

Code Technology Committee

2010 Final Action Agenda

CO Alarms

The following are code changes and public comments to be considered at the 2010 Dallas Final Action Hearings that are related to the CTC Area of Study noted above.

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F133-09/10

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

Proposed Change as Submitted

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 sleeping 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/IRC 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.

ICCFILENAME: DAVIDSON-SHUMAN-F14-908.7.DOC

Public Hearing Results

Committee Action:

Approved as Modified

Note: The following analysis was not in the Code Change monograph but was published on the ICC website at <http://www.iccsafe.org/cs/codes/Documents/2009-10cycle/ProposedChanges/Standards-Analysis.pdf>

Analysis: Review of proposed new standards NFPA 720-2009 and UL 2034-2008 indicated that, in the opinion of ICC Staff, the standards did comply with ICC standards criteria.

Modify proposal 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*, or enclosed parking garage ventilated in accordance with Section 404 of the *International Mechanical 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 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.

908.7.1 Carbon monoxide detection systems. Carbon monoxide detection systems, that include carbon monoxide detectors and audible notification appliances, installed and maintained in accordance with this section for carbon monoxide alarms and NFPA 720 shall be permitted. The carbon monoxide detectors shall be listed as complying with UL 2075.

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*, or enclosed parking garage ventilated in accordance with Section 404 of the *International Mechanical 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.

(Portions of the proposal not shown remain unchanged.)

Committee Reason: The committee approved the proposal adding CO detectors to the code since having provisions within the IBC and IFC is a better approach than what has been occurring on a state level through the legislative process. This also makes the IBC and IFC consistent with the IRC. The first modification clarifies that ventilated enclosed parking garages were not intended to be considered as an attached garage for the purposes of enforcing this section. The second modification includes the use of CO detectors and associated systems in accordance with UL 2075. Such detectors are allowed by NFPA 720 and the committee felt it was appropriate to recognize both CO alarms and detectors.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Ron Nickson representing National Multi Housing Council, requests Approval as Modified by this Public Comment.

Further modify the proposal 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 with a communicating opening shall be provided with single station carbon monoxide alarms outside of each separate dwelling unit sleeping area in the immediate vicinity of the bedrooms and on every occupiable level of a dwelling unit. 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*, or enclosed parking garage ventilated in accordance with Section 404 of the *International Mechanical 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 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~~ the room with the fuel burning A carbon monoxide detector is installed in the room containing the fuel burning appliance.

908.7.1 Carbon monoxide detection systems. Carbon monoxide detection systems, that include carbon monoxide detectors and audible notification appliances, installed and maintained in accordance with this section for carbon monoxide alarms and NFPA 720 shall be permitted. The carbon monoxide detectors shall be listed as complying with UL 2075.

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 with a communicating opening shall be provided with single station carbon monoxide alarms outside of each separate dwelling unit sleeping area in the immediate vicinity of the bedrooms and on every occupiable level of a dwelling unit. 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*, or enclosed parking garage ventilated in accordance with Section 404 of the *International Mechanical 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~~ the room with the fuel burning A carbon monoxide detector is installed in the room containing the fuel burning appliance.

(Portions of the proposal not shown remain unchanged.)

Commenter's Reason: The modification to F133 cleans up the language approved during the code development hearings as to when carbon monoxide detection is required in Group I and R occupancies. The change modifies the requirement to requirement carbon monoxide detectors only when the attached garage has an opening that communicates with the dwelling unit and second clarifies the location when the carbon monoxide detectors are installed. The change to item 3 of the exception removes the requirement for a carbon monoxide alarm system and requires only that a carbon monoxide detector be installed in the room containing a fuel burning appliance. This type of installation would provide warning of any problem with the heating system, without the excessive cost burden associated with a complete carbon monoxide alarm system.

This change as modified has been submitted as a public comment to PM-23-09/10 which was approved by the code development establishing requirements for carbon monoxide in the IPMC and IEBC. If the modifications as proposed above and the modifications as proposed by NMHC to PM23-09/10 are approved by the membership the codes will be aligned with the same requirements thus eliminating the problem that the requirements for new construction differ from those in the IPMC and IEBC that are enforced after the building is completed.

RB60-09/10

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

Proposed Change as Submitted

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 / EPA.

