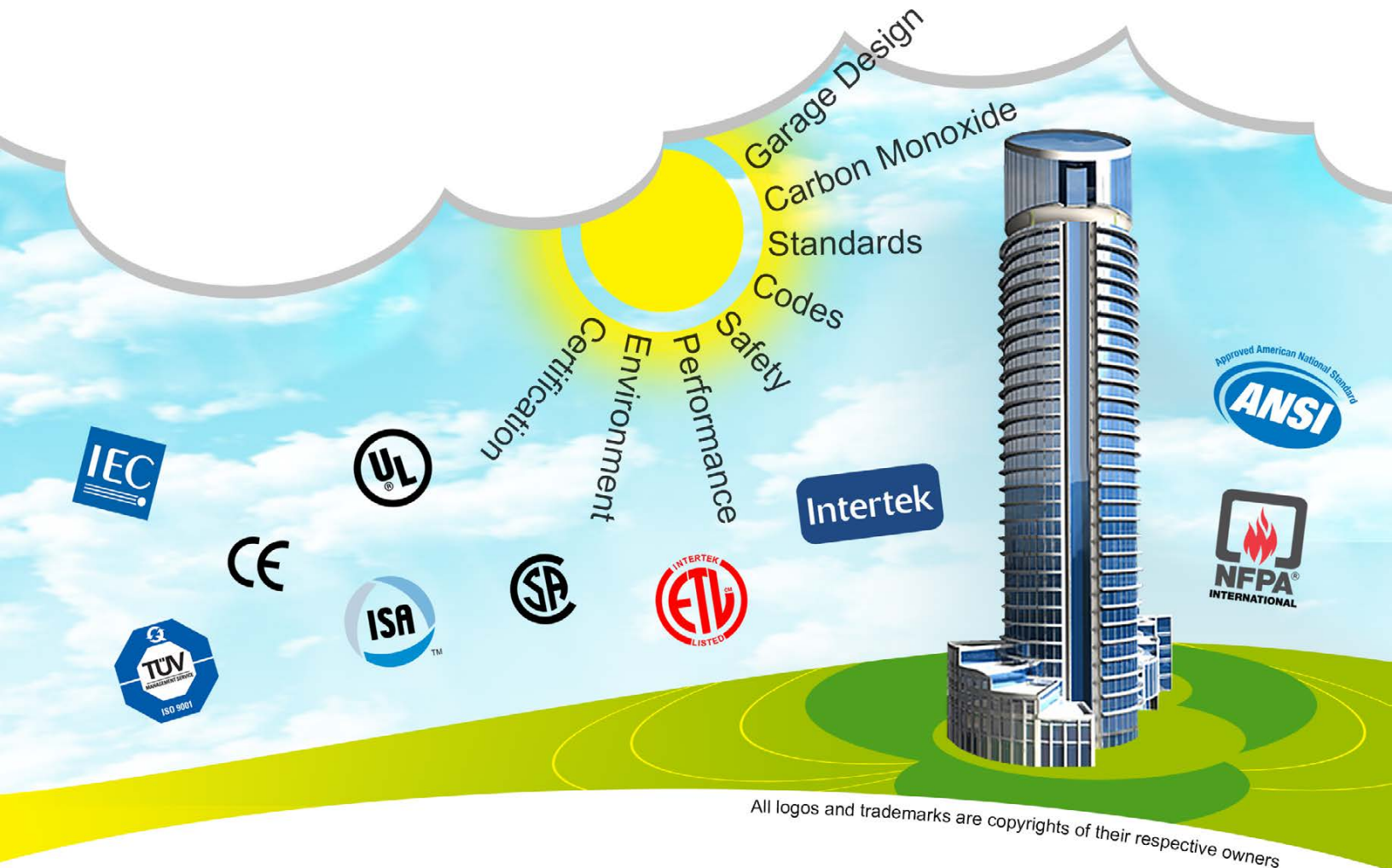


Overview of Standards for CO Detection Products

Rev 1.1



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1 General Overview

The commercial building industry (i.e., building owners and operators, design professionals, and institutions) is concerned about environmental safety and minimizing energy costs. When designing and choosing a carbon monoxide (CO) detection and control system for a parking structure, it is essential to evaluate established codes and standards.

2 Application and Installation Codes & Standards

Various institutions, societies, organizations and government agencies (i.e., International Mechanical Code (IMC), Occupational Safety and Health Administration (OSHA), National Fire Protection Agency (NFPA), and other) have established codes and standards to limit carbon monoxide levels in parking structures. Most building codes and application standards allow demand-based ventilation in enclosed parking garages if carbon monoxide levels are monitored. This type of design can drastically reduce energy costs (i.e. operating of garage fans and heating system), increase fan belt and motor life, and reduce noise.

