NATIONAL FIRE PROTECTION ASSOCIATION

The leading information and knowledge resource on fire, electrical and related hazards

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

Posted 8:50 p.m. Monday

Updated 1:13 p.m. Tuesday

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

Reuters

Posted: 04/08/2013 12:28 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

July 04, 2007 | Dionne Walker, Associated Press

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.

Man rescued from fuel storage tank in Green Bay

7:56 AM, Apr. 22, 2014

Green Bay Metro Fire Department crews rescued a man from a fuel storage tank at U.S. Oil in Green Bay Monday.

Maryland Agency Investigating Manure Pit Deaths

Like Tweet 0 Share

6/2/2012 10:00 AM
By Lancaster Newspapers

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 Centerdel Farm a 200 acre dairy farm in Kennedyville, 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 bodies of Glenn W. Nolt, 48, and his sons Kelvin R., 18, and Cleason 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 asphyxia. The deaths were ruled accidental by the Office of the Chief Medical Examiner in Baltimore.

In addition, the body of Cleason Nolt 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.

UPDATE: Man Dies After Fall at Sunnyside Corp in Wheeling

Rescue crews spent hours in Wheeling Thursday attempting to rescue or recover a member of the cleanin crew who fell into a tank.

By AMY JOHNSON (Open Post)
November 30, 2012

Share Comment

Friday, July 13, 2012

Man rescued from silo of cement powder in Holden

Worker trapped at R.J. Paquette Concrete yard

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 43-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.

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 — *Apr. 24, 2012*

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

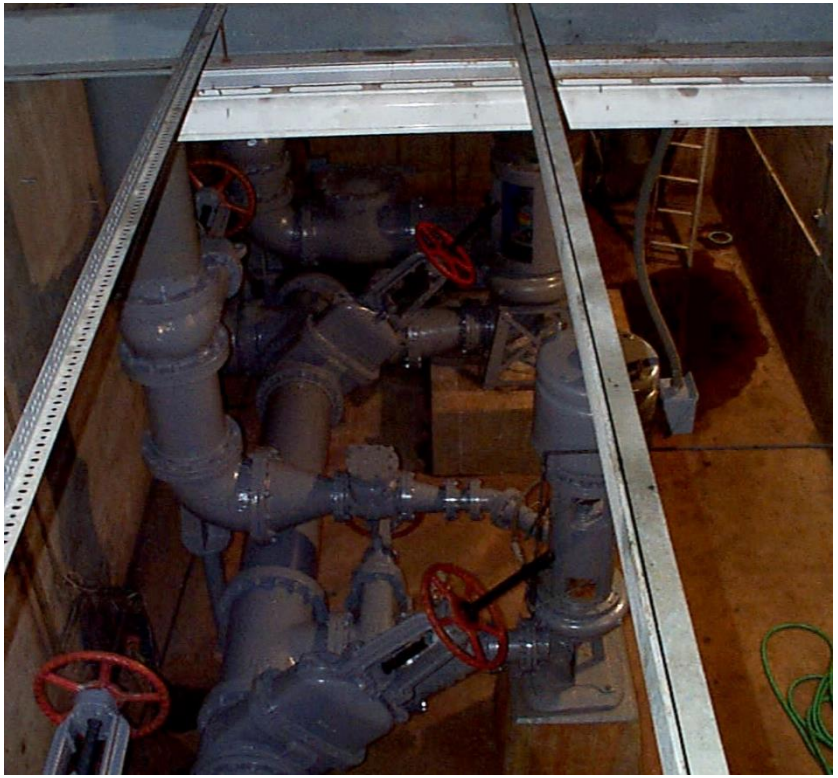
Issues Identified as Causing Confusion

- 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

Type of Entry	Hazards	What Documentation is Needed
Alternate Procedures Entry	Safety hazards eliminated. Only atmospheric hazards remain (controlled by ventilation).	Need a **certification that includes date, location, signature** of person making the determination.
Reclassification Entry	No hazards-all eliminated.	Need a **certification that includes date, location, signature.**
Permit Entry	Hazards remain.	Permit listing control measures, acceptable entry conditions, atmospheric monitoring, rescue, communication. Need a **certification that includes date, location, signature.**

Solution

- Pre-entry evaluation for all confined spaces.
- Use one form-Pre-entry Evaluation/Permit.
- All entries undergo the same evaluation.

