The NFPA 350 Guide for Safe Confined Space Entry and Work!
Objectives

- Explain the background and vision for the new NFPA 350 document on confined spaces
- Highlight some of the ways NFPA 350 addresses confusion and gaps identified in existing standards
- Explain how you can provide input into the document
- Show you how to access NFPA 350
Have we “solved” the confined space entry problem?
Two workers killed in Wayne County industrial accident

GOLDSBORO, N.C. — Two workers died and a third was injured Monday after an industrial accident at the SPX Transformer Solutions Inc. plant in Wayne County.

Authorities said that emergency personnel were called to the Goldsboro plant at 6 p.m. An employee who had been working in a large transformer became unresponsive. Two other employees then entered the transformer to help the first employee and both became unresponsive as well.
Modelo Brewery Accident Leaves Seven Dead In Mexico City

5 killed in methane gas accident on Virginia dairy farm
Poisonous fumes accumulated in manure pit

BRIDGEWATER, Va. — Deadly methane gas emanating from a dairy farm’s manure pit killed five people: a Mennonite farmer who climbed into the pit to unclog a pipe, and then in a frantic rescue attempt that failed, his wife, two young daughters, and a farmhand who tried to help.

“They all climbed into the pit to help,” Sheriff Donald Farley said. “Before they hit the floor, they were probably all dead.”

Farmers typically take pains to ventilate manure pits where methane often gathers. A family member questioned whether cattle feed could have trickled into the pit and accelerated the formation of the gas.

UPDATE: Man Dies After Fall at Sunnyside Corp in Wheeling
Rescue crew dies on course in Wheeling Thursday attempting to rescue or recover a member of the clean crew who fell into a tank.

Man rescued from fuel storage tank in Green Bay

Lancaster, Pa — Maryland officials are investigating the deaths of a Peach Bottom man and two of his sons in a manure pit to make sure the farm met all workplace safety requirements.

The Maryland Occupational Safety and Health agency is interviewing the workers and owners of Centodex Farm, a 200-acre dairy farm in Kennardsville, a spokeswoman said Tuesday.

Sharon戴 worked with the state’s Department of Labor Licensing and Regulation said such investigations are standard practice after a workplace injury or death.

The bodies of Glen R. Hitt, 48, and his sons Kevin R., 18, and Cleason S., 14, were found in a 30-foot deep manure pit on the farm on May 24.

Maryland state police have said the three died of asphyxia. The death were ruled accidental by the Office of the Chief Medical Examiner in Baltimore.

In addition, the body of Cleason Hitt had injuries believed to have been inflicted by a large propeller on the end of an auger that circulates the liquid manure in the pit.

State investigating death of Napa worker found in wine tank

ASSOCIATED PRESS
Published: Friday, April 22, 2011 at 4:30 p.m.
Last Modified: Friday, April 22, 2011 at 4:30 p.m.

NAPA — California occupational safety and health officials are investigating the death of an assistant winemaker at a Napa winery.

Cal-OSHA spokeswoman Krisann Chasarik said Friday that 45-year-old Gustavo Muro died at Ancien Wines apparently while transferring wine from a small tank to a larger tank Wednesday evening.

Chasarik says preliminary information indicates that Muro died after falling into a 6-foot tank while making sure wine was being moved to the larger 1,500-gallon tank.

Man rescued from silo of cement powder in Holden
Worker trapped at R.J. Paquette Concrete yard

CSB: DuPont Overlooked Hazards in Fatal Welding Explosion
DuPont failed to require monitoring of the interior of storage tanks on which hot work is to be performed, according to a draft report from the U.S. Chemical Safety Board (CSB) released April 19 at a news conference in Buffalo. This failure was the primary reason for an explosion that killed one and injured another contract welder on Nov. 9, 2010.

Sandy Smith
The Numbers

• 2005-2009 Department of Labor almost 2 deaths per week, ~ 96 per year. Does not include injuries or illnesses.

• ~ 61% occurred during construction, repair or cleaning activities

• In the past statistics showed the majority of confined space fatalities were the result of atmospheric hazards.

• Statistics from 2005-2009 appear to indicate that the scales have tipped and more died from safety related hazards.
Grain Bin Engulfment

In 2010 alone 26 workers were killed in grain engulfments.

A center grain unloading auger draws grain from the top center and the grain forms a cone as the bin is emptied.
Background NFPA 350 Guide for Confined Space Entry and Work

- OSHA regulations performance based standard tells “what” to do, not “how” to do it.

- Need something to translate the requirements into practical guidance.

