

# MACURCO

GAS DETECTION



## GAS BOILER GUIDE

This publication is intended to serve as a guideline for the use of the Macurco products. It is not to be considered all-inclusive, nor is it intended to replace the policy and procedures for any facility. If there are any doubts about the applicability of the equipment to your situation, consult an industrial hygienist or call Macurco Technical Service at 1-877-367-7891



Made in the USA

# MACURCO

GAS DETECTION

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## INDUSTRY OVERVIEW

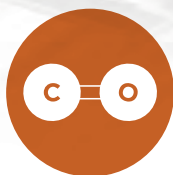
A building's mechanical system is the heartbeat of the heating, ventilation, and air conditioning systems. These areas include utility plants, boiler and chiller rooms, mechanical or electrical rooms, and fuel rooms. Natural gas is a flammable gas mainly composed of methane, with the remaining amount consisting of a mixture of other gases. Natural gas is typically the primary fuel source that is used in a boiler room.



There are two main gas safety concerns within gas boiler rooms. The first concern is a natural gas leak occurring and going undetected. In the event of a gas leak a build-up can occur, increasing the risk of an explosion and potentially posing significant damage and loss of life. Another concern occurs when natural gas does not combust efficiently and Carbon Monoxide is produced. Carbon Monoxide is a colorless, odorless toxic gas that will go undetected without a proper gas detector; this is driving states to adopt legislation mandating CO detection and activation of shutting down the boiler in the event of a CO build up. Many states are adopting laws that require the monitoring of these gases that could cause potentially hazardous environments.



# TYPES OF GASES FOUND



**CARBON MONOXIDE (CO)** – Carbon Monoxide is often referred to as the “silent killer” because you cannot see it or smell so it can cause great harm going undetected, therefore a monitor is critical in the detection of CO. Symptoms of Carbon Monoxide poisoning include headaches, dizziness, vomiting which can often be mistaken for other flu-like illnesses. Carbon Monoxide (CO) is a poisonous gas responsible for hundreds of deaths and numerous non-fatal poisonings each year in the United States. CO poisoning is also the leading cause of unintentional poisoning deaths in the United States.



## TOXIC

- Some gases are poisonous and are dangerous to life at very low levels. Some toxic gases have distinct odors ( $H_2S$ ,  $NH_3$ ) and others have no odors at all (CO).
- Very low levels inhaled, ingested, or absorbed through the skin pose adverse effects from exposure.
- Gases such as Carbon Monoxide, Nitrogen Dioxide, Ammonia, Hydrogen Sulfide.

CO Level in Air	Health Effects and Symptoms
0 ppm	Fresh outdoor air.
100 ppm	Slight Headache after 1-2 hours.
200 ppm	Dizziness, headache, nausea after 2-3 hours.
400 ppm	Dizziness, headache, nausea after 1-2 hours / life threatening after 3 hours.
800 ppm	Dizziness, headache, nausea after 45 minutes, unconscious after 1 hour, death within 3 hours.
1,600 ppm	Dizziness, headache, nausea after 20 minutes, death within 2 hours.
3,200 ppm	Dizziness, headache, nausea after 10 minutes, death within 60 minutes.
6,400 ppm	Dizziness, headache, nausea after 1-2 minutes, death within 30 minutes.
12,800 ppm	Instantaneous effect, death within 3 minutes.

# COMBUSTIBLE GASES

TOO RICH FOR COMBUSTION

COMBUSTIBLE MIXTURE

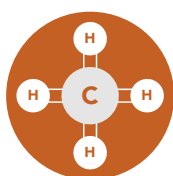
TOO LEAN FOR COMBUSTION

100% by Volume

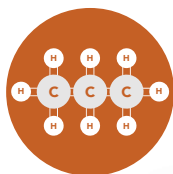
UEL

LEL

0% by Volume



**METHANE ( $CH_4$ )** – Methane is single carbon alkaline and the main constituent of natural gas (roughly 95%) and is used as a common fuel source in many types of applications.