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	2002-2004 ⁺	Annual Estimate					
	Average Estimate	Average Estimate	1999	2000	2001	2002	2003 ⁺	2004 ⁺
Total	21	54	13	27	22	51	<i>57</i>	<i>55</i>
Generators	16	44	7	19	21	41	50	41
Other Engine-Driven Tools	5	10	6	8	1	10	<i>7</i>	<i>14</i>
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 ⁺		Annual Estimate					
	Average Estimate	Average Percent	1999	2000	2001	2002	2003 ⁺	2004 ⁺
Total	166	100%	109	137	122	181	<i>154</i>	<i>162</i>
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

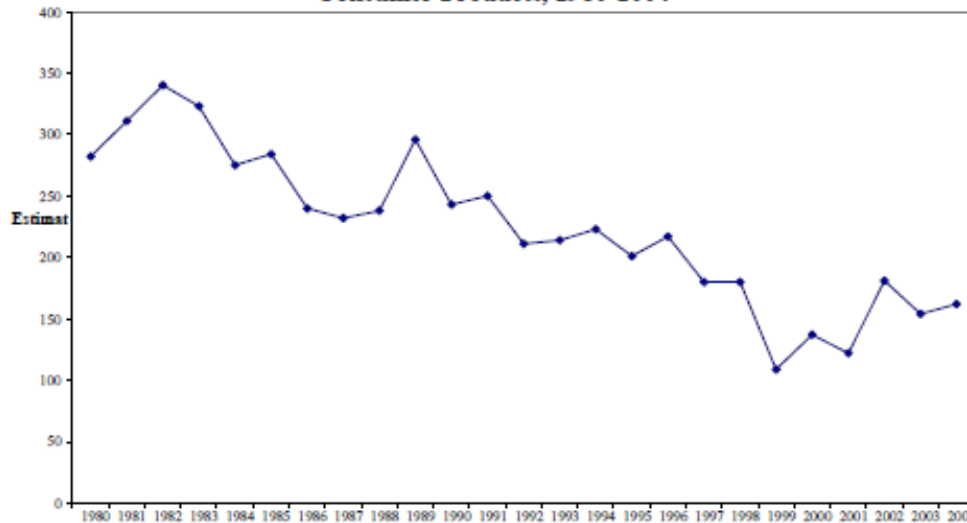
**Estimated Non-Fire Carbon Monoxide Poisoning Deaths
Associated with Consumer Products, 1980-2004**

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 / EPA.

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, CO₂, 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 O₂ 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.

ICCFILENAME: DORNFELD-RB-2-R315

Public Hearing Results

Committee Action:

Disapproved

Committee Reason: The committee feels that deleting carbon monoxide detectors would weaken the code relative to life safety. Carbon monoxide detectors are within the intent of the IRC and the ICC membership voted to place them into the code.

Assembly Action:

None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Rick Davidson, representing self, requests Approval as Submitted.

Commenter's Reason: One of the most egregious acts that our organization can impose on the public is the adoption of rules that provide little or no benefit to improving life, health and safety yet increase the cost of owning a home.

The rule requiring the installation of carbon monoxide alarms is one of those acts.

There have been attempts at placing carbon monoxide alarms in the code for perhaps a decade. The membership has voted every one of them down because there was no factual evidence to indicate that there was a problem that warranted or could be solved by costly regulation.

Is carbon monoxide a problem? There is no question that carbon monoxide kills people. But is it a problem in homes worthy of expensive corrective action? And are corrective actions available that will change the number of deaths that occur? Adopting rules aimed at preventing deaths may make people feel good but if they don't achieve their intended purpose, they are a costly failure.

Unlike some issues, there is a wealth of information available regarding carbon monoxide deaths. The Consumer Product Safety Commission regularly produces a document, the most recent of which is entitled "Non-Fire Carbon Monoxide Deaths Associated with the Use of Consumer Products 2006 Annual Estimates."

The report states that 180 accidental carbon monoxide deaths occurred in 2006 in the US. To put the number of CO deaths in perspective, how does the number of CO deaths compare with other accidental deaths? Compared to the 180 CO deaths in 2006:

- 784 people died in bicycle accidents in 2005 (nearly 4 ½ times more than died of CO poisoning).
- 3,579 people died from accidental drowning in 2006.
- 20,823 people died from accidental falls in 2006.
- 43,313 people died in auto crashes in 2008.
- 3,320 people died in fires in 2008.
- 18,573 people were murdered in 2006.
- 27,531 people died from accidental poisoning in 2006.
- 31 people died from dog attacks in 2006

The number of accidental CO deaths pales compared to many other common types of accidental deaths.

But, if we take a position that accidental CO deaths are a problem, is the solution of putting CO alarms in new homes going to have an impact, any impact, on the number of CO deaths.