- Confusion surrounding the terminology, gaps identified

- NFPA has solid track record of success with marine chemist program for confined space entry, NFPA 306 Standard for Control of Hazard on Vessels. Also has several standards on Rescue and Rescue Qualifications. Many incidents related to flammable atmospheres and hot work.
First meeting of Committee held in Philadelphia September 2012

Preliminary Draft to NFPA Standards Council Approved August 2013

Document was posted for public input, revised again, the posted for public comment, revised again.

Document has just been released, November 2015.
Key Confined Space Standards in US

- **ASSE Z117.1 Safety Requirements for Confined Spaces (1977)**
  This standard provides *minimum* safety requirements to be followed while entering, exiting, and working in confined spaces at normal atmospheric pressure.

- **OSHA Permit-Required Confined Space Standard 1910.146 (1993)**
  This standard describes *minimum* safety and health program management practices for a permit-required confined space.

- **Confined Space in Construction 1926.1200-1926.1213(2015)**
  This subpart provides *minimum* safety and health requirement and procedures to protect employees who work in confined spaces. It addresses how to protect employees from confined-space hazards.
OSHA 1910.146-Performance Based

- Identify permit-required confined spaces
- Determine acceptable entry conditions
- Test atmosphere
- Ventilate if needed
- Train
- Written Program
- Three roles, entrant, attendant, entry supervisor
- Develop procedures for rescue
What are some of the problems with performance based standards?
NFPA 350 Guide for Safe Confined Space Entry and Work

• Guide, not a standard (should vs shall)

• "How To" versus performance

• Provides cross references to related confined space documents

• Document designed to be used in its entirety OR specific chapters can be used on their own.
Goal of NFPA 350

- Do not want to conflict with OSHA
- Provide guidance on best practices
- Eliminate confusion over terminology
- Address recognized gaps
- Supplement information in existing recognized standards
NFPA 350 - Scope

• Provide information to protect workers who enter confined spaces in all settings

• Supplement existing confined space regulations, standards, and work practices with additional guidance for safe entry and work

• Provide guidance on identifying, evaluating, assessing, eliminating and controlling hazards
NFPA 350 Table of Contents

- Administration
- References
- Definitions
- Identification of Spaces
- General
- Hazard Identification
- Atmospheric Monitoring
- Hazard Elimination/Control
- Ventilation
- Rescue
- Training and Competencies
- Written Program
- Permits
- Recordkeeping
- Management of Change
- Prevention through Design
Issues Identified as Causing Confusion

• Confusion over *permit-required* versus confined spaces

• Terminology “*non-permit*” spaces implies nothing to be done

• Confusion over use of *Reclassification* and *Alternate* procedures
• How can the same space be a confined space one day, a permit required confined space the next??

• How can a space that was entered using alternate procedures now need a permit??
Day One
Worker entering water pump vault to visually check for leaks in lines.

Day Two
Worker entering water pump vault to repair line by welding
Problem Identified-Confined Space versus Permit-required Confined Space

• All confined spaces have potential to become permit-required confined spaces.

• Proposed solution-Use only the term confined space in the document then establish the requirements based on the presence or absence of hazards!
Another Issue That Causes Confusion

OSHA allows for three type of permit-required confined space entries depending on the hazards:

1) Alternate procedures entry
2) Reclassification to non-permit confined space
3) Full permit entry

The procedures and requirements are different for each of these three different entries.
## Three Types of Entries Under OSHA

<table>
<thead>
<tr>
<th>Type of Entry</th>
<th>Hazards</th>
<th>What Documentation is Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternate Procedures Entry</td>
<td>Safety hazards eliminated. Only atmospheric hazards remain (controlled by ventilation).</td>
<td>Need a <strong>certification that includes date, location, signature</strong> of person making the determination.</td>
</tr>
<tr>
<td>Reclassification Entry</td>
<td>No hazards—all eliminated.</td>
<td>Need a <strong>certification that includes date, location, signature.</strong></td>
</tr>
<tr>
<td>Permit Entry</td>
<td>Hazards remain.</td>
<td>Permit listing control measures, acceptable entry conditions, atmospheric monitoring, rescue, communication. Need a <strong>certification that includes date, location, signature.</strong></td>
</tr>
</tbody>
</table>
Solution

• Pre-entry evaluation for all confined spaces.

• Use one form-Pre-entry Evaluation/Permit.

• All entries undergo the same evaluation.
Pre-Entry Evaluation for All Spaces

• Checklist that walks you through the hazards and potential hazards of the space and helps you determine what controls are needed.

• “Formalizes” what was already being done to determine if alternate procedures or reclassification could be used.

• Atmospheric test done prior to entry into all confined spaces to verify that space is safe to enter.
A key component of the pre-entry evaluation is to monitor the atmosphere of all confined spaces-default position.
Assume the Dog will Bite!
**Pre-Entry Evaluation Form / Permit**

### CONFINED SPACE Pre-Entry Evaluation

1. **Location of confined space**
   - Additional descriptive info: Location, size, access, etc.