**PROPANE ( $C_3H_8$ )** – Propane is a three-carbon alkaline produced as a by-product of two other processes, natural gas processing, and petroleum refining. It is used as a fuel source for domestic, industrial, and transportation applications.



## FLAMMABLE

- Having the right combination of an ignition source, oxygen, and fuel in a gas or vapor form provides the necessary means to create a fire or explosion.
- The minimum concentration of combustible gas or vapor necessary to support its combustion in air is defined as the Lower Explosive Limit (LEL). Below this level, the gas mixture is too “lean” to burn.
- The maximum concentration of a gas or vapor that will burn in the air is defined as the Upper Explosive Limit (UEL). Above this level, the mixture is too “rich” to burn.
- The range between the LEL and UEL is known as the flammable range for that gas or vapor.
- Gases such as Methane, Hydrogen, Propane.

# EQUIPMENT SELECTION & LOCATION

## Ventilation Considerations

The primary purpose of having ventilated air in a boiler room is to provide combustion air for the boiler to work correctly. Ventilation can also aid in the reduction of a natural gas leak or the accumulation of Carbon Monoxide. Depending on the type of ventilation and the air exchanges, this is not a guarantee of safety mitigation. That is why it is recommended to have a gas detection system for these types of applications.

## Detection System

Each application and installation may be different, but at a minimum, you will want both a Carbon Monoxide detector and the appropriate combustible gas sensor based on the fuel being used.



### MACURCO CM-6 (24V) CM-12 (120V) FOR CARBON MONOXIDE

- Coverage Area up to 7,500 sq. ft  
(Centrally mounted, the radius is 48 ft.)
- Recommended mounting height 4-6 ft. above the floor
- Centrally mounted where air movement is generally good
- Do not mount in a corner
- Do not mount where normal ambient temperature is below 0°F or exceeds 125°F (-18°C to 52°C)



### MACURCO GD-6 (24V) GD-12 (120V) FOR COMBUSTIBLE GAS

- Coverage Area up to 1,257 sq. ft  
(Centrally mounted, the radius is 15-20ft)
- Recommended mounting height (target gas-dependent):
  - Natural Gas (Methane) roughly 12" below the ceiling
  - Propane roughly 12" above the floor
- Centrally mounted where air movement is generally good
- Do not mount in a corner
- Do not mount where normal ambient temperature is below -4°F or exceeds 122°F (-20°C to 50°C)

# EQUIPMENT SELECTION & LOCATION



## MACURCO GAS BOILER CONTROLLER

- Used with Macurco detector it is used to shut down boilers or the safety circuit in the presence of gas
- Use up to 4 detectors per controller
- Shutdown up to 8 boilers/appliances with dedicated relays
- Local audible/visual notification
- Optional External audible/visual notification



