



U.S. CONSUMER PRODUCT SAFETY COMMISSION
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EXCEPTED BY: PETITION
RULE: 40KING ADMIN. PROC.
REVISIONS APPROVED:

August 30, 2000

Mr. Robert Stack
Standards Engineer
Canadian Standards Association-International
8501 East Pleasant Valley Road
Cleveland, Ohio 44131

**Re: Review of Selected Investigation Reports Involving Gas-Fired Central Furnaces and
Disconnected and Blocked Vents**

Dear Mr. Stack:

At the September 1997 meeting of the ANSI Z21.47 Central Furnace Subcommittee, the U.S. Consumer Product Safety Commission (CPSC) staff presented the results of a review of CPSC In-Depth Investigation (IDI) reports involving carbon monoxide (CO) poisoning incidents resulting from disconnected vents on gas-fired central furnaces. The results of the incident review supported staff's proposal that the central furnace standard, ANSI Z21.47, be revised to include performance requirements to protect consumers from the risk of carbon monoxide exposure if the vent pipe becomes disconnected.

CPSC staff has completed an update of the 1997 review of incident reports. The update includes 14 additional incidents (not included in the previous review) which resulted in 5 deaths and 21 injuries. The failure scenarios in the reports are often corroborated by authorities such as a gas utility, fire department, and medical personnel. This lends support to staff's position that a disconnected vent pipe poses a risk of CO exposure to consumers that should be addressed by appropriate performance requirements in the furnace standard. The enclosed tables (Enclosure 1, Review of Selected Furnace Investigations Involving Disconnected Vent Pipes (1989-2000)) summarize the results of staff's review of individual incidents investigated during the period January 1, 1989 through June 30, 2000.

Staff conducted a similar review of incident reports involving blocked furnace vents. The purpose of this review was to help staff assess the adequacy of existing requirements addressing blocked vents in two areas: (1) partial vent blockage; and (2) total vent blockage. This review identified 38 incidents which resulted in 13 deaths and 25 injuries. One incident report (IDI #911114CCC2078) indicated that the furnace vent pipe was partially blocked. The majority of the reports only describe the vent condition as being "blocked" or "plugged," but do not indicate the degree of blockage. Staff's position is that any degree of vent blockage that allows combustion products into the living space, instead of being vented to the outdoors, presents a risk of CO exposure to consumers that should be addressed by appropriate performance requirements in the furnace standard. The enclosed tables (Enclosure 2, Review of Selected Furnace Investigations Involving Blocked Vent Pipes (1991-2000)) summarize the

Mr. Robert Stack
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results of the review of cases investigated during the period January 1, 1991 through June 30, 2000.

Staff is aware of the position of those in the gas furnace industry who state two failures are necessary before a CO hazard exists. One of those failures causes the furnace to generate elevated levels of CO. The other failure creates a leakage path for combustion products from the furnace into the living space. The incidents included in the enclosed reviews provide information that clearly demonstrates that disconnected, totally blocked, or partially blocked vent pipes caused the leakage path. The furnace standard includes performance requirements that limit the concentrations of CO produced in an air free sample of flue gases. While these requirements might assure that CO emissions from a newly certified furnace do not exceed a specified concentration, they do not: (1) provide assurance that furnace CO emissions will not or cannot exceed the standard limits once installed in the field; and (2) provide a means, once the furnace is in the field, to shut down if CO emissions exceed the standard limits. The CO emissions requirements currently in the standard, while important, by themselves are not adequate to protect against many of the failures that occur in the field and that have been reported in CPSC incidents.

Finally, it should be noted that the IDIs in each review are a subset of a convenience sample (i.e. not statistically selected) and may not include all such incidents that occur. Purged copies of the investigation reports are also enclosed for distribution at the September 14, 2000, Central Furnace Subcommittee meeting.

The positions represented herein are those of the CPSC staff. This information has not been reviewed 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

