Code Technology Committee
Area of Study – Carbon Monoxide Alarms

2007/2008 Cycle
Code changes related to the CTC area of study noted above

The following are code changes related to the CTC Carbon Monoxide Area of Study that will be considered at the 2007/2008 Code Development Hearings in Palm Springs, California.

F132–09/10
908 (New) [IBC [F] 908(New)], 902 (IBC [F] 902), Chapter 47 (IBC Chapter 35); IRC R315, R202, Chapter 44

Proponent: Roger Evans, Park City Municipal Corporation, representing Utah Chapter of ICC

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IFC COMMITTEE. PART II WILL BE HEARD BY THE IRC BUILDING/ENERGY COMMITTEE. SEE THE TENTATIVE HEARING ORDERS FOR THESE COMMITTEES.

PART I – IFC

1. Add new text as follows:

SECTION 908 (IBC SECTION [F] 908)
CARBON MONOXIDE ALARMS AND
CARBON MONOXIDE DETECTION SYSTEMS

908.1 General. This section covers the application, installation, performance and maintenance of carbon monoxide alarms and carbon monoxide detection systems in new buildings and structures.

908.1.1 Carbon monoxide alarms, carbon monoxide detectors and combination smoke/carbon monoxide devices. Carbon monoxide alarms, carbon monoxide detectors and combination smoke/carbon monoxide alarms and combination smoke/carbon monoxide detectors described in sections 908.1.2 through 908.1.5 shall be installed and maintained in accordance with the provisions of this code, NFPA 72 and NFPA 720.
908.1.2 Carbon monoxide alarms. Single- or multiple-station carbon monoxide alarms shall be listed and labeled in accordance with ANSI/UL 2034.

908.1.3 Carbon monoxide detectors. Carbon monoxide detectors shall be listed and labeled in accordance with ANSI/UL 2075.

908.1.4 Combination smoke/carbon monoxide alarms. Combination smoke/carbon monoxide alarms shall be listed and labeled in accordance with ANSI/UL 217 and ANSI/UL 2034

908.1.5 Combination smoke/carbon monoxide detectors. Combination smoke/carbon monoxide detectors shall be listed and labeled in accordance with ANSI/UL 268 and ANSI/UL 2075

908.2 Power Source. Required single- or multiple-station carbon monoxide alarms, carbon monoxide detectors, combination smoke/carbon monoxide alarms or combination smoke/carbon monoxide detectors shall receive their power by one of the following means:

1. Listed carbon monoxide alarms shall receive their primary power from the building wiring when such wiring is served from a commercial source with secondary power backup and without a disconnecting switch other than those required for overcurrent protection. Listed carbon monoxide alarms that are battery-powered or plug-in with battery backup shall not be permitted in new construction.
2. Listed carbon monoxide detectors shall receive their power from the approved control panel. The approved control panel shall receive its primary power from the building wiring when such wiring is served from a commercial source and the primary power source shall not include a disconnecting switch other than those required for overcurrent protection. The control panel shall be equipped with rechargeable batteries for secondary power backup.
3. Listed low-power radio frequency (wireless) detectors shall be permitted to be battery powered when the battery is electrically supervised and shall be capable of sending an alarm signal to the approved control panel for a minimum of 7 days after sending the initial battery depletion signal.

908.2.1 Interconnection. Where more than one listed carbon monoxide alarm, or, combination smoke/carbon monoxide alarm is required to be installed within a dwelling unit they shall be interconnected in such a manner that the activation of one carbon monoxide alarm shall activate all of the carbon monoxide alarms in the dwelling unit and the activation of a carbon monoxide detector or combination smoke/carbon monoxide detector shall activate the carbon monoxide audible notification devices throughout the individual dwelling unit. The required carbon monoxide alarm signal shall be clearly audible in all sleeping rooms, having a sound level of at least 15 db above average ambient sound level or 5 db above the maximum sound level, or a sound level at least 75 db at the pillow.

Exception: Carbon monoxide alarms, carbon monoxide detectors, combination smoke/carbon monoxide alarms or combination smoke/carbon monoxide detectors installed in existing construction shall not be required to cause all carbon monoxide alarms to sound.

908.2.2 Acceptance testing. When the installation of carbon monoxide alarms, carbon monoxide detectors, combination smoke/carbon monoxide alarms or combination smoke/carbon monoxide detectors is complete, each alarm or detector and interconnecting wiring shall be tested in accordance with NFPA 72 and NFPA 720.

908.2.3 Where required. Listed single- or multiple-station carbon monoxide alarms, carbon monoxide detectors, combination smoke/carbon monoxide alarms or combination smoke/carbon monoxide detectors shall be installed in locations described in sections 908.2.4 through 908.2.5.

908.2.4 Group R-1. Group R-1 occupancies located in a buildings that contain fuel burning appliances or which have attached garages, listed multiple-station carbon monoxide alarms, carbon monoxide detectors, combination smoke/carbon monoxide alarms or combination smoke/carbon monoxide detectors shall be installed in the following locations:

1. On the ceiling or wall of the same room as permanently installed fuel burning appliances in accordance with manufacturers published instructions
2. Centrally located on every habitable level, in every HVAC zone of the building

Exception: Carbon monoxide alarms or carbon monoxide detectors shall not be required in sleeping units unless the sleeping unit contains a fuel-burning appliance.

