



U.S. CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, D.C. 20207

July 22, 1997

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2-502-0111/1/97
EXEMPTED BY PETITION
RULE: 438.10 ADMIN. PROC. 2/23/86
WITH PORTIONS REMOVED

Mr. Robert Stack
Standards Engineer
International Approval Services, Inc.
8501 East Pleasant Valley Road
Cleveland, Ohio 44131

Re: Review of Selected Investigation Reports Involving Vent
Disconnection from Gas-Fired Central Furnaces

Dear Mr. Stack:

At the May 1997 meeting of the Central Furnace Technical Working Group (TWG) the engineering staff of the Consumer Product Safety Commission (CPSC) presented the results of a preliminary review of CPSC carbon monoxide (CO) poisoning investigation reports involving vent disconnection from gas-fired central furnaces. The purpose of the review was to support staff's recommendation to the Central Furnace Subcommittee (letter dated October 29, 1996), that the central furnace standard, ANSI Z21.47, be revised to require appliance shutoff if the vent pipe becomes disconnected. The results of the review clearly demonstrated the need for such a requirement.

Staff is pleased by the TWG's decision to draft a work statement, for consideration by the Central Furnace Subcommittee, requesting the Gas Research Institute (GRI) to explore and develop technologies to shut off a furnace when its vent pipe becomes disconnected. Staff realizes that development of the draft work statement for GRI and submission of it to the full subcommittee is an important first step in developing the performance requirements necessary to remove this avoidable risk of CO poisoning.

Engineering staff has completed the review of the remaining investigation reports and has summarized the results in the enclosed four tables. The final results are consistent with the preliminary results provided with our letter of May 1997 and presented at the May 1997 TWG meeting. Approximately one-sixth (22) of the 143 cases reviewed involved disconnected vents. These incidents resulted in 29 deaths and 34 injuries. The enclosed tables represent the results of staff's review of individual cases investigated during the period January 1, 1989 through December 31, 1996. They are a subset of a convenience sample (i.e., not statistically selected) and may not be

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representative of all such incidents that occur. Purged copies of the investigation reports will be provided to the International Approval Services standards staff prior to distribution of the agenda for the September 1997 Central Furnace Subcommittee meeting.

This recommendation represents the position of the Commission staff. It has not been reviewed or accepted by the Commissioners. If you have any questions please call me at (301) 504-0508, extension 1295.

Sincerely,



Ronald A. Jordan
Project Manager, Fire/Gas Codes &
Standards
Directorate for Engineering Sciences

Enclosures

REVIEW OF SELECTED FURNACE INVESTIGATIONS INVOLVING DISCONNECTED VENT PIPES (1989-1996)
 Vent Failure Mode/Condition & Result

Investigation Case Number	Incident Date	Vent Failure Mode/Condition	CO exposure? (yes/no)	CO concentration (in ppm)	Number of Deaths	Number of Injuries	Total Number of Victims
890228HCC1249	02/26/89	Disconnected vent	yes	3000	0	8	8
910208HCN00853	01/02/91	Disconnected (not attached)	yes	unknown	3	1	4
910222HCN0703	02/09/91	Misaligned flue/missing cover plate	yes	unknown	1	0	1
910508HCC0219	03/16/91	Gap in the vent pipe	yes	unknown	1	1	2
911004HCC2003	09/22/91	disconnected & blocked	yes	unknown	1	0	1
911112HCN0464	11/08/91	Disconnected	yes	200-300+	10	0	10
920110CCC3172	11/01/91	Disconnected vent	no	unknown	0	0	0
920204HCN0945	11/29/91	Disconnected vent	yes	unknown	0	2	2
920414HCN1506	03/09/92	Disconnected vent	yes	unknown	0	7	7
921209HCN0460	12/07/92	Disconnected vent	yes	unknown	3	2	5
921215HCN0481	11/24/92	Disconnected vent	yes	unknown	0	6	6
930225HWE5022	03/00/92	Disconnected vent	yes	unknown	0	1	1
930324CCC2284	01/23/93	Disconnected vent	yes	unknown	1	0	1
940107CEP9003	12/26/93	Disconnected vent	yes	unknown	0	1	1
940203CCC3249	01/04/94	Disconnected vent	yes	0 to 14	5	5	10
940208CCC2288	10/18/92	Disconnected vent	yes	268, 238, 180	1	0	1
940321CBB2386	02/17/94	Plastic flue pipe separated	yes	unknown	0	0	0
940831HCC2216	11/28/93	vent or firebox misaligned at draft diverter	yes	2000, 300	1	0	1
950310CCC2471	12/16/94	Disconnected vent	yes	69	2	0	2
960326CCC8106	02/07/96	Disconnected vent	yes	unknown	0	0	0
960501CMC9017	04/11/96	Disconnected vent	no	unknown	0	0	0
960529CAA5196	04/29/96	Vent system collapsed when tapped on lightly	no	n/a	0	0	0
TOTALS					29	34	63