Vent Failure Mode/Condition & Result

Investigation Case Number	Incident Date	Vent Failure Mode/Condition (ID# page, exhibit, or attachment number)	CO exposure? (Yes/no)	CO concentration (in ppm)	Number of Deaths	Number of Injuries	Total Number of Victims
900618CCE2496	05/03/90	Vent Failure Mode/Condition (ID# page, exhibit, or attachment number) disconnected above pipe from furnace (p. 1, 2)	no	nr	0	0	0
940289CCE1264	01/16/94	point on the exhaust outlet of a gas furnace broke (p. 4)	yes (p. 1, 4)	nr	1	0	1
940310CWE5911	02/06/94	the flue pipe for the furnace separated in the attic (p. 1, 2)	yes (p. 1)	nr	1	0	1
9703021CWE5914	1/09/96	in-temp plastic vent became separated (p. 3, 6)	no	nr	0	0	0
9703096HCC7405	01/20/96	"top" vent pipe and vents blocked with paper (p. 2, Attach 2, p. 2; Attach 3, p. 2)	Yes (p. 1, 2, Attach's 1 & 2)	5300, 10 (p. 2, Attach 2, p. 1, Attach 3, p. 1)	2	0	2
9901066CCE1755	1/00/287	disconnected vent to furnace activated CO alarm (p. 3)	Yes (p. 3)	30, 40 (p. 3)	0	0	0
9901232HME4201	12/17/87	boots vent pipes to furnace (p. 2, exhibit 7, p. 3; exhibit 8)	Yes (p. 2, exhibit 7)	150, 133, 127, 60, 44, and lower (p. 3 exhibit 7)	0	2	2
9902191CCEC3617	01/69/88	vent became disconnected under home (p. 2, exhibit 1a, exhibit 1b, exhibit 2)	Yes (p. 2, exhibit's 1a, 1b, 2)	180, 160, 157, 130, 118 (exhibit's 1a, 1b, 2)	1	1	2
9903021HCC3660	05/08/87	vents disconnected in multiple locations, after roof repairs (p. 2, Attach 3, p. 1)	Yes (p. 1, exhibit 3)	nr	1	1	2
990307CWE7147	04/08/88	vent above furnace partially disconnected, 3 in gap (p. 1, 2)	Yes (p. 1, exhibit 1)	25, 22 (p. 1, exhibit 1)	0	5	5
990315HES3042	03/12/99	"disconnected furnace pipe" (p. 3, 5)	Yes (p. 3, 5)	78 (p. 3, 5)	0	1	1
990319CNE5111	02/26/99	section of exhaust vent to furnace fell off (p. 2, 3, 4, Exhibit 1, p. 2, Exhibit 2, p. 1, 4, 5, Exhibit 3, p. 2)	Yes (p. 1, 2, 3, Exhibit 1, p. 2, Exhibit 2, p. 1, 2, 3, Exhibit 3, p. 2)	250, 48, 40 (p. 2, 3, Exhibit 2, p. 1, 2, Exhibit 3, p. 2)	0	4	4
9910144HAA0222	06/19/99	in-temp plastic vent separated at joints (p. 2, 3, 4, Attach 8, Photos #3 & #4)	possible, similar symptoms (p. 1, 2, 3)	240 (p. 3)	0	0	0
000207HAA0390	02/04/00	furnace-disc. Vent, possibly intentional (p. 2, Exhibit 1, p. 8, 15)	Yes (p. 1, 2, exhibit 1)	450, 440 (p. 1, 2, exhibit 1, p. 2, 4, 6, 8, 10, 13)	0	5	5
Totals					5	21	26

nr/= not reported

Note 1: Investigations were systematically selected for review from the CPSC In-Depth Investigation File based on the following criteria: Narrative fields included keywords CARB, MONO, VENT, CONNECT, SEP, FLU, or PIP. Product Codes included 310, 322, 371, 372, 373, 374, 384, or 389. Date of incident was between 1/1/89 and 6/30/00.

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.

Note 3: Investigations presented here should be considered in addition to those included in the "Review of Selected Furnace Investigations Involving Disconnected Vent Pipes (1989-1996)" submitted to IAS, September 1989.

Source: U.S. Consumer Product Safety Commission/EPHA CPSC In-Depth Investigation File

REVIEW OF SELECTED FURNACE INVESTIGATIONS INVOLVING DISCONNECTED VENT PIPES (1989-2000)

Investigation Case Number	Location of Vent Disconnect	Verified or Investigated by Authorities? (Yes/No)	Code for Investigating Authorities (1, 2, 3, 4, 5, 6)	Other potential contributing factors
990618CC2498	n/r	Yes	6 (p 2, 4, 5, 6)	vent failure caused by corrosion attributed to improper/inadequate vent installation
940208CC1264	n/r	Yes	2, 4 (p 4)	n/r
940310CWWE5011	in the attic (p 1)	Yes	2, 5 (p 1, 2)	n/r
973032CWWE5014	at a joint (p 3, 6)	Yes	6 (p 2, 3, 4, 5, 6)	The change in exhaust pressure caused by the disconnect allegedly cut furnace off (p 3)
973030BHCC7405	n/r	Yes	1, 2, 6 (p 1, Attch's 2 & 3)	vents also blocked with paper
960106CC1765	n/r	Yes	6 (p 3, exhibit 1)	holes in heat exchanger & upper collector box may have been ultimate cause of CO leakage
960124HWWE4201	n/r	Yes	6, 2 (p 2, 3, 4, exhrs 7 & 8)	n/r
980719CC3617	at joints (exhib 3)	Yes	1, 2 (p 1, 2, 3, exhrs 1a & 2)	lack of maintenance, dirty filter
980302HCC3660	n/r	Yes	2, 6 (p 1, 2, Attch 3)	n/r
980207CWWE7147	at elbow (p 1, 2)	Yes	1, 2, 6 (p 1, 2)	opening in former return air duct may have helped circulate CO throughout home (pg 1 & 2)
990315HEP3042	n/r	Yes	1, 2 (p 3, 4, 5)	n/r
990319CNE5111	at vent collar on top of furnace (Exhib 1, p	Yes	1, 2, 6 (p 1, 2, 3, 4, 5, exhrs 1, 2 & 3 dirty filter, dirty burner unsealed return air compartment (p 2, 3, 4 Exhrs 2 & 3) (Note: The HVAC	colluctor believed CO generation due to other contributing factors listed, not disconnected vent (see pg 4 of IOI)
991014HAA0022	at a 90 deg Elbow (Attch 8, photo #4)	Yes	6	n/r
000207HAA0390	n/r	Yes	1, 2, 6	furnace ill maintained, residents may have disconnected vent intentionally for more heat (p 2)

