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Fire Prevention Using an Automatic Shut-of Valve

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Abstract

In the supply of natural gas to residential buildings, interruptions in the network may occur for various reasons.

In the supply of residential buildings with natural gas, interruptions in the network may occur for various reasons. In the event of an interruption due to an accident while using the network, the consumer closes the gas path by turning the valve. Gas does not leak into the room when the gas is fed back into the network. But in many cases, it is impossible to constantly control the gas transmission, especially during the season. In such cases, when there are short-term interruptions, the gas burning in the burner goes off, and when the gas is re-supplied to the network, gas starts leaking into the room due to the valve remaining open. The risk of fire increases as a result of gas-air mixture in the room. An automatic shut-off valve prevents fire.

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INTRODUCTION

Internal gas pipes of the building are made of steel, with a thickness of not less than 2 mm and a diameter of 15 to 50 mm.

Inside the building, gas pipes are laid in open view along the walls of the building.

The composition of natural gas consists of the following: methane (CH4) – 97,8%, ethane (C2H6) – 1,6%, propane (C3H8) – 0,3%, heavy carbons – 0,08%, ballast gases-nitrogen (N2) – 0,1%, carbon dioxide (CO2) – 0,12%.

Another major requirement for gases is their odor.

Gases are odorized because natural gases are odorless. Ethylmercoptan is added to natural gas in GRS, to liquefied gases in factories and gas processing plants. 16 grams of ethyl mercaptan is added to 1000 cubic meters of natural gas in summer and 19 grams in winter. Natural gas always tends to rise when leaking from gas lines, gas pipes, or gas appliances because natural gas is lighter than air.

Heat separation properties of gases.

Combustible gases release a certain amount of heat regardless of their composition. The property of heat release is measured in calories. How much heat is released when 1 m3 of gas is burned etermines the calorie of the gas. The lowest level of heat release of natural gas is 8500 ccal/m3, and the highest level is 9500 ccal/m3.

Flammability of gases.

Gases ignite when heated to a certain temperature or given heat at that temperature. Flammability of natural gas - methane is equal to 645 OC, liquefied gas - 490-540 OC.

METHODS

Dangerous properties of gas.

All types of gaseous fuels are fire hazard. A mixture of gases with air in a certain amount explodes. The explosion limit of natural gas under normal conditions is in a closed environment: low – 5%, high – equal to 15%. Explosive limits of liquefied gas in a closed environment are equal to: low - 1.6%, high - 9.8%.

Natural gas gives heat of at least 1950 O C when burning. Liquefied gas releases heat of at least 2150 OC when burning. As a result of incomplete combustion of gases, CO - is gas is released, which has a dangerous effect on human life. The amount of carbon dioxide in residential apartments should not exceed 0.002 mg/l, and in industrial enterprises 0.02 mg/l.

Carbon monoxide (SO) is considered a poisonous gas if the amount of this gas in a closed environment is as follows:

a) 0.01 – 0.05% (in a closed environment) is poisoned in 2 hours

b) 0.2-0.3% is moderately poisoned within 30 minutes

v) 0.5 - 0.8% (in a closed environment) is toxic to life in a short time.

Carbon dioxide enters the human body through the nasal cavity and into the lungs. It is added to the blood from the lungs and is added to the blood with hemoglobin. As a result, oxygen does not reach the human body enough. As a result of lack of oxygen, "oxygen starvation" occurs in the body.

The following symptoms and complications are felt in case of light and moderate carbon monoxide poisoning: headache, dizziness, nausea, vomiting, weakness - arms and legs become loose.

In case of severe poisoning, the ears become blocked, thinking becomes difficult, loss of consciousness, and sometimes, in case of strong excitement, various erratic actions may be performed, and finally features of euphoria are observed.

Methane (CH4) is an inert gas, but in large quantities it has a negative effect on the human body. Methane gas suffocates.

A person who breathes in an environment with a large amount of methane gas lacks oxygen in his body.

Depletion of oxygen causes damage to the body. The percentage of oxygen in the atmosphere is 21%. If the oxygen level drops to 17%, then the body will lack oxygen and cause it to deteriorate. When it is 14-15%, oxygen starvation occurs. In this case: a person often pants for breath, the heart beats fast. 10-12% oxygen causes a person to pass out. If the oxygen level is 8%, then a person will shiver and die in a short time.

