



## INVESTIGATION GUIDELINE

**Appendix 16**  
**Revised October 2005**

### **ALL CARBON MONOXIDE (CO) POISONING-RELATED INCIDENTS**

(Including motor vehicles, generators, camping equipment and CO alarms <sup>1</sup>)

#### Table of Contents

<i>Heading</i>	<i>Page</i>
I. Introduction	
A. Special Instructions	2
B. Background Information	3
C. Specific Items of Interest	4
D. Headquarters Contacts	6
II. Instructions for Collecting General Information on the Incident	
A. Free Text Summary	6
B. Description of the Incident Environment	6
Data Recording Sheet: General Information	8
C. Description of the Injured Person	11
Data Recording Sheet: Injured Persons	13
D. Description of Product	15
Data Recording Sheet: CO Alarms	17
E. Product Safety Standards	20
III. Instructions for Photographing and/or Diagramming Factors Related to the Investigation	20
IV. Instructions for Obtaining Samples and Documents Related to the Investigation	22
V. Instructions for Collecting Detailed Incident Information in On-Site Investigations	22
Pre- On-Site Investigation CO Product Checklist	22
Data Recording Sheet: Residence Environment	23

<sup>1</sup> Up until October 1, 1998, "CO detector" was the accepted terminology. However, since that date, both UL and IAS voluntary standards have replaced this terminology with "CO alarm" to more accurately reflect the intended purpose of the product as an alarming device, rather than a monitor.



## INVESTIGATION GUIDELINE

### Table of Contents (cont'd)

<i>Heading</i>	<i>Page</i>
Data Recording Sheet: Product Identification	26
Data Recording Sheet: Conditions of Vented Products	27
Gas Ranges/Ovens	29
Gas Water Heaters	31
Gas Central Furnaces	34
Space Heaters and Fireplace Log Sets	38
Wood Fireplaces, Woodburning Inserts, and Wood Stoves	41
Gas Clothes Dryers	44
Generators and Gas Engine Consumer Products	46
Gas Fired Portable Heaters	48

## I. INTRODUCTION

### A. Special Instructions

A strategic goal of the Consumer Product Safety Commission is to reduce the rate of death from carbon monoxide poisoning by 20% by the year 2013 (compared to the average of 1999 and 2000). To bolster this effort, CPSC staff is attempting to collect more detailed information on CO poisoning and alarm incidents where possible, especially in on-site investigations. To gain information about how interacting products and environmental effects impact CO incidents, investigators are requested to collect a broad range of data when conducting *on-site* residence investigations. Such detailed documentation is often required to support the case for voluntary standards improvements or to prompt action from industry.

Investigators are requested to complete guideline sections I – III, including the data recording sheets contained in these sections titled *General Information*, *Injured Persons*, and *CO Alarms* (if applicable) **for all CO-related investigations**. In cases where limited information is available (e.g., official documents only), please complete these sections with the amount of information you have.

In addition to the above, when conducting an **on-site investigation in a residence only**, investigators should complete guideline sections IV and V, including the data recording sheets contained in these sections titled *Residence Environment*, *Product Identification*, and *Conditions of Vented Products*. Section V of the guideline also contains data collection instructions and data recording sheets corresponding to specific products that may be found in the residence. Only complete these product-specific materials for each product that was in use during, or immediately prior to, the CO incident. The *Pre- On-site Investigation CO Product Checklist* is included so that investigators may identify these products before making the on-site visit.

The *Pre- On-site Investigation CO Product Checklist* may be used in the following way: While making the appointment to conduct an on-site investigation, the investigator may use the checklist to determine that a gas central furnace and a gas range were in use the day of the



## INVESTIGATION GUIDELINE

incident. In addition, the resident had used a woodburning fireplace (without an insert) early in the day, and the residence had one CO alarm. The investigator would then conduct the on-site interview, completing the guideline sections I – V, including the data recording sheets. In section V, the product-specific instructions, and data recording sheets would be completed for the gas central furnace, range, fireplace, and CO alarm. Assume the resident also owns a gas clothes dryer, but it had not been in use around the time of the incident. The investigator would not need to complete the guideline and data recording sheet for gas clothes dryers.

### B. Background Information

Carbon monoxide (CO), in its pure state, is a colorless, odorless, and poisonous gas which results from the combustion of organic materials such as gas, oil, wood, coal, and other domestic fuels. The number of CO poisoning deaths associated with consumer products in non-fire situations in the home ranged from 250 in 1991 to 180 in 1998. Mortality data indicate that gas heating systems account for the majority of these deaths, primarily space heaters, both vented and vent-free, and furnaces. Portable camping heaters, lanterns, stoves or charcoal grills, as well as gasoline-engine powered appliances and tools (e.g., pressure washers, generators, pumps), may also result in CO poisoning.

CO poisoning in a home may result from the use of virtually any type of fuel-burning equipment or a combination of equipment operating simultaneously under conditions where there is poor ventilation or a potential for backdrafting. For example, picture an airtight house that has both a gas furnace and a woodburning fireplace. The fireplace has been in use over a period of time and it is giving off enough heat to keep the furnace thermostat above the threshold at which the furnace would switch on. Because the house is air tight, the furnace vent acts as a path for air to enter the house and, as a result, cold outdoor air has been back flowing through the vent, replacing the air which the fireplace has been removing from the house. As the fire dies down or the house gets colder, the thermostat switches the furnace on. Documented cases exist where the furnace exhaust is unable to reverse the direction of the cold flue backdraft. As a result, the furnace combustion products flow into the home, rather than out through the vent.<sup>2</sup> The same scenario could occur with the use of a dryer or attic fan instead of the fireplace.

Vehicle engine exhaust is another source of CO deaths, both intentional and unintentional. Vehicles are not under CPSC jurisdiction; however, in such incidents where a vehicle was running in an attached garage/carport and a CO alarm was in the home, an investigation should be performed so that CPSC staff may develop a comprehensive evaluation of the prevention-potential of CO alarms. In the case of obvious suicide, CPSC staff is primarily interested in how the CO alarms functioned and any overflow effects of CO on persons inside the home. CPSC staff is also interested in CO incidents that occur in schools and other institutions, especially when CO alarms were present. In the past, CPSC staff has worked on voluntary standards relating to industrial-type appliances.

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<sup>2</sup> *Stegmeir, Paul, Hearth and Home, February 1997, p. 39-4.*



## INVESTIGATION GUIDELINE

Recent data shows that increasing cross-over of generators from occupational use to the consumer market has resulted in an “epidemic” of generator-related CO deaths and injuries – generators are now the fastest growing category of consumer products causing fatal CO poisoning, and serious injuries. Generators are typically used by consumers when power is unavailable due to weather-related conditions, termination of service for failure to pay bills, or during construction activities. Generator-related CO deaths and injuries typically occur when consumers operate generators inside living spaces, within enclosed spaces such as crawl spaces, porches, garages and garden sheds, or outside of a home but with the generator exhaust in close proximity to open windows, doors and/or air intake vents. The extremely high CO levels in generator exhaust can rapidly infiltrate the entire home so that exposed occupants can lose consciousness in less than an hour and will likely die without outside intervention.

**Carbon monoxide alarms** are devices that are designed to alert the occupants of a dwelling to the presence of CO, at a stage early enough to prevent acute poisoning. They are usually powered by battery or by household current (AC), or occasionally both. Some AC powered alarms incorporate battery backup in case of electric power failure.

The three different technologies used in CO alarms are:

Biomimetic. The biomimetic technology utilizes a semi-permeable, initially clear gel that darkens when exposed to CO. The gel absorbs CO at the same rate as the hemoglobin in the blood, and its color change is directly related to the amount of CO it has absorbed. A beam of light is passed through the gel, and the sensor determines any change (usually a reduction) in the light intensity caused by color changes in the gel. When the color change corresponds to 10% carboxyhemoglobin in the blood, the alarm sounds. The Biomimetic technology can be distinguished in the field because the sensor and the battery are enclosed in a sensor pack. In most models, this sensor pack must be replaced every two years; however certain alarms utilizing Biomimetic technology are not subject to this requirement. Note that gel discoloration can occur with aging and other exposure to non-CO chemicals.

Metal Oxide Sensor (MOS) or Taguchi. The metal oxide sensor technology uses a doped semiconductor that changes conductivity when exposed to CO. An electronic circuit senses the change in current through the semiconductor and sounds the alarm.

Electrochemical. The electrochemical sensor technology relies on an oxidation/reduction reaction of CO with a reactive surface. The diffusion of CO gas into the sensor prompts the chemical reaction, which in turn generates an electrical current through an external circuit, sounding the alarm when potentially hazardous CO levels are reached.