A range of gas detection (sensors/transmitters) and control systems are available for handling the sequence of operations in parking structure applications. The actual parking structure's design will determine which type of gas detection (sensor/transmitter) and control system best fits the application.

For additional information please refer to INTEC Controls' "CO Parking Garage Design Guidelines".

"The selected detectors (sensors/transmitters) and controllers must be capable of providing the control sequence of operations and alarming for the mechanical system design and building safety."

3 Product Standards

The American National Standard Institute (ANSI) and Underwriters Laboratories (UL) have issued appropriate standards (i.e. ANSI/UL2075, ANSI/UL2017, etc.) applicable for carbon monoxide (CO) detection and control products.

“Only utilize CO product solutions that are tested, certified, and listed for the intended use and in compliance with the industry’s standards.”

<p>Electrical Safety and Performance Codes & Standards for Gas Detection and Control Systems Products</p> <ul style="list-style-type: none">➤ Standards and technical regulations exist for gas detection, alarm and control systems in order to impose electrical safety and performance protection for the building owner & user.➤ Many organizations and authorities participated, in a partial or full capacity, in the process of establishing codes and standards, i.e., recommending, developing, writing, establishing consensus, preparing and publishing, and enforcing protective standards.
<p>OSHA (Occupational Safety and Health Administration) – OSHA establishes and enforces protective standards to save lives, prevent injuries, and protect the health of America’s workers.</p>
<p>NFPA (National Fire Protection Association) – The NFPA establishes fire safety standards, including those standards for the safe operation of process.</p>
<p>ANSI (American National Standards Institute) – ANSI is a private, non-profit organization that administers, promotes, and facilitates the U.S. voluntary consensus standards and conformity assessments. ANSI is also the official U.S. representative to the International Electrotechnical Commission (IEC) and the International Organization for Standardization (ISO). The National Electric Manufacturers Association (NEMA) publishes a number of their standards.</p>
<p>ISA (Instrument Society of America) – ISA is globally recognized as a standard writing organization, developing consensus standards and protecting facilities from flammable hazards.</p>
<p>UL (Underwriters Laboratories) – UL is an independent, non-profit organization. They participate in developing standards to enhance public safety, preserve the environment, and facilitate trade. In addition, UL is a NTRL (Nationally Recognized Testing Laboratory), approved by OSHA.</p>
<p>International</p>
<p>CSA (Canadian Standard Association) – CSA is a non-profit association serving business, industry, government and consumers in Canada and the global marketplace. They work to develop standards to enhance public safety, preserve the environment, and facilitate trade. In addition, CSA is a NTRL (Nationally Recognized Testing Laboratory), approved by OSHA.</p>
<p>IEC (International Electrotechnical Commission) – IEC is the leading global organization that prepares and publishes international standards for all electrical, electronic and related technologies. These serve as a basis for national standardization.</p>

EU (European Union)

The EU is a treaty-based, framework institution that defines and manages economics and political cooperation. The EU covers many issues, such as the environment, agriculture, trade, energy and transport, and mandates various **standards**, and **directives** to which manufacturers must comply. The following is a list of **directives** to which **gas detection equipment manufacturer must comply**.

EC (European Conformity) –

The **CE Mark** is the official marking required by the European Community for all electric and electronic equipment that will be sold, or put into service, anywhere in the European community. It ensures that a product fulfills all essential safety and environmental requirements as defined by the EU (European Union) through the European Directives.

ATEX (Atmosphere Explosive) –

The **ATEX Directives** are EU (European Union) legislation enforced since July 1, 2003. They are intended to standardize, clarify, and improve the way in which equipment used in explosive atmospheres is modified, utilized, and maintained across the EU. The purpose of the directives is to align technical and legal standards while promoting the free movement of goods throughout the EU.

EMC (Electromagnetic Compatibility) –

The **EMC Directives** set essential apparatus protection requirements while dictating the electromagnetic disturbance a product may generate or be immune to. The directives are in accordance with EU standards defining the technical requirements necessary to achieve the required level of protection. The EMC Directives are applied to electrical equipment and components, domestic appliances, and industrial appliances.

LVD (Low Voltage Directive) –

The **LVD Directives** apply to all electrical equipment. They are designed to operate in the voltage range of 50-1000 VAC or 75-1500 VDC. The Directives ensure that all electrical and electronic equipment placed on the market in the EU is safe.

For more details and specific information, visit the websites of the appropriate organization and/or government authorities.