The required carbon monoxide alarms or carbon monoxide detectors shall be annunciated at a constantly attended location

908.2.5 Groups R-2, R-3 and R-4. Group R-2, R-3 and R-4 occupancies located in buildings that contain fuel burning appliances or which have attached garages, listed multiple-station carbon monoxide alarms, carbon monoxide detectors, combination smoke/carbon monoxide alarms or combination smoke/carbon monoxide detectors shall be installed in the following:

1. Outside each separate dwelling unit sleeping area in the immediate vicinity of the bedrooms
2. On every level of a dwelling unit, including basements and in every HVAC zone of the building
3. On the ceiling or wall of the same room as permanently installed fuel burning appliances in accordance with manufacturers published instructions.

Exception: Carbon monoxide alarms or carbon monoxide detectors shall not be required in sleeping units

unless the sleeping unit contains a fuel-burning appliance.

The required carbon monoxide alarms or carbon monoxide detectors shall be annunciated at a constantly attended location

2. Add new definitions as follows:

902.1(IBC [F] 902.1) Definitions. The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

CARBON MONOXIDE.

Single-Station Carbon Monoxide Alarm. A device intended for the purpose of detecting carbon monoxide gas and alerting occupants by a distinct and audible signal comprising of an assembly that incorporates a sensor, control components and an alarm notification appliance in a single unit operated from a power source either located in the unit or obtained at the point of installation.

Multiple-Station Carbon Monoxide Alarm. A carbon monoxide alarm capable of being interconnected to one or more additional carbon monoxide alarms so that the actuation of one causes the appropriate alarm signal to be annunciated in all interconnected alarms.

Carbon Monoxide Detector. A device intended to be connected to an approved carbon monoxide detection system for the purpose of detecting carbon monoxide gas and alerting occupants by a distinct and audible signal.

Carbon Monoxide Detection System. A system of devices that consists of a control panel and circuits arranged to monitor and annunciate the status of carbon monoxide detectors and to initiate the appropriate response to those signals.

Combination Smoke/Carbon Monoxide Device. A device that combines a carbon monoxide alarm or carbon monoxide detector with smoke sensing technology; provided that the combined device is listed by a nationally recognized testing laboratory (NRTL) to the applicable ANSI/ UL Standards for both smoke detection and carbon monoxide detection. Such combined alarm units or detection systems shall emit an audible alarm in a manner that clearly differentiates between the two hazards as specified in the appropriate NFPA and ANSI/UL Standard.

3. Add new standards to Chapter 47 (IBC Chapter 35) as follows:

NFPA

720-2009	Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment 2009 Edition

UL

2034-2008	Standard for Single and Multiple Station Carbon Monoxide Alarms, with Revisions through February 20, 2009
2075-2004	Standard for Gas and vapor Detectors and Sensors, with revisions through September 28, 2007

PART II – IRC BUILDING/ENERGY

1. Revise as follows:

R315.1. Carbon monoxide alarms, carbon monoxide detectors or combination smoke/carbon monoxide devices. Carbon monoxide alarms, carbon monoxide detectors and combination smoke/carbon monoxide devices described in sections R315.1.1 through R315.1.4 shall be installed and maintained in accordance with the provisions of this code, NFPA 72 and NFPA 720. ~~**Carbon monoxide alarms.** In new construction, dwelling units within which fuel-fired appliances are installed or have attached garages shall be provided with an approved carbon monoxide alarm installed outside of each separate sleeping area in the immediate vicinity of the bedroom(s).~~

R315.1.1 Carbon monoxide alarms. Single- or multiple-station carbon monoxide alarms shall be listed and labeled in accordance with ANSI/UL 2034.

R315.1.2 Carbon monoxide detectors. Carbon monoxide detectors shall be listed and labeled in accordance with

ANSI/UL 2075.

R315.1.3 Combination smoke/carbon monoxide alarms. Combination smoke/carbon monoxide alarms shall be listed and labeled in accordance with ANSI/UL 217 and ANSI/UL 2034

R315.1.4 Combination smoke/carbon monoxide detectors. Combination smoke/carbon monoxide detectors shall be listed and labeled in accordance with ANSI/UL 268 and ANSI/UL 2075.

R315.2 Where Required in New Construction. In new construction within which fuel burning appliances exist or which have attached garages, carbon monoxide alarms, carbon monoxide detectors, combination smoke/carbon monoxide alarms or combination smoke/carbon monoxide detectors shall be installed in the following locations:

1. Outside each separate dwelling unit sleeping area in the immediate vicinity of the bedrooms.
2. On every level of a dwelling unit, including basements

~~**R315.2**~~ **R315.3 Where required in existing dwellings.** Where work requiring a permit occurs in existing dwellings that have attached garages or in existing dwellings within which fuel-fired appliances exist, carbon monoxide alarms/detectors shall be provided in accordance with Sections R315.1 and R315.2.

~~**R315.3 Alarm Requirements** Single station carbon monoxide alarms shall be listed as complying with UL 2034 and shall be installed in accordance with this code and the manufacturer's installation instructions.~~

R315.4 Carbon monoxide alarm signal requirements. Where more than one listed carbon monoxide alarm, or combination smoke/carbon monoxide is required to be installed within a dwelling unit they shall be interconnected in such a manner that the activation of one carbon monoxide alarm shall activate all of the carbon monoxide alarms in the dwelling unit and the activation of a carbon monoxide detector or combination smoke/carbon monoxide detector shall activate the carbon monoxide audible notification devices throughout the individual dwelling unit. The required carbon monoxide alarm signal shall be clearly audible in all sleeping rooms, having a sound level of at least 15 db above average ambient sound level or 5 db above the maximum sound level, or a sound level at least 75 db at the pillow.

