CONFINED SPACES

OSHA 29 CFR 1910.146
DANGER

PERMIT-REQUIRED
CONFINED SPACE
DO NOT ENTER

TOXIC, CORROSIVE, STEAM,
FLAMMABLE, LIMITED EXIT, OIL
ELECTRICAL, HAZARDS, SMOKE
CHEMICALS, MOVING MACHINERY, FALLS
LIMITED ENTRY, RADIOACTIVE
AGENTS, NARROW, WET, DARK,
TAPERING, SLIPPERY SURFACES,
UNDERWATER VESSELS, SILOS,
VAULTS, CHLORINE ROOMS,
TANKS

CONFINED SPACES
Examples:

- Tunnels
- Wells
- Manholes
- Cold storage
- Ship Holds
- Subcellars
- Tanks
- Culverts
- Silos
- Vaults
- Open Ditch

Also:

- Boilers
- Furnaces
- Sewers
- Hoppers
- Bins
- Pipes
- Ducts
OVERVIEW OF TRAINING

• EMPLOYEE RESPONSIBILITIES
• OSHA DEFINITIONS - PERMIT VS NON-PERMIT
• DISCUSSION OF CONFINED SPACE HAZARDS
• ENTRY REQUIREMENTS, PERMITS, AND PROCEDURES
Employee Responsibilities

ENTRANT – PERSON ENTERING CONFINED SPACE

ATTENDANT

• STAYS OUTSIDE CONFINED SPACE; ASSISTS ENTRANT IN EXITING
  CONFINED SPACE

• COMMUNICATES WITH ENTRANT; CALLS FOR EMERGENCY
  ASSISTANCE WHEN REQUIRED

SAFETY REPRESENTATIVE – EH&S STAFF

• EVALUATES HAZARDS AND PRESCRIBES PRECAUTIONS

• ISSUES CONFINED SPACE ENTRY PERMIT
OSHA defines two types of Confined Spaces...

(1) Permit Not Required

• LARGE ENOUGH TO BE ENTERED FULLY WITH INTENT TO PERFORM WORK

• RESTRICTED OR LIMITED MEANS OF ENTRANCE OR EXIT

• AREA NOT DESIGNED FOR CONTINUOUS OCCUPANCY
OSHA defines two types of Confined Spaces . . .

(2) Permit Required if Space Also Has One or More . . .

• POTENTIAL TO CONTAIN HAZAROUS ATMOSPHERE; ENGULFING OR ASPHYXIATING SUBSTANCE

• CONFIGURATION FOR POTENTIAL ENTRAPMENT

• ANY RECOGNIZED HAZARD
NON-PERMIT SPACES

- ARE STILL CONFINED SPACES
- REQUIRE TRAINING OF ENTRANT
- REQUIRE TESTING AND HAZARD ASSESSMENT
- NOT FOUND TO CONTAIN OR HAVE POTENTIAL TO CONTAIN ANY HAZARD CAPABLE OF CAUSING DEATH OR SERIOUS PHYSICAL HARM
EXAMPLE: UTILITY TUNNELS

USE ESTABLISHED PROCEDURES

ASSESS POTENTIAL HAZARDS

ALWAYS USE BUDDY SYSTEM

CARRY A TWO WAY RADIO
"NON-PERMIT" SPACES CAN BECOME "PERMIT REQUIRED"

** IMPORTANT **

IF A POTENTIAL HAZARD DEVELOPS!

