Preventing Gas Installation Disasters
Environmental Note:
In consideration of the environment, this handout has been designed to conserve printing costs.

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Preventing Gas Installation Disasters
News 10 Boston - Feds Recommend New Requirements After Merrimack Valley Gas Explosions


1937 New London, Texas: New London School:
Deaths 295, mostly children
Injured over 300

Mercaptan/Methanethiol
https://en.wikipedia.org/wiki/Methanethiol
• colorless gas with
• a smell like:
  • Rotten cabbage
  • Garlic
  • Rotten eggs
• Odorant Standard

  • LEL is lower level gas detection (LEL)
    • LEL detection by persons with normal sense of smell
  • UEL is upper level detection (UEL)
  • Detection level 1/5 or 20%
  • Detection impairment
  • Odor Fatigue
  • Odor Fade

October 12, 2012 Castle Rock Colorado – Residential Home

All survived

https://kdvr.com/2012/10/12/explosion-levels-house-in-castle-rock/


2 injured

July 19, 2018, Topeka, Kanas – Residential Home
4 people injured


Purging Gas Piping

• Definition:
  - The practice of displacing either air or inert gas with fuel gas.
  - Normally after pressure testing
  - Returning line to service
  - New line into service

• Natural Gas Blow Down
  - Natural gas is forced through the piping at a high pressure and volume to remove debris.

Gas Purging Disasters

Sept. 19, 1975 Imperial, PA - West Allegheny Middle School
Aug 1, 1977 Cary, North Carolina - Fitness center
Jan 26, 2003 Fairfield, CA - Wolfskill Energy
Nov 16, 2005 Porterville, CA - School
Aug 7, 2007 Cheyenne, WY - Hotel
May 19, 2008 San Diego, CA - Hotel
June 9, 2009 Garner, North Carolina - Con Agra Foods
Deadly Practices Video

Link to video Deadly Practices: https://youtu.be/rjxBtwl8-Tc

June 9, 2009, Garner, North Carolina – ConAgra Manufacturing Plant

https://notesmatic.com/2016/10/conagra-gas-explosion/

67 deaths

Natural Gas Blown Down - The term gas blowdown is referred to venting of gas accumulated in equipment, process facilities, oil production wells etc. The gas which is to be blown down is not desired to be used for production of a variety of possible reasons and is usually vented through a flare.

6 people died
At least 50 injured


September 19, 1975 Imperial, Pittsburgher – West Allegheny Middle School


Lessons learned

• Purging new or existing gas piping into buildings can be highly hazardous
• Purging indoors should only be done in limited circumstances
• Never rely on odor alone to detect releases of fuel gases
• Always use combustible gas detectors to monitor the gas concentration during purging operations
• Ensure personnel are fully trained
• Pig piping rather than gas blows
What’s under our feet?

Disaster Prevention with code Application

- Uniform Plumbing Code Section 1213.3 Test Pressures
- 10 psi for 15 minutes or AHJ satisfaction
  - Air
  - CO₂
  - Nitrogen
- No perceptible drop in pressure allowed
- Test gauges per Uniform Plumbing Code Section 318.0
- Uniform Plumbing Code Section 1213.3 Test Pressures
- Welded pipe and >14” w.c. pressures
  - Min 60psi
  - 30 min or AHJ satisfaction
  - Nitrogen, air or CO2
  - AHJ present during testing
- No perceptible drop in pressure allowed
- Test gauges per Uniform Plumbing Code Section 318.0

Test Gauges 318.0

- <10 psi test pressure
  - 0.10 increment or less gauge
- >10 psi to 100 psi
  - 1 psi increment or less gauge
• >100 psi
  • Incremented for 2% or less of test pressure
  • Pressure range twice applied pressure

**Gas Purging Requirements Outdoors 1213.6.1**

• Systems required purging outdoors
  • DOP exceeds 2 psi
  • Pipe size and length criteria table use inert gas
  • CSST EHD 62 to nominal 2"