The CPSC 2006 report listed a number of key findings. Among them:

- "There were an estimated 180 unintentional non-fire CO poisoning deaths associated with consumer products under CPSC's jurisdiction. The estimated annual average from 2004-2006 was 181 deaths."
- "Engine-Driven Tools were associated with the largest percentage of non-fire CO poisoning fatalities at 58 percent (104 deaths). Heating Systems-related CO fatalities were associated with 28 percent (50 deaths) and five of the remaining six product categories [Charcoal Grills or Charcoal (10 deaths), Gas Water Heaters (4 deaths), Gas Grills, Camp Stoves, Lanterns (4 deaths), Other Appliances (1 death), and Multiple Appliances (7 deaths)] combined were associated with a total of 14 percent. There were no reported deaths in the Gas Ranges/Ovens category."

Comment: 180 accidental CO deaths occurred. 58% of the CO deaths were a result of engine-driven tools. How many could have been prevented if CO alarms were in new homes? Some of these deaths occurred in garages, tents, campers and locations other than the home. If one subtracts the 104 deaths from engine-driven tools, 10 deaths from charcoal grills, and 4 deaths from gas grills, camp stoves, and the like, that leaves only 62 deaths occurring from heating systems, water heaters, and other appliances likely to be found in a home. Clearly, CO alarms would have prevented few if any of the 114 CO deaths attributed to engine-driven tools, camp stoves, charcoal grills and similar devices not found in homes. That leaves 62 deaths that may have been impacted by CO alarms.

- “Of the estimated 104 CO fatalities in 2006 that were associated with Engine-Driven Tools, 82 percent (85 deaths) involved generators. Additionally, generator usage was associated with three of the estimated seven multiple appliance CO poisoning fatalities.”
- “There is a statistically significant increasing trend in consumer product-related non-fire CO fatalities from 1999 to 2006 that is attributable to generators.”

Comment: Generators are not a home appliance and should not be operated in a home. Should homes be provided with CO alarms because someone may run engine driven tools in their home? Where does this stop? Is the solution to this problem putting alarms in homes or are there better solutions such as public education or better labeling and instructions for engine-driven tools. The entire US population should not have to pay hundreds of millions of dollars to install CO alarms in their homes because 50 people operated gas powered tools or charcoal grills inside their homes.

- “Of the estimated 50 Heating Systems-related fatalities in 2006, 90 percent involved gas heating. Natural gas heating accounted for 46 percent of heating system-related fatalities, liquefied petroleum (LP or propane) gas heating accounted for 38 percent, and an additional six percent were only identified as unspecified gas heating. Kerosene/oil heating and unspecified heating systems accounted for the remaining eight percent.”

Comment: Since the adoption and enforcement of model codes in rural areas of the country is sporadic to non-existent, those areas are seen as less likely to benefit from a CO alarm mandate because there is no agency to educate the public or enforce rules. Because of the cost of installing gas lines, natural gas is usually only available in communities or more highly developed areas. Rural areas are more dependent on propane, fuel oil, and kerosene. Of the 50 estimated CO deaths attributable to heating systems, 23 occurred with a natural gas appliance. The remainder of the deaths was attributed to propane, fuel oil, and kerosene. These deaths are more likely to have occurred in areas that wouldn't be reached by code adoption. How many of these 50 estimated deaths could be saved with a CO alarm mandate?

- “Seventy-one percent of the estimated 180 CO deaths in 2006 occurred in a home; while an estimated 17 percent of deaths occurred in tents, campers, and other temporary shelters.”

Comment: 31 of the 180 CO deaths occurred outside the home. Requirements for CO alarms would have no impact on these deaths.

- “CO poisoning fatalities in isolated locations account for a larger proportion of all CO fatalities (13% in 2004 through 2006) than the proportion of the U.S. population living in isolated areas (4%). The disparity is even higher at isolated non-home locations which account for 25 percent of all CO fatalities occurring at non-home locations.”

Comment: The model codes are not adopted uniformly across all areas of the country. Often, rural areas are not governed by codes. This statistic indicates that more isolated areas have a greater incidence of CO deaths. Could it be that rural areas have less supervision of building construction that leads to more CO deaths? What other explanations are there? What impact would a CO alarm mandate have on these areas?

- “... for non-engine driven tool products, the mortality rate has decreased by 16 percent since 1999/2000, from 3.67 in 1999/2000 down to a 3.08 average mortality rate in 2004 through 2006.”

Comment: So with no requirements for CO alarms in the I-Codes, the mortality rate has decreased by 16% since 2000. With the number of deaths decreasing at a steady pace, how necessary is it to require CO alarms?

