

OFFICE OF ENGINEERING SERVICES, REGION X
CODES & INTERPRETATIONS COMMITTEE
REVIEW SUMMARY

- REFERENCE: Kenneth E. Olson, Bemidji Area IHS, Memorandum dated January 23, 1998
- ISSUE: Clarification under what conditions liquefied petroleum (LP) gas appliances can be installed in basements or similar spaces (UMC, Section 304.6)
- LOCATION: Tribal Clinic Facilities throughout Bemidji Area
- BACKGROUND: There are several tribal clinic facilities in the Bemidji Area that currently have a liquefied petroleum gas-fired furnace in the basement. Typically, the furnace has a closed combustion chamber supplied with outside air for combustion and exhaust gases vented to the exterior. (Closed combustion chamber is by definition totally separated from inside air.) In some instances the room in which the furnace is located is vented to the exterior. There are also instances where the basement is open on one or more sides to the exterior. Current state codes allow the installation of liquefied petroleum gas appliances in basements. The Joint Commission on Accreditation of Health Organizations (JCAHO) has in the past granted waivers for such installations if allowed by the applicable state code. At many installations, liquefied petroleum gas is the most economical fuel available; and conversions from oil-fired to gas-fired furnaces is common. The Bemidji Area Indian Health Service (IHS) is concerned that these liquefied petroleum gas appliances be installed with adequate safety measures and in accordance with the requirements of the Uniform Mechanical Code (UMC).
- DISCUSSION: IHS, Technical Handbook for Environmental Health and Engineering, Volume III - Health Care Facilities Design and Construction, Part 24 - Construction Guidelines, identifies the following codes and standards as applicable:
- NFPA 54 - *National Fire Code*
 - NFPA 58 - *Standard for the Storage and Handling of Liquefied Petroleum Gases*
 - Uniform Building Code (UBC)
 - Uniform Plumbing Code (UPC)
- NFPA 54, National Fire Code, provides guidance on the installation of LP gas appliances including in specific locations. However, NFPA 54 does not require any special provisions for LP gas appliances installed in pits or basements.
- NFPA 58, Standard for the Storage and Handling of Liquefied Petroleum Gases, does require some special provisions for ventilation for LP gas distribution facilities. Section 7-2.1 .2 indicates "The floor of such structures shall not be below ground level. .." Section 7-2.2.1 states "The structure shall be ventilated using air inlets and outlets, the bottom of which shall be not more than 150 mm above the floor ..." Section 7-2.2.1 elaborates further on mechanical and natural means to provide acceptable ventilation. NFPA 58 does not extend these requirements to the installation of appliances (Section 3-5).

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The Uniform Mechanical Code (UMC) is considered a subset of the Uniform Building Code (UBC). The applicable requirements of the UMC 1997 Edition, are as follows:

Section 1 314 - Liquefied Petroleum Gas Facilities and Piping, paragraph 1314.1.6 states: "Liquefied petroleum gas piping shall not serve appliances located in a pit or basement where heavier-than-air gas might collect to form a flammable mixture."

Section 304 - Prohibited Locations, paragraph 304.5 states: "Equipment burning liquefied petroleum gas or liquid fuel shall not be located in a pit, an underfloor space, below grade or similar location where vapors or fuel might unsafely collect unless an approved method for the safe collection, removal and containment or disposal of the vapors is provided."

The Uniform Plumbing Code (UPC) is maintained by the International Association of Plumbing and Mechanical Officials (IAPMO). The text in the 1997 edition is similar to the text in the UMC except that the UPC only relates to gas water heaters".

The International Conference of Building Officials (ICBO), the responsible organization for the UBC and UMC, are concerned about the physical properties of LP gas, i.e., denser than air, low Brownian motion and high flammability. Consequently, the code is concerned about the accumulation of fugitive LP gas. LP gas is flammable within a large range of concentrations. The ICBO indicates that " ... an approved method for the safe collection, removal and containment and disposal of the vapors ... "(UMC 304.5) includes "draining by gravity". An illustration of "draining by gravity" is shown in Figure 1.

NFPA 58 suggests that ventilation for the removal of LP gases in a facility (LP Gas distribution facility) can be accomplished by natural ventilation as well as mechanical ventilation. The NFPA 58 LP Gas Handbook indicates that mechanical ventilation is effective and offers better reliability of positive ventilation.

INTERPRETATION: LP gas appliances are allowed to be installed in basements if they are provided with an approved method for the safe collection, removal, and containment or disposal of the vapors.

Facilities with LP gas appliances with sealed combustion chambers located in basements should be provided with continuous mechanical ventilation (scavenging exhaust) with an intake grille located within 150 mm from the floor, and in sufficient proximity to the LP gas appliance to capture fugitive LP gases. We recommend the mechanical ventilation be a minimum 25- 50 1/s. Alternatively, the LP gases can be drained by gravity, e.g., a louver, located low in a wall of a daylight basement of a facility. We recommend the louver be located within 4 meters of the appliance.

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Your proposal as submitted is a satisfactory method for the safe collection, removal, and containment or disposal of the vapors. The minimum requirements are:

The appliance room is separate from other rooms,
 The appliance room is mechanically ventilated continuously,
 The inlet grille for the exhaust is within 150 mm above the floor, and
 Combustion chamber is sealed type.

In addition, we recommend that in the event of a loss of power the LP gas supply is automatically shut off.

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