n/r="not reported"

- Code for Investigating Authorities**
- 1=utilities
 - 2=police or fire department
 - 3=hospital
 - 4=toxicology lab or coroner's office
 - 5=code official
 - 6=service technician

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Source: U.S. Consumer Product Safety Commission / EPHA CPSC In-Depth Investigation File

REVIEW OF SELECTED FURNACE INVESTIGATIONS INVOLVING DISCONNECTED VENT PIPES (1989-2000)

Description of Vent

Investigation Case Number	Vent Type	Vent Material	Connection Type	Fitting Type	Vent Configuration	Diameter (inches)	Length (feet)
900619CCCC3496	vent-to-chimney	metal	metal pipe interface	90 deg Elbow	horizontal and vertical	4	horizontal-97 in, vertical-63 in
940208CCCT284	n/r	plastic (PVC)	n/r	n/r	n/r	n/r	n/r
940310CWES011	n/r	n/r	n/r	n/r	horizontal	n/r	n/r
970321CWES014	HTPV, single pipe	HTPV	n/r	n/r	horizontal	3	n/r
970309BHCC7405	n/r	metal (likely)	n/r	n/r	n/r	n/r	n/r
990106CCCT1765	n/r	n/r	n/r	n/r	n/r	n/r	n/r
990122HWEL4201	n/r	n/r	n/r	n/r	horizontal	n/r	n/r
990219CCCS8617	single	double wall metal (b-vent)	metal pipe interface	n/r	horizontal	n/r	n/r
990302HCC3860	n/r	metal (likely)	n/r	elbow	n/r	n/r	n/r
990507CWEL7147	n/r	metal (likely)	n/r	n/r	n/r	n/r	n/r
990315REPS3042	n/r	n/r	n/r	90 deg Elbow	n/r	n/r	n/r
990319CNEE5111	n/r	metal (double wall b-vent and single wall)	n/r	n/r	horizontal & vertical	3 or 4	21 in vertical, 85 in horizontal
991014HAA0022	single	HTPV	n/r	joints	n/r	n/r	n/r
000207HAA0390	single	n/r	n/r	n/r	n/r	n/r	n/r

n/r="not reported

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REVIEW OF SELECTED FURNACE INVESTIGATIONS INVOLVING DISCONNECTED VENT PIPES (1989-2000)

Investigation Case Number	Age of Furnace	Year Installed	LP-gas (converted from natural gas)	Fuel Type	BTU Input (Bluh)	Efficiency Rating (%)	Furnace Category	Furnace Configuration	BVSS? (yes/no)	Other product(s) mentioned? (yes/no)	
										Type of product(s)	Type of product(s)
300618C0CC2498	7 (p 3)	1987 (p 1)	n/r	natural gas	90,000	81	n/r	horizontal	n/r	no	
940208C0CT1264	n/r	n/r	n/r	natural gas	n/r	n/r	n/r	n/r	n/r	no	
940310C0WE50114	15 (p 1)	1979 (p 1)	n/r	natural gas	n/r	mid-80	n/r	horizontal	probable	no	
970321C0WE5014	3 to 4 (p 2)	n/r	n/r	natural gas	n/r	n/r	n/r	n/r	n/r	no	
970306HCCT7405	n/r	n/r	n/r	natural gas (likely)	n/r	n/r	n/r	n/r	n/r	no	
980106C0CC1755	10 (p 2, enhor 4A)	1987	n/r	natural gas	75,000 to 80,000	n/r	n/r	upright	n/r	no	
980212H0WE4201	20 (p 2, 4)	n/r	n/r	natural gas	n/r	n/r	n/r	horizontal	n/r	no	
980219C0CC3617	n/r	n/r	n/r	natural gas (likely)	n/r	n/r	n/r	n/r	n/r	no	
980302H0CC3660	n/r	n/r	n/r	natural gas	n/r	n/r	n/r	n/r	n/r	no	
980507C0WE7147	8 (p 1)	1990	n/r	natural gas	n/r	n/r	n/r	n/r	probable	no	
990315H0EP3042	n/r	n/r	n/r	natural gas	n/r	n/r	n/r	n/r	n/r	no	
990319C0NE5111	n/r	1980 (p 1)	n/r	natural gas	50,000	n/r	n/r	upright	n/r	yes, gas range; gas water heater; no impact on CO	
991014H0AA0022	6 (p 1)	1993 (p 1)	n/r	natural gas	100,000	78	n/r	upright	n/r	yes, gas water heater; no impact on CO	
000207H0AA0390	n/r	n/r	n/r	natural gas	n/r	n/r	n/r	n/r	n/r	yes, gas water heater; gas range; no impact on CO (p 2)	