Note 1: Investigations were selected for review based on queries of Narrative field using keywords "Vent, Disconnect, and Separation" and "CO poisoning, Disconnect, and Separation" Product Code used was "310". Date Range was 01/01/87 through 12/31/96

Note 2: These investigations are a subset of a convenience sample (i.e. not statistically selected) of gas furnace-related incidents and may not be representative of all such incidents that occur. These investigations were chosen to illustrate the hazards associated with disconnected vent pipes and cannot be used to determine the relative frequencies of hazard patterns.

Source: CPSC investigations involving gas furnaces with disconnected vent pipes

REVIEW OF SELECTED FURNACE INVESTIGATIONS INVOLVING DISCONNECTED VENT PIPES (1989-1996)
Description of Vent Failure Mode/Condition

Investigation Case Number	Description	Location of Vent Disconnect
990220HCC1249	disconnected vent connector	b/w vertical section and elbow
9102008HCN0653	unit operated w/o vent attached	unknown
910222HCN0703	vent misaligned at flue outlet/combust chamber plate not on unit	flue outlet
910508HCC0219	1 inch gap in 90 degree elbow section of vent pipe above furnace near exit thru wall	90 degree elbow
911004HCC2003	flue disconnected due to corrosion	flue outlet collar
911112HCN0464	Vent T separated 2.5 in.	flue outlet collar
920110CCC3172	vent disconnected at flue outlet at top of furnace	flue outlet
920204HCN0945	vent left unconnected during maintenance	unknown
920414HCN1506	vent separated at an elbow joint	elbow
921209HCN0460	screws missing at points of separation	flue outlet & vertical vent pipe
921215HCN0481	duct tape connecting vent removed	unknown
930225HWE5022	vent loosened & dislodged at coupling at chimney, leaving 4 in. gap	entry point into chimney
930324CCC2284	vent corroded and became separated 2 to 3 in. from chimney	entry point into chimney
940107CEP9003	exhaust vent was not connected during installation	furnace outlet
940203CCC3249	3/4 in. gap b/w flue outlet/vent and vent pipe fell apart	at flue outlet
940321CBB2386	Flue pipe separated @ connection b/w 3 in. plastic collar & condensate drain T section	unknown
940831HCC2216	corroded vent & recirculation of exhaust into intake	b/w collar & cond. T section
950310CCC2471	disconnected flue pipe	unknown
960326CC6106	vent pipe terminated at 1st floor ceiling	90 degree elbow
960501CMC9017	HTPV vent pipe separated at elbow and cracked	at ceiling
960529CAA3196	Vent pipe broke loose at multiple joints when lapped lightly w/ one finger by inspector	90 degree elbow multiple joints

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Source: CPSC investigations involving gas furnaces with disconnected vent pipes

REVIEW OF SELECTED FURNACE INVESTIGATIONS INVOLVING DISCONNECTED VENT PIPES (1989-1996)

