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

Rocky Mountain AIHA/ASSE Fall Conference
September 17, 2015
Nancy Pearce, CIH, Senior Fire Protection Engineer, NFPA
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?
Modelo Brewery Accident Leaves Seven Dead In Mexico City

Reuter's

Posted: 04/09/2013 12:30 pm EDT | Updated: 04/09/2013 12:20 pm EDT

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

BRIDGEWATER, Va. — Deedly methane gas emanating from a dairy farm's manure pit killed five people: a Mennonite farmer who climbed into the pit to unplug a pipe, and then 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.” Farm workers typically undertake 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 spent hours in Wheeling Thursday attempting to rescue or recover a member of the chemical crew who fell into a tank.

Friday, July 13, 2012

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

Maryland Agency Investigating Manure Pit Deaths

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 Centennial Farm, a 200 acre dairy farm in Kennethville, a spokeswoman said Tuesday.

Shannon Davis of the state's Department of Labor Licensing and Regulation said such investigations are standard practice after a workplace injury or death.

The bodies of Earnest W. Nott, 48, and his sons Kevin R., 18, and Clesson S., 14, were found submerged in a 20 foot deep manure pit on the farm on May 24.

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

In addition, the body of Clesson Nott had injuries believed to have been suffered 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 spokesman Kristan Chasakir said Friday that 43-year-old Gustavo Muro died at Ancien Wines apparently while transferring wine from a small tank to a larger tank Wednesday evening.

Chasakir 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.

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
CSB-Confined Space Injury and Fatalities in a Flammable Atmosphere 1993-May 2009
Background NFPA 350 Guide for Confined Space Entry and Work

- NFPA has history of dealing with confined spaces.
- Since 1922-NFPA 306 Standard for Control of Gas Hazards on Vessels (marine chemist origin)
- Aboveground and underground storage tanks – NFPA 326 Standard for the Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair
- Operations and Training for Technical Search and Rescue Incidents – NFPA 1670
- Rescue Technician Professional Qualifications – NFPA 1006
- Many confined space fatalities relate to flammable atmospheres
Background NFPA 350 Guide for Confined Space Entry and Work

• CSB noted gaps in existing confined space requirements related to hot work

• OSHA regulations performance based and did not provide guidance on “HOW TO”

• NFPA has solid track record of success with marine chemist program for confined space entry

• NFPA Standards Council approved new project for confined space entry in 2007
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.

Will be released in 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.
NFPA 350 Guide for Safe Confined Space Entry and Work

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

• Provide information to protect workers who enter confined spaces

• 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
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
Why the confusion?

• 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??
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!
I'll not,
but, I'll change you, if I can

from using rough, tough swear
words, even a diet, little damn

Cuss Bank.
Basic document Tenet

• **All** spaces that meet OSHA definition of confined spaces are confined spaces

• **All** confined spaces must undergo a pre-entry evaluation in order to determine if a hazard

• **If** a hazard found on the pre-entry evaluation then a permit is needed-BUT it is still just called a confined space!
Another Basic Document Tenet
Pre-Entry Evaluation for All CS

Part of the pre-entry evaluation is atmospheric monitoring. Default is to monitor.
Assume the Dog will Bite!
Confusion over Terminology-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!
Example Alternate Procedures in NFPA 350

• CS with only a potentially hazardous atmosphere.

• Pre-evaluation, you will determine that the only hazard is atmospheric

• Then go to permit form and will end up with a signed document that only requires atmospheric monitoring

• Safety hazards will be not applicable
Example-Reclassification Procedures in NFPA 350

• Have a confined space where all hazards have been eliminated.

• Go through pre-evaluation and determine that no hazards exist

• Will end up with a signed pre-entry evaluation form

• No permit needed
Confined Space Flowchart

Start

Is the space large enough to enter and perform work?

Yes

Does the space have restricted means of entry or exit?

Yes

Is this a space designed for continuous human occupancy?

No

Pre-Entry Evaluation is needed per NFPA 350

Yes

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

No

Perform atmospheric monitoring

Yes

Full Confined Space Permit needed

Sign Pre-Evaluation Form; No permit needed

Levels outside of established parameters?

No

Yes

Full Confined Space Permit needed

Pre-Entry Evaluation is needed including atmospheric monitoring

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.
# Pre-Entry Evaluation Form / Permit

## CONFINED SPACE Pre-Entry Evaluation

<table>
<thead>
<tr>
<th>Location of confined space</th>
<th>Additional description (Ex: location #, risk assessment #, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Description of confined space (Tank #, manhole, etc.)</th>
<th></th>
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<tbody>
<tr>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Date issued</th>
<th>Time of entry/issued</th>
<th>Time permit expires (Max duration = h)</th>
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<tr>
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<table>
<thead>
<tr>
<th>Description of work to be done</th>
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</table>

Initial confined space safe work evaluation. If "Yes" is indicated for any of the questions, entry is not permitted until hazards are identified and mitigated by use of the permit and authorized Entry Supervisor.
If "No" is indicated for every question, work may proceed.

Evaluation signature: 
If any condition change, work shall stop and the supervisor shall be contacted.

## HAZARD IDENTIFICATION

<table>
<thead>
<tr>
<th>Hazards present or potentially present (indicate &quot;Yes&quot; or &quot;No&quot; in every box)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inherent hazards</td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td>Mechanical/electrical (springs, elevated parts, electric &gt;50 volts)</td>
</tr>
<tr>
<td>Physical engulfment by material</td>
</tr>
<tr>
<td>Pneumatic/hydraulic (fluids/gases) (lifts, agitators, etc.)</td>
</tr>
<tr>
<td>Chemical/biological/atmospheric</td>
</tr>
</tbody>
</table>

**Note:** Atmospheric monitoring should be conducted before assessment of the space to determine no potential hazardous atmosphere hazard.