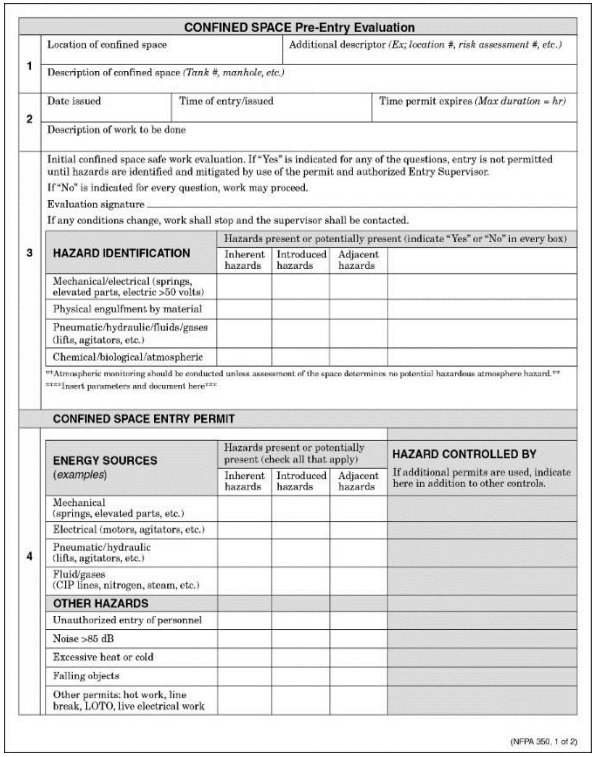
Pre-Entry Evaluation for All Spaces

- 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 descriptor *(Ex; location #, risk assessment #, etc.)*

Description of confined space *(Tank #, manhole, etc.)*

2 Date issued | Time of entry/issued | Time permit expires *(Max duration = hr)*

Description of work to be done

3 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 conditions change, work shall stop and the supervisor shall be contacted.

HAZARD IDENTIFICATION	Hazards present or potentially present (indicate "Yes" or "No" in every box) Inherent hazards	Introduced hazards	Adjacent hazards	
Mechanical/electrical (springs, elevated parts, electric >50 volts)				
Physical engulfment by material				
Pneumatic/hydraulic/fluids/gases (lifts, agitators, etc.)				
Chemical/biological/atmospheric				

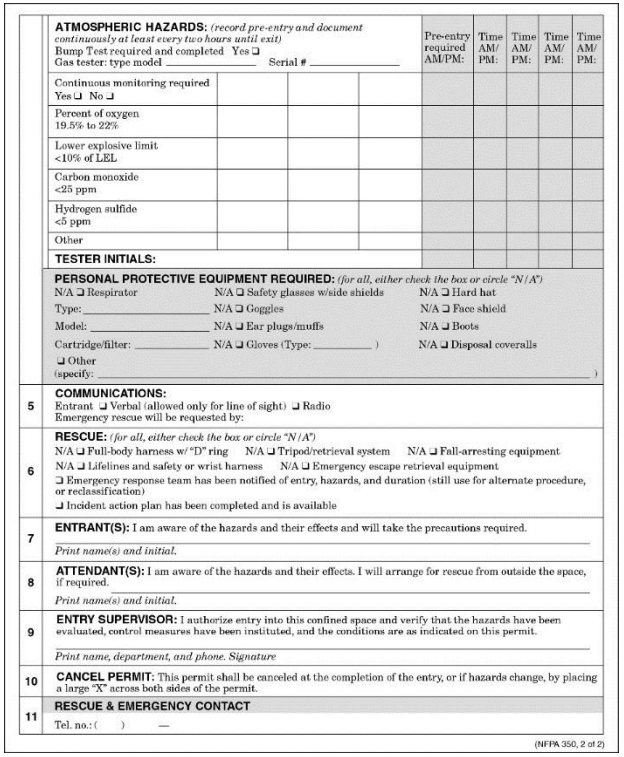
Atmospheric monitoring should be conducted unless assessment of the space determines no potential hazardous atmosphere hazard.
Insert parameters and document here

CONFINED SPACE ENTRY PERMIT

4

ENERGY SOURCES (examples)	Hazards present or potentially present (check all that apply) Inherent hazards	Introduced hazards	Adjacent hazards	HAZARD CONTROLLED BY If additional permits are used, indicate here in addition to other controls.
Mechanical (springs, elevated parts, etc.)				
Electrical (motors, agitators, etc.)				
Pneumatic/hydraulic (lifts, agitators, etc.)				
Fluid/gases (CIP lines, nitrogen, steam, etc.)				
OTHER HAZARDS				
Unauthorized entry of personnel				
Noise >85 dB				
Excessive heat or cold				
Falling objects				
Other permits: hot work, line break, LOTO, live electrical work				