### C. Specific Items of Interest

CO from vehicles in an attached garage/carport, campground, or close to living spaces may result in CO exposure to persons in the home, as well as to those near the source of CO.



## INVESTIGATION GUIDELINE

Provide the following data for cases involving vehicle exhaust: type of vehicle, manufacturer, model (include year), location of vehicle, location of all victims, and information indicating whether the incident was intentional. Refer to the following product guidelines for technical and background information if necessary:

- Appendix 91 (All-Terrain Vehicle)
- Appendix 70 (Snow Mobile).

· CO poisoning from portable camping lanterns, grills (gas and charcoal), heaters or stoves often occurs in tents and vehicles such as campers or vans. For these cases, provide descriptive information of the size of the area in which the product was used, any openings or ventilation to the area, location of the victims and the position of the product. For vans, pick-up campers, RVs and other vehicles, provide the manufacturer, model and year. For tents and other portable structures, include the manufacturer, model, dimensions and materials of construction.

· For CO incidents involving an LP gas grill, provide the BTU rating and the length of time the product had been operating up until the incident. Note if the fuel cylinder or appliance hoses or fittings were cracked or separated. If a leak was detected, determine the exact location on the appliance. Refer to the following product guideline for technical and background information if necessary: Appendix 101 (Portable LP Gas Grills).

· For camping incidents, determine if heavy condensation was reported on the interior of the enclosure. This is caused by the interior temperature exceeding the exterior ambient temperature and may indicate inadequate ventilation.

· CO poisoning from small gasoline-engine powered appliances and tools have been known to occur even in well-ventilated spaces partially exposed to the outdoors. For incidents involving these products, provide the location of the product in relation to the victim at the time of the incident. Describe and provide the dimensions of the area where the product was used. Describe any openings or ventilation to the area, including fans and other venting devices, determine how long the victim was in the room while the engine was running, and the victim's workload prior to the incident. Note if other occupants were involved and their position and status. If the engine was operated outdoors, note the distance between the engine exhaust outlet and the air intake of the room where the victim was working. Note if the engine was found in a switched on state and whether the gas tank was empty or not when found. Refer to the following product guidelines for technical and background information if necessary:

- Appendix 17 (Walk-behind Power Mower)
- Appendix 88 (Lawn Trimmer and Edger)
- Appendix 12 (Riding Mower)
- Appendix 14 (Log Splitter)
- Appendix 2 (Chain saw)
- Appendix 71 (Snow Thrower)

· Section V of this guideline (to be used for on-site residence investigations only) refers to several products that may produce CO, as well as CO alarms. For many of these products, however, other investigative guidelines exist which address hazards other than CO, such as fires



## INVESTIGATION GUIDELINE

or burns. Refer to the product guidelines as necessary to become familiar with the specific background and technical aspects of the products, since they may not be covered in detail in this CO guideline.

· Often it is difficult to determine the cause of CO poisoning. There may be conflicting statements from the victim and other observers or investigators. Identify clearly the source of the information you provide, i.e., the persons with whom you spoke or corresponded about the incident. State clearly any conflicting opinions. If you have reason to believe that statements made by any of the parties are inaccurate, please state why. Determine which federal, state or local agency may be involved in the incident investigation and, if possible, obtain copies of any written reports, and any photographs of the incident scene or products involved.

· If the manufacturer, model number, date of manufacture or installation date of an installed appliance is not available, contact the local building or plumbing code or gas utility to determine if a permit was issued for the appliance in question. Ask the first responder or other authoritative investigating official to determine who the appropriate building or plumbing code official is. If a permit was issued, request a copy of the permit. If a copy of the permit cannot be provided, request the date of installation and manufacturer and model number if available.

· No guideline can cover all pertinent factors that may apply to a particular incident. Be sure to include an explanation of any such factors in your narrative, even if CPSC staff has not specifically mentioned them in these guidelines.

### D. Headquarters Contacts

Donald Switzer, ESFS, 301 504-7534 and Janet Buyer, ESFS 301-504-7542

## II. INSTRUCTIONS FOR COLLECTING GENERAL INFORMATION ON THE INCIDENT

### A. Free Text Summary

Please provide a summary of the sequence of events that occurred prior to, during, and subsequent to the incident. Be sure the words *carbon monoxide* are used in the synopsis.

### B. Description of the Incident Environment

· Provide a comprehensive description of the residence, vehicle, tent, or other enclosure where the incident occurred. For residences, include the number of levels, ceiling heights, materials of construction, the age of the home, dimensions, and the approximate square footage. Note if home had ductwork for HVAC system and if a system was in place. Also, determine any materials used to reduce air exchanges from outside to inside (e.g., weather stripping, storm windows, etc.). Also, for all cases, note if there were doors/windows and whether they were open or closed.



## INVESTIGATION GUIDELINE

- Note if the residence had a woodburning fireplace and chimney, any type of fireplace insert, or a gas fireplace. For each fireplace, include whether it was masonry or a factory-built type.
- Specify the incident location; e.g., apartment, private home, tent, cabin, RV, camper, van, vehicle garage. Note the locations of all victims within that location. Note if the home or enclosure had been recently renovated, painted, or newly furnished.
- Describe the ventilation conditions in the location where the incident occurred, as well as the approximate temperature, both inside and out, at the time the victim(s) were found. (Previous investigations have often mentioned an unusually hot temperature in the room where the victims were found.)
- Report the temperature setting of the thermostat at the time of the incident and the approximate size of the room(s) where the product(s) suspected of producing CO were located.
- Determine if the resident noticed any odors in home or at the suspected product(s) prior to or during incident. Although CO itself is odorless, incomplete combustion may produce strong odors such as “rotten eggs” or propane. Describe any odors and the locations where they were detected.
- State whether the consumer, firefighters, utility company, etc mentioned “backdrafting” as a factor.
- Determine from weather reports the prevailing weather conditions on the day of the incident, such as the outdoor temperature range, wind speed and direction, barometric pressure, and relative humidity.
- Describe whether there was mildew or soot in the house (e.g., windows, walls, and floors) or other enclosure. The existence of soot may indicate the presence of incomplete combustion. Soot on a vent-free fuel-burning product, however, may be normal, depending on the amount and location of the sooting and the age and history of the product involved. The amount of sooting considered “normal” might vary considerably among vent-free products. Sooting is not considered normal on vented products.
- Determine the number of exhaust/ventilation fans that were present in the residence and their respective locations. For each fan, indicate whether it was vented to the outdoors or if it recirculated air back indoors. Determine which fans, if any, were operating at the time of the incident.
- Provide any CO measurements taken and under what conditions; e.g., after house was aired, after appliance was relit. Also provide the type of instrument that was used to take the measurements, the lowest level of CO the meter can detect, whether the meter is/has been calibrated on a regular basis, and what kind of training the field personnel have on using the equipment.



## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: GENERAL INFORMATION

Complete for all incidents involving carbon monoxide poisoning and/or an activated CO alarm as instructed and attach to CPSC form 182, Epidemiologic Investigation Report. The purpose of this data recording sheet is to capture general information, victim information, and CO alarm information (if applicable) for all CO incidents. In addition, it is designed to capture detailed information concerning home environment conditions and individual products for CO incidents that are investigated on-site in a residence.

#### Instructions for all CO investigations:

Please complete the data recording sheets entitled *General Information* (pp.8-10), *Injured Persons* (pp.13-14), and *CO Alarms* (if applicable, pp.17-19) **for all incidents**. In addition, **when conducting an on site investigation in a residence** (as opposed to an RV, outdoor enclosure, etc.), complete the sections entitled *Residence Environment* (p.23-25), *Product Identification* (p.26), and *Conditions of Vented Products* (p.27-28). For these on-sites, also complete the data-recording sheet in section V (p.22) of the guideline for those products in use around the time of the incident. Each product from the *Pre- On-Site Investigation CO Product Checklist* (p. 22) is listed on a separate page (or similar products are grouped together on one page) for your convenience.