n/r = "not reported"

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Note 3: Investigations presented here should be considered in addition to those included in the "Review of Selected Furnace Investigations Involving Disconnected Vent Pipes (1989-1996)"

submitted to IAS, September 1999.

Source: U.S. Consumer Product Safety Commission / EPHA CPSC In-Depth Investigation File

REVIEW OF SELECTED FURNACE INVESTIGATIONS INVOLVING BLOCKED VENT PIPES (1991-2000)

Investigation Case Number	Vent Failure Incident Date	Vent Failure Mode/Condition (Total or Partial Blockage?)	CO exposure? (year/no)	CO concentration (in ppm)	No. of Deaths	No. of Injuries	Total No. of Victims
910731HCC1346	02/06/91	Blocked chimney to furnace (p 1, 2, Exhibit 1, Exhibit 2)	Yes (p 1, 2, Exhibits 1, 2, 6, 3)	nr	1	0	1
911023HBB1458	10/26/91	unclogged chimney (and possibly heat exchanger) became blocked from falling debris, clogged flue to furnace (p 1, Exhibit 1)	Yes (p 1, Exhibit 1)	nr	2	2	4
911030HCC00324	10/06/91	Blocked chimney and flue to furnace (p 1, Aitch 1, Aitch 2)	Yes (p 1, Aitch 2)	no trace found (p 1)	0	6	6
911114HCC20278	03/11/90	90-95% blockage in vent to furnace due to mouse nest (p 1, Aitch 1)	Yes (p 1, Aitch 1)	nr	2	0	2
911119HCC00040	12/29/90	vent clogged by snow and ice (p 2, Exhibit 3, p 2)	Yes (Aitch 1)	852, 825 (p 2, Exhibit 3, p 2)	0	2	2
912121HCC00633	11/14/91	Blocked chimney to furnace (Aitch 1)	Yes (p 1, 2, 3, 4, Exhibit 1)	nr	1	0	1
920124HCC2086	12/26/91	soot blocked the flue to furnace (also holes in pipes) (p 1, 3)	Yes (p 1, 2, 3, 4, Exhibit 1)	420, 380, 41p, 4 Exhibit 1, p 2)	0	2	2
920119HCC1906	08/19/92	furnace exhausted several problems, including blocked flue (p 3)	Yes (Aitch 1)	nr	1	0	1
930524HCC3372	01/20/92	furnace flue pipe closed as a result of windy conditions (p 3)	Yes (p 3, 6a, 7th, 8th, 9th exhibits)	nr	1	0	1
930608HCC2180	05/16/93	vent of RV's propane furnace blocked with sock nest (p 3, 7th Exhibit, Final Summary)	Yes (p 1, Aitch 2)	111, 86, 56 (p 1, Aitch 2)	0	5	5
931115HCC99003	11/02/93	clay liner in chimney collapsed blocking furnace exhaust (p 1, Aitch 2)	Yes (p 2)	nr	0	1	1
940124HCC99003	10/09/94	furnace vent clogged, covered with mss-sized mesh cover (p 2)	Yes (p 2, 3, 4)	nr	0	2	2
940230HCC1486	02/26/94	gas furnace flue was plugged (p 1)	Yes	nr	0	2	2
940230HCC1486	01/01/94	furnace flue and water heater flue were "stopped up"	Yes (p 1, Aitch 1, p 2, Aitch 2, p 3, 4)	nr	1	0	1
951113HCC00239	11/17/95	Blocked furnace flue and cracked furnace vent pipe (p 1, 2)	Yes (p 1, 2)	nr	1	14	14
950411HCC06140	01/19/96	vent pipe clogged with various debris (p 2, 4, 5)	Yes (p 2, 5)	nr	1	1	1
960816HCC5476	09/19/96	vent pipe for furnace and H2O heater s was crushed by debris from inside chimney (p 2, 3, Aitch 3)	Yes (p 2, 3, Aitch 2, p 1, 3, Aitch 3)	630 to 700 (p 3, Aitch 2, p 3)	1	0	1