(NFPA 350, 1 of 2)



ATMOSPHERIC HAZARDS: *(record pre-entry and document continuously at least every two hours until exit)*
Bump Test required and completed Yes ❑
Gas tester: type model _____ Serial # _____

				Pre-entry required AM/PM:	Time AM/PM:	Time AM/PM:	Time AM/PM:	Time AM/PM:
Continuous monitoring required Yes ❑ No ❑								
Percent of oxygen 19.5% to 22%								
Lower explosive limit <10% of LEL								
Carbon monoxide <25 ppm								
Hydrogen sulfide <5 ppm								
Other								
TESTER INITIALS:								

PERSONAL PROTECTIVE EQUIPMENT REQUIRED: *(for all, either check the box or circle "N/A")*

N/A ❑ Respirator
Type: _____
Model: _____
Cartridge/filter: _____
N/A ❑ Safety glasses w/side shields
N/A ❑ Goggles
N/A ❑ Ear plugs/muffs
N/A ❑ Gloves (Type: _____)
❑ Other (specify: _____)
N/A ❑ Hard hat
N/A ❑ Face shield
N/A ❑ Boots
N/A ❑ Disposal coveralls

5 **COMMUNICATIONS:**
Entrant ❑ Verbal (allowed only for line of sight) ❑ Radio
Emergency rescue will be requested by:

6 **RESCUE:** *(for all, either check the box or circle "N/A")*
N/A ❑ Full-body harness w/ "D" ring N/A ❑ Tripod/retrieval system N/A ❑ Fall-arresting equipment
N/A ❑ Lifelines and safety or wrist harness N/A ❑ Emergency escape retrieval equipment
❑ Emergency response team has been notified of entry, hazards, and duration (still use for alternate procedure, or reclassification)
❑ Incident action plan has been completed and is available

7 **ENTRANT(S):** I am aware of the hazards and their effects and will take the precautions required.
Print name(s) and initial.

8 **ATTENDANT(S):** I am aware of the hazards and their effects. I will arrange for rescue from outside the space, if required.
Print name(s) and initial.

9 **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.
Print name, department, and phone. Signature

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

11 **RESCUE & EMERGENCY CONTACT**
Tel. no.: ( ) —

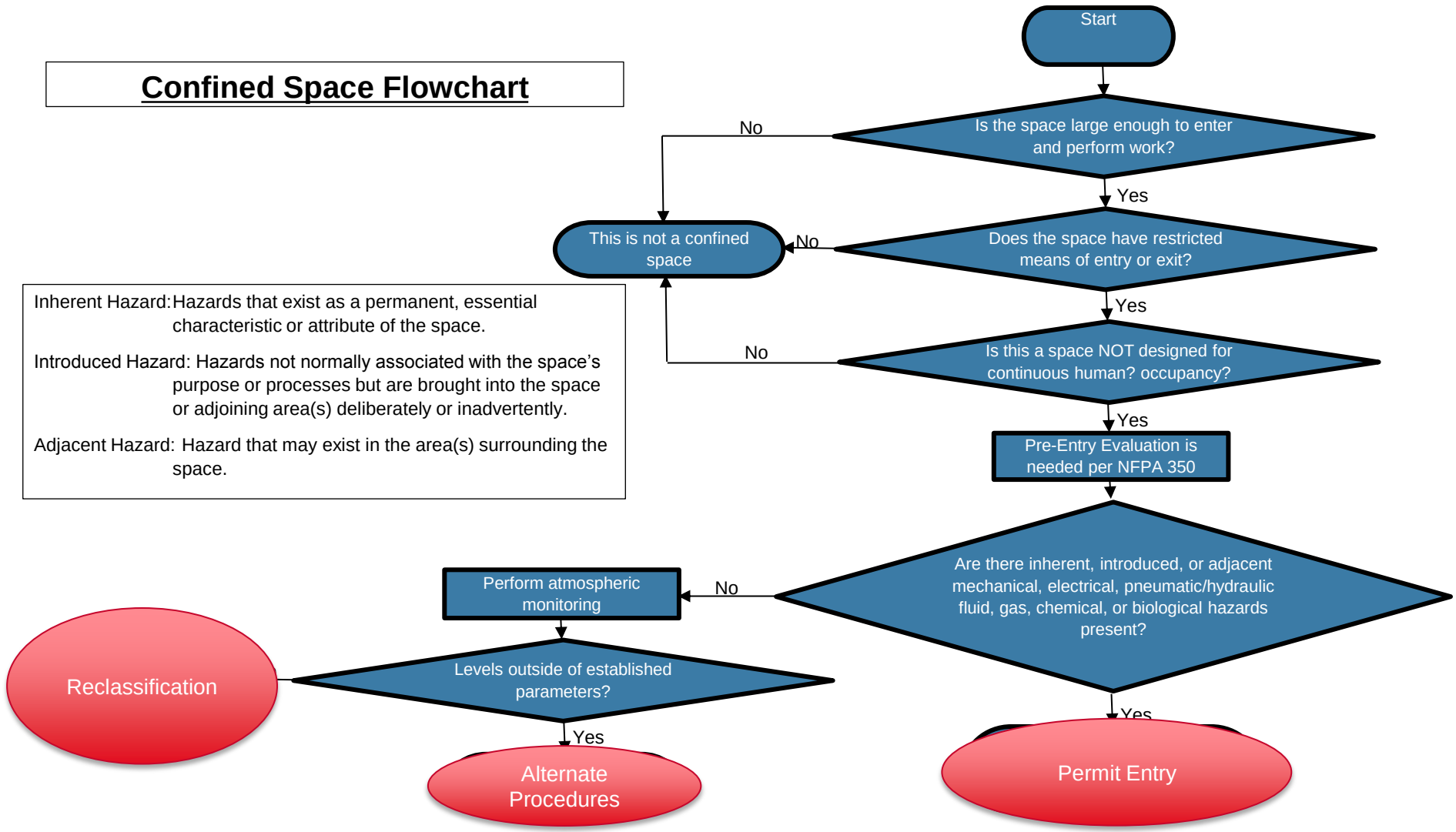
(NFPA 350, 2 of 2)