## MACURCO HORN/STROBES

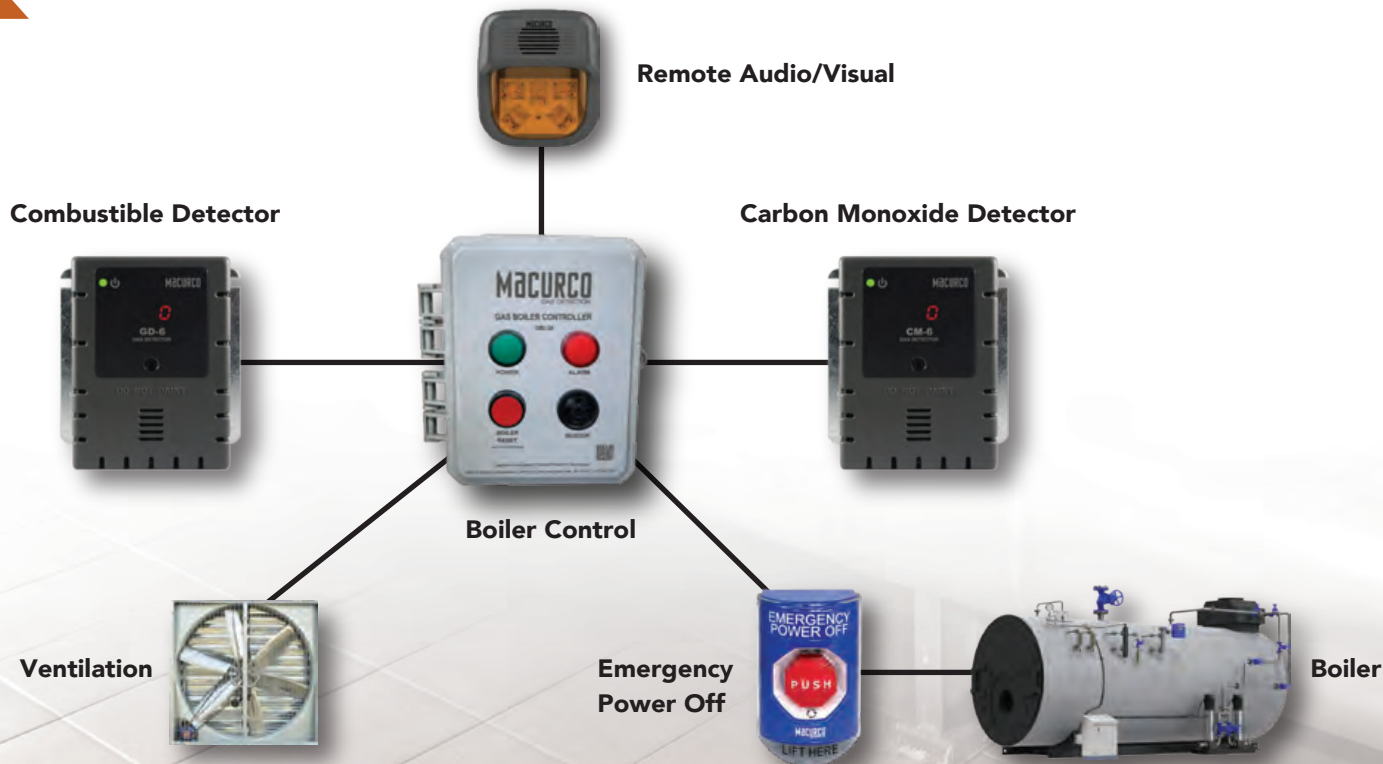
The Macurco Horn and Strobe are recommended for areas needing distinctive visual or audible signal outside the boiler room to provide additional advance notification in the event of an alarm condition.