R315.5 Power source. Required single- or multiple-station carbon monoxide alarms, carbon monoxide detectors, combination smoke/carbon monoxide alarms or combination smoke/carbon monoxide detectors shall receive their power by one of the following means:

1. Listed carbon monoxide alarms shall be battery-powered, plug-in with battery backup, or receive their primary power from the building wiring when such wiring is served from a commercial source with secondary power backup and without a disconnecting switch other than those required for overcurrent protection.Listed carbon monoxide alarms that are battery-powered or plug-in with battery backup shall not be permitted in new construction.
2. Listed carbon monoxide detectors shall receive their power from the approved control panel. The approved control panel shall receive its primary power from the building wiring when such wiring is served from a commercial source and the primary power source shall not include a disconnecting switch other than those required for overcurrent protection. The control panel shall be equipped with rechargeable batteries for secondary power backup.
3. Listed low-power radio frequency (wireless) detectors shall be permitted to be battery powered when the battery is electrically supervised and shall be capable of sending an alarm signal to the approved control panel for a minimum of 7 days after sending the initial battery depletion signal.

2. Add new definition to Section R202 as follows:

CARBON MONOXIDE.

Single-Station Carbon Monoxide Alarm. A device intended for the purpose of detecting carbon monoxide gas and alerting occupants by a distinct and audible signal comprising of an assembly that incorporates a sensor, control components and an alarm notification appliance in a single unit operated from a power source either located in the unit or obtained at the point of installation.

Multiple-Station Carbon Monoxide Alarm. A carbon monoxide alarm capable of being interconnected to one or more additional carbon monoxide alarms so that the actuation of one causes the appropriate alarm signal to be annunciated in all interconnected alarms.

Carbon Monoxide Detector. A device intended to be connected to an approved carbon monoxide detection system for the purpose of detecting carbon monoxide gas and alerting occupants by a distinct and audible signal.

Carbon Monoxide Detection System. A system of devices that consists of a control panel and circuits arranged to monitor and annunciate the status of carbon monoxide detectors and to initiate the appropriate response to those signals.

Combination Smoke/Carbon Monoxide Device. A device that combines a carbon monoxide alarm or carbon monoxide detector with smoke sensing technology; provided that the combined device is listed by a nationally recognized testing laboratory (NRTL) to the applicable ANSI/ UL Standards for both smoke detection and carbon monoxide detection. Such combined alarm units or detection systems shall emit an audible alarm in a manner that clearly differentiates between the two hazards as specified in the appropriate NFPA and ANSI/UL Standard.

3. Add new standards to Chapter 44 as follows:

NFPA

720-2009 Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment 2009 Edition

UL

2075-2004 First Edition of the Standard for Gas and vapor Detectors and Sensors, with revisions through September 28, 2007

Reason (Part I): The purpose for this code change is to protect people sleeping in commercial Group R occupancies such as hotels, motels, adult & child day care, apartments and dormitories from serious injury or possibly death from unintentional non-fire related carbon monoxide (CO) exposure by mandating the installation of carbon monoxide detection devices. The Centers for Disease Control and Prevention (CDC) reports that an estimated 15,000 emergency department visits and 500 unintentional deaths in the United States each year for the six year period 1999-2004. These carbon monoxide incidents were a contributing factor for 20 states enacting laws to require the installation of carbon monoxide detection devices. Of the 20 states that have adopted requirements for carbon monoxide detection, ten require the installation of carbon monoxide detectors in commercial Group R occupancies. In the absence of a national installation standard for commercial Group R occupancies each jurisdiction developed its own regulations with varying installation requirements.

We recommend that the International Fire Code develop the necessary installation requirements for CO detection devices in commercial Group R.

Cost Impact (Part I): It is estimated that the proposed code modification will have a minimal cost impact on the construction of Group R occupancies. For example in R-1 occupancies a CO alarm or detector will be installed by fuel burning appliance(s) and in each HVAC zone. In other R occupancies cost will be minimal as installation requirements are outside of each sleeping area and on each floor.

Analysis (Part I): UL 2034 is already referenced in the IRC but not currently in the IFC or IBC. If the code change is approved, UL 2034 would be added to Chapter 47 of the IFC and Chapter 35 of the IBC as a referenced standard.

UL 2075 is already referenced in the IFC but not currently in the IBC. If the code change is approved, UL 2075 would be added to Chapter 35 of the IBC as a referenced standard.

Reason (Part II): The purpose for this code change is to improve the life safety of citizens by reducing the incidence of carbon monoxide (CO) poisoning in dwellings and to revise the language in the 2009 edition of the IRC so it is consistent with nationally recognized industry consensus standards.

The CO provisions in the 2009 edition of the IRC did not include the reliable, proven and tested technologies of system-connected CO detectors even though they meet nationally recognized industry consensus standards

1. ANSI/UL 2075, *Gas and Vapor Detectors and Sensors*
2. ANSI/NFPA 720, *Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment*

The performance and reliability of system-connected CO detectors have shown to be extremely high if they are listed and maintained to ANSI/UL 2075 and installed in accordance with NFPA 720. System-connected CO detectors designed to be part of a carbon monoxide detection system are required to be connected to an approved panel. The panel is required to be equipped with rechargeable batteries that keep the carbon monoxide detection system operating during a power outage and will communicate the power loss condition to the supervising station. When the primary power is restored, the control panel will fully recharge the standby batteries. An added feature of a carbon monoxide detection system is that the interconnecting wiring to system-connected CO detectors are supervised such that a wiring fault results in a trouble signal at the premises and the supervising station.

The installation provisions in the 2009 edition of the IRC seem inconsistent with NFPA 720 when two or more CO alarms are installed within a dwelling unit. Section 9.6.5 of NFPA 720 requires that when two or more carbon monoxide alarms are to be installed that they are interconnected.. The rationale for this requirement is if a CO device is activated in the basement the occupants on the second floor on the opposite end of the home is unable to hear the audible alarm if the devices are not interconnected.