### GENERAL INFORMATION

1. Task number \_\_\_\_\_
2. Incident date (MM/DD/YYYY) \_\_\_\_\_
3. Completion of this investigation is based on (check one):
  - \_\_\_ Site visit to residence where incident occurred (may include written reports)  
*Complete guideline sections I – V, including data recording sheets (for relevant products).*
  - \_\_\_ Telephone interview and/or written reports (e.g., fire report)  
*Complete guideline sections I – III, including data recording sheets contained in those sections.*
  - \_\_\_ Written reports or newsclips only  
*Complete guideline sections I – III, including data recording sheets contained in those sections.*
  - \_\_\_ Other, specify \_\_\_\_\_  
*Complete guideline sections I – III, including data recording sheets contained in those sections.*
4. Type of residence: Check one.
  - \_\_\_ Detached house
  - \_\_\_ Attached house (e.g., townhouse, duplex)
  - \_\_\_ Apartment building or condominium
  - \_\_\_ Other, specify \_\_\_\_\_
  - \_\_\_ Don't know

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## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: **GENERAL INFORMATION** (continued)

5. What is the approximate age of the residence where the incident occurred?

- 0 – 5 years
- 5 – 10 years old
- 11 – 20 years old
- 21 – 30 years old
- 31 years or older
- Don't know

6. Did the consumer smell an unusual odor (e.g., burning smell, rotten eggs) in the home or near a gas appliance prior to or during the incident?

- Yes  No  Don't know

7. At the time of the incident what was the approximate outdoor temperature where the incident occurred?

- Less than 32 degrees Fahrenheit
- 32 to 50 degrees Fahrenheit
- 51 to 70 degrees F
- 71 to 90 degrees F
- Over 90 degrees F
- Don't know

8. At the time of the incident, how windy was it where the incident occurred?

- Calm, not windy
- Slightly windy
- Very windy
- Don't know

9. At the time of the incident, what was the approximate outdoor relative humidity where the incident occurred?

- Low humidity, 50% or less
- Slightly humid, 50-80%
- Very humid, over 80%
- Don't know

10. Was it foggy or rainy at the location of the residence at the time of the incident?

- Yes  No  Don't know

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## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: **GENERAL INFORMATION** (continued)

11. Had there been a hurricane/tropical storm or ice storm near the time of the incident?  
\_\_\_ Yes \_\_\_ No \_\_\_ Don't know \_\_\_\_\_ Hurricane/storm name if known
12. Was a vehicle's engine running in a garage, carport or driveway attached to or adjacent to the residence during the incident?  
\_\_\_ Yes \_\_\_ No \_\_\_ Don't know
13. Was there a fire in the fireplace at the time of, or just prior to, the incident?  
\_\_\_ Yes \_\_\_ No \_\_\_ Don't know
14. Was the CO incident related to the use of camping equipment (e.g. portable camping lanterns, heaters, stoves, grills, and hibachis)?  
\_\_\_ Yes \_\_\_ No \_\_\_ Don't know
15. If incident was related to the use of camping equipment, mark the type of equipment. Check all that apply:  
\_\_\_ Lantern  
\_\_\_ Heater  
\_\_\_ portable stove  
\_\_\_ grill or hibachi  
\_\_\_ Other, specify \_\_\_\_\_  
\_\_\_ Don't know
16. Did someone turn off appliances or other sources of CO post-incident?  
\_\_\_ Yes \_\_\_ No \_\_\_ Don't know
17. Did someone open windows or doors to air out the residence?  
\_\_\_ Yes \_\_\_ No \_\_\_ Don't know
18. If the consumer left the residence immediately, were outside doors and windows left open?  
\_\_\_ Yes \_\_\_ No \_\_\_ Don't know



## INVESTIGATION GUIDELINE

### C. Description of the Injured Person

- Please report the activity of the victim(s) at the time of the incident, and their location in relation to the suspected product or vehicle.
- Estimate the length of time the victim was exposed to the CO.
- Specify the number of persons exposed to the CO, the number who died, the number of ill who survived, and the number unaffected.
- Report the age, sex, and long term prognosis for each of the victims (Note: severely poisoned survivors can appear to recover initially after oxygen treatment, but 2-4 weeks after CO exposure can experience delayed effects of CO poisoning. These effects on the central nervous system, termed “delayed neurological sequelae (DNS)”, can range from loss of memory/inability to concentrate to frank personality changes and Parkinson’s disease-like muscular effects that can have drastic impact on ability to function normally. Staff is interested in learning more about the health status of CO poisoning survivors of generator-related incidents in the weeks/months after the accident.)
- Describe all reported symptoms, the length of time these symptoms had been experienced prior to the incident, and the nature and length of time of any after-effects of the incident.
- Determine how the CO poisoning was diagnosed, such as by a medical examiner or coroner, by a physician in an emergency room or doctor’s office, or by the victim himself. Indicate type of treatment provided (specify if hyperbaric oxygen (HBO) treatment was given y/n/?), whether hospitalized, and duration of hospital stay.
- Describe health status of victim(s) prior to the incident, such as if they were pregnant, had a heart or lung condition, or allergies at the time of the incident, as these factors may influence one’s susceptibility to CO poisoning. Also indicate if any of the victims were under the influence of alcohol, drugs, or other medication. If they smoked, determine frequency and type of product used (e.g., pipe, cigar, and cigarette). Note any preexisting physical infirmities of the victim(s) that might relate to the incident.
- Specify whether the carboxyhemoglobin level in the blood of the victim(s) had been measured by the coroner or doctor and the type of COHb test done (e.g., blood test, breathalyzer, etc.). Provide the measurement, if available. Determine approximately how much time had passed between the exposure to CO and the COHb measurement and find out if oxygen was administered to the victim prior to the measurement.



## INVESTIGATION GUIDELINE

- Determine the method of transportation used by the victim (e.g., ambulance, driven by someone, drove self) to receive any medical attention. This may indicate the severity of the victim's symptoms and if in-transit treatment was received.
- Indicate costs associated with any medical treatment related to CO poisoning.



# INVESTIGATION GUIDELINE

## DATA RECORDING SHEET: INJURED PERSONS

1. How many non-firefighter victims were injured? Specify \_\_\_\_\_
2. How many non-firefighter victims died? Specify \_\_\_\_\_
3. List the age, sex of each victim (up to 5 persons) and answer yes or no to whether the person was injured or died.

Victim	Age (yrs)	Sex (M/F)	Died? Y/N	Died same day at scene? Y/N	Injured? Y/N
Person 1					
Person 2					
Person 3					
Person 4					
Person 5					

The next questions are about the **most severely injured** victims – please complete this section for each severely poisoned victim who received hyperbaric oxygen treatment, or who was admitted to hospital for more than 24 hours. If no victims meet these criteria, complete the questions only for the most severely poisoned victim.

4. How long was the victim in the home prior to the incident?

- Less than 30 minutes
- 30 minutes to 1 hour
- 1 – 2 hours
- More than 2 hours
- Don't know

5. Was the victim a smoker?

Yes  No  Don't know

**If "no" or "don't know" go to question 8.**

6. If the victim smoked cigarettes, how many did he/she smoke a day?

Specify, if known \_\_\_\_\_  Don't know

7. If the victim smoked cigars, how many did he/she smoke a day?

Specify, if known \_\_\_\_\_  Don't know

8. Did the victim receive medical treatment from a hospital emergency room as a result of the incident?

Yes  No  Don't know

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## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: **INJURED PERSONS** (continued)

9. Did the victim have a blood test to measure exposure to CO poisoning?  
\_\_\_ Yes \_\_\_ No \_\_\_ Don't know
10. If a blood test was given for CO poisoning, will the victim allow the CPSC investigator access to the medical test result?  
\_\_\_ Yes \_\_\_ No \_\_\_ Don't know
11. Did the victim receive hyperbaric oxygen therapy (HBO), and if so how many HBO treatments were given?  
\_\_\_ Yes \_\_\_ No \_\_\_ Don't know
12. At this time, does the victim/victim's family consider the victim has fully recovered from the CO exposure?  
\_\_\_ Yes \_\_\_ No \_\_\_ Don't know (victim)  
\_\_\_ Yes \_\_\_ No \_\_\_ Don't know (family member – specify relationship\_\_\_\_\_)  
\_\_\_\_Note how many days have lapsed since the CO exposure occurred and this assessment
13. For any victim/family member who answered “no” to question 12, please note specifics of effects/symptoms that are considered to still impact the victim and when they were first noticed.
14. Is victim still under medical care for health effects related to the CO poisoning incident?  
\_\_\_ Yes \_\_\_ No \_\_\_ Don't know. If yes, provide further details.



## INVESTIGATION GUIDELINE

### D. Description of Product

This information should be provided for the product(s) suspected as being responsible for excess CO emissions and/or any CO alarms.