**Note:** Insert parameters and document here.

## CONFINED SPACE ENTRY PERMIT

<table>
<thead>
<tr>
<th>ENERGY SOURCES (examples)</th>
<th>Hazards present or potentially present (check all that apply)</th>
<th>HAZARD CONTROLLED BY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>If additional permits are used, indicate here in addition to other controls.</td>
</tr>
</tbody>
</table>

If additional permits are used, indicate here in addition to other controls.

<table>
<thead>
<tr>
<th>Mechanical/electrical (springs, elevated parts, etc.)</th>
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<tbody>
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<table>
<thead>
<tr>
<th>Electrical (motors, agitators, etc.)</th>
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</table>

<table>
<thead>
<tr>
<th>Pneumatic/hydraulic (lifts, agitators, etc.)</th>
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<table>
<thead>
<tr>
<th>Fluid/gases (CIP lines, nitrogen, steam, etc.)</th>
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</table>

## OTHER HAZARDS

<table>
<thead>
<tr>
<th>Unauthorized entry of personnel</th>
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</thead>
<tbody>
<tr>
<td>Noise &gt;85 dB</td>
</tr>
<tr>
<td>Excessive heat or cold</td>
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<tr>
<td>Failing objects</td>
</tr>
<tr>
<td>Other permits: hot work, live breaks, LOTO, live electrical work</td>
</tr>
</tbody>
</table>

## ATMOSPHERIC HAZARDS:

- Record pre-entry and document continued at least every two hours until exit.
- Bump Test required and completed.
- Yes
- Gas tester: type indicated
- Serial #

<table>
<thead>
<tr>
<th>Pre-entry required (AM/PM)</th>
<th>Time AM/PM</th>
<th>Time AM/PM</th>
<th>Time AM/PM</th>
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<tbody>
<tr>
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</table>

**Continuous monitoring required:**
- Yes: No 

<table>
<thead>
<tr>
<th>Percent of oxygen</th>
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<tbody>
<tr>
<td>19.5% to 22%</td>
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</table>

<table>
<thead>
<tr>
<th>Lower explosive limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10% of LEL</td>
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<table>
<thead>
<tr>
<th>Carbon monoxide</th>
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<tbody>
<tr>
<td>&lt;25 ppm</td>
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<table>
<thead>
<tr>
<th>Hydrogen sulfide</th>
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<tr>
<td>&lt;5 ppm</td>
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<table>
<thead>
<tr>
<th>Other</th>
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## TESTER INITIALS:

- PERSONAL PROTECTIVE EQUIPMENT REQUIRED:
  - Respirator
  - N/A Safety glasses/wide fields
  - N/A Hard hat
  - Type: N/A Goggles
  - N/A Face shield
  - Model: N/A Ear plugs/muffs
  - N/A Boots
  - Cartridge/filter: N/A Gloves (Type: )
  - N/A Disposable coveralls

<table>
<thead>
<tr>
<th>Other</th>
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<thead>
<tr>
<th>COMMUNICATIONS:</th>
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<table>
<thead>
<tr>
<th>RESCUE: (for all, either check the box or circle &quot;N/A&quot;)</th>
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</thead>
<tbody>
<tr>
<td>N/A Full-body harness w/&quot;D&quot; ring</td>
</tr>
<tr>
<td>N/A Tripod/retrieval system</td>
</tr>
<tr>
<td>N/A Emergency escape retrieval equipment</td>
</tr>
</tbody>
</table>

- Emergency response team has been notified of entry, hazards, and duration (still see for alternate procedure, or rescission). |

- Incident action plan has been completed and is available.

<table>
<thead>
<tr>
<th>ENTRANT(S):</th>
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<table>
<thead>
<tr>
<th>ATTENDANT(S):</th>
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<tbody>
<tr>
<td>I am aware of the hazards and their effects and will take the precautions required.</td>
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</table>

<table>
<thead>
<tr>
<th>Print name(s) and initial.</th>
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## ENTRY SUPERVISOR:

- I authorize entry into this confined space and verify that the hazards have been evaluated, control measures have been instituted, and the conditions are as indicated on this permit.

<table>
<thead>
<tr>
<th>Print name, department, and phone. Signature</th>
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## CANCEL PERMIT:

- This permit shall be canceled at the completion of entry, or if hazards change, by placing a large "X" across both sides of the permit.

## RESCUE & EMERGENCY CONTACT

<table>
<thead>
<tr>
<th>Tel. no.</th>
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</table>
Gaps identified

- Need more guidance on gas monitoring
- Need more guidance on ventilation procedures
- Need more guidance on identification of hazards
- Need to address adjacent spaces
- Need more guidance on control of hazards
- Need to define competencies of those performing the evaluation of the space
- Need more info on competencies and levels of rescue
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

Figure A.9.5.1.1 Typical Space Configurations.
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
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

- Many of 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

- 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
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 scheduled for release 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 revision of NFPA 350

• 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.

NFPA 350: GUIDE FOR SAFE CONFINED SPACE ENTRY AND WORK


Alerts: Receive e-mail updates on this document

Welcome. As a member of the committee for this document, you have access to both public and committee-only information.

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

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Questions or Comments??