The 2009 edition of the IRC requires CO alarms outside each separate dwelling unit sleeping area in the immediate vicinity of the bedrooms. However, NFPA 720 requires CO devices to be installed on every level of a dwelling unit, including basements as well as outside each separate dwelling unit sleeping area in the immediate vicinity of the bedrooms.

Cost Impact (Part II): It is estimated that the proposed code modification will have a minimal cost impact on the construction of one- and two- family dwellings and townhouses. The proposed new requirements will not require addition CO detection devices to be installed; however the proposed changes will require additional wiring. While there are many variables that affect the cost of construction, most new dwelling construction is anticipated no more than two stories in height and will require wiring between no more than three CO detection devices: one per floor and one in the basement.

Analysis (Part II): A review of the standard(s) proposed for inclusion in the code, NFPA 720-2009, for compliance with ICC criteria for referenced standards given in Section 3.6 of Council Policy #CP 28 will be posted on the ICC website on or before September 24, 2009.

UL 2075 is already referenced in the IFC but not currently in the IBC. If the code change is approved, UL 2075 would be added to Chapter 35 of the IBC as a referenced standard.

PART I – IFC

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

PART II – IRC BUILDING/ENERGY

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

ICCFILENAME: EVANSR-F1-908.DOC

F133–09/10

908.7 (New) [IBC [F] 908.7 (New)], 4606.1 (New), Chapter 47 (IBC Chapter 35)

Proponent: Robert J Davidson, Code Consultant/Alan Shuman, President, representing the National Association of State Fire Marshals (NASFM)

1. Add new text as follows:

908.7 (IBC [F] 908.7) Carbon monoxide alarms. Group I or R occupancies located in a building containing a fuel-burning appliance or a building which has an attached garage shall be provided with single station carbon monoxide alarms. The carbon monoxide alarms shall be listed as complying with UL 2034 and be installed and maintained in accordance with NFPA 720 and the manufacturer's instructions. An open parking garage, as defined in the *International Building Code*, shall not be deemed to be an attached garage.

Exception: Sleeping units or dwelling units which do not themselves contain a fuel-burning appliance or have an attached garage, but which are located in a building with a fuel-burning appliance or an attached garage, need not be provided with single station carbon monoxide alarms provided that:

1. The ~~s~~leeping unit or dwelling unit is located more than one story above or below any story which contains a fuel-burning appliance or an attached garage;
2. The sleeping unit or dwelling unit is not connected by duct work or ventilation shafts to any room containing a fuel-burning appliance or to an attached garage; and
3. The building is provided with a common area carbon monoxide alarm system.

4606.1 Carbon monoxide alarms. Existing Group I or R occupancies located in a building containing a fuel-burning appliance or a building which has an attached garage shall be provided with single station carbon monoxide alarms. The carbon monoxide alarms shall be listed as complying with UL 2034 and be installed and maintained in accordance with NFPA 720 and the manufacturer's instructions. An open parking garage, as defined in the *International Building Code*, shall not be deemed to be an attached garage.

Exception: Sleeping units or dwelling units which do not themselves contain a fuel-burning appliance or have an attached garage, but which are located in a building with a fuel-burning appliance or an attached garage, need not be provided with single station carbon monoxide alarms provided that:

1. The sleeping units or dwelling unit is located more than one story above or below any story which contains a fuel-burning appliance or an attached garage;
2. The sleeping units or dwelling unit is not connected by duct work or ventilation shafts to any room containing a fuel-burning appliance or to an attached garage; and
3. The building is provided with a common area carbon monoxide alarm system.

2. Add new standards to Chapter 47 (IBC Chapter 35) as follows:

NFPA

720-2005 Standard for the Installation of Carbon Monoxide (CO) Warning Equipment in Dwelling Units

UL
2034-2008 Standard for Single and Multiple Station Carbon Monoxide Alarms

Reason: At the final action hearings for the last code change cycle held in Minnesota the voting membership present voted overwhelmingly to add requirements for the installation of carbon monoxide alarms for dwelling units built in compliance with the International Residential Code (IRC). The threat of poisoning from exposure to carbon monoxide is not limited to dwellings regulated by the IRC, it includes other institutional and residential occupancies. This proposal is intended to provide correlation with the position the membership took on this issue and add language to the IBC/IFC requiring the installation of carbon monoxide alarms in institutional and residential group occupancies.

According to the Journal of the American Medical Association (JAMA), carbon monoxide is the leading cause of accidental poisoning deaths in America with approximately 2,100 deaths per year. http://jama.ama-assn.org/cgi/search?fulltext=Carbon+Monoxide Over 15,000 people seek medical attention due to carbon monoxide exposure each year. http://www.ul.com/newsroom/newsrel/nr012609a.html

The industry has addressed the issue of reliability by updating the requirements of the UL 2034 standard. http://www.iccsafe.org/cs/cc/ctc/CO/CO_UL2034History.pdf Underwriters Laboratories instituted a Carbon Monoxide Field Study in 1994 and completed the study in March of 2004. The report on the study includes the following summary:

"Throughout the first phase of this study, the CO alarms have performed in an effective manor. During the September 2002 tests we recorded our first false positive at 70ppm CO (94 minutes into the test, post 1998 alarm). Also during the September 2002 tests we recorded our first no response sample (pre1998 alarm). During the September 2003 we recorded a significant late response sample (pre1998 alarm). These samples have been returned and analyzed by the manufacturer and/or the UL Field Report Group has opened an investigation. Other samples in the survey of the same, or similar, models are continuing to perform as expected.