EXAMPLE: SEWAGE SPILL IN A UTILITY TUNNEL
PERMIT - REQUIRED CONFINED SPACE

• POTENTIALLY HAZARDOUS ATMOSPHERE

• MATERIAL THAT HAS POTENTIAL FOR ENGULFING AN ENTRANT

• INTERNAL CONFIGURATION SUCH THAT AN ENTRANT COULD BECOME TRAPPED OR ASPHYXIATED

• CONTAINS ANY OTHER SERIOUS SAFETY OR HEALTH HAZARD
OXYGEN DEFICIENT ATMOSPHERES

19.5%  MINIMUM ACCEPTABLE OXYGEN LEVEL
15 -19%  DECREASED ABILITY TO WORK STRENUOUSLY; IMPAIRED COORDINATION
12-14%  RESPIRATION INCREASES; POOR JUDGMENT
10-12%  RESPIRATION INCREASES; LIPS BLUE
8-10%  MENTAL FAILURE; FAINTING; NAUSEA; UNCONSCIOUSNESS; VOMITING
6 -8%  8 MINUTES FATAL; 6 MINUTES 50% FATAL; 4-5 MINUTES POSSIBLE RECOVERY
4-6%  COMA IN 40 SECONDS; DEATH
OXYGEN ENRICHED ATMOSPHERES

- OXYGEN LEVEL ABOVE 23% CAUSES FLAMMABLES AND COMBUSTIBLE MATERIALS TO BURN VIOLENTLY WHEN IGNITED
- NEVER USE PURE OXYGEN TO VENTILATE
- NEVER STORE OR PLACE COMPRESSED TANKS IN A CONFINED SPACE
FLAMMABLE ATMOSPHERES

CRITICAL FACTORS

• OXYGEN CONTENT IN THE AIR
• PRESENCE OF A FLAMMABLE GAS OR VAPOR
• PRESENCE OF DUST (VISIBILITY OF 5’ OR LESS)
AIR/GAS MIXTURE CAN LEAD TO EXPLOSION

TYPICAL IGNITION SOURCES

• SPARKING OR ELECTRIC TOOL
• WELDING / CUTTING OPERATIONS
• SMOKING
Toxic atmospheres may result from products stored in confined space. This includes:

- Gases released when cleaning
- Materials absorbed into walls of space
- Decomposition of materials in space
TOXIC ATMOSPHERES MAY RESULT FROM

WORK PERFORMED IN OR ADJACENT TO CONFINED SPACE

- WELDING, CUTTING, BRAZING, SOLDERING
- PAINTING, SCRAPING, SANDING, DEGREASING
- SEALING, BONDING, MELTING
Kinda smells like rotten eggs don't it?
**HYDROGEN SULFIDE**

- **DECOMPOSITION OF MATERIALS**
- **ROTTEN EGG ODOR AT LOW CONCENTRATIONS**
- **POSSIBLY NO WARNING AT HIGH CONCENTRATIONS**

<table>
<thead>
<tr>
<th>PPM</th>
<th>EFFECT</th>
<th>TIME</th>
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</thead>
<tbody>
<tr>
<td>10 PPM</td>
<td>PERMISSIBLE EXPOSURE LEVEL</td>
<td>8 HOURS</td>
</tr>
<tr>
<td>50 - 100</td>
<td>MILD IRRITATION EYES, THROAT</td>
<td>1 HOUR</td>
</tr>
<tr>
<td>200 – 300</td>
<td>SIGNIFICANT IRRITATION</td>
<td>1 HOUR</td>
</tr>
<tr>
<td>500 - 700</td>
<td>UNCONSCIOUSNESS, DEATH</td>
<td>1/2 - 1 HOUR</td>
</tr>
<tr>
<td>&gt;1000</td>
<td>UNCONSCIOUSNESS, DEATH</td>
<td>MINUTES</td>
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Invisible Poison

Carbon monoxide poisoning: a year-round danger
# Carbon Monoxide

- **Odorless, Colorless Gas**
- **Combustion Byproduct**
- **Quick Collapse at High Concentrations**

<table>
<thead>
<tr>
<th>PPM</th>
<th>Effect</th>
<th>Time</th>
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<tbody>
<tr>
<td>50</td>
<td>Permissible Exposure Level</td>
<td>8 HOURS</td>
</tr>
<tr>
<td>200</td>
<td>Slight Headache, Discomfort</td>
<td>3 HOURS</td>
</tr>
<tr>
<td>600</td>
<td>Headache, Discomfort</td>
<td>1 HOUR</td>
</tr>
<tr>
<td>1000 – 2000</td>
<td>Confusion, Nausea, Headache</td>
<td>2 HOURS</td>
</tr>
<tr>
<td>1000 – 2000</td>
<td>Tendency to Stagger</td>
<td>1 1/2 HOURS</td>
</tr>
<tr>
<td>1000 – 2000</td>
<td>Slight Heart Palpitation</td>
<td>30 MIN.</td>
</tr>
<tr>
<td>2000 – 2500</td>
<td>Unconsciousness</td>
<td>30 MIN</td>
</tr>
</tbody>
</table>
TEMPERATURE EXTREMES

