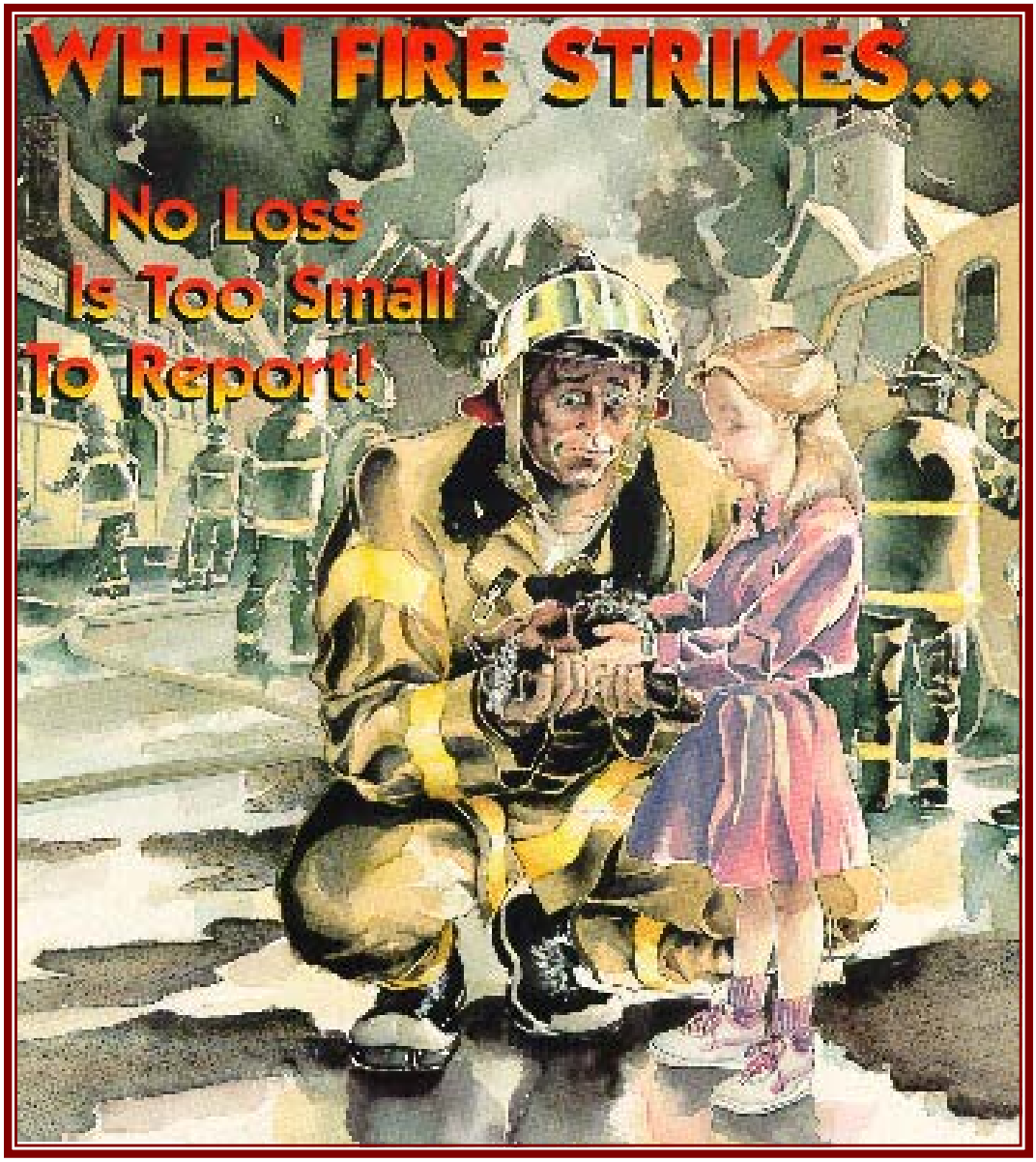
Saskatchewan
Corrections and
Public Safety

Office of the Fire Commissioner

Guide To Fire Incident Reporting



REPORT FIRE LOSSES

1-800-739-3473

OFC 2003

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Introduction

The investigation and reporting of fires in the province is critical to the development, and to measuring the success, of every local and provincial program dealing with fire safety, fire prevention and suppression. The investigation and reporting of fires is recognized as being important enough that it is established as a mandatory duty within the *Fire Prevention Act*.

Responsibilities/Duties of a Local Assistant

Investigating Fires

The local assistant is responsible to investigate and report every fire that occurs within their jurisdiction in a timely manner.

> ***15(1)*** *Every local assistant shall investigate, or cause to be investigated, the cause, origin and circumstances of every fire occurring in the local assistant's jurisdiction.*
> ***(3)*** *An investigation required under subsection (1) must be commenced within three days, excluding Sunday, of the occurrence of the fire.*

Reporting Fires

> ***15(2)*** *The local assistant shall notify the fire commissioner within 24 hours of the commencement of an investigation pursuant to subsection (1) if:*
>
> *(a) the fire is, in the opinion of the local assistant of suspicious origin;*
> *(b) death or serious injury is involved; or*
> *(c) the fire involved a building, structure or premises owned or leased by the Crown.*
>
> ***(4)*** *Immediately after the completion of an investigation pursuant to subsection (1), the local assistant shall furnish a written report of all facts concerning the cause, origin and circumstances of the fire to the fire commissioner in the form prescribed in the regulations.*

Additionally, insurance companies and insurance adjusters are required to report fires where they have an interest or involvement.

Reports by insurance companies and adjusters

37(1) *On or before the twenty-first day of each month,* ***every fire insurance company*** *that is licensed pursuant to The Saskatchewan Insurance Act shall furnish the fire commissioner with a statement relating to the preceding month of every fire that occurs in Saskatchewan in which it is interested as an insurer.*
(2) *On or before the seventh day of each month,* ***every fire insurance adjuster*** *shall furnish the fire commissioner with a statement relating to the preceding month, of every fire that occurs in Saskatchewan in which the fire insurance adjuster is interested as an adjuster.*
(3) *The statements described in subsections (1) and (2) shall be in the form prescribed in the regulations and shall contain:*

(a) the name and address of the insured;
(b) the location of the risk;
(c) the value and contents of the buildings, structure or premises;
(d) the amount of insurance carried; and
(e) the amount of the loss sustained.

(4) *In the case of a fire of suspicious origin, the insuring company shall make a preliminary report as soon as possible showing:*

(a) the names of the owner and occupant;
(b) the location, use and occupancy of the burnt premises;
(c) the date of the fire; and
(d) any facts and circumstances that the company receives knowledge of tending to establish the cause, origin or circumstances of the fire.

(5) *The report mentioned in subsection (4) is in addition to, and not in lieu of, any report that the company may be required to make pursuant to any other law of Saskatchewan.*

FIRES THAT MUST BE REPORTED INCLUDE **EVERY FIRE** THAT OCCURS.
There is no limitation on the requirement to report a fire.

A fire is defined as:
Any occurrence of destructive and uncontrolled burning, including explosions, of any material that is a solid, a liquid or a gas, where destruction of property, human injury or human death occurs.

All fires meeting this definition must be reported regardless of dollar loss, type of property, or location within the province - in other words - **EVERY FIRE**.

All injuries and deaths that result from fire must be reported.

Civilian Casualty
A civilian casualty is defined as: ***a person killed or injured as the direct result of a fire or a person who dies of fire injuries within one year of the date the injury was sustained, and who was not a member of the responding fire department.***

Fire Fighter Casualty
A fire fighter casualty is defined as: ***a person killed or injured as the direct result of a fire or a person who dies of fire injuries within one year of the date the injury was sustained, and who was a member of the responding fire department to the specific fire incident.***
Further, a fire fighter casualty will include a member of a fire department who is injured or killed while responding to a fire incident, while attending a fire incident, or while returning from a fire incident.

Because numerous circumstances exist that may result in doubt whether a fire injury or death has occurred (ie: vehicle collision - did the death occur due to the collision or the fire that resulted from the collision). **If you are unsure if the person was killed or injured by fire - report the casualty**. The Office of the Fire Commissioner will confirm all injuries and deaths.

Without the co-operation of local assistants, fire department chiefs, and insurance companies and adjusters, in reporting fire losses, it will be impossible to reduce the losses that are suffered each year by fire.

REPORTING FIRES
Reports of fires may be provided to the OFC by one of the following methods;

1. **mailing the completed form(s) to the** Office of the Fire Commissioner
   Suite 310-1855 Victoria Avenue
   Regina, Saskatchewan
   S4P 3V7
2. **FAXing the completed form(s) to the** Office of the Fire Commissioner (306) 787-9273,
3. **Telephoning 1-800-739-FIRE (3473)** and provide the information verbally
4. E-mail the forms to jrennick@cps.gov.sk.ca (contact the OFC for computer forms).
5. File transfer by e-mail or disk (contact the OFC for details).

COMPLETING FIRE REPORTING FORMS

The Fire Incident Reporting System has 3 forms that fire departments are required to complete, each designed for a specific purpose. The forms are;

- **BASIC FIRE INCIDENT REPORT - FORM A**
- **FIRE DEPARTMENT RESPONSE TO FIRE INCIDENT - FORM B**
- **FIRE CASUALTY REPORT - FORM C**

There are two additional forms that the Office of the Fire Commissioner uses for specific fires and that fire departments are asked either to complete or to notify the OFC so they can be completed. They are:

- **SMOKE ALARM PROFILE – FORM D**
  This includes a Death/Injury Document Form
- **LARGE LOSS IMPACT – FORM E**

The Saskatchewan Fire Incident Report system is based on plain language reporting. Use common, every day language to describe what happened at the fire.

All fires involving any suspicious circumstances or casualties must be reported immediately to the Office of the Fire Commissioner at 1-800-739-3473.

FORM A BASIC INCIDENT REPORT

Enter the name of the **Fire Department** that responded to the incident at the top of the form.

Line 1 Fire involved (check):

Please check the appropriate box. This visual signal to the Office of the Fire Commissioner (OFC) assists in determining follow up investigations and helps identify (generally) fire types for statistical purposes.

Line 2 Address of the fire:

The location should be a distinctive physical address for the property where the fire occurred. It should be a street address, plan description or a rural land location. Do not use the owners mailing address (ie: Box 3) or any other mailing address to identify the physical site location where the fire occurred. The address should include the name of the town or Rural Municipality and the postal code.

For vehicle fires, the location should again be identified as a distinctive location. A street address, plan, or rural land location can be used or a description, ie: 3km west of Humboldt on Highway # 5.

Line 3 Date fire occurred: Time fire occurred:

The date the fire occurred (day/month/year).

The time the fire occurred should be filled out keeping in mind that it is not the time the fire department, police or insurance arrived at the scene. It should be the time the 1st person discovered the fire.