970311HCC1791	05/04/96	metal cap fell into flue vent due to snow & ice and blocked vent (cover)	Yes (p 1, 2, 3, Exhibit 1)	1, 1 (after heavy boiler door opened (p 4), (mins (p 2)	1	0	1
970515HCC1172	01/23/97	multiple fuel-burning apps. incl furnace vented to clogged vent (p 1)	Yes (p 1, 3)	30, 30, 75, 700 (p 1, 2)	1	0	1
971001HCC2004	12/24/96	Blocked vent to furnace and disconnected vent to H2O heater (p 1)	Yes (p 1, 2)	nr	1	2	3
971308HCC2152	11/03/97	birds nest blocked chimney and furnace vent (p 1)	Yes	nr	0	4	4
980130HCC99003	11/24/97	chimney collapsed blocking vent to furnace (p 6, 8)	Yes (p 3, 5)	250 (p 6, 8)	0	10	10
981028HCC99442	10/04/98	furnace vent in chimney blocked by debris (p 5)	Yes	100's, 999 (p 3)	0	0	0
981028HCC99442	10/27/98	main flue blocked and cracked heat exchanger (cover)	Yes	220 (p 2, exhibit 2, pg 2, exhibit 4, pg 2)	0	2	2
981222HCC2121	03/26/98	furnace vent blocked by insect nest (p 2, 3)	Yes	nr	1	1	2
990104HCC6001	12/02/98	furnace flue collapsed (p 1, 2)	Yes (p 2, exhibit 3)	nr	1	1	2
990108HCC7257	11/02/98	gauge screen installed in vent became soiled and clogged (p 2)	Yes (p 1, 2, exhibit 1)	400, 30 (p 1, exhibit 2, pg 4)	1	1	2
990113HCC82191	01/02/99	rodent nest partially blocked vent, improper rise over run (p 1, 2, exhibit 1, pg 13)	Yes (p 1, exhibits 1 & 2)	17, 14 (p 1)	0	2	2
990131HCC00384	02/03/99	chimney collapsed with gas heating and/or water heater vent (p 1)	Yes (p 3, 4)	188 (cover)	0	1	1
990420HCC99601	04/12/99	clogged chimney to furnace (p 3)	Yes (p 1, Aitch 2, pg 2)	80 (p 2, Aitch 1)	0	1	1
000120HCC99006	06/25/00	Blocked chimney to furnace (p 1, Aitch 2, pg 2, 4)	Yes (p 1, 2, 5)	300 (p 7)	0	0	0
000201HCC99007	12/01/99	Blocked chimney to furnace (p 2)	Yes (p 1, 2, Aitch 1)	nr	0	1	1
000329HCC2395	01/21/00	Blocked flue in mobile home furnace (p 1)	Yes (p 1, 3, 4, Aitch 1, pg 1, 5)	nr	1	0	1
000421HCC2463	03/11/00	chimney to furnace blocked after roof repairs (p 1, 3, 4, Aitch 1, pg 1, 5)	Yes (p 1, 2, Aitch 1, Aitch 2)	1000, 850, 273, 210 (p 1, 2, Aitch 1, pg 1)	1	0	1
000425HCC2466	01/10/99	ice and snow on roof blocked vent to furnace (p 1, 2, Aitch 2, pg 2, 4)	Yes (p 1, 2, Aitch 1, Aitch 2)	nr	1	0	1
nr=not reported					13	25	38
TOTALS							

nr=not reported

Note 1: Investigations were systematically selected for review from the CPSC In-Depth Investigation File based on the following criteria: Narrative fields included keywords: CARR MONI) VENT FLU FR; BLOCK CLOG OBST STUCK Product Codes included 310, 322, 371, 372, 373, 374, 384, or 389. Date of incident was between 1/1/89 and 6/30/00

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Source: U.S. Consumer Product Safety Commission / EPA CPSC In-Depth Investigation File

REVIEW OF SELECTED FURNACE INVESTIGATIONS INVOLVING BLOCKED VENT PIPES (1/1991-2000)
Description of Vent Failure Mode/Condition