On one occasion, a field study CO sample alarmed in an employee's home after their furnace was serviced. It was confirmed that there was a high level of CO present in their home. The problem was corrected and the alarm continues to function properly during follow-up sensitivity tests. On another occasion, a field sample was activated when the damper on a fireplace closed prematurely. The damper was opened, the house vented, and the alarm returned to its normal standby condition.

Throughout the entire survey program we have experienced a few units providing early/delayed signals during the sensitivity tests, but all of these CO alarms would provide effective signaling protection to the users should there be a fatal concentration of CO.

Of the few CO alarms that did not meet the UL2034 test points, most of them alarmed early and it was determined with the Stability Test results that these samples would most likely not false alarm in the field.

It is important to note that providing effective signaling protection does not necessarily mean complying with the finite test points of UL2034. All the alarms would have sounded while a person can react and follow the recommended procedures during an alarm signal.

The data shows that these CO alarms are providing the necessary signaling protection."
http://www.iccsafe.org/cs/cc/ctc/CO/CO_UL_AlarmSurvey.doc

All carbon monoxide detectors available today meet the updated requirements of the UL standard which eliminated the false positive indications that occurred when carbon monoxide detectors were first brought to market in the 1990's. The State of New Jersey has had regulations mandating the installation of carbon monoxide alarms in all new and existing residential occupancies since 1992. The state implemented a reporting program at that time to identify reliability and false positive indication problems and there have been no problems identified in over 10 years.

Carbon monoxide poisonings leading to injury or death is well documented and the only way to protect the occupants from this odorless and tasteless product of combustion, known as the "Silent Killer" is through the installation of detectors complying with today's standards.

Cost Impact: The code change proposal will increase the cost of construction.

Analysis: A review of the standards proposed for inclusion in the code, NFPA 720-2005 and UL 2034-2008, for compliance with ICC criteria for referenced standards given in Section 3.6 of Council Policy #CP 28 will be posted on the ICC website on or before September 24, 2009.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

ICCFILENAME: DAVIDSON-SHUMAN-F14-908.7.DOC

RB60–09/10

R315, R315.1.1, R315.1.2, R315.1.3, Chapter 44

Proponent: Scott Dornfeld, City of Delano, MN

1. Delete without substitution:

~~**SECTION R315**~~
~~**CARBON MONOXIDE ALARMS**~~

~~**R315.1 Carbon monoxide alarms.** For new construction, an approved carbon monoxide alarm shall be installed outside of each separate sleeping area in the immediate vicinity of the bedrooms in *dwelling units* within which fuel-fired *appliances* are installed and in dwelling units that have attached garages.~~

~~**R315.2 Where required in existing dwellings.** Where work requiring a *permit* occurs in existing *dwellings* that have attached garages or in existing dwellings within which fuel-fired *appliances* exist, carbon monoxide alarms shall be~~

~~provided in accordance with Section R315.1.~~

~~**R315.3 Alarm requirements.** Single station carbon monoxide alarms shall be listed as complying with UL 2034 and shall be installed in accordance with this code and the manufacturer's installation instructions.~~

2. Delete standard as follows:

UL

~~2034-2008 Standard for Single and Multiple Station Carbon Monoxide Alarms~~

Reason: A new rule should never be imposed unless it can be shown that there is a significant hazard posed that can be directly influenced by the rule. It is not the goal of the I-Codes, the stated purpose of which is to provide minimum standards, to eliminate all hazards such that no one will ever be killed or injured as a result of the design of or a defect in a building. It is simply too expensive and impractical to do so. Such is the case with the addition of carbon monoxide requirements in the IRC that nationwide will increase costs to homeowners in the hundreds of millions of dollars with a potentially negligible impact on CO deaths. Additionally, it requires that the alarms be installed any time work is done and a permit is required. This means if I have my house reroofed, I must install CO alarms (but not smoke alarms). I would be required to install them if I have an attached garage even when studies show the likelihood of carbon monoxide poisoning occurring from motor vehicles is extremely low and even if portions of the garage are permanently open to the outside.

Following are some excerpts taken from a publication by the Consumer Product Safety Commission entitled ***"Non-Fire Carbon Monoxide Deaths Associated with the Use of Consumer Products 2003 and 2004 Annual Estimates".***

P. 4 - During 2004, the most recent year for which nearly complete data are available, there were an estimated 162 carbon monoxide (CO) poisoning deaths associated with the use of a consumer product under the jurisdiction of the U.S. Consumer Product Safety Commission (CPSC). There were an estimated 154 fatalities in 2003. Carbon monoxide poisonings referred to in this report do not include those where the CO gas resulted from a fire or a motor vehicle, were intentional in nature or were directly work-related.

Comment: The number of CO deaths was often cited as being in the thousands, not 150-160, which is the accurate number.

Table 1
Estimated Non-Fire Carbon Monoxide Poisoning Deaths
By Associated Fuel-Burning Consumer Product, 1999-2004.