Line 4 RCMP/Municipal Police notified

This will assist the OFC in identifying a contact for a follow up investigation. Typically a police officer is assigned but even if just the detachment is known, enter the name. The person reporting should attempt to identify a phone number, but it is not critical if the

police agency/person has been identified. If there is no police response, don't enter anything here, just answer the first question - Were the police notified Yes or No ?

Line 5 Is the Property Insured?: Estimated Value: Estimated Damage: Insurance File#:
Fill in the name of the insurance company contact person, the broker's or company name or any known insurance contact. The police and fire official should fill out estimated values for the property value and fire loss. Insurance officials should provide damages and estimates in the most accurate fashion possible. Insurance officials are requested to provide follow up information after claim settlement to provide the most accurate dollar loss information. The Insurance file # will allow update information or request information from the OFC by simply quoting a file #.

Line 6 Name of person reporting the fire:
Care should be taken to complete this portion accurately and fully. For the question "how they reported the fire" all that is required is identification of how the alarm was transmitted to the response agency. Typical answers would be *telephone, fire alarm, direct verbal report, radio,* etc.

Line 7 Owner's Name:
Line 8 Owner's Address:
This is the full name, mailing address and phone # for the **owner** of the property. If the owner has just lost their home to fire and the telephone is out of order, enter a phone number where the owner can be contacted, ie: neighbour, work, relative, etc...

Line 9 Occupant's Name:
List all occupants by first name-last name that were directly affected or involved by the fire. Use additional paper if needed. In an apartment building for example, neighbours above and beside the fire apartment may suffer damage and result in an insurance claim, perhaps from different insurance companies. Please list all occupants who may have suffered a loss in the fire.

Line 10 Property Use: Describe Property:
Describe the properties **primary** use, as specifically as possible. A store is a store, but *grocery store* is specific. For vehicles, enter *"vehicle*" and go to line 14 to describe the vehicle. For multiple residential occupancies, which include hotels/motels/inns/bed & breakfast/travel lodges etc..., apartments, condos, it is important the description include full use and occupancy (ie: a 25 room hotel with beverage room and restaurant). This information, used with data from line 11 will assist us in specifically identifying property use.

Line 11 Building height (storeys): Building area: Year built:
Stories are those above grade. Building area can be estimated to the nearest 100 square feet. Year built is important and should be included (even if estimated, such as *pre 1970*) where possible.

Line 12 Building occupant load: # of persons in the building: Did the fire department rescue occupants?:
The **occupant load** is the maximum number of persons permitted in the building or the building design load. The # of persons in the building is the **actual number** in the building when the fire started. The # rescued by the fire department is self-explanatory.

Line 13 Describe the construction of the building:

Asks for a description of the materials used in construction of the building. The terminology may be very diverse and the following terms are provided to allow for descriptions that are simple and adequate.

Combustible Construction - means the interior had open wood (not metal or concrete) joist or framing exposed to fire, either totally or some part, that was not protected by a material having a fire resistance such as plaster or gypsum board (gyproc.) An example is a dwelling where although the majority of the home is finished in gypsum board on walls and ceilings, the basement is unfinished and may have open joist spaces.

Protected Combustible Construction - means all wood (not metal or concrete) joist or framing materials in the building were protected by a material having a fire resistance such as plaster or gypsum board (gyproc).

Heavy Timber Construction - means all construction materials are wood and that the least dimension of thickness on any wood member is at least 3 inches. The wood thickness is applicable to all wood used in the building whether it is a framing member or a finish material. Most wood grain elevators meet this description.

Non-Combustible Construction - means the construction materials used for structural framing are noncombustible (steel, concrete) and are exposed to fire, either totally or in part, and they are not protected by a material having a fire resistance such as plaster or gypsum board (gyproc). Very small amounts of wood framing may be present, but it is used only as nailing strips.

Protected Non-Combustible Construction - means the construction materials used for structural framing are noncombustible (steel, concrete) and are totally protected by a material having a fire resistance such as plaster or gypsum board (gyproc). Very small amounts of wood framing may be present, but only as nailing strips.

General Construction - may be used if construction styles are mixed (combustible and non-combustible in combination).

Unknown, Not Applicable - where construction was not known or the fire was in a vehicle

Line 14 Description of vehicle/equipment involved:

A complete description of a **vehicle** or the **equipment** that may have been involved in the fire should be entered. For equipment (ie: a water heater) a description should include the fuel source (ie: electric (or gas) water heater). Vehicles need description as well. "Car" is sufficient to describe an automobile, but "truck" should be clarified as to size, type, cargo or other descriptive terms to further identify. *Semi-trailer hauling furniture* is specific and allows for identification of vehicle type and hazard.

Line 15 Serial number: License plate # (if vehicle):

Some vehicles may not be licensed (farm, etc.), but will have a serial number, please provide this information whenever possible. Where a vehicle is licensed, the plate information should be entered.

Line 16 Name of the manufacturer of the vehicle/equipment involved:

The manufacturer of the vehicle or equipment is required to track failures of equipment or vehicle problems.

Line 17 Model (number or name): Year manufactured:

Model name for vehicles and number for equipment is important for the same reason as line 16. The year allows identification for analysis for time in use and to identify recalled or equipment with safety warnings.

Line 18 (If Equipment) Date purchased: time in service:(years): where installed:

This line need not be filled out for vehicles but is important for equipment. **Where installed** is to identify location (ie: basement, furnace room, attic, roof, living room, etc.)

Line 19 (If Equipment) Installed by: certification label & #:

The OFC is not looking for the individual installer's name, but rather was the equipment installed by the owner or a licensed/qualified installer or someone else? The label and serial # is helpful, but in many cases will not be attainable (due to damage), but it should be recorded if possible to assist in identifying if failure may have involved design, installation, usage or other factor.

Line 20 (If Equipment) Last inspection/maintenance:

As per line 19, the intent is not to identify an individual, but assist in identifying potential factors of loss. The last date will assist in identifying maintenance cycles. This is a critical area for loss prevention purposes.

Line 21 (If Equipment) Action taken as result of last inspection/maintenance:

Was there a repair, modification or was there no action taken/required?

Line 22 Describe as specifically as possible the following CIRCUMSTANCES of the fire:

The first part of identification of the circumstances surrounding a fire is the **Area of Origin** and the **Level of Origin.**

The **Area of Origin** is the location within a building where the fire started and should be described as specifically as possible. Fires may start in any part of a building, including in concealed wall, floor and ceiling spaces. If the fire was outside or in a vehicle, the area should still be described. For vehicles, engine area, passenger area, cargo area, or control area (for aircraft, ships, trains) may be used as descriptions.

The **Level of Origin** is not applicable to vehicles or outside fires and asks what level the fire started (ie: basement, 1st floor, 2nd floor, etc.).

The identification of the five items listed below provides a specific sequence of how a fire occurred.

Igniting Object:	the "hot" object causing ignition of the fire,
Fuel/Energy Associated:	how the "hot" object is powered/fuelled,
Energy Causing Ignition:	how or by what means the "hot" object ignited the material first ignited,
Material 1st Ignited:	what the "hot" object ignited, and
Act or Omission:	how the "hot" object and the fuel came together to result in the fire.

Each requested item should be described as specifically as possible. Some samples have been provided below, but they may not be sufficiently detailed to describe certain items or circumstances.

Igniting Object:

The form lists general categories of potential igniting objects. Cooking equipment, heating

equipment, electrical distribution equipment, smoker's material, open flame, exposure from another fire. However, the igniting object should be described specifically (ie: coffee pot rather than cooking equipment).

Fuel/Energy - Igniting Object:
An igniting object is "powered" by a fuel/energy source. Coal, wood, fuel oil, gasoline, natural gas, propane, electricity, smoker's material, or lightning are possible sources of fuel/energy. If a candle is the igniting object - the fuel/energy is "direct flame".

Energy Causing Ignition:
An igniting object releases energy that ignites the Material First Ignited. Energy causing ignition identifies this energy. Examples are; spark/ember (as from a fire place), spark-electrical, static electricity, direct flame, friction heat, hot object, spontaneous ignition, smoker's material or lightning.

Material First Ignited:
Refers to the actual material ignited that brings about the fire condition. General catagories are; structural components, wall/floor/ceiling finishes, furniture, clothing/textiles, wood/paper item, flammable/combustible liquid or gas, chemicals/plastics, crops/grass/forest. The material first ignited should be described specifically (ie: couch rather than furniture).

Act or Omission:
The action or inaction that results in a fire. Fires can result from incendiary or deliberate set fires, misuse of an ignition source or a material, mechanical or electrical malfunction, a design/installation fault, human failing or vehicle collision. Use of the "Remarks" section will assist in identifying the act/omission specifically.

These 5 events should be clarified in **Remarks:** by providing a brief description of the fire circumstances (bolded words show 5 pieces of information required), for example:

> *- a **grease** fire in the kitchen of the second floor apartment started in a **deep fat fryer** that was **left unattended** on an **electric stove** while the occupant watched TV.*
>
> *- a lit **cigarette** was **dropped into a garbage can** in the basement storage room and it ignited **papers** in the garbage can.*
>
> *- **lightning struck the roof** of the silo and ignited the **asphalt shingles**.*
>
> *- the **electric motor** for the fan in the suspended gas furnace in the service bay **overheated** and shorted out.*
>
> *- a **spark** from the **electric motor** fell to the floor and ignited **gasoline** that had been **spilled** on the floor.*
> *- the back of the **wood burning fire place** in the second floor bedroom was **installed too close** to the **enclosure framing** and use of the fire place over an extended period caused the **wood framing** to ignite.*
>
> *- **gasoline** was **spread** throughout the living room and ignited by a **match or lighter.***

In the instance where the report is identifying property being damaged from a fire in another separate property from an exposure fire;

- *fire spread from burning vehicle to house* will provide detailed information on the circumstances surrounding a fire.

Line 23 Did the building have:

To assist in tracking fire protection/detection equipment installation and operation, including fire extinguisher use in suppressing a fire, all protection and detection equipment installed in the building should be identified and if it operated as designed/intended or was used during the fire.

The following is provided to allow a clearer understanding of this section.

A **smoke alarm** is a smoke-sensing device that has an alarm-sounding device built into it. Typically these devices are installed as an isolated device, but they may be connected to another smoke alarm. These devices may be battery operated or wired to the buildings electrical system (hardwired).

A **smoke detector** is a smoke-sensing device connected to a fire alarm system. It does not have an alarm-sounding device built into it and requires connection to the fire alarm system so the alarm bells of the fire alarm system sound an alarm. This device is included under **fire alarm system.**

The report form asks for a description of the smoke alarm device (battery, hardwired, interconnected) and its location in relation to the fire (in same room, not in same room) and asks if the device did not operate, why didn't it?

Other extinguishing system includes kitchen fire suppression systems or any automatic fire suppression system (other than a water automatic sprinkler system) such as dry chemical, halon, or carbon dioxide that provides specific hazard or property protection from fire.