Investigation Case Number	Location of Vent Blockage	Verified or Investigated by Authorities?	Code for Investigating Authorities (1, 2, 3, 4, 5, 6)	Other potential contributing factors
910731HCC1346	n/r	yes	1, 2, 4 (p 1, 2, Exhib 1, 2, 3, 6)	none mentioned
911023HBB1458	n/r	yes	1, 2 (p 1, Exhib 1)	dirty filter, cutout in return duct, windows in house sealed w/plastic
911030HCC0324	n/r	yes	1, 2, 5 (p 1, Atch 1, Atch 2)	water heater was a possible source per gas co (p 1)
911114CC2078	at an elbow (p 1, Atch 1)	yes	1, 2 (p 1, Atch 1)	LP-gas regulator vent plugged (Atch 1)
911119HCC0040	at outlet (p 2, Exhib 3, p 2)	yes	1, 2 (p 2, Exhib 3)	none mentioned
911217HCC0833	n/r	yes	2 (Atch. 1)	none mentioned
920124HCC2066	n/r	blockage was not	1, 2, 4 (p 2, 3, 4, exhrs 1, 2, 3, 4)	holes in vent pipe
920610HCC2180	n/r	yes	2, 4 (p 3, 4, atch 1)	dirty filter, burner, and pilot (p 3 & exhibit 1, p 5)
921118HCC1908	@ the vent outlet (p 3)	yes	1, 2, 4 (p 2, 3, 4, atch 1)	unit shut down in past due to complaints of noise (p 2), the victim may have re-connected the unit (p 2)
930524CC3372	n/r	yes	2, 4 (p 2, 3, 4, 2nd, 4th, 6th, 7th, 8th, 9th Exhibs)	gas water heater common vented w/furnace through chimney (p 1, Atch 2)
930608HCC2180	n/r	yes	1, 2 (p 1, Atch's 1 & 2)	none mentioned
931115CCP9003	within chimney (p 1 Atch 2)	yes	1, 2	none mentioned
940124CCP9003	n/r	yes	1, 6 (p 4, 5)	none mentioned
940331CCP9001	n/r	yes	1	none mentioned
940520CC1486	n/r	yes	1, 2, 4 (Atch 1, p 2, Atch 2, p 4)	pilot light went out (p 4)
951130CCN0239	n/r	yes	2 (p 1, 2, 4)	furnace was in need of cleaning (cover, p 1)
960411CC06140	n/r	yes	1, 2, 4 (p 2, 3, Atch 2, Atch 3)	gas water heater flue also blocked (p 1, Atch 1 p 2)
960812CC05476	n/r	yes	2 (p 1, 2, 3)	furnace vent pipe also cracked (cover, 1, 2)
960816CC07391	at exhaust vent outlet and intake vent inlet (p 1, 2, 3)	yes	2 (p 1, 2)	failure to have furnace maintained
970312CC02009	rain cap (i.e. Vent terminal) (p 1, 2)	Yes	2 (p 1, 2, 3, exh 4)	n/r
970515HCC2172	@ a vent connector connection to chimney (p 1, 2, 3, exh 4 (p 8)	Yes	1, 2, 4 (p 1, 2)	burnt wires, common venting
971001HCC2004	@ 15 ft to 20 ft from top cap (p 2)	Yes	1, 2, 4 (p 1, 2)	disconnected water heater vent
971208CC2152	n/r	yes	6 (p 1)	n/r
980123CCP9003	n/r	yes	1, 2 (p 6, 7, 8)	cracked heat exchanger
981008HEP5442	n/r	Yes	1 (p 3, 4)	disconnected water heater vent
981022CCN0030	n/r	Yes	1, 2 (p 1, 2, 3)	n/r
981222HCC2121	n/r	Yes	1, 2, 6, 4 (p 1, 2, 3, exhibit 2, pg 2, exhibit 3, pg 1, exhibit 4)	logged/leaky heat exchanger. Clogged burner air shutter
990104HEP6001	n/r	Yes	6 (p 2)	n/r
990108HWT257	n/r	Yes	1, 2, 4 (p 1, exhibit 2, exhibit 3)	n/r
990113CCBB2191	n/r	Yes	2, 6 (p 2, exhibit 1, pg 13)	improper rise over run for vent, un-insulated, exposed vent
990331HCC0384	n/r	yes	5 (p 1)	n/r
990428HEP6401	n/r	yes	1 (p 4)	n/r
000201HEP9006	n/r	yes	1, 2 (p 1)	n/r
000201HEP9007	n/r	yes	1, 2 (p 2, atch 1)	n/r
000202HEP9001	n/r	yes	1, 2 (p 1, 2, 3, 5, 6)	n/r
000329HCC2395	n/r	yes	2 (p 1)	n/r
000421HCC2463	n/r	yes	1, 2 (p 1, 2, 3, 4, Atch 1, pg 1, 2, 3, 4)	n/r
000429HCC2466	vent exhaust @ roof top (p 1, 2)	yes	1, 2 (p 1, 2, atch 1, pg 1)	n/r

Code for investigating Authorities

- 1=utilities
- 2=police or fire department
- 3=hospital
- 4=toxicology lab or coroner's office
- 5=code official
- 6=service technician
- n/r=not reported

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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.

