute ventilation period (if ventilation is necessary);
- As needed based on conditions and hazards;
- Performed by EH&S.
Ventilation

Forced ventilation is **required** when:

- Testing indicates a hazardous atmosphere out of acceptable range
- There’s a potential for atmospheric conditions to move out of acceptable range
- The work can cause a hazardous atmosphere, such as welding, cutting, painting, chemical cleaning, etc....
Entry Procedure

Equipment Requirements

- Testing and monitoring equipment
- Ventilating equipment
- Communications equipment
- Lighting equipment
- Barriers
- Equipment needed for safe entry and exit
- Emergency equipment
- Other equipment for safe entry
Entry Permit Form

- authorization and approval in writing that specifies the location and type of work.
- certifies an evaluation of all existing hazards and that necessary protective measures have been taken
- submitted by FS to EH&S for review five days prior to any confined space entry.
Entry Permit Form

shall include:

- name of the confined space being entered
- purpose
- date and duration of the entry permit
- the names of the authorized entrants and attendants, entry supervisor
- the hazards of the space
- available equipment.

Pre-entry atmospheric testing results will be added to the permit on the day of entry, immediately prior to the entry.
Activated by Entry Supervisor’s signature.

- No entry is allowed without a valid permit.
- Permits are valid for duration of single shift or once cancelled, whichever is less.
- When work is completed, cancelled permit and tailgate form should be returned to EH&S - kept on file for at least one year.
Entry Permit Form

• Per policy non-permit space entries require:
  • the completion of permit form
  • Attendant
Entry Procedure

Rescue and Emergency Services

hazard assessment and/or entry permit shall include emergency and rescue procedures

• Self-Rescue
• Non-entry Rescue
• University Police
• Designated fire rescue - NOFD
• Entry rescue is **not permitted**
Entry Procedure

Rescue Equipment

- full body harness (and a retrieval line (if feasible) for entrants
- A mechanical retrieval device (Tripod) shall be available for vertical type permit spaces more than 5 feet deep
- shall be used for all permit space entries unless they increase the overall risk of entry or would not contribute to the rescue
Entry Procedure

When entry is complete:

• Remove all personnel, tools, and debris from the space. Sign off the log.
• Close the space.
• Cancel the permit
Confined Spaces - LSUHSC

- Pipeline tunnel – CSRB
- Cooling towers
- Boilers
- Sump pits
- Crawl spaces
- Tanks
- Utility/sewer/communication manholes
If you have questions regarding this training, contact Darren Burkett at 402-9085 or dburk2@lsuhsc.edu.