Check off each system or device that was present in the fire building. In some circumstances, equipment may not be used (ie: fire extinguishers), or may not be involved in a fire (a fire in a restaurant may not involve the suppression system for cooking equipment). The installation of the equipment should be reported and that they were not used or not in the area of the fire.

If the device(s)/system(s) checked off did not operate, indicate NO and then state why the device or system did not operate. (ie: *fire extinguishers not used* or *suppression system not installed in area of fire origin,* alternatively – *battery removed from smoke alarm, fire alarm shut off, sprinkler system shut off, etc*…).

If **unknown** if the device was present or why the device or system failed to operate, state **Unknown**.

Line 24 How was the fire discovered?:

A simple description of how the fire was discovered is needed such as, *smoke alarm in room (or hallway) sounded, smoke (or heat) detector in hall (or room) operated and sounded fire alarm, occupant smelled smoke and on investigating discovered fire, sprinkler system operated and sounded alarm, neighbour (passerby) saw smoke and called fire department* are examples.

Line 25 If fire involved grassland, crops, forest or other wildland:

The OFC is tracking all types of fires and this section should be used for grass fires, etc. The land area can be estimated.

Persons filling out the report should identify them selves at the bottom of the form to allow for follow up.

Form B Fire Department Response Form

ONLY THE FIRE DEPARTMENT SHOULD FILL THIS FORM OUT.

Enter the name of the Fire Department that responded to the incident at the top of the form.

If this form is submitted with the "A Form", the first 4 lines need not be filled out.* These 4 lines only identify the fire as lines 4, 6, 7 and 8 of the "A Form".

Line 1 Date fire occurred: Time fire occurred
Line 2 Address of the fire:
Line 3 Owner's Name:
Line 4 Owner's Address:

** FORM A may be submitted immediately (arson, death) and the other forms sometime later. If FORM B is not submitted with FORM A, the top 4 lines must be completed to help identify what report it belongs to.*

Line 5 Time of alarm: Time of arrival: Time all vehicles back "in service":
Back in service is the time when all vehicles, equipment etc. are back in the fire hall, ready for the next call.

Line 6 Number of FD vehicles dispatched initially:
Line 7 Number of FD vehicles dispatched total#:
These two lines are identical except that one asks for **INITIAL** response and the second asks for **TOTALS**. The information may be identical for both lines for many fires, but it is important to show how response escalated.

Line 8 Distance of fire department response:
This is extremely important for fire departments to complete. The distance should be measured (estimated) from fire hall to scene.

Line 9 Fire Fighters responded INITIALLY: TOTAL NUMBER:
How the fire fighters got to the fire is not a factor (they may have responded in their own vehicles), just how many **INITIALLY** responded and how many in **TOTAL** responded.

Line 10 Mutual Aid: Fire Protection Agreement Response:
Indicate if the response was a Fire Protection Agreement or if Mutual Aid was given or received. In some instances both will be checked.

Fire Protection Agreement (FPA),
One municipality has a fire service while the other does not. An agreement is made so that the municipality with the fire service may provide fire protection services to the municipality without a fire service.

Mutual Aid Agreement (MAA),
Both municipalities have a fire service. An agreement is made so that either municipality may call upon the other municipality's fire service for assistance in the event of an emergency.

Line 11 Situation on arrival:
Requests a brief description of the fire situation on arrival of the first fire department vehicle, such as; *fire - no evidence from street, fire - smoke visible only, fire - some flames visible, fire - large flames showing, fully involved*
exposure(s) involved, are suggested responses that are sufficiently descriptive.

Line 12 Fire Ground Operations:

This may be very simple or extremely complex. It is important this information be recorded to not only give us information regarding operations, but to provide the fire department a record. In this section the fire department may record information as ***"property returned to control of owner at **** hours"*** as well as other information.

Line 13 Time to control fire: Time to extinguish fire:

Time to control is the time the fire fighters take to get the fire under control and start extinguishing the fire.

Time fire is extinguished is after overhaul and the fire is determined to be completely out.

Line 14 Weather condition: Temp: Wind Direction: Wind Speed:

Please provide weather information at the time of the call.

Persons filling out the report should identify them selves at the bottom of the form to allow for follow up.

Form C Fire Casualty Form

A separate form for **each** casualty must be completed. If this form is submitted with the "A Form", the first 2 lines of Form C need not be filled out.

Civilian Casualty
A civilian casualty is defined as a person killed or injured as the direct result of a fire or a person who dies of fire injuries within one year of the date the injury was sustained, and who was not a member of the responding fire department.

To clarify what a civilian fire casualty is, the following examples and situations are provided.

1. A person who is injured or who dies from as a direct result of fire occurring from a motor vehicle collision would be classed as a fire casualty. If the person was injured or died as a result of the motor vehicle collision, they would not be classed as a fire casualty even if the vehicle burned and was classed as a fire incident. The coroner's report or autopsy report will provide information on the cause of death. Injuries will involve burns from the fire.

2. A person who attempts or commits suicide by setting themselves or property on fire, is a fire casualty if they sustain injuries or are killed as a direct result of the fire.

3. A person may be injured or killed by a fire deliberately set by another person. Injuries sustained or a death occurring as a direct result of the fire are considered reportable fire casualties. If the person was injured or killed before the fire was set to destroy evidence for example, they are not considered fire casualties. The coroner's report or autopsy will provide information on the cause of death. Injuries will include burns from the fire.

Fire Fighter Casualty
A fire fighter casualty is defined as a person killed or injured as the direct result of a fire or a person who dies of fire injuries within one year of the date the injury was sustained, and who was a member of the responding fire department to the specific fire incident. Further, a fire fighter casualty will include a member of a fire department who is injured or killed while responding to a fire incident, while attending a fire incident, or while returning from a fire incident.

To clarify what a fire fighter casualty is, the following examples and situations are provided.

1. Any injury or death of a fire fighter while responding to a fire incident, actively engaged in the suppression of a fire incident, or while returning from a fire incident, where the injury or death occurs as the direct result of fire incident is considered a reportable fire fighter casualty. This includes;

cuts/lacerations	crushing
burns	frostbite
broken bones	strains/sprains
heart attack	falling from
asphyxiation	tripping over

2. A fire fighter injured or killed during a fire department response, operations or returning to the fire hall where standby services was provided in case of fire, medical, rescue or extrication services, or to control hazardous goods spills does not require a fire fighter

casualty report. If there is any doubt whether an investigation or a report is required, contact the OFC for further direction and assistance.

Line 1 Date fire occurred: Time fire occurred:

Line 2 Location of fire:
These 2 lines only identify the fire as lines 4 and 6 of the "A Form" do. The reason for these lines to be included on this form is if the form is submitted sometime after the "A Form" is submitted. The "A Form" may be submitted immediately (arson, death) and the other forms sometime later. If this happens, the top 4 lines must be completed to help identify what report it belongs to.
The definitions and explanatory information on what a civilian and what a fire fighter casualty are may not be sufficient in every instance of fire injury or death. If a person completing a report has any questions, contact the OFC @ 1-800-739-3473.

Line 3 Casualty's Name: Phone #:
Line 4 Casualty's Address:
Identification of the casualty. Phone numbers are important for injuries. The address should be both street and mailing addresses where possible.

Line 5 Casualty is a:
Indicate if the casualty is a civilian or a fire fighter

Line 6 Casualty's Date of Birth: Sex:
This line must be completed as fully/completely as possible to identify the age and sex of the casualty.

Line 7 Casualty was a:
The three categories of injury are

MINOR no treatment or minimal treatment (applied a bandage).
LIGHT would include those requiring medical attention, but not a stay in the hospital (stitches).
SERIOUS would any thing requiring hospitalization for any period of time.

If the casualty died, only a **DEATH** should be indicated. If the casualty is reported as an injury, but later dies as a result of the fire (see definitions below), please enter the date of death.

Boxes: The first 8 boxes deal with **all** casualties, civilian and fire fighter.
IN EACH BOX, ONLY A *SINGLE, MOST APPROPRIATE* RESPONSE SHOULD BE CHECKED.

CONDITION OF CASUALTY	ACTION OF CASUALTY
CAUSE OF FAILURE TO ESCAPE	IGNITION OF CLOTHING OR OTHER FABRICS
INJURY OBSERVED	FAMILIARITY WITH STRUCTURE
LOCATION OF CASUALTY AT TIME OF IGNITION	TYPE OF FABRIC OR MATERIAL IGNITED

The last 4 boxes deal with fire fighters **only** (not civilians) and ONLY A ***SINGLE, MOST APPROPRIATE*** **RESPONSE** SHOULD BE CHECKED.

FIRE FIGHTER INJURY INFORMATION

CAUSE OF FIRE FIGHTER INJURY

FIRE FIGHTER ACTIVITY AT TIME OF INJURY

WHERE FIRE FIGHTER INJURY OCCURRED

FIRE FIGHTER CLOTHING

Fire fighter Employment: indicate if full-time or volunteer
Fire Fighter Experience: indicate time in years
Did (fire fighter) clothing contribute to injury?

Provide a brief description of the circumstances surrounding the injury or death:

For casualties, and especially for fire fighters, it is very important this section be completed accurately and fully to help support insurance, WCB or other forms of insurance claims that the casualty may wish to make. A brief explanation is all that is required, for example;

fire fighter tripped on hose and fell injuring right wrist and elbow.

Persons filling out the report should identify them selves at the bottom of the form to allow for follow up.

The following Forms are <u>not</u> a mandatory part of the Saskatchewan Fire Incident Reporting System but is included within this document. Form D and E are designed for use by fire departments and by the Office of the Fire Commissioner to gather specific information on certain types of fires.

There has been, and continues to be, questions regarding the effectiveness of smoke alarm devices and the requirement for these devices to be installed in specific occupancies. The fire service is constantly challenged to demonstrate that smoke alarms save lives and to demonstrate why these devices should be required. By gathering specific information on smoke alarms and the role they play in fires, it will be much easier to clarify the role that smoke alarms have in saving lives. All fire departments are asked to complete Form D and submit it to the Office of the Fire Commissioner. Investigators using this form are asked to read "SMOKE DETECTOR TECHNOLOGY AND THE INVESTIGATION OF FATAL FIRES" to assist in completing this form properly.

Form D – Smoke Alarm Profile

The smoke alarm profile form should be completed for every fire occurring in a building required to have a smoke alarm installed. Smoke alarms are required in all dwelling units and in each sleeping room not within a dwelling unit. Smoke alarms must be installed on each level or storey of a dwelling unit. Provincial Regulations allow battery operated smoke alarms to be installed in existing buildings, but smoke alarms should be hardwired to the building's electrical system and interconnected so that when one device is activated by smoke, all devices sound an alarm.
NOTE: *a dwelling unit is defined as a single room or series of rooms of complimentary use, used as a domicile or for sleeping accommodation and includes*

- *houses,*
- *apartments,*
- *condominiums,*
- *guest rooms in hotels/motels,*
- *boarding, lodging and rooming homes (including bed and breakfast facilities), and*
- *any room where persons are provided sleeping accommodations.*

Where an injury or death occurs in an occupancy required to have smoke alarm(s) installed, the Death/Injury portion of the form should also be completed (**OFC Staff only**).