Consumer Product	2002 - 2004+		Annual Estimate					
	Average Estimate	Average Percent	1999	2000	2001	2002	*2003+*	*2004+*
Total Deaths	*166*	*100%*	109	137	122	181	*154*	*162*
Heating Systems	*82*	*49%*	50	81	72	97	*66*	*84*
Unspecified Gas Heating	*7*	*4%*	5	1	5	2	*4*	*14*
LP Gas Heating	*29*	*18%*	22	28	24	41	*22*	*25*
Natural Gas Heating	*30*	*18%*	20	42	28	32	*27*	*30*
Coal/Wood Heating	*3*	*2%*	0	2	6	4	*2*	*4*
Kerosene/Oil Heating	*6*	*4%*	2	8	6	8	*6*	*4*
Diesel Fuel	*< 1*	*< 1%*	*	*	*	1	*	*
Heating Systems, Not Specified	*7*	*4%*	1	*	3	9	*5*	*7*
Charcoal Grills or Charcoal	*7*	*4%*	17	8	10	11	*8*	*3*
Gas Water Heaters	*3*	*2%*	1	3	1	1	*7*	*1*
Gas Grills, Camp Stoves, Lanterns	*5*	*3%*	14	4	1	5	*2*	*8*
Gas Ranges/Ovens	*3*	*2%*	6	12	9	3	*3*	*4*
Other Appliances	*1*	*1%*	1	0	0	0	*2*	*1*
Multiple Appliances	*8*	*5%*	6	2	7	12	*8*	*4*
Engine-Driven Tools	*54*	*33%*	13	27	22	51	*57*	*55*
Generators	*44*	*27%*	7	19	21	41	*50*	*41*
Other Engine-Driven Tools	*10*	*6%*	6	8	1	10	*7*	*14*

\+ Data collection for 2003 and 2004 is incomplete. Italicized estimates may change in the future.
* No reports received by CPSC staff.
Source: U.S. Consumer Product Safety Commission / EPHA.
CPSC Death Certificate File, CPSC Injury or Potential Injury Incident File, CPSC In-Depth Investigation File, National Center for Health Statistics Mortality File, 1999 - 2004.
Note: Reported average percentages by product may not add to total due to rounding.

P. 6 - Of the 47 estimated deaths in 2003 and 2004 that were associated with LP gas heating systems, 32 (68%) involved unvented portable propane heaters. These unvented portable propane heaters were fueled by a propane tank and were not a component of an installed heating system. Unvented portable propane heaters were either camping heaters that used disposable propane tanks, one pound propane bottles, or tank top heaters that used bulk tanks larger than one pound.

Comment: Unvented portable propane heaters cannot be used as a primary heat source in a building. Therefore these incidents likely occurred when they were used for temporary heat or in locations outside a home such as a camping unit. Requiring CO alarms in homes will have no impact on CO deaths that occur in camping trailers and locations other than the home. Requiring CO alarms in homes because someone might bring an unvented heater into their house and improperly use it is unwarranted.

P. 6 - In 2003 and 2004, an estimated 11 CO deaths (3% of the 316 total consumer product estimate) were associated with charcoal or charcoal grills; an estimated eight deaths (3% of the total consumer product estimate) were associated with a gas water heater; gas grills, camp stoves and lanterns were associated with an estimated eight deaths (3% of the total consumer product estimate); gas ranges and ovens were associated with an estimated seven deaths (2% of the total consumer product estimate); and three deaths were either associated with consumer products that did not fit into the categories given above or there was insufficient detail to categorize the appliance. One fatality was associated with a propane-fueled refrigerator, one was associated with a product simply defined as a "propane appliance" and another as a "gas-fueled appliance".
These incidents were categorized as "Other appliances". Additionally, in 2003 and 2004 an estimated 12 deaths were associated with multiple appliances (4% of the total consumer product estimate). The multiple appliances category included all incidents where multiple fuel-burning products were used simultaneously such that a single source of the CO could not be determined. Of the 12 multiple appliance fatalities, six were associated with a generator and another product. These other products were a kerosene heater (three deaths), an LP gas heater (two deaths) and a wood stove. Other fatalities where multiple products were simultaneously used and associated with a CO poisoning death involved a portable propane heater and a gas-powered snow thrower; a portable propane heater and a propane lantern; a kerosene heater and a propane heater; a natural gas heater and hot water heater; a propane furnace and a propane oven in a travel camper; and a natural gas furnace and natural gas oven.

Comment: While it may seem cruel, at times one needs to invoke the "any idiot rule". The code should not require CO alarms to deal with people operating charcoal grills or lawn mowers in their living rooms.

P. 6 - An estimated 112 CO poisoning deaths (35% of the estimated total from 2003 and 2004) were associated with engine-driven tools, which includes generators, riding mowers, a concrete cutter, a gas-fueled welder, power washers, a water pump, an air compressor and an ATV. Generator associated deaths comprise the majority of this category. There were an estimated total of 91 generator-related CO poisoning deaths in 2003 and 2004 (81% of all engine-driven tool fatalities and 29% of the total consumer product estimate).

P. 7 - Of the 123 liquid fueled appliance-related fatalities in 2003 and 2004, 112 (91%) were associated with all engine-driven tools (generators, lawn mowers, power washers, concrete saws, etc.). Generators accounted for 91 of the estimated 123 fatalities (74%) in the Liquid Fueled Appliances category.

Table 2

Estimated Non-Fire Carbon Monoxide Poisoning Deaths

Associated with Consumer Products Organized by Fuel Type, 1999-2004.