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!

NFPA

Confined Space Flowchart



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.

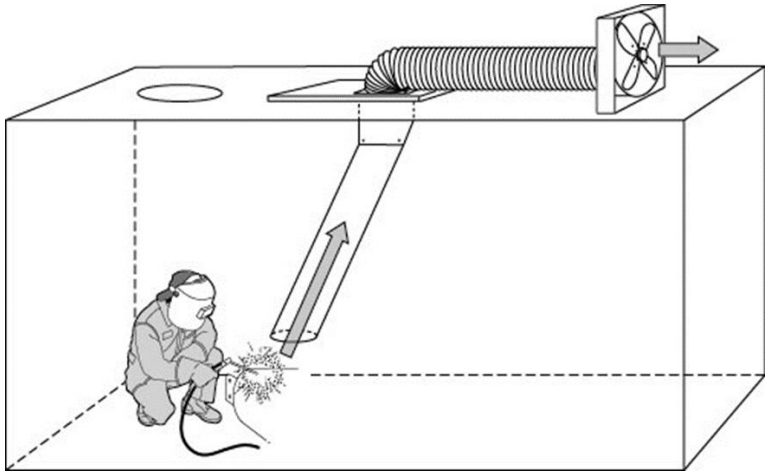
Adjacent Hazard: Hazard that may exist in the area(s) surrounding the space.

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.

Valero- 2 contract employees died. Nitrogen asphyxiation.

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

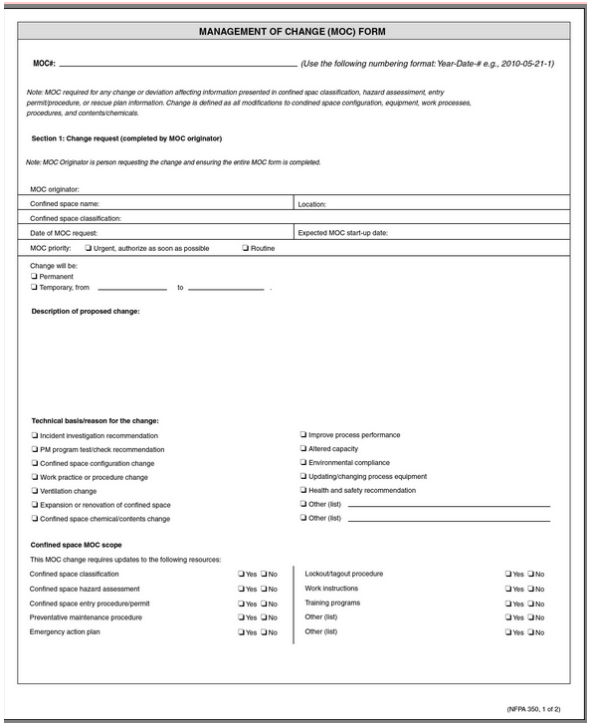
- **Tier 1**- No recognized hazards or all hazards have been controlled. Rescue team does not need to be on site at the time of the entry.
- **Tier 2**-No immediate life-threatening hazards but have other hazards that could incapacitate a worker. Rescue team should be available on site.
- **Tier 3-** 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.