PART 1 INITIAL INFORMATION

Address of the fire:

The location should be a distinctive physical address for the property where the fire occurred. It should be a street address, plan description or a rural land location. Do not use the owners mailing address (ie: Box 3) or any other mailing address to identify the physical site location where the fire occurred. The address should include the name of the town or Rural Municipality and the postal code.

For vehicle fires, the location should again be identified as a distinctive location. A street address, plan, or rural land location can be used or a description, ie: 3km west of Humboldt on Highway # 5.

Date fire occurred: Time fire occurred:

The date the fire occurred (day/month/year).

The time the fire occurred should be filled out keeping in mind that it is not the time the

fire department, police or insurance arrived at the scene. It should be the time the 1st person discovered the fire.

Location of fire:
Identify if the fire occurred in a CITY, TOWN, VILLAGE, HAMLET, or RURAL location by circling one of the choices listed.

Casualties:
Identify the number of injuries and/or number of deaths that occurred at the fire.

Smoke Alarm(s) Installed?
Were smoke alarms installed in the building? Answer either yes or no. If YES is answered, please continue to fill out the entire form. If NO is answered, go to the Remarks Section and identify why no smoke alarm was installed.

PART 2 SMOKE ALARM IDENTIFICATION
This section assists in identifying if certain makes, models or types of smoke alarms or if the age of the smoke alarm has an effect on the successful operation of the device.

Alarm Age:
Identify the date the smoke alarm was installed or estimate in years/months the age of the smoke alarm.

Manufacturer:
If the manufacturer make and model of the smoke alarm can be identified please record this information.

Type:
Identify the type of smoke alarm, either **IONIZATION**, **DUAL CHAMBER IONIZATION**, **PHOTOELECTRIC** or **UNKNOWN**.
Ionization alarms contain a microcurie or less of Americium 241. Ingesting the radioactive particle may result in health problems in the future. Wear a filter mask (99.75% effective) and disposable gloves when recovering a smoke alarm. Place the smoke alarm debris in a plastic bag and seal the bag before examining the debris. Dispose of gloves, mask and smoke alarm in a sealed plastic bag in the garbage after examination is completed.

Power:
Identify how the smoke alarm was provided electrical power to operate. Either by **BATTERY** using a normal or extended type of battery power, **HARDWIRED** to the building's electrical service and if the smoke alarms were **INTERCONNECTED**. Please circle all that apply.

Smoke alarm was:
Identify if the smoke alarm was **WALL MOUNTED** or **CEILING MOUNTED**. Please note that if the device was improperly mounted (ie: too low on the wall, too close to the wall if on the ceiling) is reported in Part 4 of this report).

Did the smoke alarm provide <u>all</u> occupants warning to escape?
Identify if the smoke alarm was effective in alerting occupants to allow them to escape. The intent is to measure the effectiveness of the smoke alarm, not the actions of a casualty after being alerted by the smoke alarm or events of the fire. Persons may have been alerted effectively by the smoke alarm, but still failed to escape (see Casualty Form C). Identify if there were **NO OCCUPANTS**, or **YES** or **NO**. if ***NO*** is answered, complete and attach casualty reports as appropriate.

PART 3 FIRE AND SMOKE DESCRIPTION

The questions asked in Part 3 assist in describing the fire and may identify factors that tend to increase the potential for a smoke alarm not to provide early warning to the occupants. The determination of the fire characteristics should take into account the early stages of the fire when the smoke alarm is designed to provide warning and allow for escape of occupants.

Was the fire:
FAST FLAMING or SMOULDERING

Was the smoke:
LARGE PARTICLE, SMALL PARTICLE or "COLD SMOKE"

Plastics tend to produce larger particle smoke than cellulose material, smouldering fires tend to produce larger particles than flaming fires.

Cold Smoke is defined as smoke that has moved some distance away from the fire and has larger particles than the smoke from the same fire that is still near the fire. Smoke particles tend to "bump" into each other and stick together creating larger particles of smoke. The further smoke has to travel to the smoke-sensing device, the larger the particle size will be.

Was the Smoke:
LIGHT COLOUR (white/gray), **DARK COLOUR** (brown/black)

Was the fire cause:
ACCIDENTAL INCENDIARY UNKNOWN

PART 4 SMOKE ALARM FAILURE

Smoke alarm failures will be due to deliberate actions, misuse (ie: battery removed), improper installation/location or possibly a lessor apparent factor. The following criteria will assist in establishing if known and identifiable factors assisted in the failure of a smoke alarm device or if there may be yet other unknown factors that must be identified.

Smoke alarm was: (circle one)
PROPERLY INSTALLED IMPROPERLY INSTALLED

In relation to walls, ceiling, proximity to air flows, etc.

Identify if the smoke alarm: (circle one)
WAS DISABLED (battery removed, disconnected, other deliberate measure) or **FAILED TO OPERATE** (mechanical failure)

Did any of the following have an effect or potential effect on the effectiveness of the smoke alarm(s)?:
OPEN WINDOWS OPEN DOORS HVAC SYSTEM OTHER

Air flow through windows and doors may result in the failure of the smoke alarm. For example, a fire starting in a room with an open window and door may have air flow that pushes the smoke out the window, preventing smoke from entering the hallway to trigger the alarm. The identification of factors or items effecting the smoke alarm may also be partially due to improper installation/location of the smoke alarm.

Please identify the **Number of doors between fire origin and smoke alarm** and the
Number of doors that were **OPEN**
Number of doors that were **CLOSED**

Remarks:

The intent of this report is to assist in identifying and measuring factors impacting the effectiveness of smoke alarm devices in assisting persons to survive a fire. As a trained fire investigator your observations and knowledge of the fire and the reasons why a smoke alarm failed or performed as intended are important to document to assist in profiling the effectiveness of smoke alarm devices.

Identify why a smoke alarm was not installed in this fire **IF POSSIBLE**.
Identify any reason(s) why the smoke alarm was disabled. (Consider location – was it susceptible to false alarms)
Identify any reason(s) why the smoke alarm failed to operate.
Describe any air flow and how it may have affected the smoke alarm operation.

Persons filling out the report should identify them selves at the bottom of the form to allow for follow up.

The second part of Form D is to be completed when a death or injury occurs in a fire-related incident. This form is completed by Fire Prevention Officers only and requires the following information.

Digital pictures will be imported into a text document and labelled.

Digital photographs required are:
1. Point/area of origin
   a) overall view of area
   b) close-up of point of origin
2. Source of ignition (if located).
   The source of ignition should be photographed in its original location showing;
   a) overall view of location
   b) close-up of source of ignition
3. Smoke and/or Fire alarm/detection equipment (if installed and located)
   a) overall view of location (where installed and where found)
   b) close-up of device
4. Location (known or determined) of Fatality at time of fire discovery
   a) overall view of location
5. Location of Fatality when found in fire scene (if different than 4. above).
   a) overall view of location
   b) view(s) of route of movement from location at discovery and location at time found.
6. Include a SIMPLE floor plan with this document identifying
   a) point of origin
   b) location of casualty/fatality at time of fire discovery and
   c) where fatality was found (if different than b) above).
   d) travel route of casualty/fatality in escaping fire (as applicable)

Form E – Large Loss Impact

All fires have an impact in one way or another. Large loss fires tend to demonstrate the impact in a more visible manner, thus it is important that certain loss fires be examined to determine what impact they had. Large Loss is a term that is relative to the fire and the community and is not limited or defined by a dollar loss amount. Large Loss is more so the impact the fire has on the community, either as a measured amount or as a suspected amount. For example, a small urban centre with a single industry suffering a loss of that industry by fire will suffer a greater impact than a much larger dollar loss fire in a large urban centre.

A number of agencies have attempted to measure loss impact. Estimates of a large loss impact suggest that the impact is 2 to 10 times greater than the actual dollar loss of the fire. However, no actual collected data exists that can be referenced to determine exactly what impacts occurred.

FPOs will be assigned to complete Impact Reports.

Saskatchewan Corrections and Public Safety

Office of the Fire Commissioner

Basic Fire Incident Report - Form A

Fire Department Name: _____

Line 1
Fire involved (check): _____ suspicious circumstance injury(ies) # _____ Please submit a casualty report (Form C)
_____ a provincial building death(s) # _____ For ALL civilian and fire fighter casualties

Line 2
Address of the fire: _____ / _____ / _____
street address/lot block and plan #/land location description RM/town/city name postal code

Line 3
Date fire occurred: _____ / _____ / _____ Time fire occurred: _____ am **(circle one)**
day month year pm

Line 4
RCMP/Municipal Police notified (on death/suspicious fire) YES NO

RCMP/Municipal Police contacted: _____ Phone #: _____

Line 5 see instructions for line 5
Is the Property Insured YES NO If YES, Name of Insurance Company: _____

Insurance contact person (if known): _____ Phone #: _____

Estimated total value of property: $ _____ Estimated damage: $ _____ Insurance File: _____

Line 6
Name of person reporting the fire: _____ how they reported the fire to the Fire Department: _____ their Phone #: _____

Line 7
Owner's Name: _____ Phone #: _____
first name middle name/initial surname

Line 8
Owner's Address: _____
street address or mailing address town/city postal code

Line 9
Occupant's Name: _____ Apt#: _____ Phone #: _____
If more than one occupant involved in the fire (ie: in an apartment building) use additional paper to list.

Line 10 see instructions for line 10
Property Use:(apartment, private dwelling, barn, storage of …, store, business offices, hospital, restaurant, type of educational facility, manufacturing of .. , hotel/motel, arena, rink, grain elevator, crops, grass, bush, forest, etc...) please be specific - if a vehicle, enter vehicle" below and complete lines 14 to 21.

Describe Property: _____

Line 11
Building height (storeys): _____ Building area: sqft _____ Year built: _____

Line 12
Building occupant load: _____ # of persons in the building: _____ Did the fire department rescue occupants : IF YES # _____

Line 13 see instructions for line 13
Describe the construction of the building: _____

Line 14 see instructions for line 14 to 21
If a vehicle: (car, truck, [½ ton, ¾ ton, 3 ton delivery, mail truck, semi trailer hauling… {gasoline, grain, furniture, etc.}], train, airplane, boat etc.)
If equipment: (gas/electric/wood/oil - furnace, wood stove, motor, pump, clothes dryer, etc.) – Please be as specific as possible in describing.