REVIEW OF SELECTED FURNACE INVESTIGATIONS INVOLVING BLOCKED VENT PIPES (1991-2000)

Investigation Case Number	Description of Vent	Vent Type	Vent Material	Connection Type	Fitting Type	Vent Configuration	Diameter (inches)	Length (feet)
910731HCC1346	vent-to-chimney	vent-to-chimney	metal (likely)	n/r	n/r	n/r	n/r	n/r
911023HBB1458	n/r	n/r	metal	n/r	n/r	horizontal & vertical	n/r	n/r
911030HQN0324	vent-to-chimney	vent-to-chimney	metal (likely)	n/r	n/r	n/r	n/r	n/r
911114CCCC2078	vent-to-chimney	vent-to-chimney	metal (likely)	n/r	elbow	horizontal & vertical	n/r	n/r
911119HCC0040	vent-to-chimney	vent-to-chimney	metal (likely)	n/r	n/r	n/r	n/r	n/r
911217HCN0633	vent-to-chimney	vent-to-chimney	metal (likely)	n/r	n/r	n/r	n/r	n/r
920124HCC2066	n/r	n/r	metal	n/r	n/r	n/r	n/r	n/r
920610HCC2180	n/r	n/r	metal (likely)	n/r	n/r	n/r	n/r	n/r
921118HCC1906	n/r	n/r	metal	n/r	n/r	n/r	n/r	n/r
930524CCCC3372	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r
930608HCC2180	vent-to-chimney; common venting	vent-to-chimney; common venting	metal (likely)	n/r	n/r	n/r	n/r	n/r
931115GEP9003	vent-to-chimney (likely)	vent-to-chimney (likely)	metal (likely)	n/r	n/r	n/r	n/r	n/r
940124GEP9003	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r
940331CEP9001	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r
940520CCC1486	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r
951113CCN0239	vent-to-chimney	vent-to-chimney	metal	n/r	n/r	n/r	n/r	n/r
960411CCCC6140	vent-to-chimney; common vent	vent-to-chimney; common vent	metal	n/r	n/r	n/r	n/r	n/r
960812CCCC5476	vent-to-chimney; common vent	vent-to-chimney; common vent	metal	n/r	n/r	n/r	n/r	n/r
960816CCCC7391	single vent intake; single vent exhaust	single vent intake; single vent exhaust	n/r	n/r	n/r	n/r	n/r	n/r
970312CCC2009	Class B	Class B	metal	n/r	n/r	n/r	n/r	n/r
970515HCC2172	vent-to-masonry chimney	vent-to-masonry chimney	metal (likely)	n/r	n/r	n/r	n/r	n/r
971001HCC2004	vent-to-masonry chimney	vent-to-masonry chimney	metal (likely)	n/r	n/r	n/r	n/r	n/r
971208CCC2152	vent-to-masonry chimney	vent-to-masonry chimney	metal (likely)	n/r	n/r	n/r	n/r	n/r
980123CEP9003	vent-to-masonry chimney	vent-to-masonry chimney	metal (likely)	n/r	n/r	n/r	n/r	n/r
981008HEP5442	vent-to-masonry chimney	vent-to-masonry chimney	metal (likely)	n/r	n/r	n/r	n/r	n/r
981022CCN0030	n/r	n/r	metal (likely)	n/r	n/r	n/r	n/r	n/r
981222HCC2121	n/r	n/r	metal (likely)	n/r	n/r	n/r	n/r	n/r
990104HEP6001	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r
990108HME7257	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r
990113CBB2191	horiz. Run single wall; vert. Run doubl	horiz. Run single wall; vert. Run doubl	metal (likely)	tee	n/r	15 ft. horizontal; 6 to 8 ft. vertical	n/r	21 to 23 ft.
990331HCC0384	vent-to-masonry chimney	vent-to-masonry chimney	metal (likely)	n/r	n/r	n/r	n/r	n/r
990428HEP6401	vent-to-masonry chimney	vent-to-masonry chimney	metal (likely)	n/r	n/r	n/r	n/r	n/r
000201HEP9006	vent-to-masonry chimney	vent-to-masonry chimney	metal (likely)	n/r	n/r	n/r	n/r	n/r
000201HEP9007	vent-to-masonry chimney	vent-to-masonry chimney	metal (likely)	n/r	n/r	n/r	n/r	n/r
000202HEP9001	vent-to-masonry chimney	vent-to-masonry chimney	metal (likely)	n/r	n/r	n/r	n/r	n/r
000329HCC2395	n/r	n/r	metal	n/r	n/r	n/r	n/r	n/r
000421HCC2463	vent-to-masonry chimney	vent-to-masonry chimney	metal (likely)	n/r	n/r	n/r	n/r	n/r
000425HCC2466	single vent	single vent	metal	n/r	n/r	n/r	n/r	n/r