Consumer Product	2002-2004+		Annual Estimate					
	Average Estimate	Average Percent	1999	2000	2001	2002	*2003+*	*2004+*
Total Deaths	*166*	*100%*	109	137	122	181	*154*	*162*
Gas Fueled Appliances	*84*	*51%*	67	91	71	92	*72*	*89*
Room / Space Heater	*33*	*20%*	20	39	23	35	*30*	*34*
Natural Gas Fueled	*8*	*5%*	3	17	5	9	*8*	*8*
Propane Fueled	*19*	*12%*	16	21	17	21	*19*	*18*
Other / Unspecified	*5*	*3%*	1	1	1	5	*3*	*8*
Furnace	*40*	*24%*	25	33	37	48	*28*	*43*
Natural Gas Fueled	*22*	*13%*	16	25	23	24	*19*	*23*
Propane Fueled	*10*	*6%*	6	8	7	20	*3*	*7*
Other / Unspecified	*8*	*5%*	3	*	7	4	*6*	*13*
Range, Oven	*3*	*2%*	6	12	9	3	*3*	*4*
Water Heater	*3*	*2%*	1	3	1	1	*7*	*1*
Refrigerator	*<1*	*<1%*	1	*	*	*	*1*	*
Lantern	*2*	*1%*	8	3	*	2	*1*	*4*
Gas Grill, Camp Stove	*2*	*1%*	5	1	1	3	*1*	*2*
Other	*1*	*<1%*	1	*	*	*	*1*	*1*
Solid Fueled Appliances	*11*	*7%*	17	10	16	15	*10*	*7*
Charcoal / Charcoal Grill	*7*	*4%*	17	8	10	11	*8*	*3*
Wood / Coal Heater	*3*	*2%*	*	2	6	4	*2*	*4*
Coal Furnace	*1*	*<1%*	*	1	1	1	*	*1*
Wood / Coal Stove	*1*	*1%*	*	1	5	1	*2*	*1*
Chimney / Fireplace	*1*	*1%*	*	*	*	2	*	*2*
Liquid Fueled Appliances	*61*	*37%*	16	34	28	59	*63*	*60*
Oil Heater / Heating	*1*	*1%*	*	4	5	3	*1*	*
Kerosene Heater / Heating	*5*	*3%*	2	3	1	4	*5*	*4*
Generators	*44*	*27%*	7	19	21	41	*50*	*41*
Other Engine-Driven Tools	*10*	*6%*	6	8	1	10	*7*	*14*
Lantern / Product / Appliance	*<1*	*<1%*	1	1	*	1	*	*1*
Multiple Products Involved	*8*	*5%*	7	2	8	13	*8*	*4*

\+ Data collection is incomplete for 2003 and 2004. Italicized estimates may change in the future.

* No reports received by CPSC staff.

Source: U.S. Consumer Product Safety Commission / EPHA.
CPSC Death Certificate File, CPSC Injury or Potential Injury Incident File, CPSC In-Depth Investigation File, National Center for Health Statistics Mortality File, 1999 - 2004.

Note: Reported average percentages by product may not add to total due to rounding.

Table 3
Estimated Non-Fire Carbon Monoxide Poisoning Deaths Associated with Engine-Driven Tools, 1999-2001 vs. 2002-2004.

Engine-Driven Tools	1999-2001 Average Estimate	2002-2004+ Average Estimate	Annual Estimate 1999	2000	2001	2002	2003+	2004+
Total	**21**	*54*	**13**	**27**	**22**	**51**	*57*	*55*
Generators	**16**	*44*	**7**	**19**	**21**	**41**	*50*	*41*
Other Engine-Driven Tools	**5**	*10*	**6**	**8**	**1**	**10**	*7*	*14*
Lawn Mowers[1]	5	*6*	6	7	1	5	*6*	*8*
Gas Welder	*	*1*	*	*	*	2	*1*	*
Concrete Saw	*	*1*	*	*	*	1	*	*1*
Power Washer	*	*1*	*	*	*	*	*	*2*
ATV	*	*1*	*	*	*	1	*	*1*
Snow Blower	< 1	*	*	1	*	*	*	*
Air Compressor	*	*< 1*	*	*	*	*	*	*1*
Water Pump	*	*< 1*	*	*	*	*	*	*1*

[1] Lawn Mowers includes riding mowers, garden tractors and gas-fueled powered push mowers.
\+ Data collection is incomplete for 2003 and 2004. Italicized estimates may change in the future.
* No reports received by CPSC staff.
Source: U.S. Consumer Product Safety Commission / EPHA.
CPSC Death Certificate File, CPSC In-Depth Investigation File, CPSC Injury or Potential Injury Incident File, National Center for Health Statistics Mortality File, 1999 - 2004.
Note: Reported average percentages by product may not add to total due to rounding.

P. 11 - Table 6 shows that in 2003 and 2004, an estimated 230 CO poisoning deaths occurred in homes, including manufactured and mobile homes. From 2002-2004, an annual average of 72 percent of CO poisoning deaths occurred in homes, including manufactured and mobile homes. In 2003 and 2004, an estimated 45 deaths took place in temporary shelters, such as tents, recreational vehicles, cube vans, seasonal cabins, and trailers (including horse trailers). In 2002- 2004, an annual average of 17 percent of CO poisoning deaths took place in temporary shelters. In 2003 and 2004, 25 of the 45 estimated deaths in temporary shelters were most commonly associated with portable gas or LP gas heating or cooking appliances. Generator usage in a temporary shelter was the second largest product category with an estimated 11 deaths in 2003 and 2004. Other scenarios included charcoal and charcoal grills, LP gas lanterns, kerosene heaters and a kerosene cooker. A consistently small percentage of deaths occurred in passenger vans, trucks, or automobiles in which victims were spending the night. For 2003 and 2004, of the estimated 13 CO fatalities in this category, nine were associated with portable LP gas heaters.

Comment: CO alarm requirements in the IRC would not impact incidents in mobile homes, tents, RV's, seasonal cabins, trailers, passenger vans, trucks, and automobiles.

Table 6
Estimated Non-Fire Carbon Monoxide Poisoning Deaths by Location of Death, 1999-2004.