Description of vehicle/equipment involved: _____

Line 15
Serial number: _____ License plate # (if vehicle): _____

Line 16
Name of the manufacturer of the vehicle/equipment involved: _____

Line 17
Model (number or name): _____ Year manufactured: _____

Line 18 (If Equipment)
Date purchased: _____ time in service:(years) _____ where installed: _____
(day/month/year)

Line 19 (If Equipment)
Installed by: _____ certification label & #: _____
(Owner, Electrician, Gas Fitter, Company Name) (ULC, CSA, WHI, ULI, AND NUMBER)

Line 20 (If Equipment)
Last inspection/maintenance: _____ by whom: _____
(date) (Owner, Electrician, Gas Fitter, Company Name)

Line 21 (If Equipment)
Action taken as result of last inspection/maintenance: _____

Line 22 see instructions for line 22
Describe as specifically as possible the following CIRCUMSTANCES of the fire:

Area of Origin: _____ **Level of Origin**: _____

Igniting Object: (What caused ignition)_____ Cooking equip., heating equip., electrical distribution equip., smokers material, open flame, exposure from another fire - please be as specific as possible in describing the object that caused ignition of the fire.

Fuel/Energy Associated with Igniting Object: (What fuel/energy powered the Igniting Object)_____
Choose one of - Coal, wood, fuel oil, gasoline, natural gas, electricity, smoker's material, lightning.

Energy Causing Ignition: (Describe how the igniting object caused the fire)_____
Choose one of - spark/ember, spark-electrical, static electricity, direct flame, friction heat, hot object, spontaneous ignition, smokers material, lightning.

Material First Ignited: (Describe what was ignited)_____ Structural component, wall/floor/ceiling finish, furniture, clothing/textile, wood/paper item, flammable/combustible liquid or gas, crops/grass/forest, etc... - please be as specific as possible.

Act or Omission:(Describe what action or inaction caused the fire)_____ Incendiary, suspicious, misuse of ignition/ material, mechanical/electrical malfunction, design/installation fault, human failing, vehicle collision, etc... - **Please be specific.**

REMARKS: _____

_____

_____

_____

_____

Line 23 see instructions for line 23
Did the building have: (check all that apply) ❑ smoke alarm(s) If YES what type? ❑ Battery Operated ❑ Hardwired ❑ Interconnected

If a smoke alarm was present, was it: ❑ in the room of fire origin ❑ not in the room of fire origin

Did the smoke alarm(s) operate? YES If NO why not? ❑ Battery dead or missing ❑ Alarm improperly located
❑ Circuit switched off ❑ Other _____

Check all that were installed in the building:
❑ fire alarm system (includes smoke/heat detectors, manual stations, alarms) ❑ sprinkler system (13D, 13R, 13)

❑ fire extinguisher(s) ❑ standpipe system ❑ other extinguishing system (describe) _____

Did the above device(s) or system(s) operate as designed/intended YES NO **If NO, explain why** (if known)

_____

Line 24 see instructions for line 24
How was the fire discovered? _____

Line 25 If fire involved grassland, crops, forest or other wildland: Total Acres burned: _____

If the fire involved more than one area, indicate: Acres grassland: _____ Acres crops: _____ Acres forest: _____

Person completing this report or contact person for this fire if further information is required:

Name: _____

Phone Number (work): _____ (home): _____

Rank/Title: _____

Representing: **(CIRCLE ONE)** Fire Police Insurance Office of the Fire Commissioner

Saskatchewan Corrections and Public Safety

Office of the Fire Commissioner

Fire Department Response to Fire Incident Report - Form B

YOU NEED NOT FILL IN LINES 1 TO 4 IF ATTACHED TO A BASIC INCIDENT REPORT FORM "A"

Fire Department Name: _____

Line 1
Date fire occurred: _____/_____/_____ Time fire occurred: _____am **(circle one)**
day month year pm

Line 2
Address of the fire: _____/_____/_____
street address/lot block and plan #/land location description RM/town/city name postal code

Line 3
Owner's Name: _____Phone #: _____
first name middle name/initial surname

Line 4
Owner's Address: _____/_____/_____
street address or mailing address town/city postal code

Line 5 see instructions for line 5

Time of alarm: _____Time of arrival (1st FD vehicle):_____Time of arrival (last FD vehicle):_____Time all vehicles back "in service": _____

Line 6
Number of FD vehicles dispatched **INITIALLY**: pumpers_____aerials_____tankers_____utility_____other_____

Line 7
Number of FD vehicles dispatched **TOTAL#**: pumpers_____aerials_____ tankers_____utility_____other_____

Line 8
Distance of fire department response: _____ km (from fire hall to fire scene)

Line 9
Fire Fighters responded INITIALLY: _____ Fire Fighters responded TOTAL NUMBER: _____

Line 10 see instructions for line 10
(circle appropriate) Mutual Aid: GIVEN RECEIVED Fire Protection Agreement Response: YES NO

Line 11 see instructions for line 11
Situation on arrival: _____

Line 12 see instructions for line 12
Give a brief description of the sequence and operations performed during the emergency, including the time it took to extinguish the fire and the equipment used or how the fire was extinguished. **Please use the reverse of this form.**

Fire Ground Operations: (circle all that apply)

rescue	forcible entry	ventilation	salvage	hydrant used
first aid	extrication	ladder(s) used	overhaul	water tank(er) used

Line 13 see instructions for line 13
Time to control fire: _____minutes Time to extinguish fire: _____ minutes

Line 14
Weather condition: _____
(clear, cloudy, rain, snow, hail/sleet, electrical storm, fog (include ice fog), high winds (hurricane/tornado)

Temp: _____ Wind Direction (blowing to the): _____ Wind Speed: _____ Kmh

Person completing this report or contact person for this fire if further information is required.

Name: _____/Rank_____

Phone Number (work):_____ (home); _____

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Saskatchewan Corrections and Public Safety

Office of the Fire Commissioner

Fire Casualty Report - Form C

YOU NEED NOT FILL IN LINES 1 & 2 IF ATTACHED TO A BASIC INCIDENT REPORT FORM "A"

Fire Department Name: _____

Line 1
Date fire occurred: _____ / _____ / _____ Time fire occurred: _____ am **(circle one)**
day month year pm

Line 2
Location of the fire: _____ / _____ / _____
street address/lot block and plan #/land location description RM/town/city name postal code

Line 3
Casualty's Name: _____ Phone #: _____
first name middle name/initial surname

Line 4
Casualty's Address: _____ / _____ / _____
street address or mailing address town/city postal code

Line 5
Casualty is a: CIVILIAN FIRE FIGHTER

Line 6
Casualty's Date of Birth: _____ or Age: _____ Sex: Male or Female **(circle one)**

Line 7
Casualty was a:
- ❑ MINOR INJURY
- ❑ LIGHT INJURY
- ❑ SERIOUS INJURY
- ❑ **DEATH** Date of Death: (if different than date of fire) _____

SELECT THE SINGLE MOST APPROPRIATE RESPONSE IN EACH SECTION

CONDITION OF CASUALTY

- ❑ Asleep at Time of Fire
- ❑ Bedridden or Other Physical Handicap
- ❑ Impairment by Alcohol, Drugs or Medication
- ❑ Awake & No Physical or Mental Impairment at the Time of Fire
- ❑ Under Restraint or Detention
- ❑ Too Young to React to Fire
- ❑ Mental Handicap - includes senility
- ❑ Child Left Unattended
- ❑ Condition of Casualty - unclassified
- ❑ Condition of Casualty - unknown

ACTION OF CASUALTY

- ❑ Injured While Attempting to Escape
- ❑ Over-Exertion, Heart Attack
- ❑ Voluntarily Entered or Remained for Rescue Purpose
- ❑ Voluntarily Entered or Remained for Fire Fighting
- ❑ Voluntarily Entered or Remained to Save Personal Property
- ❑ Loss of Judgement or Panic
- ❑ Received Delayed Warning Did Not Act
- ❑ Action of Casualty - unclassified
- ❑ Action of Casualty - unknown

CAUSE OF FAILURE TO ESCAPE

- ❑ Trapped by Rapid Spreading of Fire/Smoke - vertical openings
- ❑ Trapped by Rapid Spreading of Fire/Smoke - horizontal openings
- ❑ High Flame Spread of Combustible Interior Finish
- ❑ Building Collapse
- ❑ Falling Debris
- ❑ Explosion
- ❑ Exit Blocked, Locked, or Obstructed
- ❑ Outdoor Fire - includes forest/brush fires
- ❑ Cause of Failure to Escape - unclassified
- ❑ Cause of Failure to Escape - unknown

IGNITION OF CLOTHING OR OTHER FABRICS

- ❑ Outer Clothing
- ❑ Sleepwear
- ❑ Underclothing
- ❑ Costume
- ❑ Bedding or Bed Linen (includes pillow)
- ❑ Mattress
- ❑ Upholstered Furniture
- ❑ Rugs
- ❑ Ignition of Clothing or Other Fabrics - unclassified
- ❑ Ignition of Clothing or Other Fabrics - not applicable

INJURY OBSERVED

- ❑ Head, neck or spine
- ❑ Wounds - incised, lacerated, puncture, etc
- ❑ Heart attack or stroke
- ❑ Bone injury or fracture
- ❑ Burns/Scalds only
- ❑ Asphyxia/Respiratory condition (smoke)
- ❑ Injury of muscle, ligaments or joints
- ❑ Eye injury
- ❑ Traumatic Shock
- ❑ Heat illness, cold exposure or fatigue
- ❑ Asphyxia (other than smoke or fire gases)
- ❑ Burns and Asphyxia (smoke)
- ❑ Unknown or unclassified
- ❑ Minor cuts and bruises

LOCATION OF CASUALTY AT TIME OF IGNITION

- ❑ Intimately involved with ignition
- ❑ In the same room as fire origin
- ❑ On the same floor of fire origin
- ❑ In the same building as fire origin
- ❑ Outside building of fire origin
- ❑ Off property of fire origin

FAMILIARITY WITH STRUCTURE

- ❑ Less than 1 day
- ❑ 1 to 7 days
- ❑ 8 to 30 days
- ❑ 1 to 2 months
- ❑ 3 to 6 months
- ❑ 7 to 12 months
- ❑ Over 1 year
- ❑ Not a structure
- ❑ Unclassified or Not Reported

TYPE OF FABRIC OR MATERIAL IGNITED

- ❑ Cotton
- ❑ Wool
- ❑ Other Natural Fibre
- ❑ Other Synthetic Fibre
- ❑ Mixture of Fibers
- ❑ Rubber
- ❑ Plastics or Plastic Foam
- ❑ Type of Fabric or Material Ignited - unclassified
- ❑ Unclassified or not reported
- ❑ Type of Fabric or Material Ignited - not applicable

FIRE FIGHTER INJURY INFORMATION

CAUSE OF FIRE FIGHTER INJURY

- ❑ Fell/slipped
- ❑ Caught/trapped - in, by, between
- ❑ Struck by
- ❑ Contact with/exposure to
- ❑ Over exertion/strain
- ❑ Exiting or escaping - jumped
- ❑ Fire Department apparatus collision
- ❑ Assaulted
- ❑ Other (specify)

FIRE FIGHTER ACTIVITY AT TIME OF INJURY

- ❑ Riding vehicle - includes accidents where boarding a vehicle
- ❑ Driving/operating apparatus
- ❑ Extinguishing fire/neutralizing incident
- ❑ Suppression support
- ❑ Access/egress
- ❑ Rescue
- ❑ Miscellaneous incident scene activity
- ❑ Station activity
- ❑ Other activity

WHERE FIRE FIGHTER INJURY OCCURRED

- ❑ En route/returning
- ❑ At emergency scene - Outside at or above grade
- ❑ At emergency scene - Outside below grade
- ❑ At emergency scene - Inside structure at or above grade
- ❑ At emergency scene - inside structure below grade
- ❑ At emergency scene - Inside vehicle
- ❑ At fire department managed location
- ❑ At inspection site
- ❑ Other

FIRE FIGHTER CLOTHING (check box as indicating item was present or worn:)

- ❑ Helmet
- ❑ Face shield
- ❑ Coat (turnout)
- ❑ Gloves (mitts)
- ❑ Breathing Apparatus
- ❑ Helmet liner
- ❑ Other eye protection
- ❑ Pants (turnout)
- ❑ Balaclava
- ❑ Boots

Fire fighter Employment: **(circle one)** Full Time Volunteer Fire Fighter Experience: years _____
Did clothing contribute to injury YES NO If YES, include details in description below.
Provide a brief description of the circumstances surrounding the injury or death: (civilian or fire fighter)

_____

_____

Person completing this report or contact person for this fire if further information is required.