#### *Suspected Product*

- Describe reported source of CO (e.g., rusted heat exchanger, clogged flue or vent, disconnected or missing flue or vent, rusted flue or vent, failed vent damper, burning charcoal, vehicle exhaust, etc.)
- Report the manufacturer, brand name, model number, and serial number of the product.
- Note the age of the product, whether purchased new or used, and if used, the length of time the present owners have had the product. Note if the product had been borrowed or rented. Note the user's experience with using the product - had he/she ever used one before? Used the one involved in the incident before?
- Determine how frequently the product was used and generally, the length of time it was used.
- Determine the length of time the product had been installed in its most recent location prior to the incident. Also note who had installed it; e.g., professional, non-professional such as homeowner, etc., and the kind of room in which it was installed, such as bedroom, living room, etc.
- Determine if the victim(s) had been aware of any instances of product malfunction prior to the incident, such as the pilot light going out, the unit not heating properly, etc. If so, describe the nature of the problem and if the user had done anything to the product in an attempt to correct the malfunction. If they had the product serviced, please note how long before the incident, and by whom, this was done. If appropriate, contact the repair person for further information about the nature of repairs and obtain copies of any repair orders.
- Describe in detail the product suspected in the incident. If necessary, please refer to other guidelines for product-specific background and technical information. Include information such as:
  - Dimensions
  - Type of fuel (if gas, LP or natural)
  - Whether the product was portable (fuel contained within unit) or permanently installed
  - Whether the product was equipped with a thermostat, and if so, the setting at the time of the incident
  - For vented products, include whether the product had a vent damper installed in the vent pipe, and if so, how long ago it was installed



## INVESTIGATION GUIDELINE

- Provide the contents of any other labeling present on the product such as warning or instructions for use or installation. Determine if the owner or user of the product involved had possession or access to an owner's manual for the product involved.
- Determine if there was any ventilation of the product at the time of the incident, and if so, describe (e.g., attached vent pipe, opening on side or top of product). Describe whether the venting system was reported to be properly constructed, installed, and/or maintained.
- For portable camping equipment, determine if the fuel source had product-warning labels.
- For incidents involving charcoal grills or hibachis, provide the contents of any warning labels on the charcoal bag. Determine if the labeling is in compliance with the Federal Hazardous Substances Act, *Products Requiring Special Labeling*, section 1500.14 (iii) (6). If possible, determine the English language reading and speaking abilities of the victims and if they were known to have read the warning labels.
- If the product was a small gasoline-engine powered appliance or tool, determine if it was owned by the consumer, borrowed, or rented for use. If product was rented, then obtain the name and address of rental agency. Ask if the rental agency had warned the consumer of possible CO hazards associated with the product verbally or in writing. Did/does the rental agency have portable CO monitors or alarms available for rent as well?

### *CO Alarm(s) [if applicable]*

- For each alarm, report the type, manufacturer, brand name, model number, and date of purchase/installation.
- Give the location of alarm(s) in home.
- Determine who responded to the emergency call (the fire department or the utility) and whether CO measurements were taken. If possible, obtain any records of measurements taken.
- If the CO alarm sounded an alarm, did it stop on its own or continue to alarm? Did the consumer disarm the alarm? Describe the consumer's behavior before or after calling the utility/fire department (such as turning off appliances, opening doors/windows, exiting immediately).
- Determine from the consumer or other reports if the consumer considered the CO alarm(s) to be too sensitive. Also, indicate whether there was any history of the alarm sounding prior to the incident.
- If applicable, indicate the condition of the alarm's biomimetic sensor (e.g., dark, light).
- If a sample was collected, please include the sample collection number.





## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: CO ALARMS

**CO ALARMS:** *If no CO alarm present or don't know, then skip.*

1. How many carbon monoxide (CO) alarms are in the residence?  
Specify: \_\_\_\_\_ Don't know
2. Did any CO alarms in the residence activate at the time of the incident?  
\_\_\_ Yes \_\_\_ No \_\_\_ Don't know
3. If a CO alarm activated, what room was the alarm located in? Check all that apply.  
\_\_\_ Kitchen  
\_\_\_ Bedroom  
\_\_\_ Basement  
\_\_\_ Other room: specify \_\_\_\_\_  
\_\_\_ Don't know
4. Does the CO alarm have a digital display of CO levels (ppm)?  
\_\_\_ Yes \_\_\_ No \_\_\_ Don't know
5. What type of warning signal does the alarm have?  
\_\_\_ Audible only  
\_\_\_ Visual only  
\_\_\_ Audible and visual  
\_\_\_ Don't know
6. Can the consumer tell the difference among warning, full alarm, and fault signals?  
\_\_\_ Yes \_\_\_ No \_\_\_ Don't know
7. If the CO alarm is a battery operated model with a replacement sensor, how many times was the sensor replaced? Specify number \_\_\_\_\_
8. Has the consumer ever ignored a CO alarm warning signal or full alarm?  
\_\_\_ Yes \_\_\_ No \_\_\_ Don't know
9. Is the consumer satisfied with the CO alarm's reliability?  
\_\_\_ Yes \_\_\_ No \_\_\_ Don't know
10. If the consumer is not satisfied with the CO alarm's reliability, did the consumer:  
\_\_\_ Continue to use the same CO alarm  
\_\_\_ Replace the CO alarm with the same or different model  
\_\_\_ Stop using the CO alarm  
\_\_\_ Don't know

(continued next page)



## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: CO ALARMS (continued)

11. When did the CO alarm sound?  
Date \_\_\_\_\_ Time \_\_\_\_\_ AM \_\_\_\_\_ PM \_\_\_\_\_ Don't know
12. What happened after the CO alarmed?  
 It stopped  
 It continued alarming  
 It was turned off by someone  
 Don't know
13. What fuel-burning appliances were operating at the time the CO alarm sounded?  
 Range or oven  
 Furnace  
 Water heater  
 Space heater  
 Fireplace (including logset or insert)  
 Clothes dryer  
 Other, specify \_\_\_\_\_  
 Don't know
14. What fuel-burning appliances were operating **24 hours before** the CO alarm sounded?  
 Range or oven  
 Furnace  
 Water heater  
 Space heater  
 Fireplace (including logset or insert)  
 Clothes dryer  
 Other, specify \_\_\_\_\_  
 Don't know
15. Were the appliances operating normally?  
 Yes  No  Don't know
16. Did someone disarm the alarm?  
 Yes  No  Don't know
17. Were there any prior incidents of the CO alarm sounding?  
 Yes  No  Don't know

(continued next page)



## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: **CO ALARMS** (continued)

18. What was the source or cause of the CO incident?

- Range
- Furnace
- Water heater
- Fireplace or logset
- Clothes dryer
- Other, specify \_\_\_\_\_
- Don't know



## INVESTIGATION GUIDELINE

### E. Product Safety Standards

- Determine if the suspected product had a certification label or any other indication that it was safety tested, and if so, by whom; e.g., UL, IAS, AGA, etc.
- If the product is a vent-free gas-fired heater, determine the presence of an oxygen depletion sensor (ODS). Look for and note the presence of a safety label which indicates the presence of an ODS.
- If CO alarm(s) were present, note if they met any standard, e.g., UL, IAS.

### III. PHOTOGRAPH/DIAGRAMS OF INCIDENT SCENE

#### PHOTOGRAPHING

- Photograph the product reported to be involved in the incident, being sure to include a clear, and labeled view of any components which are defective or improperly installed or maintained. Also photograph any labeling present on the product such as certification emblems, warnings, or instructions for use or installation.
- Photograph evidence of mildew, moisture, sooting inside structure of home (other than on products).
- For all fuel-burning products that were in use at the time of the incident, photograph the visible portion of vent system, especially any conditions such as vent pipe separations/sagging, holes or blockages, including any blockage of the vent damper. If no vent pipe was attached, photograph any openings on the product.
- Photograph conditions of soot, rust, or debris on product burners or heat exchangers. Also photograph any blockages found. Photograph evidence of heat/fire damage to any of the products, as well as any soot, rust or debris found inside a unit's cabinet.