Any carbon monoxide (CO) detection system selection done by specifying engineers, installers and building owners should include solutions that are in compliance with industry standards. Every **HVAC, Security, Controls and Building professional should understand** the differences between the American National Standard Institute (ANSI) and Underwriters Laboratories (UL) standards ANSI/UL 2075, ANSI/UL 2017 and ANSI/UL 2034, and **be aware of the new ANSI/UL2075 requirement that became effective at the end of 2009.**

4 Certified and Listed Products (Conforms to ANSI/UL Standards)

Major Authorized NRTL
CSA – Canadian Standard Association <i>(also known as CSA International)</i>
FM – FM Approvals LLC <i>(formerly Factory Mutual Research)</i>
INTERTEK / ITSNA – Intertek Testing Services NA, Inc. <i>(formerly ETL)</i>
TUV / TÜV – TÜV SÜD America, Inc. (TUVAM) TÜV SÜD Product Services GmbH (TUVPSG) TÜV Rheinland of North America, Inc. (TUV)
UL – Underwriters Laboratories Inc.
An additional six (6) approved/certified NRTL companies are available – visit OSHA’s website for details. <i>Only CSA, Intertek and UL are currently certified to test to Standard ANSI/UL 2075.</i>

Nationally Recognized Testing Laboratory “NRTL” –
 An organization that is approved by OSHA (Occupational Safety and Health Administration) to independently test, certify and conform electrical instrumentation and control products to the appropriate standards, and to provide product listing and labeling.

“Only choose CO product solutions that have the appropriate NRTL listing and label.”

Existing USA Standards and Certification applicable for Carbon Monoxide Detectors, Transmitters & System Controllers			
For	Scope / Applications (key excerpts)	Standards	Title
Commercial Buildings	Applies to the following electrical products and applications: <ul style="list-style-type: none"> ▪ Multi-gas sensors/transmitters ▪ Multi-gas detectors ▪ Solely for control of ventilation or shutting off devices such as fans or control valves ▪ For operating as part of gas detection or emergency signaling systems <p><i>Note:</i></p> <ul style="list-style-type: none"> ▶ <i>It is not appropriate to use ANSI/UL 2075 “residential” type of detectors for commercial applications.</i> 	ANSI/UL 2075 Includes ANSI/UL 2034	Standards for Safety Gas, Vapor Detectors and Sensors/Transmitters. <i>Comments:</i> <ul style="list-style-type: none"> ▶ <i>Standard ANSI/UL 2075 incl. sensor/transmitter performance tests, and sensitivity testing to ANSI/UL 2034</i> ▶ <i>NFPA in their application standard NFPA 720, 2009 edition, for installation of CO detection and warning equipment, states:</i> <i>Each carbon monoxide detector (senor/transmitter) shall be in compliance with ANSI/UL 2075. Also, gas and vapor detectors (sensors/ transmitters) shall meet the sensitivity tests and alarm thresholds of ANSI/UL 2034, the standard for single and multiple station carbon monoxide alarms.</i>

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Commercial Buildings	<p>Applies to the following electrical products and applications:</p> <ul style="list-style-type: none"> Self-monitored devices or systems are intended to be self-monitoring. These devices are intended for, but not restricted to, commercial use. A product covered by these requirements consists of a unit assembly of electrical parts having provision for the connection of power supply circuits routed through the equipment by a prescribed scheme of circuiting. Circuits extending from the products connect to separate devices by which the operating part of the product is actuated for signals, and to separate and/or integral devices by which the signals are indicated so as to form a coordinated system combination for definitive signaling services. An installation wiring diagram attached to the product, or referenced in the product marking, indicates the devices and circuits which have been determined to be capable of being used with the product in the field. Installed and used in accordance with the National Electrical Code, NFPA 70. 	ANSI/UL 2017	<p>Standard for Safety General-Purpose Signaling Devices and Systems.</p> <p><i>Comments:</i></p> <ul style="list-style-type: none"> Commercial CO detection and control systems for parking garages (i.e., a central control unit connected with multiple sensors/transmitters, analog or digital bus types), located across the parking space controlling ventilation and alarming, shall be certified products conforming to: <ul style="list-style-type: none"> ANSI/UL 2017 for controller/central control unit ANSI/UL 2075 for sensors/transmitter (detectors)
Commercial Buildings	<p>Applies to the following electrical products:</p> <ul style="list-style-type: none"> Control equipment Test and measurements Laboratory equipment Accessories 	ANSI/UL 61010-1 IEC 61010-1	<p>Standards for Safety Electrical Equipment for measurement, control, and laboratory.</p> <p><i>Comments:</i></p> <ul style="list-style-type: none"> Standard ANSI/UL61010-1 does not include sensor/transmitter performance testing. For commercial garage CO detection and control systems, the latest revised standards call for products with NRTL certification that conforms to ANSI/UL 2075 (CO sensors/transmitters) and ANSI 2017 (central control units). Many local authorities (building and safety departments), are known for strict enforcement of local codes and standards within their jurisdiction. This includes the cities of Los Angeles, San Diego, Chicago, Orlando, New York City, as well as the states of North Carolina, Oregon and Florida. The building inspectors will look for the appropriate NRTL listing on the installed products.
Residential Dwellings	<p>Applies to electrical alarms intended for:</p> <ul style="list-style-type: none"> Indoor locations of dwelling units Recreational vehicles Mobile homes Boats, enclosed spaces 	ANSI/UL 2034	<p>Standard for Safety single and multiple station CO alarms.</p> <p><i>Comments:</i></p> <ul style="list-style-type: none"> Products NRTL certified to ANSI/UL 2034 are intended for residential applications and should not be connected to a commercial central control and alarm system panel.
<p>Note: For the complete and exact definition (title, scope, etc.), please refer to the officially issued standards available through the respective organizations, i.e., OSHA, NFPA, ANSI and/or any NRTLs.</p>			