Name: _____/Rank_____

Phone Number (work): _____ (home): _____

Saskatchewan Corrections and Public Safety

Office of the Fire Commissioner

Smoke Alarm Profile - Form D

Please complete this form for all fires occurring in a building where smoke alarms are required to be installed. Please complete this form even if an injury/death casualty did not occur.

ATTACH TO Basic Fire Incident Report - Form A and Fire Casualty Report - Form C.

The fire service is constantly challenged to identify that smoke alarms save lives and every few years a new "problem" or concern is identified. The ***PROFILE*** information should assist in answering the questions and challenges about smoke alarms.

Fires occur where:

- Smoke alarms are installed and
  - People escape or
  - People become casualties
- Smoke alarms are not installed or are disabled and
  - People escape or
  - People become casualties

Please detail all information revealed by your investigation that you consider to be important regarding the installation and effectiveness of smoke alarm(s) in relation to the escape or injury/death or persons for this specific fire loss.

To assist in completing this ***PROFILE***, please read *Smoke Detector Technology and The Investigation of Fatal Fires*

INITIAL INFORMATION

Address of the fire: _____ / _____ / _____
(street address/lot block and plan #/land location description) (RM/town/city name) (postal code)

Date fire occurred: _____/_____/_____ (day / month / year)

Time fire occurred: _____ (circle one) am pm

Location of fire: (circle one) **CITY** **TOWN** **VILLAGE** **HAMLET** **RURAL**

Casualties: (identify number of) **INJURY(IES)** _____ **DEATH(S)** _____

SMOKE ALARM(S) INSTALLED? YES NO If ***YES*** continue – **If *NO* go to *Remarks* Section**

Smoke Alarm Profile

1. Collect the alarm(s). If the investigation warrants it can be sent to the OFC for identification.
2. Record the type of the detector. A simple way of identifying ionization detectors is the radioactive symbol or reference to microcuries that might appear on the back of the detector.

Ionization alarms contain a microcurie or less of Americium 241. Ingesting the radioactive particle may result in health problems in the future. Wear a filter mask (99.75% effective) and disposable gloves when recovering a smoke alarm. Place the smoke alarm debris in a plastic bag and seal the bag before examining the debris. Dispose of gloves, mask and smoke alarm in a sealed plastic bag in the garbage after examination is completed.

3. **Determine if the smoke alarm was properly installed and located. Was it in a dead air space, too close to walls, HVAC, etc.?**
4. Consider whether the fire was fast flaming, small particle, or smouldering, large particle
5. Consider the location of the detector, relative to the location of the fire. How many doors are between the detector and the fire? Where the doors open or closed?
6. Consider the impact that open windows or HVAC systems might have on the flow of the smoke.
7. If the detector was disabled, consider how close the detector was to potential nuisance alarms. If no survivor is alive to help determine why it was disabled it may be helpful to talk to neighbours, relatives, or adjacent apartment or townhouse occupants, who probably have the detectors installed in the same location.

Alarm Age: _____ (Date installed or estimate in years/months) Manufacturer (make/model) _____ (if this can be identified – leave blank if unknown)

Type: (circle one) **IONIZATION** **DUAL CHAMBER IONIZATION** **PHOTOELECTRIC** **UNKNOWN**

Power: (circle appropriate) **BATTERY (NORMAL EXTENDED)** **HARDWIRED** **INTERCONNECTED**

Smoke alarm was: (circle one) **WALL MOUNTED** **CEILING MOUNTED**

Did the smoke alarm provide **all** occupants warning to escape? **NO OCCUPANTS** **YES** **NO** (if ***NO*** complete and attach casualty reports)

FIRE AND SMOKE DESCRIPTION

Was the fire: (circle one)	**FAST FLAMING**	**SMOULDERING**	
Was the smoke: (circle one)	**LARGE PARTICLE**	**SMALL PARTICLE**	**"COLD SMOKE"**
Was the Smoke:(circle one)	**LIGHT COLOUR**	**DARK COLOUR**	
Was the fire cause:	**ACCIDENTAL**	**INCENDIARY**	**UNKNOWN**

"Cold smoke" exists where smoke particles have sufficient time to collide and stick together resulting in a smoke particle size that is too large to enter the sensing chamber in an ionization smoke alarm.

SMOKE ALARM FAILURE

Smoke alarm was: (circle one) **PROPERLY INSTALLED** **IMPROPERLY INSTALLED**

Identify if the smoke alarm: (circle one) **WAS DISABLED** **FAILED TO OPERATE** (mechanical failure)

Did any of the following have an effect or potential effect on the effectiveness of the smoke alarm(s)?:

OPEN WINDOWS **OPEN DOORS** **HVAC SYSTEM** **OTHER** _____

Number of doors between fire origin and smoke alarm _____

Number of doors **OPEN**_____ **CLOSED**_____

Remarks:

Identify why a smoke alarm was not installed in this fire **IF POSSIBLE**.
Identify any reason(s) why the smoke alarm was disabled. (Consider location – was it susceptible to false alarms)
Identify any reason(s) why the smoke alarm failed to operate.
Describe any air flow and how it may have affected the smoke alarm operation.

PLEASE IDENTIFY:

Person completing this report (Name): _____

Position: _____ Municipality: _____

Phone #: _____ FAX: _____

Death / Injury Document – Form D2

Digital pictures will be imported into this text document and labelled.
Digital photographs required are:

1. Point/area of origin
a) overall view of area
b) close-up of point of origin

2. Source of ignition (if located).
The source of ignition should be photographed in its original location showing;
a) overall view of location
b) close-up of source of ignition

3. Smoke and/or Fire alarm/detection equipment (if installed and located)
a) overall view of location (where installed and where found)
b) close-up of device

4. Location (known or determined) of Fatality at time of fire discovery
a) overall view of location

5. Location of Fatality when found in fire scene (if different than 4. above).
a) overall view of location
b) view(s) of route of movement from location at discovery and location at time found.

Include a SIMPLE floor plan with this document

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Saskatchewan
Corrections and
Public Safety

Office of the Fire Commissioner

Large Loss Impact - Form E

INITIAL INFORMATION

Address of the fire: _____ / _____ / _____
street address/lot block and plan #/land location description — RM/town/city name — postal code

Date fire occurred: _____ / _____ / _____ Time fire occurred: _____ am (circle one) pm
day — month — year

Location of fire: (circle one) **CITY** **TOWN** **VILLAGE** **HAMLET** **RURAL**

Casualties: (identify number of) **INJURY(IES)** _____ **DEATH(S)** _____

Fire cause: **ACCIDENTAL** **INCENDIARY** **UNDETERMINED**

Estimated Value: _____ Reported Loss: _____

Was the property: **EDUCATIONAL** **INSTITUTIONAL** **MERCANTILE** **INDUSTRIAL** **AGRICULTURAL**

Specific use: _____

CRITERIA	NEGATIVE	POSITIVE	INTERVIEW	NOTES
Business Rebuilt (% of prefire)			Owner	If less than 100% identify % rebuilt in NEGATIVE
Job Loss/Gain (direct result of fire)			Administrator/Development	Enter a number (+ or -)
Job Loss/Gain (Indirect result)			Administrator/Development	Enter a number (+ or -)
Municipal Assessment/Taxes			Administrator	Up or Down as result of loss (+ or -)
Property Value Down			Administrator/Realtor	% change from before fire (+ or -)
Population Loss/Gain			Administrator	Enter a number (+ or -)
More/Less Houses for Sale			Administrator/Realtor	Enter MORE or LESS
More/Less Empty Houses			Administrator/Realtor	Enter MORE or LESS
Housing sales			Administrator/Realtor	Enter WORSE, SAME or BETTER

Details of the loss impact – negative and/or positive

SMOKE DETECTOR TECHNOLOGY AND THE INVESTIGATION OF FATAL FIRES

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Introduction

During the investigation of most fires, including fatal fires, the investigator is focusing almost all of their attention to the question of cause and origin. This has been the traditional purpose of the investigation. Because of this, the type of smoke detector involved, i.e: ionization or photoelectric, is seldom a factor that is considered important. In fact, in some cases little effort is made to determine if a smoke detector was even present. Complicating the investigation of this aspect of the fire is the fact that quite often the ceilings have been pulled down, along with the remains of the detector in an effort to extinguish the fire. The smoke detector, at least what is left of it is buried in debris and difficult to recognize. In addition the different factors that can affect a smoke detectors ability to detect a fire in time to alert the occupants are not well understood. As a consequence investigators are not away of any reason to investigate the operation of the smoke detector.

In this paper I hope to show why investigating aspects of smoke detector performance may be important. If not to the cause and origin of the fire, at least to the cause of injuries and fatalities. In doing this I hope to answer some questions that some investigators have had as to why some detectors may not have gone off in time to alert the occupants.

The problem of poor data and information regarding smoke detector operation during fatal fires can be highlighted by a couple of quotes from "Fire in the United States, 1985-1994[1].

> *In apartments, "Detectors were present and did not operate in 20% of the deaths (30% adjusted). This is 50% higher than the rate of non-working detectors in dwellings. These statistics are unexpected as apartment detectors are more likely to be hard-wired into the electrical system and professionally maintained than detectors in dwellings."*
>
> *"Detectors do indeed make a difference. Yet in 19% of the reported residential fire deaths in 1994, a detector did operate; in 1988, it was 9 percent. In some cases, the detector may have gone off too late to help the victim, or the victim may have been too incapacitated to react. But, the percentage of deaths with detectors present, especially the upward trend is somewhat disturbing since there is a widespread belief that an operating detector will save lives. Further study is needed to show what other factors were involved."*

Further study is indeed needed. The information needed to study these and other matters that relate to smoke detection and fatal fires must be gathered by fire investigators at the scene. This paper will hopefully aid in that process.