2. **Date issued**
   - Time of entry ordered
   - Time permit expires

3. **Description of entry to be made**
   - Initial confined space safe work evaluation:
     - "Yes" means the entry is not permitted until hazards are identified and mitigated by a permit and authorized entry supervisor.
     - "No" means the entry is not permitted.

### HAZARD IDENTIFICATION

- **Inherent hazards**
- **Extraneous hazards**
- **Adjacent hazards**

<table>
<thead>
<tr>
<th>Mechanical/structural hazards</th>
<th>Explosive or flammable materials</th>
<th>Chemical or biological hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inherent</strong></td>
<td><strong>Extraneous</strong></td>
<td><strong>Adjacent</strong></td>
</tr>
<tr>
<td>Physical</td>
<td><strong>Inherent</strong></td>
<td><strong>Extraneous</strong></td>
</tr>
<tr>
<td>Pressure</td>
<td><strong>Inherent</strong></td>
<td><strong>Extraneous</strong></td>
</tr>
<tr>
<td>Chemical</td>
<td><strong>Inherent</strong></td>
<td><strong>Extraneous</strong></td>
</tr>
</tbody>
</table>

### ACQUIRING SPACE ENTRY PERMIT

- **Energy sources**
  - **Inherent hazards**
  - **Extraneous hazards**
  - **Adjacent hazards**

### ATMOSPHERIC HAZARDS

- **Personal protective equipment required**
  - **Respiratory**
  - **Eye**
  - **Face shield**
  - **Hearing**
  - **Other**

### TESTER INITIALS:

- **Personal protective equipment required** (for all, either check the box or circle "N/A")
  - N/A Head protection
  - N/A Foot protection
  - N/A Body protection
  - N/A Respiratory protection
  - N/A Other protection

### COMMUNICATIONS:

- **Rescue** (for all, either check the box or circle "N/A")
  - N/A Emergency responder is N/A.
  - N/A Emergency response team has been notified.
  - N/A Emergency response team has not been notified.

### EMERGENCY CONTACT:

- **Name of employer**
- **Address**
- **Telephone number**

---

*NFPA 358, 1 of 5*
In Summary: Alternate Procedures/ Reclassification

• If we call all spaces CONFINED spaces and

• If we require a pre-entry evaluation for all spaces then

• We can identify the hazard (or lack thereof) and list controls required without concern about the terminology. Signed form required for alternate procedures and reclassification is essentially now the pre-entry evaluation or permit form!
Start

Is the space large enough to enter and perform work?

This is not a confined space

Does the space have restricted means of entry or exit?

Is this a space NOT designed for continuous human? occupancy?

Pre-Entry Evaluation is needed per NFPA 350

Are there inherent, introduced, or adjacent mechanical, electrical, pneumatic/hydraulic fluid, gas, chemical, or biological hazards present?

Perform atmospheric monitoring

Levels outside of established parameters?

Recallification

Alternate Procedures

Permit Entry

Inherent Hazard: Hazards that exist as a permanent, essential characteristic or attribute of the space.

Introduced Hazard: Hazards not normally associated with the space’s purpose or processes but are brought into the space or adjoining area(s) deliberately or inadvertently.

Adjacent Hazard: Hazard that may exist in the area(s) surrounding the space.
Gap Identified-Insufficient Guidance on Atmospheric Monitoring

- How to select gas monitor
- Calibration, zeroing, function tests and bump testing
- Monitor limitations- LOD, interferences, tubing, etc.
- Atmospheric conditions- Acceptable Levels of Entry-O2 (19.5-22%)
- Qualified Gas Tester (person doing the monitoring)
Gap Identified-Insufficient Guidance on Ventilation

- Limitations on use of natural ventilation
- Selection and design of ventilation
- Selection related to contaminant type
- Types of ventilation equipment
- Configuration of equipment-diagrams
Guidance on the Use of Supply versus Exhaust Ventilation

• Depends on type of atmosphere

• Do not use supply when above UFL
  – Do not want to bring flammables into the LFL-UFL range
  – Inerting

• Do not use supply for highly toxics-
  – need to control where they are exhausted to and may need to scrub exhaust
Gap Identified-Insufficient Guidance on Hazard Identification

- Inherent
- Introduced
- Adjacent Hazards

- Guidance on information gathering, types of hazards and how to evaluate the hazards
Adjacent Hazards

Nov 2012 Fatality inside Methylene Chloride tank-Cleaning near opening. Medical examiner said 37 year old worker fell into tank first.

