Revision Date: January 2014

Fuel & Process Gas Piping Inspection

INTRODUCTION

Scope & Applicability: The regulations in this program apply to all piping carrying fuel gas, excluding service pipe, at a pressure of 125 psi or below, commonly referred to as distribution piping.

Outside the scope: Certain processes are excluded from this assessment due to the unforeseen necessity when applied to smaller system or inapplicability due to other prevailing code regulations applicable to the situation in question. Scenarios outside the scope of this assessment include but are not limited to:

1. Fuel gas lines ***less than*** 6 feet connecting a gas outlet to a proprietary piece of equipment (such as a compressor);
2. Liquefied Natural Gas installations or any device used by the gas supplier for distribution;
3. All Hydrogen gas piping including distribution piping, subject to NFPA 2.

Cited Regulations:

- California Mechanical Code, Chaper 13, 14
- NFPA 54 (Chapter 1-8), NFPA 2, 55, 58

Date of Inspection:

Follow-up Date:

EH&S Surveyor:

Dept.	
Building:	**Room Number:**

***Principal Investigator* Name:**

***Principal Investigator* Phone/Email:**

***Lab Representative(s)*:**

***Lab Representative* Phone/ Email(s):**

DEFINITIONS

Process Piping- Piping or tubing that conveys liquid or gas, which is used directly in research, laboratory or production processes, and that is not regulated under the mechanical or plumbing code. (*CMC)*

Hazardous Process *Piping*-A process material piping or tubing conveying a liquid or gas that has a degree-of-hazard rating in health, flammability, or reactivity of Class 3 or 4, as ranked by the fire code. (*CMC*)

Hazardous process piping includes:

- Natural Gas (4)
- Jet Fuel-4 (3)
- Propane (4)
- Hydrogen (4)
- Ethane (4)
- Gasoline (3)
- Methane (4)

For any questions or clarifications, please contact EH&S at 949.824-6200, email fibrahim@uci.edu.

DESCRPTION OF PROCESSES

Fuel gas(es) being piped:

Pipe diameter(s):

Pipe Pressure(s):

Description of equipment connected to fuel pipe:

N/A- Not Applicable ✓- Compliance **R**-Requiring Correction

1. LABELING	Status	Comments
1. 1 Labeling of lines includes name of gas, direction of flow & pressure.		
1.2 Piping conveying more than one gas at different times must be marked.		
1.3 Labeling for piping systems must be at the following locations: ▪ At each critical process control valve ▪ At wall, ceiling or floor penetrations ▪ At each change of direction ▪ At a minimum of every 20 ft throughout the piping		

2. DESIGN/ MATERIALS/ COMPONENTS		
2.1 Piping sketch drawn showing sizes of different branches, load demands, and location of the point of delivery (integrity of drawings is the responsibility of the facility).		
2.2 Is the piping sized correctly? (Reference CMC Table 1319.2 or NFPA 54 Table 6.2).		
2.3 Can the Design Pressure loss in the piping system (under maximum flow) give rise to a supply pressure below the minimum pressure required by the equipment? If yes, then pressure safety interlock required.		
2.4 Material		
a. No piping material can be made of cast iron		
b. Steel and wrought iron cannot be less than schedule 40		
c. Copper and copper alloy piping (ex.brass) are not used with gases and gas mixtures that are corrosive to them including sulfur-containing gases.		
d. Aluminum alloy pipes have the ASTM B 241 compliance sticker.		
e. Is all piping and tubing free from defects/cuts/burrs etc.? All defective piping must be replace and NEVER REPAIRED.		
f. Piping exposed to the atmosphere is protected from corrosion.		
g. Pipe joints are threaded, flanged, brazed, press connected or welded.		
2.5 Gas Meters a. Located in readily accessible ventilated areas. b. Protected from high temperatures or damage. c. Protected from overpressure, backpressure and vacuum.		
2.6 Valves a. Manual Plug Valve tested for integrity and maintained.		
b. ***For Mixing Blowers only***-No valves are installed between the blower discharge and the burner		