- EXTREMELY HOT OR COLD TEMPERATURES
- STEAM CLEANING OF CONFINED SPACES
- HUMIDITY FACTORS
- WORK PROCESSES INSIDE CONFINED SPACE CAN INCREASE TEMPERATURE EXTREMES
- PERSONAL PROTECTIVE EQUIPMENT
ENGULFMENT
ENGULFMENT HAZARDS

- LOOSE, GRANULAR MATERIALS STORED IN BINS AND HOPPERS (GRAIN, SAND, COAL, ETC.)
- VISCOSE LIQUIDS
- FLOODING OF CONFINED SPACE
- WATER OR SEWAGE FLOW

ACTUAL INCIDENTS INCLUDE:
- CORN GRAIN
- SAND
- MOLASSES
- CHOCOLATE
- PAINT
- OIL
Noise

AMPLIFIED DUE TO ACOUSTICS WITHIN THE SPACE

DAMAGES HEARING, AFFECTS COMMUNICATION
WET AND SLIPPERY SURFACES

• SLIPS AND FALLS

• ELECTRIC SHOCK HAZARD
FALLING OBJECTS

TOPSIDE OPENINGS MAY EXPOSE WORKERS INSIDE CONFINED SPACE TO FALLING OBJECTS
ELECTROCUTION
ENTRAPMENT
ENTERING A CONFINED SPACE
TRAINING REQUIREMENTS

• WORKERS WHO ENTER CONFINED SPACES
• ATTENDANTS AND RESCUE TEAM MEMBERS
• PRIOR TO INITIAL WORK ASSIGNMENT

RETRAINING

• WHEN JOB DUTIES CHANGE
• CHANGE IN PERMIT SPACE PROGRAM
• NEW HAZARDS IDENTIFIED
• ANNUAL REFRESHER
ATMOSPHERE
Then...
Now!
• VERIFY A SAFE ATMOSPHERE IN ALL AREAS OF THE CONFINED SPACE

REMEMBER:
MUST HAVE SUFFICIENT O2
TAKE VERTICAL MEASUREMENTS
CARBON MONOXIDE IS SAME DENSITY AS AIR
HYDROGEN SULFIDE IS HEAVIER THAN AIR
 METHANE IS LIGHTER THAN AIR

• ASSESS POTENTIAL HAZARDS

  PHYSICAL
  CHEMICAL
  ELECTRIC

• FILL OUT THE REQUIRED PERMIT

CONTACT EH&S AT 479-575-5448
• VENTILATION IS FIRST OPTION
• CONTINUOUS VENTILATION WHENEVER POSSIBLE
• RETEST THE CONFINED SPACE BEFORE ENTRY
• CONTINUE TO MONITOR ATMOSPHERE
RESPIRATORS