5 State & City Authorities and Building Inspectors

State and local inspectors, who are empowered by their authority having jurisdiction (AHJ), have universally adopted the National Fire Protection Agency, standard NFPA 70, also known as the National Electrical Code (NEC).

Some authorities and their inspectors are known for strict enforcement beyond the local electrical codes and may require the installed CO detectors (sensors/transmitters) and controllers to be NRTL listed. Los Angeles, San Diego, Chicago, Orlando, New York City, and as well the states of North Carolina, Oregon and Florida are some examples.

The inspector or building official may “red tag” installed, unlabeled equipment as unfit for operation until the applicable product safety requirement is met or replaced with a NRTL listed product. Local authorities, building owners and operators have been dissatisfied in the past with many of the substandard commercial carbon monoxide (CO) detection equipment, which emphasized electrical safety only. The new ANSI/UL 2075 standard was eventually developed and adopted to address both electrical safety and product performance.

The National Fire Protection Association (NFPA) in their **application standard NFPA 720**, 2009 edition, for **installation of CO detection and warning equipment**, states:
Each carbon monoxide detector shall be **in compliance with ANSI/UL 2075**. Also, gas and vapor detectors and sensor/transmitters shall meet the sensitivity tests and alarm thresholds of ANSI/UL 2034, the standard for single and multiple station carbon monoxide alarms.

“Only install CO solutions which have been thoroughly performance tested and their product specifications accurately verified.”

6 Performance

Various designed and manufactured CO sensors/transmitters offer differing levels of accuracy, repeatability, detection with or without cross sensitivity to other gases, and sensor element life span. These factors will influence the performance and operating costs of the mechanical and CO detection system.

The market offers mainly two types of CO gas sensing element technologies for commercial garage applications – electrochemical and solid state			
Technology	Accuracy PPM CO	Life Span	Features
<u>Electrochemical</u> – Type High Accuracy	< +/- 1	5+ years	<ul style="list-style-type: none"> ▪ Detects the true level of CO in ppm ▪ Reduced drift <p><i>“High accuracy & reduced drift means fewer calibration intervals”</i></p>
<u>Electrochemical</u> – Type Standard	+/- 3	< 5 years	
<u>Solid State / Semiconductors (MOS) – Type 1</u>	+/- 7 to 15	7+ years	Solid state sensors: <ul style="list-style-type: none"> ▪ Are cross sensitive and prone to false alarm ▪ Subject to drifts of readings at sizeable space, temperature and/or humidity change ▪ Require more frequent calibration intervals
<u>Solid State / Semiconductors (MOS) – Type 2</u>	Unknown	2.5 years	

The CO central controller should have the capability to fulfill all required sequence of operation, provide self-diagnostic with malfunction warning, intelligently identify each individual sensor/transmitter’s detection value and local and remote alarms, and sensor element’s End-of-Life (EOL) fail-safety alarm.

“Review the product data sheet’s specifications and select the solution that will secure an economical installation, provide safety and performance to fit the mechanical system design, and lower calibration intervals.”

7 “The Right Choice”

The analog or digital multi-point bus CO detection and control systems for commercial parking structures should provide:

- ▶ Sensor/transmitter: NRTL Performance Tested & Certified, conforming to STD ANSI/UL 2075
- ▶ Central Controller: NRTL Tested & Certified, conforming to STD ANSI/UL 2017