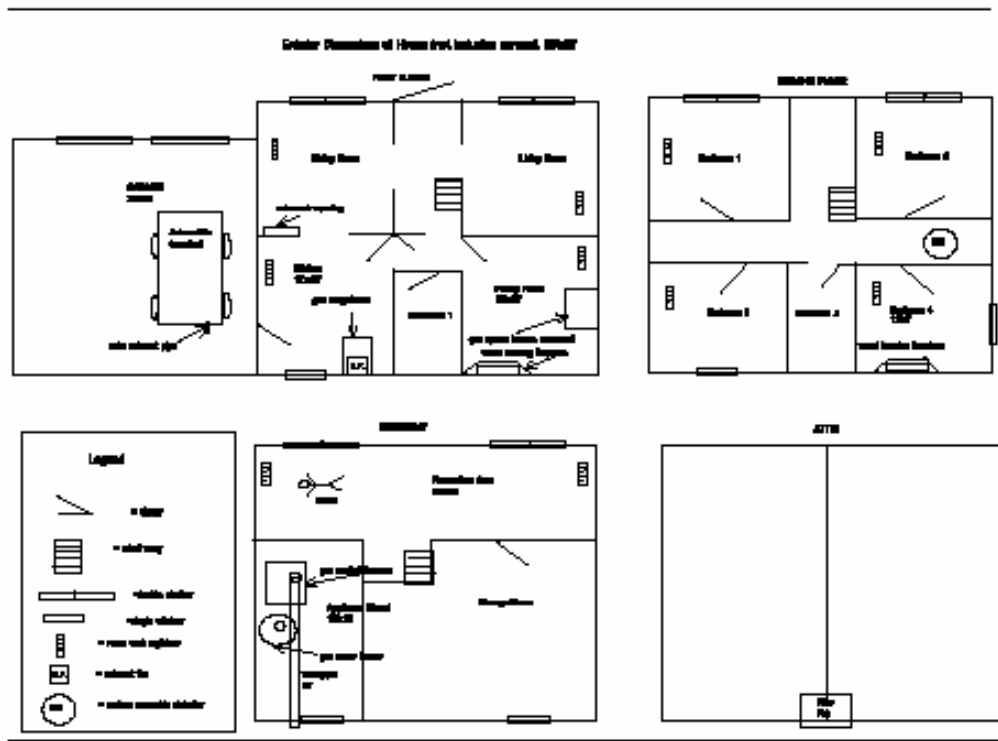
## INVESTIGATION GUIDELINE

### DIAGRAMMING THE LOCATION

Provide the approximate dimensions of the exterior of the house, dimensions of rooms with fuel-burning products, dimensions of room(s) where the victim(s) was located, and the ceiling height of each level of the house, including the basement. Show the locations of the following at the time of the incident (see example sketch below):

- All fuel-burning products and vent pipes (if applicable)
- CO alarm(s)
- Doors, windows, or other openings that may normally provide some ventilation for the residence
- Kitchen/room exhaust fans and attic fans
- Fireplaces/chimneys
- Fans or blowers associated with fireplace inserts, wood stoves, or gas log sets
- Supply and return air duct openings
- Room vent registers
- Running motor vehicle in an attached garage
- Include length of horizontal vents

**NOTE: THE SKETCH IS ONLY AN EXAMPLE! THE SAME LEVEL OF NEATNESS IS NOT REQUIRED!**





## INVESTIGATION GUIDELINE

### IV. OBTAINING SAMPLES AND DOCUMENTS RELATED TO THE INVESTIGATION

· Obtain a copy of the fire department/and or utility reports and, if possible, a copy of the product installation and maintenance instructions. If necessary, contact Compliance staff for subpoena. Sample any alarm found which does not work for any reason other than missing, dead, or incorrectly inserted batteries. But if batteries were removed to prevent nuisance alarms, collect that alarm as a sample as well.

· For CO-related fatalities, collect all official documentation including coroners' and medical examiners' reports and police reports. For CO-related hospitalizations, determine the type of treatment administered and the duration of hospitalization.

### V. INSTRUCTIONS FOR COLLECTING DETAILED INFORMATION ON INDIVIDUAL PRODUCTS AND HOME CONDITIONS

This section of the guideline contains data recording sheets for the following topics: *Residence Environment, Product Identification, and Conditions of Vented Products*. This section also contains instructions and data recording sheets to be used in collecting detailed data on specific fuel-burning products that may be involved in CO incidents. The *Pre- On-Site Investigation CO Product Checklist* below lists these products. CPSC Staff suggests that you determine which of these products were in use around the time of the incident prior to conducting the on-site visit. Given the amount of data requested in the on-site investigations, it may help to know ahead of time the number and type of products for which materials will need to be completed.

#### PRE- ON-SITE INVESTIGATION CO PRODUCT CHECKLIST

\_\_\_ RANGE/OVEN

\_\_\_ GAS WATER HEATER

\_\_\_ GAS CENTRAL FURNACE

\_\_\_ GAS SPACE HEATER/GAS LOG SET

\_\_\_ WOOD FIREPLACE/WOODBURNING INSERT/WOOD STOVE

\_\_\_ GAS CLOTHES DRYER

\_\_\_ GENERATORS AND OTHER ENGINE-POWERED CONSUMER PRODUCTS

\_\_\_ GAS FIRED PORTABLE HEATER

\_\_\_ OTHER PRODUCT, Please specify \_\_\_\_\_



## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: RESIDENCE ENVIRONMENT

1. Around the time of the incident, did the consumer notice any mildew or moisture around windows?

\_\_\_ Yes \_\_\_ No \_\_\_ Don't know

2. Around the time of the incident, did the consumer notice any sooting on walls, floors, or other areas of the residence?

\_\_\_ Yes \_\_\_ No \_\_\_ Don't know

3. Was the consumer ever told by a firefighter, utility company employee, or any other professional that they had a backdrafting problem?

\_\_\_ Yes \_\_\_ No \_\_\_ Don't know

4. How many exhaust fans are in the residence?

Specify: \_\_\_\_\_ \_\_\_ Don't know

5. How many exhaust fans were in use at time of, or immediately prior to, the incident?

Specify: \_\_\_\_\_ \_\_\_ Don't know

6. Location of exhaust fans: Check all that apply in the table below.

Exhaust Fan Location	Is there an <b>exhaust fan located in this room?</b>			Is the exhaust fan <b>vented</b> to the outside?		
	Yes	No	Don't know	Yes	No	Don't know
Kitchen						
Bathroom						
Attic						
Basement						
Other room: Specify _____ _____						

(continued next page).



## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: **RESIDENCE ENVIRONMENT** (continued)

7. Who was called first upon discovery of the incident?

- Utility company
- Fire department
- No one was called
- Other
- Don't know

*If no one was called, then END of section.*

8. What was the time of the call?

Specify: \_\_\_\_\_ AM \_\_\_ PM \_\_\_ Don't know

9. Who responded first?

- Utility company
- Fire department
- Other
- Don't know

10. What was the time of arrival?

Specify: \_\_\_\_\_ AM \_\_\_ PM \_\_\_ Don't know

11. Were CO measurements taken?

Yes  No  Don't know

*If no CO measurements were done by anyone, then END of section.*

12. What instrument was used to measure the CO?

Specify brand , if known \_\_\_\_\_ Don't know

13. What is the lowest CO level the meter can detect?

Specify in ppm \_\_\_\_\_ Don't know

14. Is the meter calibrated or checked for calibration regularly?

Yes  No  Don't know

(continued next page).





## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: **RESIDENCE ENVIRONMENT** (continued)

15. When was the last time the meter was calibrated?

- Less than 1 week before the first measurement was taken
- 1 week to 1 month before the first measurement was taken
- 1 month to 6 months before the first measurement was taken
- More than 6 months before the first measurement was taken
- Don't know

16. Who took the measurements?

- Utility company
- Fire department
- CPSC field investigator
- Other
- Don't know

17. What training did this person have about using the CO meter?

- Hands on training by someone else
- Written instructions or video training
- No training
- Don't know

18. Complete the following table for each CO measurement taken in the residence:

Fuel-burning appliances in use during measurement	Date & time of measurement	Location of meas'ments in the home	Number of meas'ments done	CO levels(in ppm)	Duration of measurements



## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: PRODUCT IDENTIFICATION

Please mark (X) yes, no or don't know for each product in the residence and in use at the time of, or immediately prior to, the CO incident.

Product	Product <b>present</b> in the residence?			Product <b>in use</b> during/prior to the CO incident?		
	Yes	No	Don't know	Yes	No	Don't know
Gas range or oven						
Wood stove						
LP gas grill						
Gas water heater						
Furnace						
Natural Gas						
LP Gas						
Oil						
Wood						
Is furnace part of forced air central Heating system?						
Space heater						
Electric						
Gas						
Kerosene						
Fireplace						
Gas / Masonry						
Gas / Factory-built						
Woodburning / Masonry						
Woodburning / Factory-built						
Fireplace Insert						
Gas						
Wood burning						
Gas clothes Dryer						
Generator						
Other Specify _____						



## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: CONDITIONS OF VENTED PRODUCTS

*If no vented products were in use around the time of the incident, then skip.*

For all vented products listed below that were in use at the time of, or immediately prior to, the CO incident, mark each condition that existed at that time.