Margin of Safety Concept

I believe that one of the reasons why some people die even though the smoke detector operates is that it operates too late to provide enough time to evacuate. To explain this concern I will have to explain what I mean by "margin of safety".

First, let me list three definitions.

> Margin of Time to Untenable Conditions - Time Required for Safety = Evacuation Time to Untenable
>
> Conditions = The time it takes for conditions along the egress route to prevent occupant evacuation
>
> Time Required for Evacuation = Detection Time + Reaction Time + Travel Time.

If detection time, reaction time, or travel time are increased then evacuation time is increased and as a consequence the margin of safety is decreased. If the margin of safety becomes a negative number, i.e. evacuation time is longer than the time before untenable conditions develop, the occupants do not evacuate. An important point to discuss here is that the time to detection is less important than the time of the margin of safety. Under smouldering conditions the time to detection

may be much longer than under flaming conditions but the margin of safety may also be larger for the smouldering fire since the time to untenability for smouldering fires is also much longer than it is for flaming fires.
Of course, there are also many factors involved with the total time involved with reaction time and travel time that could cause the margin of safety to become negative. Perhaps the detector alarm was not heard. Perhaps the occupant was incapacitated. Perhaps they tried to save valuables rather than evacuate. These are important areas to investigate but they are also pretty well understood by most investigators. This paper will deal with a subject that may not be so familiar. Namely, factors that may cause a detector to operate too late to allow for safe evacuation.

Smoke and Smoke Detector Technology
Factors Affecting a Detector Response
An equation that helps illustrate some of the more important factors that affect smoke detector response is listed below. It was originally proposed by Heskestad[2] in 1975, and later discussed in a paper by Benjamin[3] in 1980.

$$Dur = Duo + L*[(d(Du)/dt)/V]$$

Where:

Dur = smoke density in the environment, around the detector, at the time of detector activation.
Duo = smoke density actually needed inside the detector to trigger the mechanism.
L = characteristic "length" of the detector, which is a way to measure the time that it takes for particles to enter the chamber (smoke entry resistance).
(Du)/dt = rate of smoke build-up.
V = velocity of the smoke near the detector.

To help explain this equation let me review some simple algebra. If, A = B/C then, as B gets bigger A will get bigger but as C gets bigger A will get smaller. Therefore, what the equation is really telling us is the following:

1. As the amount of smoke needed inside the detector to trigger the mechanism, Duo, is increased then the amount of smoke in the environment at the time of detector activation, Dur, is increased. The item that has the most obvious impact on this factor is the detector sensitivity. (This factor can be considered as analogous to the temperature rating of a sprinkler.)

2. As the smoke entry resistance or "length" of the detector, L, is increased then the amount of smoke in the environment at the time of detector activation, Dur, is increased in comparison to the amount of smoke inside the chamber, Duo. (This factor can be considered as analogous to the "thermal lag" of a sprinkler.)

3. As the rate of smoke build-up, d(Du)/dt, is increased then the amount of smoke in the environment at the time of detector activation, Dur, is increased in comparison to the amount of smoke inside the chamber, Duo.

4. As the velocity of the smoke near the detector, V, is decreased, then the amount of smoke in the environment at the time of detector activation, Dur, is increased in comparison to the amount of smoke inside the chamber, Duo. A lower velocity smoke will enter the detector chamber more slowly than a high velocity smoke. In addition, low velocity smoke "agglomerates" more than high velocity smoke. (Smoke agglomeration will be explained later in this paper.)

Now I would like to discuss each of the four factors listed above in terms of the impact that they have on the margin of safety, i.e. people's ability to successfully escape a fire.

Factor One - Amount of Smoke inside the Detector (Duo)
Most investigators that I know assume that all smoke is the same, in regards to triggering smoke detectors. This is not actually true. Different smoke can have the same optical density, a measure of how much light the smoke obscures, and yet have different typical particle sizes and color. Certain factors can affect the particle size and color of smoke.[4]
For example:

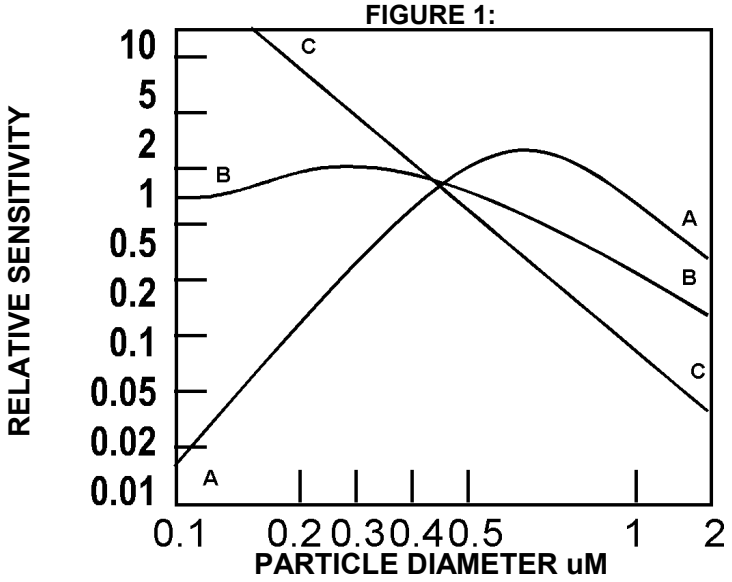
1. Plastics tend to produce larger particle smoke than cellulose material produces,
2. Smouldering fires tend to produce larger particles than flaming fires,
3. "Aged" smoke, ie: smoke that has moved some distance away from the fire tends to have larger particles than the smoke from the same fire that is still near the fire.

In addition to the fact that there are different kinds of smoke, these different kinds of smoke can affect ionization and photoelectric detectors differently, since these detectors operate on different principles. These principles are summarized in the NFPA Handbook.[5]

> *"An ionization smoke detector has a small amount of radioactive material that ionizes the air in the sensing chamber, rendering the air conductive and permitting a current flow the air between the two charged electrodes. This gives the sensing chamber an effective electrical conductance. When smoke particles enter the ionization area, they decrease the conductance of the air by attaching themselves to the ions, causing a reduction in ion mobility. When the conductance is below a pre-determined level, the detector responds."*
>
> *"A photoelectric detector operates on a light scattering principle. They contain a light source and a photosensitive device arranged so the light rays normally do not fall onto the device. When smoke particles enter the light path, light strikes the particles and is scattered onto the photosensitive device, causing the detector to respond."*

These differences can impact on a detectors response time. As a rule ionization detectors are most sensitive to smaller particles and photoelectric detectors are more sensitive to larger particles. In addition photoelectric detectors tend to show a decreased sensitivity to dark smoke. (This is due to the fact that dark smoke absorbs rather than refracting the light, which the photoelectric detector relies upon.) As a consequence different kinds of smoke will cause different detectors to respond at different levels of smoke inside the detector, i.e. Duo.
A chart which graphically displays the changing sensitivities of photoelectric and ionization detectors ionization detectors over the ranges of particle sizes is Figure 1[6.]

FIGURE 1:



In Figure1: A represents a photoelectric detector utilizing a "scattered light principle, a spot detector, B represent a photoelectric detector utilizing "obscuration", a beam detector, and C represents an ionization detector, a spot detector. It should also be noted that this chart assumes that the total mass of particulate stays constant for a given volume. This causes the number of particles to decrease as the size increases. It is actually the decrease in the number of particles that cause the ionization detector to become less sensitive to large particle smoke.
Figure 1 helps illustrate the relative loss of sensitivity of the ionization detector as the average particle size becomes larger or as the number of particles decreases. In fact it reinforces the statement that if you "Double the radius of the average particle you have only one quarter of the effect on an ionization detector".[7] In addition it helps explain why an ionization detector that is extremely sensitive to the small particles that are often given off by cooking may not be very sensitive to the larger particles given off by smouldering fires. It also helps illustrate the relative low sensitivity that the photoelectric has to small particles, which helps explain why it is much less susceptible to nuisance alarms than ionization detectors.
In addition to reinforcing the information illustrated by Figure 1, Figure 1 illustrates the photoelectric detectors relative insensitivity to dark particle smoke.
Using the information on Figures 1, one could conclude that; 1) Ionization detectors are more sensitive than photoelectric detectors to flaming fires, which tend to have smaller particles, and that 2) Photoelectric detectors are more sensitive than ionization detectors to smouldering fires, which tend to have larger particles. This is exactly what Heskestad2 found in his study as indicated in Table 1.

TABLE 1
OPTICAL DENSITIES (OD/ft) & % OBSCURATIONS (%obs/ft)
FOR VARIOUS FIRE SOURCES

SOURCE	COMBUSTION MODE	ION DET (OD/ft& %obs/ft)	PHOTO DET (OD/ft & %obs/ft)
Pillow	Flaming	.001-006OD/ft(<2.0%obs/ft)	<.01OD/ft(2.0%obs/ft}
Sofa Cushion	Flaming	.026OD/ft(5.5%obs/ft)	?
Sofa Cushion	Smouldering	.062OD/ft(14.0%obs/ft)	.013OD/ft(3.0%obs/ft)
Sofa Cushion	Smouldering	.026OD/f(5.5%obs/ftt)	.008OD/ft(<2.0%obs/ft)
Wastebasket & Paper	Flaming	.0002OD/f(<1.0%obs/ft)	>.005OD/f(>1.0%obs/ftt)
Wastebasket & paper	Smouldering	.064OD/f(14.0%obs/ftt)	.014OD/f(3.0%obs/ftt)
Grease Pan	Overheating	0.04OD/ft(9%obs/ft)	?
Toast	Overheating	.0009OD/f(2.0%obs/ft)	.07OD/f(15.5%obs/ftt)

Table 1 clearly indicates that detectors can go off at much higher levels of obscuration than the rating on the back, typically 1%-2%, would indicate. For the fire scenarios this is particularly true for the ionization detectors. The photoelectric detectors not only responded to fire scenarios much more consistently but since the time of this study in the mid-seventies the photoelectric detector has improved its response to fires because it has greatly improved its smoke entry characteristics. This factor will be discussed in the next section.

Factor Two - Smoke Entry Resistance or "Length" (L)
According to Heskestad[2],

> *"L is a characteristic length scale of the detector geometry (not necessarily related to a physical scale) which certainly may depend on the direction of flow relative to the detector, but is independent of the properties of the smoke. Consequently, L is a quantity characteristic of the detector itself, whereas the characteristic optical density, Duo, depends on the property of the smoke as well as the detector design (including sensitivity setting). … As L increases (entry of smoke to detection chamber becomes more difficult), the sensitivity to the smoke must increase to be able to provide the same type of response."*

At the time Heskestad was conducting his test, the typical L factors for the detectors in his test were 6ft for the ionization detectors and 20.9-86.7 ft^{-1} for the photoelectric detectors. Due to changes in smoke detector design and technology these numbers for today's detectors are different. The typical

L factors for today's detectors were measured by researchers in Finland in 1992[9]. They were 10.0-12.0 ft^{-1} for the ionization detectors and 8.5-26.5 ft^{-1} for the photoelectric detectors. This change in L Factors is important since many of the studies used to justify today's testing and installation standards were conducted with detectors having the old L Factors.