RESULT AND DISCUSSION. In our life, fires often occur due to the use of defective and non-standard gas equipment, leaving gas equipment unattended, young children using gas equipment, not following the rules of gas use. In practice, consumers are continuously supplied with gas. Gas supply to the consumer is stopped only in some cases

When the following situations occur:

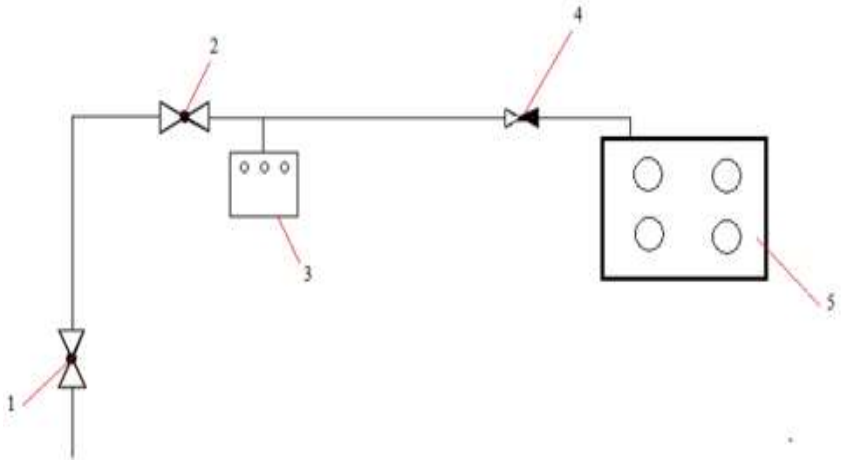
Damage to gas pipelines as a result of various road traffic accidents;

When main gas pipelines are being repaired;

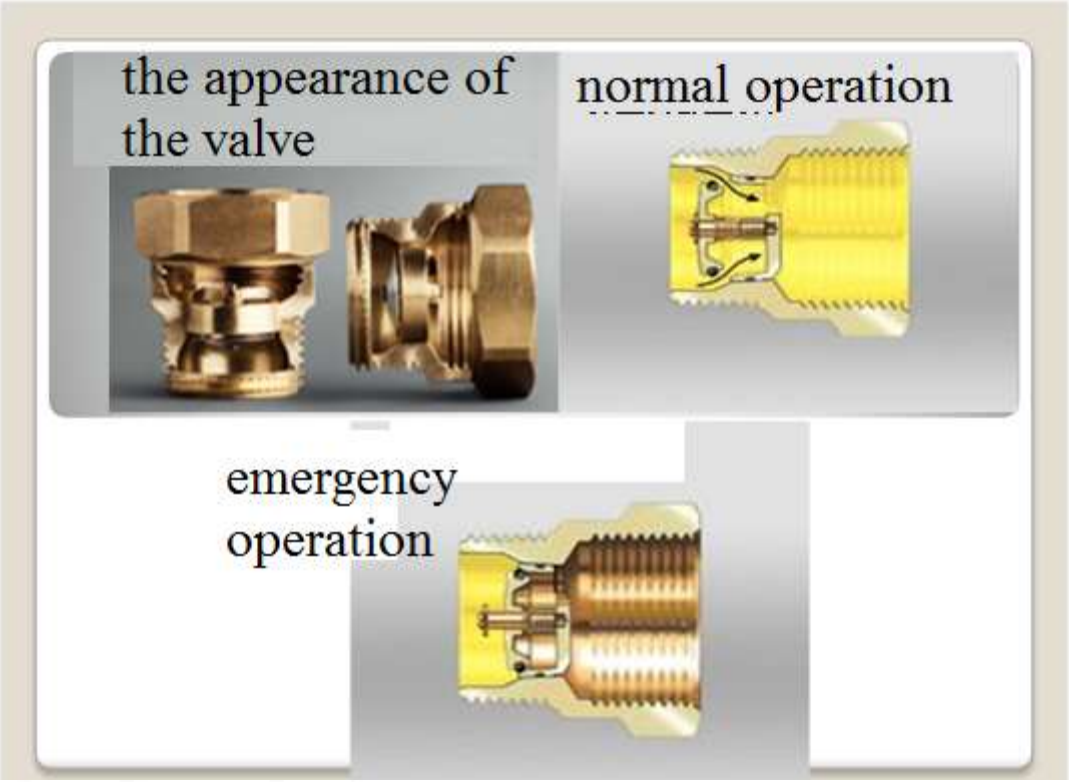
When there is a fire and in other situations

In such situations, the consumer opens the gas equipment and, knowing that there is no gas in the network, leaves without closing the tap. When the gas is delivered to the consumer again, the gas tap is open and gas starts to flow into the room. An explosive concentration is formed in the room. An explosion can occur as a result of turning on or off electrical equipment or a small spark. In order to prevent such an accident, it is advisable to install an automatic shut-off valve. When gas is re-supplied to the network with the taps in the network open, the automatic shut-off valve is activated and closes the gas line. A very small amount of gas is emitted for the consumer to notice when entering the room. The consumer enters the room and, smelling the gas, closes the tap and ventilates the room. In such a situation, it is strictly forbidden to turn on and off electrical equipment, use spark-generating substances, and light matches.