The report goes on to say:

“Of the estimated 19 deaths in 2006 that were associated with LP gas heating systems, 11 (58%) involved unvented 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.”

And, “...an estimated 10 CO deaths (6% of the 180 total consumer product estimate) were associated with charcoal or charcoal grills”

“...an estimated four deaths (2% of the total consumer product estimate) were associated with a subcategory of products which include gas grills, camp stoves, and lanterns; and one death was either associated with a consumer product that did not fit into the categories given above or there was insufficient detail to categorize the appliance involved. This latter incident involved the use of a grill inside a house, but it is unclear whether the grill was a gas grill or a charcoal or wood burning grill. This incident was categorized as Other Appliances.”

“Additionally, in 2006, an estimated seven deaths were associated with multiple appliances (4% of the total consumer product estimate). The Multiple Appliances category includes all incidents where multiple fuel-burning products were used simultaneously such that a single source of the CO could not be determined. Of the estimated seven multiple appliance fatalities, three were associated with the simultaneous use of a gasoline-fueled generator and an LP heater. Of the estimated seven multiple appliance fatalities, six were associated with some type of LP heater.”

“An estimated 104 CO poisoning deaths (58% of the estimated total from 2006) were associated with the category of Engine-Driven Tools, which includes generators, riding mowers or garden tractors, pressure washers, a snowmobile, a snow thrower, an air compressor, a water pump, and a non-vehicular internal compression engine.”

There is much discussion in the report regarding the type of appliances that cause the CO problems. Often they are found to be old, poorly maintained products. This indicates that the problems aren't in new homes and requiring CO alarms in new homes won't solve these problems.

The current rules require CO alarms if the home contains an attached garage. Presumably, the reason for this requirement is the assumption that automobiles in garages generate sufficient carbon monoxide to be a hazard. There is no data to indicate this is so.

According to the US Environmental Protection Agency and in recognition of the fact that cold engines give off more CO, the 1990 Clean Air Act calls for 1994 and later cars and light trucks to meet federal carbon monoxide standards at 20 degrees Fahrenheit whereas the old rules required those standards be met at 75 degrees Fahrenheit. So the risk of increased CO levels emitting from cold engines is significantly reduced.

Furthermore, 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.

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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, CO₂, 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 O₂ given at the scene and the time taken to obtain the HbCO level.

More findings related to automobile carbon monoxide poisoning can be found in a technical paper entitled "**Reducing the Risk of Accidental Death Due to Vehicle-Related Carbon Monoxide Poisoning**" by **Linsey C. Marr, Glenn C. Morrison, William W. Nazaroff, and Robert A. Harley**, Department of Civil and Environmental Engineering, University of California, Berkeley, California. This technical paper reports on studies and analysis of computer modeling undertaken to determine the risk of death from CO poisoning in homes and garages. Among the findings: "The risk of death ranged from 16-21% for a 3-hr exposure *in* a garage to 0% for a 1-hr exposure in a house."

With any study with so many variables, one can question the validity of the study. This one is no different. Among the difficulties in modeling the conditions were numerous variables including:

- Age and condition of the motor vehicle
- Air exchange rates for the garage and dwelling
- Size of the garage and dwelling
- Length of time the vehicle is running
- Amount of fuel in the fuel tank
- Age and health of the individual
- Temperature and weather conditions
- Newer vehicles have more effective catalytic converters
- Socioeconomic factors may result in older, less efficient vehicles stored outside or garages with higher air exchange rates

But the study was based on very conservative conditions and it was pointed out that the risks may be overestimated.

The study points out that unintentional CO deaths from automobiles do occur. But most all of these deaths occurred *in* the garage. The most frequent cause of CO deaths were a driving into a garage (often under the influence of alcohol or drugs) and leaving the engine running (42% of deaths) and starting the car to perform vehicle maintenance (25%) or to provide heat (23%).

Importantly, the study points out that even these deaths are dropping at a rate of about 7% a year as older vehicles are replaced by newer, more efficient ones. In fact, in the technical paper by **M. Shelef** titled "**Unanticipated benefits of automotive emission control: Reduction in fatalities by motor vehicle exhaust gas**" SAE Technical Paper No. 922335, Society of Automotive Engineers: Warrendale, PA, 1992, Shelef argued that reducing CO poisoning deaths may be the biggest benefit from current motor vehicle emission control programs, even though the programs are motivated by concentration standards for outside air.

After reading the various reports and studies on automobile carbon monoxide emissions, it is difficult to come to any conclusion that automobile generated carbon monoxide creates any sort of hazard in the home and the proponent has provided no statistical evidence that it does.