Factor Three - Rate of Smoke Build-Up (d(Du/dt))

This factor is easy to understand. If the environmental obscuration is doubling every 30 seconds as opposed to every 300 seconds, then it just makes sense that there will be a greater discrepancy between Duo and Dur for the fire with the faster rate of smoke production. This increase in the response delay between the environmental obscuration and the internal obscuration the rate of smoke production impacts on margin of safety. In addition to this increasing in environmental obscuration at detection time, the rate of smoke development impacts on the margin of safety in other ways. For any given amount of time, to allow for occupant reaction and egress, a higher rate of smoke development will cause a worse environment during egress than a lower rate of smoke development.

Factor Four - Velocity of Smoke Near the Detector (V)

Low velocity of smoke flow impacts on a detector's response in two ways. Low velocity smoke flow affects the ease of entry of smoke into the detector chamber. Another way that smoke flow velocity can affect detector response is by impacting on the smoke aging phenomena. By smoke "aging" I am referring to the fact that as smoke particles cool and travel from the fire source they start to "stick together" forming larger and fewer particles.10 The fact that "aged" smoke has fewer particles per unit volume cause the ionization detector to be less sensitive to "age" smoke.

This "aging" affect, which is increased at lower velocities, should be accelerated by doorways, which have a creation distance between the ceiling and the top of the door. The time that it takes to "fill up" the upper part of the room of origin before it starts to flow through the doorway will provide extra time for the smoke to "age" relative to a situation where there is a smooth ceiling between the fire and the smoke detector. This should cause detectors, particularly the ionization detector, to have a decreased sensitivity to smoke when the detector is located outside the room of origin. This is often the case since most building and fire codes only require detectors to be located in hallways of residential occupancies.

Potential Conclusion Drawn from Previous Data

The information presented so far is important in and of itself for an investigator to consider. What I would like to discuss in the next section is a logical syllogism that arises from this information.

> *Major Premise: Smoke from smouldering fires, smoke from fires involving plastics, and aged smoke can be characterized in general as "large particle" fires*
> *Minor Premise: Ionization detectors are least sensitive to "large particles" fires Conclusion: Ionization detectors may not operate in time if they have to detect: smouldering fires, fires involving plastics, and "aged smoke fires.*
> Conclusion: Ionization detectors may not operate in time if they have to detect: smouldering fires, fires involving plastics, and "aged smoke fires.

This syllogism is particularly important since smouldering fires tend to occur when people are sleeping. To quote from a 1985 NFPA Fire Journal article, [11]

"Delayed discovery, typically associated with fires that occur at night when everyone is asleep, also tends to be a characteristic of smouldering fires caused by discarded smoking materials. These smouldering fires are the leading cause of US fire fatalities and detectors are ideally designed to deal with them."

Of course one could make a similar conclusion concerning the photoelectric detector and fast flaming fires, but improvements in technology and the short time periods involved in fast flaming fires makes it appear that the data does not support that syllogism. However, there appears to be a lot of data supporting the "ionization syllogism". I would now like to refer to the conclusions of three studies, which seem to support the conclusion in the "ionization syllogism".

Four Assumptions Investigators Often Make Concerning Detectors

There are four assumptions, in my opinion, that investigators often make concerning smoke detectors that may not always be correct:

1. Investigators sometimes assume that if these smoke detectors did not respond that there was insufficient smoke early enough that there was insufficient smoke.

2. Investigators sometimes hypothesize that if the smoke detectors did not respond until the smoke reached a dangerous level that the fire must have been growing at such a fast rate that even though it responded quickly the occupants did not have enough time to escape. I know of at least a couple investigators who used this logic to assume that accelerants were involved since the occupants were not alerted until the smoke was already at a level that impeded egress.

3. Investigators sometimes assume that if the occupants could not evacuate safely that the occupants were not able to respond to the alarm. This could be due to the fact that they did not hear the alarm or that they were physically incapable of speedy evacuation.

4. In some cases, investigators assume that there was no smoke detector. They assume that if there had been a working smoke detector that the occupant would have evacuated. This conclusion is often supported by the fact that a smoke detector cannot easily be located due to overhauling.

I believe that the basis for these hypotheses, is the assumption that a small amount of smoke will always trigger a smoke detector. This assumption based on the common experience that most people, in which the smoke detector in their home triggers in response to minute amounts of cooking smoke, even cooking odors that are invisible, or steam. In this case, our common sense is misleading, particularly in regards to ionization detectors. As stated earlier, the sensitivity of ionization detectors is inversely related to the size of the smoke particle, assuming a constant mass/volume. Smoke from: fires involving synthetics, fires that start in the smouldering mode, and fires that start remote from the detector, will tend to have larger particles and therefore possible delayed response from ionization detectors.
Let me make it clear at this point that I am not saying that these hypotheses are not valid for many fire that are investigated. I just want to point out that they are not the only explanations for detectors not providing enough warning. No hypotheses or conclusions should be made concerning why smoke detectors did not respond in time until the factors discussed in this paper are considered.

Recommendations
To properly investigate fires, particular fatal residential fires the investigator should be aware of and consider the types of factors discussed in this paper. They can do this by doing the following.

1. Always collect the involved detector(s) as evidence. If the investigation warrants it can be sent out for testing. Too often the detector involved is destroyed or lost during the overhaul stage of the fire scene.
2. Record the type of the detector. A simple way of identifying ionization detectors is the radioactive symbol or reference to microcuries that might appear on the back of the detector.
3. Consider whether the fire was fast flaming, small particle, or smouldering, large particle
4. Consider the location of the detector, relative to the location of the fire. How many doors are between the detector and the fire? Where the doors open or closed?
5. Consider the impact that open windows or HVAC systems might have on the flow of the smoke.
6. If the detector was disabled, consider how close the detector was to potential nuisance alarms. If no survivor is alive to help determine why it was disabled it may be helpful to talk to adjacent apartment or townhouse occupants, who probably have the detectors installed in the same location.

To help find the detector it may be helpful to look at adjacent apartment or townhouses. If constructed at the same time or if they have the same landlord there is a possibility that the location of the detector(s) in the adjacent living unit can provide clues to the location in the unit of fire origin. In the absence of the clues it should be assumed that they located where the local codes require them to be located. More than once I have been able to find the detector and the battery in the debris laying on the floor right under the spot on the ceiling where I assumed the detector was located. Even though

the plastic had melted the metal parts of the detector were still recognizable.

Most of the work of a fire investigator is involved with determining the cause and origin of a given fire. In particular, an investigator must determine if a fire was incendiary. I admit that few of these factors discussed in this paper deal directly with this work. However, while they may not help determine the cause of the fire they could be critical in helping to determine the cause of death or injuries.
This information can then be utilized by local or state fire marshals to modify and improve building and fire codes. Without this type of data code officials have trouble justifying code changes. For example, assume that investigators find that in many case a sleeping occupant with a closed bedroom door, either was overcome before the smoke could reach the hallway detector or did not hear the detector in the hallway. This information can be used to justify requiring interconnected detectors in every bedroom. If investigators find that in many cases of smouldering fires that the ionization detector is operating too late or not at all then this information could be used to justify changes in testing and selection of detectors.
I hope this information proves useful to those who read this paper. I would appreciate any information that could be provided to me concerning the factors that this paper discusses.

BIBLIOGRAPHY

1. National Fire Data Center, "Fire in the United States", 198351994, U.S. Fire Administration, Emmitsburg, Md. 1995.
2. Heskestad, G., Final Technical Report -Escape potential from Apartments Protected by Fire Detectors in High-Rise Buildings, Factory Mutual Research Corp., Norwood, MA, Sponsored by Dept. of Housing and Urban Development, Washington, D.C. (June 1974).
3. Benjamin, I., A., "Detector Response in Large Buildings," Proceedings - Engineering Applications of Fire Technology Workshop, National Bureau of Standards, Gaithersburg, MD, April 1980.
4. Fleming, J.M., "Photoelectric v. Ionization Detectors - A Review of the Literature," Proceedings - Fire Suppression and detection Research Application Symposium, National Fire Protection Research Foundation, Orlando, Florida, February 1998.
5. Moore, W. D., "Automatic Fire Detectors," Fire Protection Handbook, 17th Ed., National Fire Protection Association, Quincy, MA, 1991.
6. Bukowski, Richard, W., "Smoke Measurements in Large and Small Scale Fire Testing," NBSIR78-1502, US Bureau of Standards, Center for Fire Research, Washington, D.C., 1978.
7. Burry, P., "The Principles of Fire detection - Ionization Chamber Smoke Detectors," Fire Surveyor, April 1982, p. 20.
8. Bertschinger, Susan, "Smoke Detectors and Unwanted Alarms", Fire Journal (Jan/Feb, 1988), pp. 43-53.
9. Bjorkman, J., Kokkala M. A., Ahola, H., "Measurements of the Characteristic Lengths of Smoke Detectors", Fire Technology, (May 1992) pp. 99-106.
10. Cable, E., and Sherman, P., "The Ionization Smoke Detector and Smoke Aging," research paper presented to Professor John Titus, Worcester Polytechnic Institute, and Deputy Chief John White, Boston Fire Department, June, 1986.
11. Hall, John, R., "A Decade of Detectors: Measuring the Effect", Fire Journal, (Sept/Oct, 1985), pp. 37-43, 78.
12. R., Riley, K., and Rogers, S., "A Study of the Operation and Effectiveness of Fire Detectors Installed in the Bedrooms and Corridors of Residential Institutions", Fire Research Station, Fire Research Current Paper 26/78, Borehamwood, England, April 1978.
13. Johnson, P., F., and Brown, S., K., "Smoke Detection of Smouldering Fires in a Typical Melbourne Dwelling," Fire Technology, Vol. 22, No. 4, November 1986, p.295.
14. Meland, Oysten, and Lonuik, Lars, "Detection of Smoke - Full Scale Tests with Flaming and Smouldering Fires, "Fire Safety Science," - Proceedings of the Third International Symposium, July, 1991, pp. 975-984.
15. Welker, Roger, W., and Wagner, John, F., "Particle Size and Mass Distribution of Selected Smokes. Effect On Ionization Detector response," Gillette research Institute, Rockville MD, Supported by U.S. Department of the Interior, Bureau of Mines, Pittsburgh Mining and research Center, Pittsburgh, PA, Journal of Fire and Flammability, Vol.8 (January 1977), p. 384-387.