After the room is well ventilated, after some time, the pressure on the left and right sides of the automatic shut-off valve in the network will equalize and the automatic shut-off valve will open. The consumer can now use gas at will. Gasification of apartments is recommended to be carried out according to the following scheme.



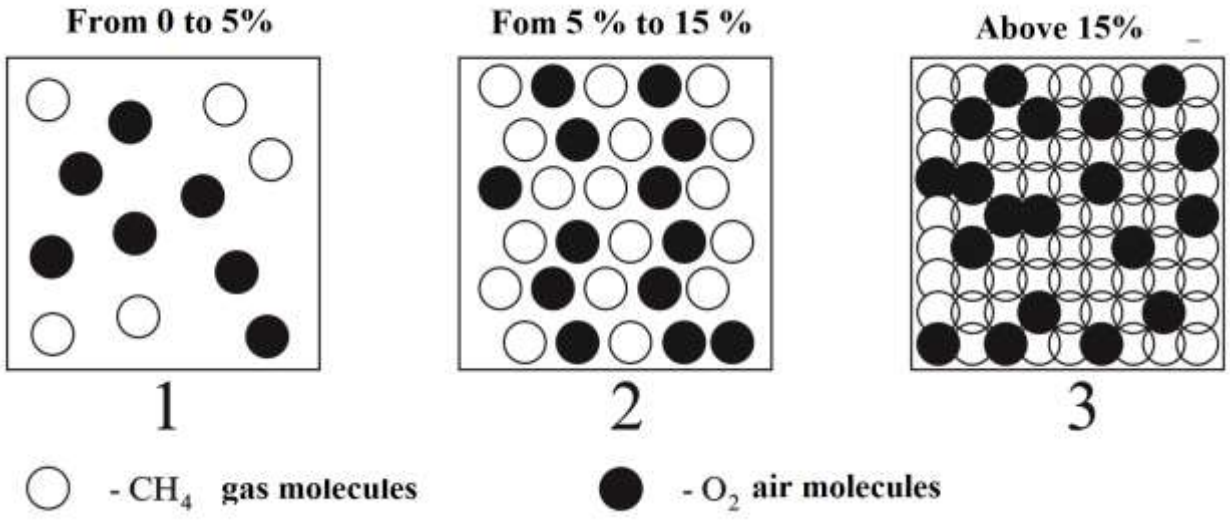
1 – scheme. Scheme of installation of an automatic shut-off valve in apartments.
1 – main valve, 2 – valve, 3 – counter, 4 – automatic shut-off valve, 5 – gas equipment.



2 – picture. The structure of the automatic shut-off valve.

CONCLUSION. If there is a spark or flame, if electrical appliances are turned on or off, an explosion will certainly occur. As a result of the explosion, the strong pressure exerts a force of 8-9 kgs/cm2 on 1 cm2 of surface, which causes any barrier, wall, floor, beds, door frames to burst and break. As a result of the explosion, heat of 2100 0C is released, causing burns and fires.

Factors leading to explosion are expressed in the following forms:



In form 1, air and natural gas and liquefied gas molecules are located far from each other, explosion does not occur, fire may occur.

In form 2, gas and air molecules are very close to each other, and if there is a flame or spark, a chain reaction (sepnaya) occurs and an explosion occurs.

In form 3, gas and air molecules stick together, and explosion and fire do not occur.

Advantages and disadvantages of natural gas

Natural gas has 5 advantages:

1. Easy to transfer through pipes;
2. When burned, it burns cleanly and leaves no ash;
3. Gas appliances can be automated;
4. High heat capacity (8500-9500 kcal)
5. Cheap compared to other fuels

Disadvantages

1. Fair hazard;
2. Pure gas.

Thus, with the help of an automatic shut-off valve, it is possible to prevent the gas-air mixture from reaching the limit of combustion and explosion and the occurrence of fire.

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