<table>
<thead>
<tr>
<th>Table 1213.6.1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pipe Size</strong></td>
</tr>
<tr>
<td>&gt;2-1/2&quot;</td>
</tr>
<tr>
<td>&gt; 3&quot;</td>
</tr>
<tr>
<td>&gt;4&quot;</td>
</tr>
<tr>
<td>&gt;6&quot;</td>
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<tr>
<td>&gt;8&quot;</td>
</tr>
</tbody>
</table>

**Removal from Service 1213.6.1.1**

• Existing piping opened
• Piping meeting table criteria

**Placing in Operation 1213.6.1.2**

• Gas piping containing air
• Inert gas purge
• Fuel gas displacement

**Outdoor Discharge of Purged Gases 1213.6.1.3**

• Valve at open end discharge point
• Required discharge distances
  • 10’ from ignition source
  • 10’ from building openings
  • 25’ from air intake
• Continuous attendance
• Monitoring with gas indicator
• Gas concentration at termination point 90% cease purging
• Nonessential personal to purging 10’ clear

**Combustible Gas Indicator 1213.6.1.4**

• Listed & Calibrated
• 0-100% scale
• 1% or smaller increments

**Systems Allowed for Indoor/Outdoor Purge 1213.6.2**

• Systems meeting both criterion
• < 2 psi DOP
• Pipe and tubing less than table 1213.6.1

**Purging Procedures 1213.6.2.1**

• Systems allowed to be purged indoor or outdoor shall be purged with one or more of the following

  • (1) Shall be purged with fuel gas to the outdoors
  • (2) Discharge inside or outside through appliance burner without combustion chamber.

  • Appliance burner without combustion chamber. Burner shall have continuous source of ignition.

  • (3) Discharge inside or outside through a burner that has continuous source of ignition and designed for such purpose

  • (4) Discharge inside or outside with discharge monitored with gas detector. Purging suspended when gas is detected

  • (5) Purging by gas supplier in accordance with written procedures

**Combustible Gas Detector 1213.6.2.2**

• Listed & Calibrated
• Capable of detecting fuel gas

**Conclusion**

• Collaborative effort for prevention

  • Education
  • Industry action
  • Code organization
  • Utility providers
  • Engineering
  • Installers
Inspecting After A Natural Disaster

Plumbing/Mechanical Inspections are the Key to Safety and Recovery
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Natural Disasters

- Earthquakes
- Floods
- Hurricanes
- Landslides
- Tornadoes
- Tsunamis
- Volcanoes
- Wildfires
- Winter Storms

National Disaster Recovery Framework

- https://www.fema.gov/national-disaster-recovery-framework

Disaster Recovery Planning Guide for State Governments

- https://www.fema.gov/media-library-data/1485202780009-db5c48b2774665e357100cc69a14da68/Pre-DisasterRecoveryPlanningGuideforStateGovernments-1.pdf

The remainder of this page and the next have been left blank for notes:
Inspections for piping Systems

Water Supply

• Inspection of the water supply system is important
• To determine if potable water supply has been compromised.
• The following are some things to evaluate:

1. Cross-connections
   • Field test and inspect all backflow assemblies and devices
   • To make sure they have not been damaged and are in good working condition.
   • If there is damage, isolate any direct connection between potable and non-potable systems
   • Until the backflow assembly or device is repaired or replaced.
   • Backflow assemblies and devices containing air inlets or relief valves
   • That have been submerged must be internally
     • inspected,
     • cleaned and
     • repaired or replaced.

2. Contamination
   • Check for any broken pipes.
   • Contamination may occur as a result of broken pipes.
   • Whether the damage is from
     • flooding,
     • fire,
     • earthquake, sinkhole or tornado,
     • contaminants may have entered through broken piping.
   • Check for submerged water outlets.
   • Contamination may also result from submerged outlets.
   • Flood levels that rise above water outlets,
   • Or outlets that have been submerged by force
• Have the potential for allowing contaminates into the water supply.
• The piping system will need to be repaired and disinfected or replaced.
  • Where there is the potential of high contamination,
  • Such as water outlets submerged in sewage,
  • The piping should be completely replaced.