Description of Vent

Investigation Case Number	Vent Type	Vent Material	Connection Type	Fitting Type	Vent Configuration	Diameter (inches)	Length (feet)
#90228HCC1249	single vent into chimney	metal	screws	elbow	vertical & horizontal	4	unknown
910208HCN0653	none attached	unknown	unknown	unknown	unknown	unknown	unknown
910222HCN0703	single	metal	not specified	not specified	vertical	unknown	unknown
910508HCC0219	single vent	metal	screws	90 degree elbow	horizontal & vertical	unknown	unknown
911004HCC2003	single vent	metal	mechanical fasteners & duct tape	90 degree elbow	horizontal & vertical	3	unknown
911112HCN0464	single vent	metal	mechanical fasteners, adhesive, metal pipe interface	tee fitting	horizontal & vertical	3	unknown
920110CCCC3172	unknown	metal	unknown	unknown	unknown	unknown	unknown
920204HCN0945	unknown	unknown	unknown	unknown	unknown	unknown	unknown
920414HCN1506	single	plastic	adhesive	elbow	unknown	unknown	unknown
921209HCN0460	common vent	metal	screws	flue connector	horizontal	2	unknown
921215HCN0481	unknown	metal	duct tape in lieu of screws	vertical	vertical	unknown	unknown
930225HWE5022	unknown	unknown	unknown	unknown	unknown	unknown	unknown
930324CCCC2284	single vent into chimney	galvanized steel	unknown	coupling(?)	unknown	unknown	unknown
940107CEP9003	unknown	unknown	unknown	2- 90 degree elbows	horizontal	unknown	8 to 10 ft.
940203CCG3249	unknown	unknown	unknown	unknown	unknown	unknown	unknown
940208CCG3268	single vent	unknown	unknown	unknown	unknown	unknown	unknown
940321CBB32366	single	plastic	unknown	90 degree elbow	unknown	2	unknown
940831HCC2216	unknown	plastic (HTPV)	adhesive/solvent	2- 90 degree elbows, 1- T section	horizontal & vertical	3 & 4	@ 26
950310CCC2471	single vent into chimney	galvanized steel	unknown	90 degree elbow	unknown	unknown	unknown
960326CCC6106	Single vent	unknown	mechanical fasteners	unknown	unknown	unknown	unknown
960501CMC9017	Single vent	plastic (HTPV)	adhesive/solvent	vent tee, 90 degree elbow	horizontal	unknown	unknown
960529CAA5196	single	plastic	unknown	multiple joints	horizontal	5	35

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Source: CPSC investigations involving gas furnaces with disconnected vent pipes.

REVIEW OF SELECTED FURNACE INVESTIGATIONS INVOLVING DISCONNECTED VENT PIPES (1989-1996)
Description of Furnace

Investigation Case Number	Age of Furnace	Year Installed	Fuel Type	BTU Input Rating	Furnace Category	Furnace Configuration	VSSS? (yes/no)
890228HCC1249	not specified	not specified	natural gas	45,000	no specified	no specified	no
910208HCN0653	unknown	unknown	unknown	unknown	unknown	unknown	unknown
910222HCN0703	@17	1974	LP-gas	not specified	unknown	not specified	no
910508HCC0219	18	@1973	LP-gas	not specified	unknown	vertical	unknown
911004HCC2003	9	1982	unknown	unknown	unknown	unknown	unknown
911112HCN0464	8	unknown	unknown	unknown	unknown	Vertical, Upflow	unknown
920110CCC3172	@15	unknown	natural gas	140,000	unknown	unknown	unknown
920204HCN0945	@15	@1976	natural gas	137,500	unknown	unknown	unknown
920414HCN1506	5	1987	natural gas	50,000	unknown	unknown	unknown
921209HCN0460	@35	@1957	natural gas	unknown	unknown	vertical	no
921215HCN0481	29	unknown	natural gas	unknown	unknown	highboy	no
930225HWE5022	10+	unknown	natural gas	unknown	unknown	unknown	unknown
930324CCC2284	17	1976	LP-gas	100,000	unknown	unknown	unknown
940107CEP9003	2 months	1993	unknown	185,000	unknown	unknown	no
940203CCC3249	unknown	1986-1988	natural gas	82,000	unknown	vertical	no
940208CCC2266	unknown	unknown	LP-gas	60,000	unknown	vertical	unknown
940321CBB2386	3	1991	LP-gas	115,000	unknown	vertical	no
940831HCC2216	unknown	unknown	unknown	unknown	unknown	unknown	unknown
950310CCC2471	13	unknown	natural gas	unknown	unknown	unknown	unknown
960326CCC6106	unknown	unknown	propane	unknown	unknown	unknown	unknown
960501CMC9017	3	1993	unknown	50,000	unknown	horizontal	yes
960529CAA5196	not specified	not specified	not specified	not specified	unknown	horizontal	not specified

Note 1: Investigations were selected for review based on queries of Narrative field using keywords "Vent, Disconnect, and Separation" and "CO poisoning, Disconnect, and Separation" Product Code used was "310"; Date Range was 01/01/87 through 12/31/96

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