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REVIEW OF SELECTED FURNACE INVESTIGATIONS INVOLVING BLOCKED VENT PIPES (1991-2000)

Investigation Case Number	Description of Furnace	Year Installed	Fuel Type	BTU Input (Btu/hr)	Efficiency Rating (%)	Furnace Category	Furnace Configuration	BVSS? (yes/no)	Other product(s)? (yes/no); Type
910731HCC1346	n/r	n/r	natural gas	n/r	n/r	n/r	n/r	n/r no	n/r
911023HBB1458	7 (p. 1)	1984	natural gas	75000	n/r	I or III	upright	n/r yes; gas range & water heater; both checked out OK by gas co. (Exhib. 1)	
911030HCN0324	n/r	n/r	natural gas	n/r	n/r	n/r	n/r	n/r yes; gas water heater; reference to heater may have been same as furnace	
911114DCC2078	n/r	n/r	LP-gas	n/r	n/r	n/r	horizontal	n/r yes; space heater	
911119HCC0040	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r no	
911217HCN0633	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r no	
920124HCC2066	@25 (p. 3)	@1966 (p. 3)	n/r	n/r	n/r	n/r	n/r	n/r no	
920610HCC2180	*20 to 30 (p. 2)	n/r	natural gas	n/r	n/r	n/r	n/r	n/r no	
921118HCC1906	@11 (p. 2)	1981 (p. 2)	LP-gas	n/r	n/r	n/r	n/r	n/r no	
930524CC3372	@21 (p. 3)	1971 (p. 3)	LP-gas	n/r	n/r	n/r	n/r	n/r no	
930608HCC2180	n/r	n/r	natural gas	n/r	n/r	n/r	n/r	n/r yes; gas water heater	
931115CEP9003	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r no	
940124CEP9003	n/r	n/r	natural gas	n/r	n/r	n/r	n/r	n/r no	
940331CEP9001	n/r	n/r	ural gas (likely)	n/r	n/r	n/r	n/r	n/r no	
940520CC1486	n/r	n/r	ural gas (likely)	n/r	n/r	n/r	n/r	n/r no	
951113CCND239	15 to 20 (p. 10+ (p. 6))	n/r	natural gas	n/r	n/r	n/r	n/r	n/r yes; possible maintenance neglect (p. 2)	
960411CC6140	n/r	n/r	natural gas	n/r	n/r	n/r	n/r	n/r yes; gas water heater	
960812CC65476	n/r	n/r	natural gas	n/r	n/r	n/r	n/r	n/r no	
960816CC7391	@4 (p. 2; 3)	@1992 (p. 2; 3)	LP-gas	n/r	n/r	n/r	n/r	n/r no	
970312CC2009	n/r	n/r	natural gas	n/r	n/r	n/r	n/r	n/r yes; LP-gas water heater; wood stove	
970515HCC2172	n/r	1980/1982 (p. 4)	LP-gas	n/r	n/r	n/r	n/r	n/r yes; natural gas water heater	
971001HCC2004	n/r	n/r	natural gas	n/r	n/r	n/r	n/r	n/r no	
971208CC2152	n/r	n/r	natural gas	n/r	n/r	n/r	n/r	n/r no	
980123CEP9003	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r yes; gas water heater; gas stove	
981008HEP5442	n/r	n/r	natural gas	n/r	n/r	n/r	n/r	n/r no	
981022CCND030	18	n/r	LP-gas	82,000	80	n/r	n/r	n/r no	
981222HCC2121	@25 (p. 2)	n/r	natural gas	80,000	n/r	n/r	n/r	n/r yes; gas water heater; gas range	
990104HEP6001	@30 (p. 2)	n/r	natural gas	n/r	n/r	n/r	n/r	n/r no	
990108HWE7257	n/r	n/r	natural gas	n/r	n/r	n/r	n/r	n/r no	
990113CBB2191	@30 (p. 2)	n/r	propane	n/r	n/r	n/r	n/r	n/r no	
990331HCC0384	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r yes; gas water heater	
990428HEP6401	n/r	n/r	natural gas	n/r	n/r	n/r	n/r	n/r	
000201HEP9006	@20	n/r	natural gas	n/r	n/r	n/r	n/r	n/r yes; gas water heater; gas range	
000201HEP9007	@25 (p. 2)	n/r	natural gas	n/r	n/r	n/r	n/r	n/r no	
000202HEP9001	n/r	n/r	natural gas	n/r	n/r	n/r	n/r	n/r no	
000329HCC2395	@20	n/r	natural gas	n/r	n/r	n/r	n/r	n/r no	
000421HCC2463	@20	n/r	natural gas	n/r	n/r	n/r	n/r	n/r no	
000425HCC2466	n/r	n/r	natural gas	n/r	n/r	n/r	n/r	n/r no	

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