2018 Uniform Plumbing Code (UPC)

• 609.9 Disinfection of Potable Water System.
  • New or repaired potable water systems shall be disinfected prior to use where required by the Authority Having Jurisdiction.
  • The method to be followed shall be that prescribed by the Health Authority or, in case no method is prescribed by it, the following:
  • (1) The pipe system shall be flushed with clean, potable water until potable water appears at the points of outlet.
  • (2) The system or parts thereof shall be filled with a water chlorine solution
    • Containing not less than 50 parts per million of chlorine,
    • And the system or part thereof shall be valved-off and allowed to stand for 24 hours;
    • Or, the system or part thereof shall be filled with a water-chlorine solution containing
    • Not less than 200 parts per million of chlorine and allowed to stand for 3 hours.
  • (3) Following the allowed standing time,
    • the system shall be flushed with clean, potable water until the chlorine residual in the water coming from the system
    • does not exceed the chlorine residual in the flushing water.
  • (4) The procedure shall be repeated where it is shown by bacteriological examination made by an approved agency that contamination persists in the system.

3. Frozen pipes
  • Check for piping that has been exposed to freezing conditions as a result of disaster.
- Look for bulges and cracks in the piping.
- An air or water test may be required to detect any damage due to freezing.
- Any piping that did not maintain its proper nominal size should be replaced.

4. Hangers and Supports
- Check for damaged or missing hangers and supports.
- If the weight of the piping system is not properly supported,
- Further damage may result when it is put back into service.

Drainage and Vent System
- Inspection of the drainage and vent system
- Is important to determine if sanitary conditions have been compromised.
- Drainage and vent systems are designed to be water and airtight
- In order to contain the flow of sewage and sewer gases.
- The following are some things to evaluate:

1. Sewage Backup/Stoppages
   - Above and below ground drainage pipes may have been damaged
   - As a result of disaster causing stoppages or sewage overflows.
   - Drains may need to be cleared or telescoped to find underground damage.

2. Contamination
   - Contamination will result wherever there is sewage overflow
   - Which may result in the premises being
   - Uninhabitable due to insanitary conditions.

3. Broken Pipes
   - Check for broken pipes that allow drain waste leakage
   - Causing insanitary conditions.
   - Testing of the drain lines for tightness may be required
   - To locate any cracks or other damage where leakage may occur.
4. Vent Closures/Blockages
   • Sewer and drain blockages may cause
   • The sewage to back up into the venting system causing vent closure.
   • Check the extent of the sewage backup and
   • Determine if any part of the venting system will need clearing.
   • Check for any breakage in the venting system
   • Which may allow sewer gases into the living space.
   • The venting system may also need to be tested for air tightness.

Gas Piping
   • Typically, under disaster conditions the main gas supply is shut off to the building.
   • Several things should be checked before putting the gas supply back into service.

1. Leaks
   • A pressure test should be conducted in order to detect any leaks in the gas piping system.

2. Broken and Disconnected Pipes
   • Check for any broken and disconnected gas pipes that will need to be repaired or replaced.
   • Reused pipes should be inspected for debris or blockages.

3. Connections to Appliances
   • Check all gas connections to appliances.
   • Replace flex connectors where necessary.
   • The use of a leak detector (liquid or electronic) is an acceptable method to detect leaks
   • Between the appliance shutoff and connection to the appliance.
4. Regulators
   • Inspect appliance regulators for damage.
   • Some regulators require venting.
   • Inspect the regulator vent for damage.

5. Shutoff Valves
   • Check the gas shutoff valves to each appliance for proper operation.
   • If the valves do not completely shut, then they need to be replaced.
   • Replace any gas control valve or regulator that has been affected by water or submerged.
   • Flush and dry lines with an inert gas
Quick Check Disaster Checklist

❑ 1. Shut down any and all gas supplies.
❑ 2. Shut down and isolate the water supply.

This is intended to stop the waste of clean water and also protect the source from possible contamination.

✓ Perform a test on the supply to see whether or not it is still potable.
✓ If water is found to be non-potable, then it must be treated.

❑ 3. Cap off all open sewer and vents.

❑ 4. If needed, set up temporary water supplies and sanitary conditions (bathrooms, showers, food prep).

❑ 5. If needed, set up temporary gas supplies for heating and cooking.