## EMERGENCY POWER OFF

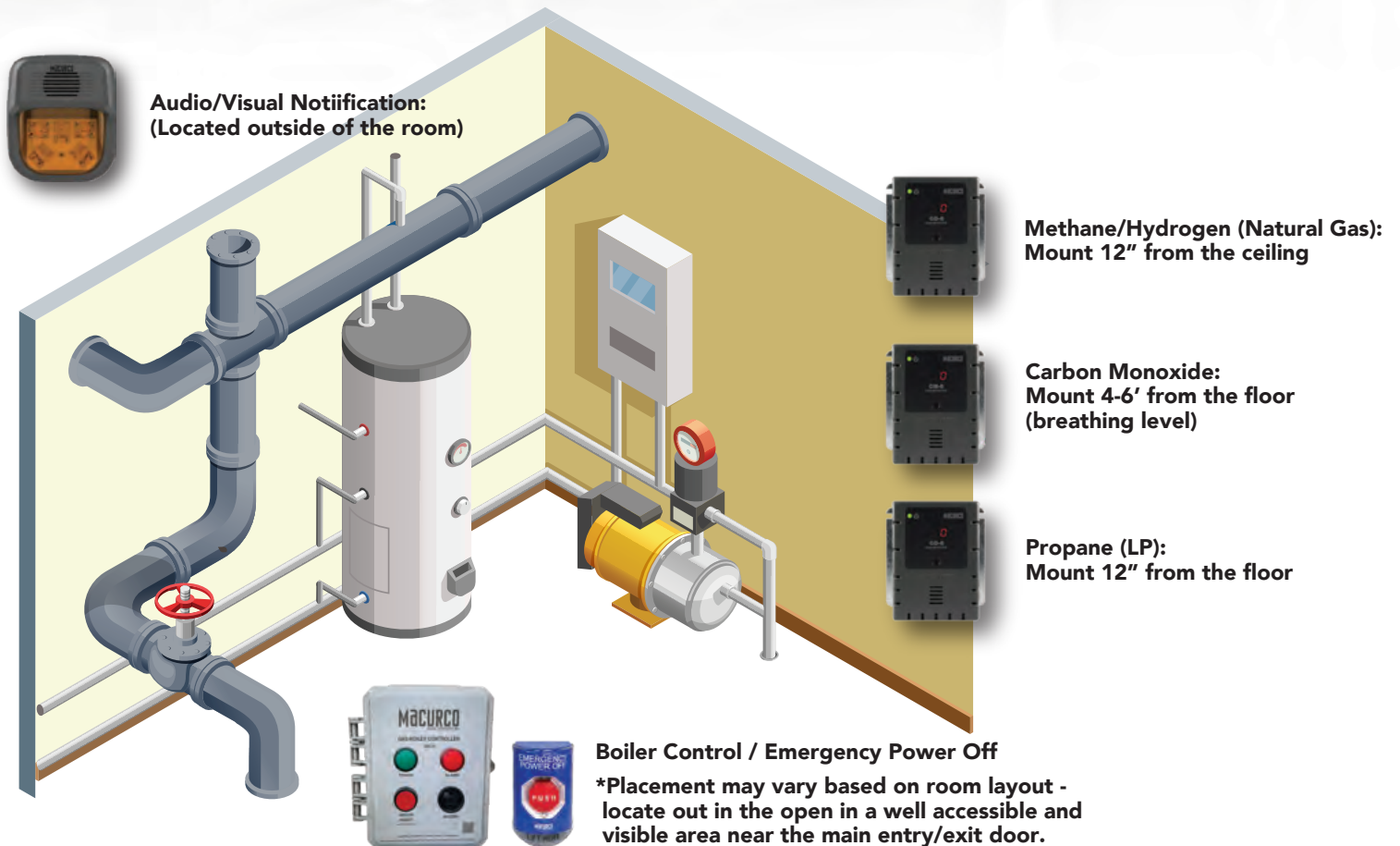
The Macurco E-Stop button is a remote button used to disengage power in the event of an emergency. This shutdown can be used to shutdown gas valves or boiler systems.

# MACURCO BOILER CONTROL SOLUTION





# EXAMPLE GAS BOILER CONTROLLER LAYOUT



## MAINTENANCE

### DEMONSTRATION AND TRAINING

Inspect the components, equipment installation, and electrical connections for compliance with requirements. Test the alarm setpoints of the gas detection system with calibration, and test gases and verify sequence of operation. Perform demonstrations and train maintenance personnel to adjust, operate, troubleshoot, calibrate and maintain the gas detection and control systems. **Calibration and test kits should be provided with the gas detection system.** Calibration and test intervals must comply with the manufacturer's recommendations. If required, prepare a written report to record test procedures, results, and corrective actions. The information should also cover the requirements for accessories like the acceptability of alarm types, signs, and protective equipment. **Macurco should perform any repair or replacement of malfunctioning units.**

# MACURCO

## GAS DETECTION

Celebrating over 50 years of gas detection, the Macurco product line offers equipment for residential, commercial, and industrial applications. Since 1972 Macurco has been providing detection options for several different gases including, carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), hydrogen (H<sub>2</sub>), propane (LP), methane (natural gas), hydrogen sulfide (H<sub>2</sub>S), ammonia (NH<sub>3</sub>), oxygen (O<sub>2</sub>), carbon dioxide (CO<sub>2</sub>), and refrigerants.

Headquartered in Sioux Falls, South Dakota, Macurco strives to provide the highest quality detection, safety and security solutions to customers worldwide. Whether you are looking for gas detection for a security system, building automation or HVAC system, for personal safety, or for monitoring specific gases in potentially hazardous environments, Macurco has a gas detector to meet your needs.



## GAS DETECTION IS ALL WE DO, AND WE DO IT BEST.

Visit [www.macurco.com](http://www.macurco.com) for additional product information and training.

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