Gas Fueled Products	Is the product vented?			If vented, mark (X) each condition that existed.				
	Yes	No	DK	Partial Block	Complete Block	Gap in vent or vent separated	Vent Holes	Size of hole/gap in vent (inches)
Range/oven								
Wood stove								
Water heater								
Furnace								
Space heater								
Fireplace/logsets								
Clothes dryer								

Gas Fueled Products	If vented, mark (X) each condition that existed.						
	Sagging vent	Distance from any problem in vent, to appliance (inches)	Metal Vent	Plastic Vent	Vent both horizontal and vertical	Vent Horizontal only	Mark (X) if horizontal vent has terminal or wind cap on outside wall
Range/oven							
Wood stove							
Water heater							
Furnace							
Space heater							
Fireplace/logsets							
Clothes dryer							

(continued next page)



## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: **CONDITIONS OF VENTED PRODUCTS** (continued)

	If vented, mark (X) each condition that existed.				
Gas Fueled Products	Vent, Vertical Only	Vented to Chimney	Vented to 2 <sup>nd</sup> pipe	Vent Damper Installed	Distance from vent damper to appliance (inches)
Range/oven					
Wood stove					
Water heater					
Furnace					
Space heater					
Fireplace/logsets					
Clothes dryer					



## INVESTIGATION GUIDELINE

### INSTRUCTIONS FOR COLLECTING SPECIFIC INFORMATION ON RANGES/OVENS

Refer to **Appendix 6 (Ranges and Ovens)** for technical information.

- Note the fuel type of the appliance and the BTU rating.
- If the appliance was on prior to or during the incident, how long had it been operating up until the incident?
- List any observed or reported soot, rust, or debris on the appliance's burner. Also list any blockages in the burners, what caused the blockage, and note whether the blockage was partial or complete.
- List any observed or reported soot, rust, or debris inside the appliance's cabinet/enclosure.
- Note any observed or reported evidence of heat or fire damage, such as flame patterns, charring, melted wires, discoloration, etc., anywhere on the appliance.
- Determine if the consumer used aluminum foil or trays with the appliance, such as lining burners or the bottom of the oven with these materials. Photograph any evidence of such usage.
- Note if the oven had a self-cleaning feature. If so, was this feature in use at the time of the incident?
- Indicate whether the range has an exhaust fan and describe how the exhaust is routed (i.e., vented outdoors or air recirculated into the kitchen).
- If the range/oven had been used to heat the home, describe how this was done.



## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: GAS RANGE/OVENS

1. Was aluminum foil used on a top burner?  Yes  No  Don't know
  
2. Was aluminum foil or an aluminum tray used to cover the bottom of the oven?  
 Yes  No  Don't know
  
3. At the time of the incident, was the range or oven being used to heat the residence?  
 Yes  No  Don't know
  
4. Is there soot, rust, or debris covering the burner?  
 Yes  No  Don't know
  
5. What color is the burner flame?  
 Mostly yellow  
 Mostly blue  
 Don't know
  
6. Is the burner flame of uniform height?  Yes  No  Don't know.



## INVESTIGATION GUIDELINE

### INSTRUCTIONS FOR COLLECTING SPECIFIC INFORMATION ON GAS WATER HEATERS

Refer to **Appendix 22 (Gas Water Heaters)** for technical information.

- Note the fuel type of the appliance and the BTU rating.
- If the appliance was on prior to or during the incident, how long had it been operating up until the incident?
- Determine if a vent pipe was attached to the appliance or if it was missing. If missing, note if the appliance had an opening at the top or side. Indicate if a vent damper was installed in any vent pipe.
- Describe the vent configuration, including the material (corrugated aluminum, plastic, galvanized steel, etc.) and color of the vent. Note the condition of the vent, such as pipe separations/sagging, holes or blockage. In addition, take the following measurements:
  - Length and slope of vertical vent pipe or section
  - Diameter of horizontal vent pipe or section
  - Diameter of vertical vent pipe or section
  - Distance from any of the above vent conditions to the point at which the vent pipe attached to the appliance
- List any observed or reported soot, rust, or debris on the appliance's burner and heat exchanger. List any blockages in the burners and heat exchanger. What caused the blockage? Was there partial or complete blockage?
- List any observed or reported soot, rust, or debris inside the appliance's enclosure.
- Note any observed or reported evidence of heat or fire damage, such as flame patterns, charring, melted wires, discoloration, etc. anywhere on the appliance.
- Note if the water heater was installed on a stand, and if so, provide the stand height.



## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: GAS WATER HEATERS

1. Is the water heater installed on a stand so the water heater sits above the floor?  
 Yes  No  Don't know
2. If the water heater is installed on a stand, what is the approximate height of the stand?  
Specify \_\_\_\_\_ inches.  Don't know
3. Is there soot, rust, or debris covering the burner?  
 Yes  No  Don't know
4. What color is the burner flame?  
 Mostly yellow  
 Mostly blue  
 Don't know
5. Is the burner flame of uniform height?  Yes  No  Don't know
6. Are there burn or flame patterns on the outside of the heater cabinet?  
 Yes  No  Don't know
7. If the furnace and water heater are both vented into a common chimney or vent, which vent pipe is higher? Check one.  
 Furnace vent pipe is higher  
 Water heater vent pipe is higher  
 Don't know
8. If the furnace and water heater are vented into a common chimney or vent, what is the distance between the two vents? Measure and specify. \_\_\_\_\_ inches
9. What color is the vent material? Check one.  
 White  
 Orange  
 Gray or silver  
 Other, specify \_\_\_\_\_  
 Don't know

(continued next page)





## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: GAS WATER HEATERS (continued)

10. Where is the vent on the appliance?

- Top
- Side
- Other, specify \_\_\_\_\_
- Don't know

11. Is there a vent damper in the vent pipe?

- Yes  No  Don't know

12. If there is a vent damper, how is it actuated? Check one.

- Thermally
- Electrically



## INVESTIGATION GUIDELINE

### INSTRUCTIONS FOR COLLECTING SPECIFIC INFORMATION ON GAS CENTRAL FURNACES

Refer to **Appendix 98 (Natural and Liquefied Petroleum Gas Furnaces)** for technical information.

- Note the fuel type of the appliance and the BTU rating.
- If the appliance was on prior to or during the incident, how long had it been operating up until the incident?
- Note whether the furnace was installed in a small, closed space (e.g., closet, alcove) or an open space (e.g., garage, basement). If installed in an open space, list any other fuel-burning appliances (incl. fireplace) that were operating in the same space at the time of the incident. Also in this case, photograph the arrangement the appliances in the space.
- Note whether any large holes or separations exist in the return air ducts of the space where the furnace is located.
- Determine if a vent pipe was attached to the appliance or if it was missing. If missing, note if the appliance had an opening at the top or side. Indicate if a vent damper was installed in any vent pipe.
- Describe the vent configuration, including the material (corrugated aluminum, plastic, galvanized steel, etc.) and color of the vent. Note the condition of the vent, such as pipe separations/sagging, holes or blockage. In addition, take the following measurements:
  - Length and slope of horizontal vent pipe or section
  - Length of vertical vent pipe or section
  - Diameter of horizontal vent pipe or section
  - Diameter of vertical vent pipe or section
  - Distance from any of the above vent conditions to the point at which the vent pipe attached to the appliance
- Document the complete vent system showing slope and duct size and any vent damper. Use sketches and photographs.
- List any observed or reported soot, rust, or debris on the appliance's burner and heat exchanger. List any blockages in the burners and heat exchanger. What caused the blockage? Was there partial or complete blockage?
- List any observed or reported soot, rust, or debris inside the appliance's cabinet.

(continued next page)



## INVESTIGATION GUIDELINE

- Note any observed or reported evidence of heat or fire damage, such as flame patterns, charring, melted wires, discoloration, etc. anywhere on the appliance.
- Note the weather conditions on the day of the incident since weather can affect vent systems. What was the minimum and maximum outdoor temperature? What was the snowfall or ice accumulation on the house?
- Note if the vent outlet is above or below the roof line, if the vent outlet is on the upwind or downwind side of the house, and if the vent outlet was blocked during the incident. Look for soot, corrosion, birds' nests, or ice.
- List all appliances that share the same vent. Are any of these appliances high efficiency appliances?
- Note if the furnace was converted from one fuel to another (e.g., oil to gas furnace).
- Has there been a change in the fresh air supply? How was it changed?
- Note if the combustion air supplied to the furnace is drawn from inside or outside the residence.
- Note condition of any opening or louvered vent that connects the furnace space to outdoor air.
- If the furnace is high efficiency or 90+ AFUE/efficiency, measure the distance between the vent pipe exit and the combustion air inlet.
- Were the front cover panels on the furnace during or immediately after the incident?



## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: GAS CENTRAL FURNACES

1. Is the furnace installed in a closed space such as a closet or alcove?  
 Yes  No  Don't know
2. Is the furnace installed in an open space such as a garage or basement?  
 Yes  No  Don't know
3. How many other gas appliances are installed in the same space as the furnace? Specify how many \_\_\_\_\_ (If none, enter zero)  Don't know
4. Is the furnace a high efficiency furnace?  
 Yes  No  Don't know
5. Were the front cover panels on the furnace at the time of the incident?  
 Yes  No  Don't know
6. Were the furnace registers blocked or covered up during the incident?  
 Yes  No  Don't know
7. Is there soot, rust, or debris covering the burner or heat exchanger?  
 Yes  No  Don't know
8. What color is the burner flame?  
 Mostly yellow  
 Mostly blue  
 Don't know
9. Is the burner flame of uniform height?  Yes  No  Don't know
10. Are there burn or flame patterns on the outside of the heater cabinet?  
 Yes  No  Don't know

(continued next page)



## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: GAS CENTRAL FURNACES (continued)

11. If the furnace and water heater are both vented into a common chimney or vent, which vent pipe is higher? Check one.

- Furnace vent pipe is higher
- Water heater vent pipe is higher
- Don't know

12. If the furnace and water heater are vented into a common chimney or vent, what is the distance between the two vents? Measure and specify. \_\_\_\_\_ inches

13. What color is the vent material? Check one.

- White
- Orange
- Gray or silver
- other, specify \_\_\_\_\_
- Don't know

14. Where is the vent on the appliance?

- Top
- Side
- other, specify \_\_\_\_\_
- Don't know

15. Is there a vent damper in the vent pipe?

- Yes  No  Don't know

16. If there is a vent damper, how is it actuated? Check one.

- Thermally
- Electrically.



## INVESTIGATION GUIDELINE

### INSTRUCTIONS FOR COLLECTING SPECIFIC INFORMATION ON SPACE HEATERS AND GAS LOG SETS

Refer to **Appendix 72 (Space Heaters)** and **Appendix 18 (Kerosene Heaters)** for technical information.

- **If the heater was a GAS-FIRED PORTABLE HEATER, than the section specific to GAS-FIRED PORTABLE HEATERS (beginning on page 48) should be completed.**
- Note the fuel type of the appliance and the BTU rating.
- If the appliance was on prior to or during the incident, how long had it been operating up until the incident?
- Is the appliance vented or vent-free? If appliance is vented, determine if a vent pipe was attached to the appliance or if it was missing. If missing, note if the appliance had an opening at the top or side.
- If appliance is vented, indicate whether combustion air was drawn from indoors or outdoors. Also, describe whether/how the vent was defective (broken or cracked?).
- If the appliance is vent-free, indicate whether the room was ventilated in accordance with the owner's manual/instructions. Was a window open for fresh air?
- State whether an oxygen depletion sensor (ODS) was on the appliance.
- Describe whether the burners were defective (leaking, ruptured?).
- List any observed or reported soot, rust, or debris on the appliance's burners. List any blockages in the burners. What caused the blockage? Was there partial or complete blockage?
- Was the appliance lit while the gas was on?

(continued next page)



## INVESTIGATION GUIDELINE

### Gas Log Sets Only

- Describe the placement of the logs and if the set was installed in a fireplace with a chimney (insert), gas fireplace, or open space. If installed in a fireplace with a chimney, determine if the flue damper was opened or closed at the time of the incident.
  
- If installed in a fireplace, get the following measurements from the installer/builder or take them:
  - Height of fireplace/enclosure
  - Width of fireplace/enclosure
  - Depth of fireplace/enclosure
  - Distance between log set and floor
  - Distance between log set and rear wall
  - Distance between log set and side walls
  
- Determine who installed or originally arranged the logs in place. Had the logs been moved prior to the incident? If so, by whom and for what reason (e.g., cleaning)? How often had the gas log set been used since then? Record any maintenance performed.
  
- Note the material of the logs and if sooting occurred.
  
- Note any options with the gas log set, such as remote control, capability to adjust flame height, fan/blower, thermostat, or other options.



## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET :SPACE HEATERS AND FIREPLACE GAS LOG SETS

1. At the time of the incident, were any windows cracked open in the same room as the space heater or fireplace gas log set?

Yes \_\_\_ No \_\_\_ Don't know \_\_\_

2. If there is a gas log set in the residence, where is it installed?: Check one.

\_\_\_ Free-standing enclosure

\_\_\_ Fireplace

\_\_\_ Open space

\_\_\_ Don't know

3. If a gas log set was installed in a fireplace, was the fireplace damper opened or closed at the time of the CO incident?: Check one.

\_\_\_ Opened

\_\_\_ Closed

\_\_\_ Don't know

4. What color is the burner flame?

\_\_\_ Mostly yellow

\_\_\_ Mostly blue

\_\_\_ Don't know

5. Is the burner flame of uniform height? \_\_\_ Yes \_\_\_ No \_\_\_ Don't know

6. What color is the vent material? Check one.

\_\_\_ White

\_\_\_ Orange

\_\_\_ Gray or silver

\_\_\_ Other, specify \_\_\_\_\_

\_\_\_ Don't know

7. Where is the vent on the appliance?

\_\_\_ Top

\_\_\_ Side

\_\_\_ Other, specify \_\_\_\_\_

\_\_\_ Don't know.





## INVESTIGATION GUIDELINE

### INSTRUCTIONS FOR COLLECTING SPECIFIC INFORMATION ON WOOD FIREPLACES, WOODBURNING INSERTS, AND WOOD STOVES

Refer to **Appendix 36 (Fireplaces – Factory Built)**, **Appendix 37 (Fireplace Inserts)** and **Appendix 24 (Wood Stoves)** for technical information.

- Note the type of wood or other solid fuel that was used in the appliance (cord wood, processed wood, wood construction materials, pellets, coal, charcoal, etc.) and the BTU rating.
- If the appliance was on prior to or during the incident, how long had it been operating up until the incident?
- Determine if a vent pipe was attached to the appliance or if it was missing. If missing, note if the appliance had an opening at the top or side. Indicate if a vent damper was installed in any vent pipe.
- Describe the vent configuration, including the material (corrugated aluminum, plastic, galvanized steel, etc.) and color of the vent. Note the condition of the vent, such as pipe separations/sagging, holes or blockage. In addition, take the following measurements:
  - Length and slope of horizontal vent pipe or section
  - Length of vertical vent pipe or section
  - Diameter of horizontal vent pipe or section
  - Diameter of vertical vent pipe or section
  - Distance from any of the above vent conditions to the point at which the vent pipe attached to the appliance
- List any observed or reported soot, rust, or debris inside the appliance's cabinet/enclosure.
- Note any observed or reported evidence of heat or fire damage, such as flame patterns charring, melted wires, discoloration, etc. anywhere on the appliance.
- Determine whether the flue damper was open or closed at the time of the incident.



## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: WOOD FIREPLACES, WOODBURNING INSERTS AND WOOD STOVES

#### WOOD FIREPLACES AND WOODBURNING INSERTS

1. At the time of the incident was the fireplace damper opened or closed? Check one.

- Damper was opened
- Damper was closed
- Don't know

2. Is there soot, rust, or debris around the fireplace or insert?

- Yes  No  Don't know

3. What color is the vent material? Check one.

- White
- Orange
- Gray or silver
- Other, specify \_\_\_\_\_
- Don't know

4. Where is the vent on the appliance?

- Top
- Side
- Other, specify \_\_\_\_\_
- Don't know



## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: WOOD STOVES

1. Is there soot, rust, or debris around the wood stove?

Yes  No  Don't know

2. What color is the vent material? Check one.

White

Orange

Gray or silver

Other, specify \_\_\_\_\_

Don't know

3. Where is the vent on the appliance?

Top

Side

Other, specify \_\_\_\_\_

Don't know

4. Is there a vent damper in the vent pipe?

Yes  No  Don't know

5. If there is a vent damper, how is it actuated? Check one.

Thermally

Electrically



## INVESTIGATION GUIDELINE

### INSTRUCTIONS FOR COLLECTING SPECIFIC INFORMATION ON GAS CLOTHES DRYERS

Refer to **Appendix 43 (Clothes Dryers)** for technical information.

