Fire Industry Association
Thames House, 29 Thames Street
Kingston upon Thames, Surrey, KT1 1PH
Phone: +44 (0) 8549 5855
Website: www.fia.uk.com

FIA APPLICATION GUIDELINES FOR CARBON MONOXIDE (CO) FIRE DETECTORS (Fact File 4 revised)

Fact File No 31

1. SCOPE

This FIA Fact File provides guidelines for the use of fire detectors utilizing carbon monoxide (CO) sensors based on electrochemical cell technology. This Fact File does not give guidelines for detectors which incorporate additional or other sensing technologies. This Fact File does not give guidelines for CO gas detectors for environmental monitoring or toxic gas detection.

2. INTRODUCTION

CO is a known product of the combustion of carbon based material. It is an invisible and odourless gas which, unlike smoke, cannot be detected by people. In certain conditions where, due to oxygen starvation, the fire develops slowly, a significant and dangerous concentration of carbon monoxide may be present in the atmosphere before other combustion products.

When present in the atmosphere in sufficient quantity, CO can seriously impair the ability of people to react in a fire situation and can eventually lead to their death.

Although there are many different techniques for sensing and detecting the presence of CO, currently available CO fire detectors use an electrochemical cell. This type of CO fire detector can be easily configured into fire detection and fire alarm systems in the same way as other fire detectors. Electrochemical cells, however, have characteristics that can make them sensitive to other gases, some creating a risk of unwanted alarms. Other substances may adversely affect the response of the cell by poisoning it and examples are listed later in this Fact File.

It is very important to understand that there are significant differences in the performance characteristics of CO gas detectors for environmental monitoring, CO toxic gas detectors and CO fire detectors. These differences include sensitivity levels, time of response and the specification of the sensing element. Only CO fire detectors which are recommended by the manufacturer for fire detection applications should be used.

3. APPLICABLE STANDARDS

LPS1265 issue 1.1 (2005), Requirement and Testing Procedures for the LPCB Approval and Listing of Carbon Monoxide Fire Detectors Using Electrochemical Cells.

BS 5839-1:2002/A2:2008 Fire detection and fire alarm systems for buildings – Code of practice for system design, installation, commissioning and maintenance.

4. GENERAL INFORMATION ON THE APPLICATION OF CO FIRE DETECTORS

CO fire detectors are not a general replacement for smoke detectors. Although their specific characteristics can be of benefit in certain fire risk situations, it is important that, for each application, the fire risk is evaluated before a choice of detector technology is made.

As with most types of detector, there are applications where CO fire detectors are appropriate and others where they are inappropriate. The following list provides information on these applications:

a) Where there is a slow smouldering fire, there will normally be reasonably high levels of CO. In addition, in the early development of most fires some degree of CO will be present.

b) Clean burning or rapid burning flaming fires, such as liquid fuel fires, produce low levels of CO as a more complete combustion occurs. As the fire develops, the air supply may be insufficient to adequately sustain the fire and oxygen starvation may begin to occur. Under these circumstances the level of CO is likely to increase.

c) Like smoke detectors, CO fire detectors benefit from the convection currents created by the heat at the source of combustion. These currents transport the CO to the sensing element. Additionally CO also diffuses within the protected volume thus sometimes enabling CO fire detectors to operate effectively in spaces where the presence of physical barriers could restrict the spread of smoke. Examples of such physical barriers include deep ceiling beams, false ceilings, partitions between adjacent rooms and hot air layers.

d) There are concerns that the application of CO fire detectors may sometimes result in early detection being ignored because the location of the fire may not be readily identified even though high levels of CO may be present. Those who are responsible for the safety of buildings and their occupants will need to be instructed on this possibility.

e) As for any detection technology, it is important that CO fire detectors are only used where the risk assessment indicates that they are appropriate for detecting the types of fire that are most likely to occur.

f) Detectors that combine CO with one or more of the other detection technologies (multi-sensor detectors) are becoming available. These may offer additional advantages over single sensor detectors.

g) Always refer to the manufacturer's recommendations to determine the suitability of the detector for the environmental conditions.

5. SITUATIONS WHERE CO FIRE DETECTORS CAN PROVIDE A MEANS OF EARLY FIRE DETECTION

A CO fire detector may give an earlier response in the following conditions:

a) Where there is a high risk of a slowly developing or smouldering fire which is likely to produce CO before smoke particles,

b) Where the potential presence of unwanted fire alarm sources makes the environment unsuitable for the use of some types of fire detectors. Examples include hotel bedrooms with an adjacent bathroom or shower room where steam may be present or areas where particularly dusty processes take place or where simulated smoke may be present.

c) Where the fire is likely to occur in an enclosed space causing oxygen starvation and incomplete combustion. Examples include laundry storage rooms or cupboards where a CO fire detector sited outside the door may detect a fire before smoke begins to spread outside the affected enclosure.

d) Where movement of the smoke from the source of a fire may be restricted due to hot air layering effects (stratification effect). In such circumstances, CO fire detection can be used to supplement other forms of detection technology.

6. SITUATIONS WHERE CO FIRE DETECTORS ARE NOT RECOMMENDED AS THE PRIME MEANS OF DETECTION

CO fire detectors should NOT be used in the following situations:

a) Where fire starts with rapid flaming and the heat generated ensures rapid and complete combustion. Examples include liquid fuel fires involving flammable liquids such as solvents.

b) Where there may be a risk of an electrical fire or overheating cables. CO may not be produced in detectable quantities.

c) For duct fire detection applications if the main objective is prevention of the spread of smoke within a building.

d) For applications where significant levels of CO may be present under normal conditions. Examples include areas where internal combustion engines are used (such as forklift trucks etc.) and enclosed or semi-open car parking areas.

e) Where the atmosphere may be polluted with substances that may cause unwanted alarms or affect the performance of the CO fire detector. Examples include alcohols, hydrogen, ammonia and certain chemicals used in sprays.

f) Where smoke detection is required to ensure adequate visibility is maintained, for example in escape routes. In such situations, supplementing smoke detectors with CO fire detectors may provide some advantage depending upon the findings of the risk assessment.

7. SITING OF CO FIRE DETECTORS

Guidance for the siting of CO fire detectors is given in Clause 22.4 of BS5839-1, as amended.

Where CO fire detectors are used to supplement BS 5839-1 systems they may be sited to give additional protection in situations described in section 5 above.

8. TESTING, SERVICING, MAINTENANCE AND REPLACEMENT

It is important to always follow the manufacturer's recommendations for testing, servicing, maintenance and replacement requirements.

Testing methods for CO fire detectors may include: a small can that delivers a measured amount of CO, another source of CO or a means of effectively mimicking CO.

January 2009