3. PRESSURE	Status	Comments

N/A- Not Applicable ✓- Compliance **R**-Requiring Correction

3.1 Pressure Regulators		
a. Are pressure regulators installed where the gas supply pressure could exceed the operating pressure range of the equipment?		
b. Pressure regulators must be protected from damage and accessible for servicing.		
c. **Overpressure protection:** if gas supply pressure is above 2psi and line pressure regulators decrease to 0.5 psi (3.4 kPal) or less, there must be a overpressure protection device installed on the regulator (factory-installed).		
d. Regulators should vent to the outside if their rupture is capable of causing a hazard and the vent must not terminate less than 3 feet away from an ignition source.		
e. Pipe sizing planned and accurately calculated for high and low pressure piping (included in diagram)		
3.2 Backpressure Protection Required if the design of the equipment is such that air, oxygen or other gases can be pushed into the gas supply**.**		
3.3 Low Pressure protection Required if the equipment is capable of producing a reduction in pressure at the supply line.		
3.4 Shut-Off Valves-Shut-off valves are clearly labeled		
3.5 Pressure Testing		
a. Piping systems properly pressure tested to the pressures they convey		
b. Regulators/ valves pressure tested during assembly & pressure changes		
c. Records are being kept for pressure testing and include time, date, pressures used, what was checked and who conducted the test		
d. Standard operating procedures for pressure testing present indicating that Oxygen should never be used as a test medium (acceptable mediums are air, N_2, CO_2 or an inert gas)		
4. FUEL MIXING	**Status**	**Comments**
4.1 Equipment/systems containing flammable fuel-air mixtures		
a. Flammable Mixing piping cannot be less than schedule 40		
b. Automatic firechecks and safety blowouts/backfire preventers provided in pipes carrying flammable mixtures (includes gas-mixing machines)-all automatic firechecks need to have a separate manually operated gas valve and be installed upstream		
c. An automatic gas-air proportioning device combined with a downstream blower or compressor		
d. If pipe is above 2.5 inches nominal pipe size: a safety blow-out or backfire preventer is required. *(Safety blow-outs protect the mixing equipment from an explosion passing through it).*		
4.1 Gas air mixing equipment operating to produce fuel-air mixtures outside the flammable range: are there stops to prevent the mixture from approaching flammable range?		

N/A- Not Applicable ✓- Compliance **R**-Requiring Correction

5. PIPING INSTALLATION	Status	Comments
5.1 Gas piping turns		
a. Metallic: Are bends arced more than 90^0		
b. Metallic Piping: Is bending properly made and free of mechanical damage including cracks, buckling etc.		
c. Plastic: Is mechanical integrity preserved		
d. Plastic: Joints must not be located in pipe bends		
5.2 Gas Outlets		
a. Outlets are not installed behind doors		
b. Outlet fittings or piping are securely fastened in place		
5.3 Branch Pipe Connections Branch outlet is the same size as the line that supplies it		
5.4 Safety Shut-off valves (SSOV)		
a. Fuel mixing machines: include a SSOV [manual reset type] in the gas supply connection to each machine- the interlock should be such that the blower/compressor stop operation when the gas supply fails (except in open burner systems)		
b. A manual shut-off valve is installed upstream of each pressure regulator		
c. Emergency shut-off valve is installed AND clearly **marked** as such (exterior)		
d. Gas outlets on tables/benches/hoods must have a single shut-off valve through which the gas outlets are supplied (if the room has more than one gas outlets in those areas). ▪ It must be labeled and located within the lab		
e. **Hazardous Process Piping:** Gas shutoff valves must be located within 3 feet of any appliance that uses gas.		
5.5 Piping Installation		
a. Are pipes seismically secured and protected from damage?		
b. Are piping supports adequately spaced?		
c. Are valves located on ceilings? Sloped?		

6. SOPS: PURGING AND OPERATIONS	Status	Comments
6.1 Purging		
a. Written criteria for venting versus purging and systems requiring outdoors purging versus those allowed indoors. ***Note: If the design operating pressure is more than 2 psi then purging is required.***		
b. Are there written SOPs for purging **indoors/ outdoors**		
c. Equipment purged before its operation after piping system is purged		
d. Employees trained on the hazards of N_2 (*Lab Safety Fundmentals*)		
6.2 Operations		
a. Are SOPs specific to processes using fuel lines and connected equipment		
b. SOPs for gas line exchanges/repairs, do procedures include proper isolation techniqes and startups after gas line repair		

N/A- Not Applicable ✓- Compliance **R**-Requiring Correction