- Note the fuel type of the appliance and the BTU rating.
- If the appliance was on prior to or during the incident, how long had it been operating up until the incident?
- Determine if exhaust tubing was attached to the appliance, and if not, indicate if the appliance had an opening at the top or side.
- Describe the exhaust tubing configuration, including the material (corrugated aluminum, plastic, galvanized steel, etc.) and color of the tubing. Note the condition of the tubing, such as separations, holes, or blockage. In addition, take the following measurements:
  - Diameter of exhaust tubing
  - Distance from any of the above vent conditions to the point at which the tubing is attached to the appliance
- List any observed or reported soot, rust, or debris on the appliance's burner and heat exchanger. List any blockages in the burners and heat exchanger. What caused the blockage? Was their partial or complete blockage?
- List any observed or reported soot, rust, or debris inside the appliance's cabinet.
- Note any observed or reported evidence of heat or fire damage, such as flame patterns, charring, melted wires, discoloration, etc. anywhere on the appliance.



## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: GAS CLOTHES DRYERS

1. Is there soot, rust, or debris covering the burner?

Yes  No  Don't know

2. What color is the burner flame?

Mostly yellow

Mostly blue

Don't know

3. Is the burner flame of uniform height?  Yes  No  Don't know

4. What color is the exhaust tubing material? Check one.

White

Orange

Gray or silver

Other, specify \_\_\_\_\_

Don't know

5. Where on the appliance is the exhaust tubing connected?

Top

Side

Other, specify \_\_\_\_\_

Don't know.



## INVESTIGATION GUIDELINE

### INSTRUCTIONS FOR COLLECTING SPECIFIC INFORMATION ON GENERATORS AND ENGINE-POWERED CONSUMER PRODUCTS

- As part of the product description, include the age of the product, manufacturer, horsepower (HP) of engine, and kilowatt/hour of output (continuous/rated watts). Lists name and address of outlet where and when the product was purchased or rented.
- Remember to include the product description of any CO alarms, including age of the product and manufacturer.
- Specify the type of fuel used by the product and document the amount of fuel (e.g., in gallons) used just prior to the incident. Note whether the generator was found in a “switched on” state and whether there was any fuel still in the tank.
- If the generator was used indoors (this includes the basement, crawlspace, attached carport or garage, or shed), find out why the consumer chose to operate it there as opposed to outdoors. If the generator was used outdoors, also ask why they used it outdoors. Were they aware of the CO poisoning hazard?
- What was the weather like at the time the generator was operated? Was it raining, snowing, or otherwise precipitating or looking like it might? If generator was used outdoors, was it protected from the weather in any way? If so, how?
- Why was the generator needed, i.e. was the power turned off, was the location not provided with electrical service at all, was there a temporary power outage, etc.? If there was a power outage, what was the cause of the outage – a hurricane, ice storm, tornado, etc.? If hurricane, what was the name of the hurricane? How long had the power been out when the incident occurred?
- How long had the generator been used prior to the incident? What time of the day was it run?
- What was the generator supplying power to, i.e. what appliances, tools, etc.? Were they plugged directly into the generator? Was an extension cord used? Was the generator connected to an electrical service panel? If so, please describe how it was connected.
- Document the square footage and layout of room or partially enclosed area where victims and generator (if used indoors) were located during the incident. Mark locations of any CO alarms, fans, doors, and windows. Indicate whether fans were operating and which doors or windows were open during the incident. Describe how far the doors and/or windows were opened.



## INVESTIGATION GUIDELINE

- Find out if product was operating near a central heating or cooling unit or other appliance that circulates air throughout the home. If so, describe how close the generator was to it.
- If incident occurred while product was operating outdoors, describe how exhaust reached the victim(s). Were there any open doors, open windows, vents, or air intakes to the home near where the generator was operating? If so, how close was the generator to any of these? If there was an open window or door, describe how far it was opened. What were the wind conditions?
- Did the consumer have prior experience using a generator? If so, please describe i.e. how many times prior to the incident did he/she use a generator, at what locations (home, camping, etc.).
- Photograph product, if possible, including standards markings and warnings. Also document any standards markings and warnings, including the year of the standard.
- Copy pages of the owner's manual or instructions, especially those that relate to ventilation requirements and safety warnings, if available from the consumer.



## INVESTIGATION GUIDELINE

### INSTRUCTIONS FOR COLLECTING SPECIFIC INFORMATION ON GAS-FIRED PORTABLE HEATERS

- Determine if the heater was attached to a disposable 1-pound bottle of propane gas or if it was connected to a bulk tank of propane gas (e.g., 20-pounds).
- Indicate the position of the gas valve on the fuel source and on the heater (i.e., open/closed).
- Determine the style of the heater (e.g., single burner radiant heater, multiple burner radiant heater, combination radiant heater/cooker, radiant heater equipped with an oxygen depletion sensor, or a catalytic heater).
- If available, list the manufacturer, the model number, and the Btu/hr rating of the heater. Note any damage or tampering to the product that may have occurred prior to the incident that may have affected the performance of the heater.
- List any other gas-fired equipment found at the scene and indicate if the gas valves on these other equipment were open.
- Photograph the gas-fired portable heater and attempt to collect the product as a sample with this investigation. Note: it is generally not necessary to collect the fuel source in CO poisoning incidents. If the product is not available to CPSC, document whether it was retained by a third party for litigation, further examination, etc.
- Sketch a layout of the area where the product and victims were located during the incident. Mark locations of doors and windows and indicate if any of them were open during the incident.
- Describe the weather conditions present during the incident, including temperature range, wind speed, etc.

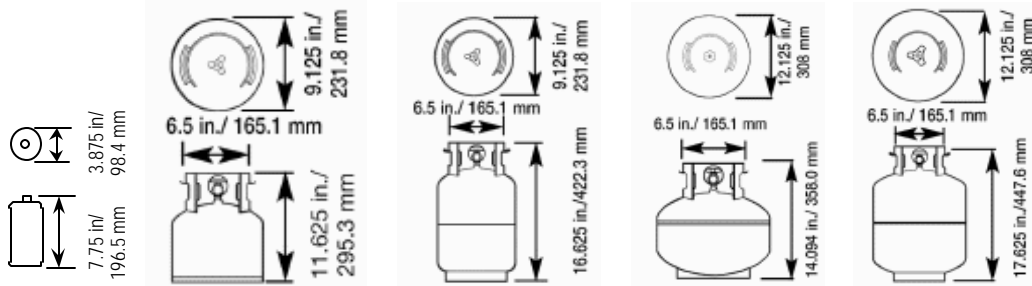




## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: Gas-Fired Portable Heater

1. What was the size of the propane tank that was connected to the heater?



\_\_\_ 1 lb.    \_\_\_ 4.25 lb.    \_\_\_ 11 lb.    \_\_\_ 14 lb.    \_\_\_ 20 lb.

2. At the time of the incident, what was the position of the gas valve on the propane tank and on the heater?

Propane Tank: \_\_\_ Open \_\_\_ Closed \_\_\_ Don't know

Heater: \_\_\_ Open \_\_\_ Closed \_\_\_ Don't know

3. Indicate which of the following heaters most closely resembles the heater involved in the incident.

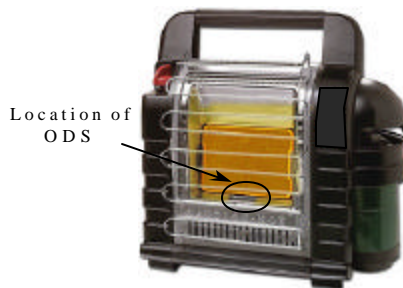
a. Camping Heater (connects to a 1-pound propane bottle)



\_\_\_ Single Burner Radiant Heater



\_\_\_ Combination Heater/Cooker



\_\_\_ Radiant Heater Equipped with an Oxygen Depletion Sensor (ODS)



\_\_\_ Catalytic Heater

(continued on next page)



## INVESTIGATION GUIDELINE

### DATA RECORDING SHEET: **Gas-Fired Portable Heater** (continued)

- b. Tank-Top Heater (connects to a bulk propane tank)



\_\_\_\_\_ Single Burner  
Heater



\_\_\_\_\_ Multiple Burner Radiant  
Radiant Heater

4. Where did the incident occur?

\_\_\_\_\_ Tent / Temporary Shelter  
\_\_\_\_\_ Camper / Trailer  
\_\_\_\_\_ Motor Vehicle (passenger vans, passenger cars, and cabs of semi trucks)  
\_\_\_\_\_ Other (specify): \_\_\_\_\_

5. What were the approximate dimensions of the space in which the incident occurred?

(L x W x H): \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_

6. If the incident occurred inside of a tent or any other temporary shelter, provide a sketch showing the approximate shape of the structure along with any doors and window. Also indicate if any of the doors and windows were open during the incident.

7. If the incident occurred inside a trailer or motor vehicle, indicate the make and model.

Make: \_\_\_\_\_

Model: \_\_\_\_\_