Posting of Inerted Atmospheres

DANGER DO NOT ENTER
INERT GAS ENVIRONMENT ATMOSPHERE
UNSAFE FOR WORKERS
INSUFFICIENT OXYGEN FOR BREATHING
PERMIT REQUIRED FOR ENTRY
Gap Identified-Insufficient Guidance on Hazard Elimination and Control

- Hierarchy of controls
- Removal of hazardous materials
  - washing
  - vapor freeing
  - inerting
- Energy control
  - isolation specialist
- Hot Work
- Portable equipment
- Bonding, grounding
- Fall Protection
- Lighting
Gap Identified - Additional guidance on Rescue is needed

• NFPA 350 provides organizational elements of emergency preparedness that are normally in place in a fire department but not necessarily in a facility rescue program.

• Works with NFPA 1670 for technical aspects of rescue

• Retrieval configuration considerations

• Provides tiered approach to response

• Pre-incident planning and evaluation

• Rescue gear

• Rescue competencies
Entry Rescue-Tiered Approach

- **Tier 1** - No recognized hazards or all hazards have been controlled. Rescue team does not need to be on site at the time of the entry.

- **Tier 2** - No immediate life-threatening hazards but have other hazards that could incapacitate a worker. Rescue team should be available on site.

- **Tier 3** - Actual or potential life-threatening emergency possible. Rescue team on site, set up and capable of immediate rescue.
Gap Identified—Competencies/qualifications of those involved in confined space activities

- Gas Tester
- Ventilation specialist
- Isolation specialist
- Standby workers
- Owner operators
- Contractor/Subcontractor
- Rescue
Gap Identified - Management of Change (MOC)

- Many confined space incidents related to change.
- MOC system identifies and evaluates potential impacts for modifications to confined space configurations, equipment, materials, content, work tasks.
- MOC form to verify that impacts of change have been considered.
Gap Identified- Prevention through Design (PtD)

• Study done shows 37% of workplace fatalities involved DESIGN related issues.

• Another 14 % fatalities DESIGN may have played a role.

• ~5800 workplace fatalities per year.... Do the math
Prevention through Design

- Platform must provide adequate work space to operate and maintain equipment—contact operating division for specific requirements.
- Railings required, see guideline.
- Stairway access required to working platform level, see stairway guideline for requirements.
- Lights and ventilation turn on automatically when door or hatch opened (preferred) or operable from exterior switch by door.
- Include instrumentation to verify ventilation is working.
- Locate lights in easily accessible location for changing bulbs.
- Hatch must be sized to provide adequate head clearance—70" recommended, 6' 6" minimum.
- Stairs and other infrequently accessed, small, confined spaces may have ladder access only.
- Recommended stair access to bottom of vault ladder access permitted where stairs not feasible.
- Ventilation provided at multiple levels for sufficient mixing and fresh air supply.

City and County of San Francisco
Public Utilities Commission
Health and Safety Program

Valve Vaults (Water System Only)

NFPA
New OSHA Construction Confined Space Standard  1926 Subpart AA

- Entry Employer (Entrant Employer)
- Competent Person evaluates spaces
- Continuous Monitoring
Codes and Standards Development and Revision

• NFPA 350 2016 edition is now available (released in November 2015)

• NFPA documents are developed through a consensus standards process approved by the American National Standards Institute (ANSI).

• Takes ~ 2 years and 2 drafts to complete a revision

• NFPA 350 will be revised every 3-5 years!!!
How to get involved in future revisions

• All committee meetings open to the public.

• Document will be put out for public input shortly after published. Go on website, click on section you want to suggest change or add new section and provide substantiation for that change.

• All public inputs must be considered by the Committee.

• Document will then be revised and will go out for second round of review. Can submit comments to the proposed changes.
Accessing NFPA Documents On-Line

• All NFPA documents are available free of charge for viewing on-line. Or can purchase in pdf or paper copy.

• Do NOT need to be an NFPA member, but DO need to set up an account with your email and password.

www.nfpa.org/# For example- www.nfpa.org/350
What is NFPA 350?
Official document scope

What does NFPA 350 address?

Articles and Reports
On-Duty Firefighter Fatalities Involving Confined Spaces, 2003-2012 (PDF, 52 KB)
Disaster Resiliency and NFPA Codes and Standards

News about NFPA codes and standards

- NFPA members: register for next Office Hours live event about NFPA 1 Fire Code
- The new issue of NFPA Journal discusses accessibility issues
- 'In a Flash' in the new NFPA Journal looks at how some school security trends are worrying fire and life safety officials
- Submit public input online for NFPA Standards in the Fall 2017 revision cycle

Subscribe to this Feed
HEADLINES BY FEEDBURNER
Thank You!
npearce@nfpa.org
www.nfpa.org/350

Questions or Comments??