Location of Death	2002-2004+ Average Estimate	Average Percent	Annual Estimate 1999	2000	2001	2002	2003+	2004+
Total	*166*	*100%*	**109**	**137**	**122**	**181**	*154*	*162*
Home	*119*	*72%*	60	88	85	128	*110*	*120*
Temporary Shelter	*28*	*17%*	35	34	24	39	*23*	*22*
Auto	*7*	*4%*	7	2	10	8	*8*	*5*
Other	*10*	*6%*	7	13	3	5	*10*	*15*
Unknown	*1*	*1%*	*	*	*	2	*2*	*

\+ Data collection is incomplete for 2003 and 2004. Italicized estimates may change in the future.
* No reports received by CPSC staff.
Source: U.S. Consumer Product Safety Commission / EPHA.
CPSC Death Certificate File, CPSC In-Depth Investigation File, CPSC Injury or Potential Injury Incident File, National Center for Health Statistics Mortality File, 1999 - 2004.
Note: Reported average percentages by product may not add to total due to rounding.

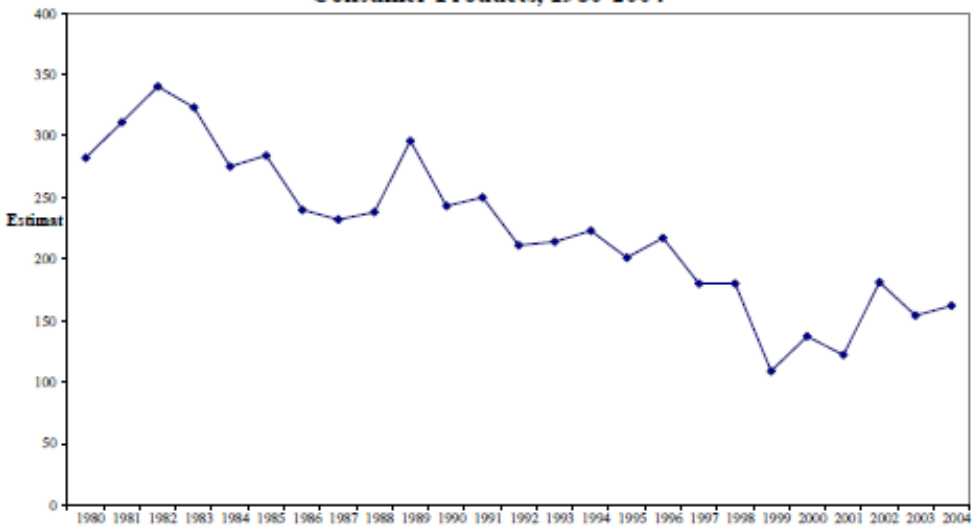
Appendix B: National Estimates of Consumer Product-Related CO Poisoning Deaths, 1980 - 2004

Estimated Non-Fire Carbon Monoxide Poisoning Deaths Associated with Consumer Products, 1980-2004

Year	Estimate
1980	282
1981	311
1982	340
1983	323
1984	275
1985	284
1986	240
1987	232
1988	238
1989	296
1990	243
1991	250
1992	211
1993	214
1994	223
1995	201
1996	217
1997	180
1998	180
1999*	109
2000	137
2001	122
2002	181
2003	154
2004	162

* The Tenth Revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10) was implemented.
Source: U.S. Consumer Product Safety Commission / EPHA.

Figure 1: Estimated Non-Fire CO Poisoning Deaths Associated with Consumer Products, 1980-2004



Reading through even these brief excerpts, one wonders if requiring CO alarms would have any impact on CO related deaths at all given the circumstances surrounding most deaths. Furthermore, the number of deaths decreased without government regulation from 340 in 1982 to 162 in 2004. This decrease occurred during a time when the population increased from about 225 million to 296 million in 2004. The steadily decreasing number of deaths and their location doesn't indicate that requiring CO alarms would have any statistical impact on deaths.

Regarding the matter of CO deaths and attached garages, following are excerpts from an article entitled:
The Role of Catalytic Converters in Automobile Carbon Monoxide Poisoning[*] A Case Report by Bradley Vossberg, MD and Judah Skolnick, MD, FCCP
[*] From the Frazier Rehab Center, Jewish Hospital Health Network, Louisville, KY.

Inhaling motor vehicle exhaust fumes is a common method used by people attempting to commit suicide; however, the decreased carbon monoxide concentrations found in the exhaust of late-model automobiles equipped with catalytic converters are changing the clinical presentation of exhaust inhalation.

Closed-environment exposure to MVEGE from automobiles not equipped with catalytic converters can result in death within 30 min. The introduction of catalytic converters beginning with 1975 new-car models dropped CO emission rates to 6.00 g/min. By 1989, the average new-car

CO emission at idling was 0.22 g/min. The catalytic conversion process removes CO, hydrocarbons, and nitrogen oxide; the resultant emission is a more desirable mixture of nitrogen, CO_2, and water. Contemporary three-way catalytic converters eliminate > 99% of CO emissions.

Given the increased efficiency of modern catalytic converters, patients presenting with closed-environment MVEGE exposure may have much lower HbCO levels than would have been previously expected; in some cases, the HbCO level may be normal. Other important factors to be considered are the role of supplemental O_2 given at the scene and the time taken to obtain the HbCO level.

Attached garages do not pose a risk. By definition, an attached garage is three walls and a roof. A garage door is not required. There are no requirements that the garage be air tight or enclosed to a degree that would create any danger, even if CO levels were high.

Clearly, expecting CO alarms to have any positive impact on CO death rates is extremely optimistic and likely unrealistic. If we are going to require the public to spend their money on safety related devices, surely we can find a more productive area on which to spend it.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

ICCFILENAME: DORNFELD-RB-2-R315