MANAGEMENT OF CHANGE (MOC) FORM

MOC#: _____ *(Use the following numbering format: Year-Date-# e.g., 2010-05-21-1)*

Note: MOC required for any change or deviation affecting information presented in confined spac classification, hazard assessment, entry permit/procedure, or rescue plan information. Change is defined as all modifications to condined space configuration, equipment, work processes, procedures, and contents/chemicals.

Section 1: Change request (completed by MOC originator)

Note: MOC Originator is person requesting the change and ensuring the entire MOC form is completed.

MOC originator:

Confined space name:	Location:
Confined space classification:	
Date of MOC request:	Expected MOC start-up date:
MOC priority: ❑ Urgent, authorize as soon as possible ❑ Routine	

Change will be:
❑ Permanent
❑ Temporary, from _____ to _____ .

Description of proposed change:

Technical basis/reason for the change:

❑ Incident investigation recommendation
❑ PM program test/check recommendation
❑ Confined space configuration change
❑ Work practice or procedure change
❑ Ventilation change
❑ Expansion or renovation of confined space
❑ Confined space chemical/contents change
❑ Improve process performance
❑ Altered capacity
❑ Environmental compliance
❑ Updating/changing process equipment
❑ Health and safety recommendation
❑ Other (list) _____
❑ Other (list) _____

Confined space MOC scope

This MOC change requires updates to the following resources:

Confined space classification	❑ Yes ❑ No	Lockout/tagout procedure	❑ Yes ❑ No
Confined space hazard assessment	❑ Yes ❑ No	Work instructions	❑ Yes ❑ No
Confined space entry procedure/permit	❑ Yes ❑ No	Training programs	❑ Yes ❑ No
Preventative maintenance procedure	❑ Yes ❑ No	Other (list)	❑ Yes ❑ No
Emergency action plan	❑ Yes ❑ No	Other (list)	❑ Yes ❑ No

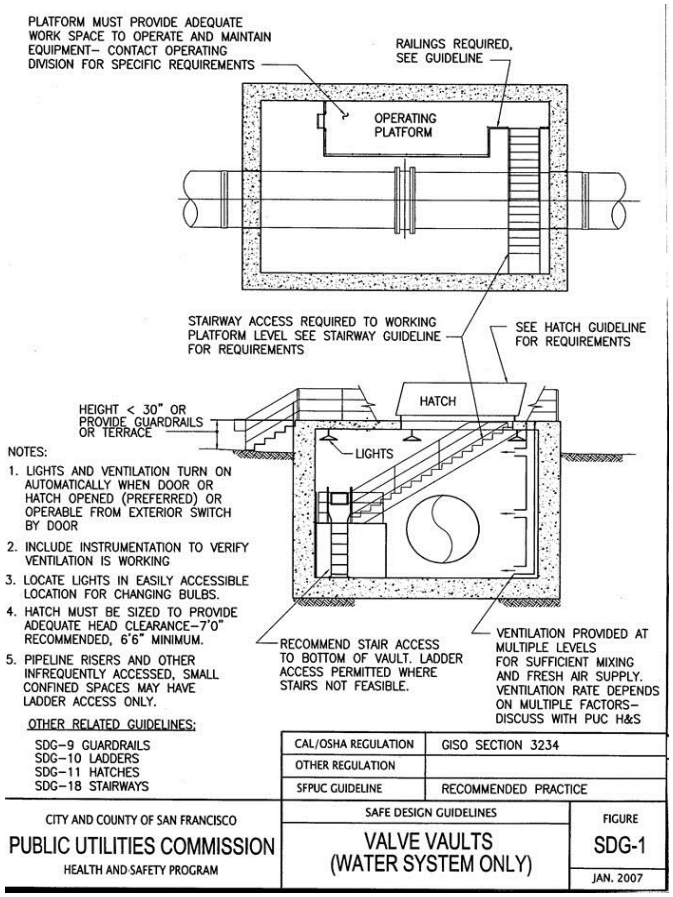
(NFPA 350, 1 of 2)

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



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**

NFPA 350: GUIDE FOR SAFE CONFINED SPACE ENTRY AND WORK

Current Edition: Proposed Standard **Next Edition: 2016**

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.

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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 officals
- Submit public input online for NFPA Standards in the Fall 2017 revision cycle

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More Info

* for committee members only

Questions or Comments??

Thank You!

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www.nfpa.org/350