- AIR PURIFYING RESPIRATORS FILTER DANGEROUS SUBSTANCES FROM THE AIR

- MUST KNOW TYPE AND CONCENTRATION OF HAZARDOUS SUBSTANCE PRESENT

- NEVER USE WITH OXYGEN DEFICIENT ATMOSPHERE!
RESPIRATORS

• AIR SUPPLYING RESPIRATORS DELIVER A SAFE SUPPLY OF BREATHING AIR FROM A TANK OR UNCONTAMINATED AREA NEARBY

• MUST BE ADEQUATELY MONITORED

• MUST BE FIT-TESTED BEFORE WEARING RESPIRATOR
ASSESS OTHER HAZARDS

IDENTIFY

EVALUATE

CONTROL

REVIEW
HAZARDS
IMPLEMENT HAZARD CONTROLS

Hierarchy of Controls

ELIMINATION
SUBSTITUTION
ENGINEERING
ADMINISTRATIVE
BEHAVIOR
PPE
ISOLATE HAZARDS WHEN POSSIBLE

• LOCK AND TAG OUT ELECTRICAL SOURCES

• BLANK AND BLEED PNEUMATIC AND HYDRAULIC LINES

• DISCONNECT MECHANICAL DRIVES AND SHAFTS

• SECURE MECHANICAL PARTS

• BLANK SEWER AND WATER FLOW
PERSONAL PROTECTIVE EQUIPMENT

- Eye
- Head
- Face
- Ear
- Respiratory
- Hand / Body
- Foot
PERMIT

WRITTEN PERMIT FILLED OUT BY EH&S

VERIFIES PRE-ENTRY PRECAUTIONS HAVE BEEN TAKEN AND SPACE IS SAFE TO ENTER

POSTED AT ENTRY TO CONFINED SPACE

SPECIFIES APPARENT HAZARDS AND CORRECTIVE ACTIONS TAKEN PRIOR TO ENTRY

REQUIRES TERMINATION OF PERMIT WHEN TASK IS COMPLETED OR WHEN NEW CONDITIONS EXIST
PERMIT INFORMATION

- DATE, LOCATION, AND TYPE OF CONFINED SPACE
- PURPOSE OF ENTRY AND KNOWN HAZARDS
- DURATION OF ENTRY PERMIT TIME
- AUTHORIZED ENTRANTS, ATTENDANTS, SUPERVISORS
- AIR TESTING RESULTS - SIGNATURE OF TESTER
- PROTECTIVE MEASURES TAKEN

VENTILATION
ISOLATION
FLUSHING
LOCKOUT/TAGOUT
PURGING
PERMIT INFORMATION

• NAME AND PHONE NUMBERS OF RESCUE AND EMERGENCY SERVICES

• COMMUNICATION PROCEDURES

• SPECIAL EQUIPMENT AND PROCEDURES

PERSONAL PROTECTIVE EQUIPMENT
RESCUE EQUIPMENT
RESPIRATORS
ENTRY AND EXIT OF CONFINED SPACES

• MEANS MUST BE PROVIDED FOR BOTH SAFE NORMAL ENTRY OR EXIT AND EMERGENCY EXTRICATION

• TRIPODS WITH HOIST, LIFELINE, AND FULL BODY HARNESS OFTEN USED FOR EMERGENCY EXTRICATION

• LADDERS MAY BE USED FOR ORDINARY ENTRY AND EXIT
HOLES AND OPENINGS CLOSED OR GUARDED WHEN NOT ATTENDED

BARRIERS TO PREVENT PASSERS-BY AND THE CURIOUS FROM FALLING INTO OPENING

WARNING SIGNS WHERE PEDESTRIANS CAN SEE THEM
SHOULD CONDITIONS DEVELOP THAT REQUIRE EXTRICATION, AND THE ENTRANT CANNOT GET OUT OF THE CONFINED SPACE ON HIS OR HER OWN, THE ATTENDANT MUST CALL FOR EMERGENCY ASSISTANCE AT ONCE!

911
• ATTENDANT SHOULD ATTEMPT TO REMOVE ENTRANT FROM CONFINED SPACE USING TRIPODS, HOISTS, AND LIFELINES

• LETHAL HAZARDS MAY BE PRESENT WITHIN SPACE

• ATTENDANTS ARE NOT TO ENTER SPACE!

• ONLY PROPERLY EQUIPPED AND TRAINED EMERGENCY RESCUE PERSONNEL MAY ENTER CONFINED SPACES TO MAKE RESCUES
REMEMBER!

DANGER

CONFINED SPACE ENTRY CAN BE FATAL
FOLLOW ALL CONFINED SPACE ENTRY PROCEDURES

CONFINED SPACE ENTRY Shouldn't Be A One Way Trip
THE END