But beyond that, it is necessary to look at what you are asked to believe is common practice. That is that a homeowner would start their car parked in a cold garage, go into the home leaving the door open, and allow the carbon monoxide as well as the noise and cold air to enter the house unabated and ignored. Then you are further led to believe that the homeowner would allow this to happen long enough for carbon monoxide levels to build to dangerous levels, never mind why they started the automobile in the first place which they are supposed to have forgotten. I suggest that people will not leave the door to a frigid garage open, they will not want the cold air and noise to infiltrate their home, and they will not leave the automobile running for extended periods of time but will continue on with whatever caused them to start the automobile in the first place.

The current rules require CO alarms in homes that have any fuel burning appliances. But some appliances have an extremely high safety record when it comes to CO incidents. No deaths were attributed to CO poisoning from gas ranges or ovens in 2006. Only four deaths occurred from water heaters. 2,426,264 people died during 2006. The number of deaths attributable to CO poisoning from water heaters is .0001648% of the total number of deaths. Given the low number of deaths compared to overall US mortality rates, deaths attributable to CO poisoning is statistically irrelevant.

Is there a problem with CO poisoning in the home that occurs to a degree that warrants expensive regulation? I would say that the evidence indicates there is not.

What will this rule cost the American public? If an average of 1 million new homes are built each year and only one alarm is required in each home and if it costs \$50 to install that one alarm, the cost to the American public is \$50 million! Furthermore, since alarms must be installed in existing homes whenever any permit is required and since there may be 10, 15, 20 homes that have repairs for each new home, the cost can quickly reach the hundreds of millions of dollars. And at the end of the five year life expectancy of the alarms, will they be replaced like they should? If they are, the costs above will double. If there are 20 or 30 lives that are currently lost that could be prevented with CO alarms, is it worth it to the public to spend hundreds of millions of dollars to do that? I suggest it is not.

It has been argued that several states have adopted CO regulations. That is true and Minnesota is one of them. Deaths attributable to CO poisoning in Minnesota are extremely rate. However, some years ago, the tragic death of a young girl occurred in a home where an older heating system had not been properly maintained. As is often the case, grieving parents fail to take responsibility for what occurred and stated that if carbon monoxide alarms had been required in all homes that perhaps their daughter wouldn't have died. The grandparents of the young girl approached the Minnesota IRC Advisory Committee about placing a mandate in the state building code that adopted the 2006 IRC. However, amendments to the state code needed to pass a need and reasonable test and there were insufficient reasons to require them to be installed. The grandparents then went to several legislators who crafted a poorly worded law that makes CO alarms mandatory in all dwellings in the state except those owned by the state. The state legislature has no burden to prove that their rules are necessary or reasonable. The rule is not in the Minnesota State Building Code and there is no enforcement mechanism. The law sold a few alarms and creates necessary work for some attorneys.

It is important that unnecessary regulation not be approved and that any that has been approved be removed. If you believe in costly unnecessary regulation, then you should vote to maintain CO alarms. If you believe that there should be a reason why rules exist, then you should support this proposal.

Public Comment 2:

Steve Orlowski, National Association of Home Builders (NAHB), requests Approval as Modified by this Public Comment.

Replace proposal as follows:

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 with a communicating opening.

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 for the following:

1. Mechanical or gas work requiring a permit in which fuel-fired appliances are being replaced or installed.
2. Addition and/or renovation of attached garages with communicating openings requiring building permit.

Commenter's Reason: In an attempt to provide clearer guidance into the requirements for where and when a CO detector is required, NAHB urges the final action assembly to approve the following modification. There are situations where one- and two- family dwellings are constructed with an attached garage that does not open directly into the dwelling unit, such as is found with homes with breezeways that separate the garage from the dwelling but share the same roof. When there is no direct communication between the garage and the dwelling unit or when there is adequate ventilation to reduce the transmission of any potential CO emission from entering the dwelling, CO detection should not be required.

As for the second modification, the original proponent is correct that there are many in the code enforcement community that interpret the existing language to include any work that is performed under a permit, requires existing homes to be equipped with a carbon monoxide detector. The premises for requiring any retrofitting requirement must be tied to the potential cause of the hazard and not an unrelated act. Carbon monoxide detectors should only be required when the work being performed is related to potential causes of carbon monoxide. Bathroom renovation, kitchen upgrades and additions that do not involve fuel-fired appliances should not trigger the installation of carbon monoxide detectors.

Final Action: AS AM AMPC____ D
