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Review of Fire Statistics Collection in Canada

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ABSTRACT

In this report, the fire incident reports ^[1-34] used by various jurisdictions in Canada for data collection are reviewed and a matrix is developed for each category in the Canadian Code Structure on Fire Loss Statistics (CCS). This determined the extent to which these various jurisdictions are applying the CCS in their data collection. In addition, the common variables collected among the various jurisdictions and non-CCS variables were identified. It was also determined that there is a limited availability of fire statistics and, at this stage, it is not yet possible to undertake an annual detailed fire analysis for Canada as whole.

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REVIEW OF FIRE STATISTICS COLLECTION IN CANADA

1 INTRODUCTION

Every year, fires result in many casualties in Canada and are also responsible for billions of dollars of material damage. The collection of fire incident data is an important task as the fire statistics can be used to assess how life safety is being affected year after year in Canada. It also motivates corrective actions to be taken and identifies key areas requiring further research.

The Canadian Code Structure on Fire Loss Statistics (2002 edition)^[35] is a general framework for fire data collection and categorization. It is also an excellent starting point for fire analysis as long as it is implemented adequately. It contains the different types of data required to understand fire incidents and to take effective measures to remedy the problems.

This report presents the diverse categories of the CCS and the extent to which the different jurisdictions apply it. Depending on their specific needs, some jurisdictions demand more information, which added to the different tables under additional variables. These variables might suggest some ways to improve the CCS in the future.

2 MATRICES FOR VARIOUS CATEGORIES OF THE CANADIAN CODE STRUCTURE (CCS)

In the following section, we present the matrices that were developed for the different categories of the Canadian Code Structure vs. the variables collected by various jurisdictions. The fire incident reports from Newfoundland, Northwest Territories, Nunavut, Yukon, National Defence and Indian Reserves were not available, therefore, these jurisdictions are not included in this study.

2.1 Incident Information

Variables in this category are intended to provide general information about the fire incident. Table 1 shows the incident information matrix.

Table 1: Incident information matrix

Incident information	ON	QC	AB	BC	MB	SK	NS	NB	PEI	HRDC
Year	√	√	√	√	√	√	√	√	√	√
Month of year	√	√	√	√	√	√	√	√	√	√
Date of month	√	√	√	√	√	√	√	√		√
Day of week			√		√				√	√
Time	√		√	√	√	√	√	√		√
Incident situation		√	√	√	√			√		
Incident location	√	√	√	√	√	√	√	√	√	√
Response time of first vehicle	√	√	√		√	√	√		√	
Mutual aid			√		√	√				
Crew size	√	√				√			√	
Response time of subsequent vehicles		√				√				
Subsequent crew size		√				√			√	
# Engines						√				
# Aerials						√				
# Tankers						√				
# CFR vehicles						√				
# Other vehicles						√				
Distance from fire department to emergency			√			√				
Status on arrival		√				√				
# Persons rescued	√	√				√			√	
# Casualties	√	√	√	√		√	√	√	√	√
Type of weather						√				
Temperature			√			√				
Wind direction						√				
Wind speed						√				
Additional variables (non CCS variables)										
# Persons evacuated		√			√					
Time to control fire		√				√				
Time to extinguish fire						√				
Response type	√								√	
Police investigation		√			√	√		√		
First aid		√								
Person starting fire			√							

2.2 Property description

This category is used for variables that are intended to gather information to describe where the fire occurred. Table 2 presents the property description matrix.

Table 2: Property description matrix

Property description	ON	QC	AB	BC	MB	SK	NS	NB	PEI	HRDC
Major occupancy	√	√	√	√	√	√	√	√	√	√
Property classification	√	√	√	√	√	√	√	√	√	√
Property ownership	√		√			√		√	√	√
Additional variables										
Building code		√								
Occupant's status	√		√	√	√	√	√	√	√	
Occupant's name	√		√	√	√	√	√	√	√	
Occupant's address	√		√	√	√	√	√	√		
Occupant's insurance		√	√	√	√	√	√	√		
Insurance company			√	√	√	√	√	√		
Claim company			√	√	√	√	√	√		
Adjusting company			√	√	√	√	√	√		

2.3 Property details

Variables in this category are intended to provide detailed information about the property where the fire incident occurred. Table 3 presents the property details matrix.

Table 3: Property details matrix

Property details	ON	QC	AB	BC	MB	SK	NS	NB	PEI	HRDC
General construction			√	√	√					√
Method of construction		√	√							
Year of construction		√	√	√	√	√				√
Building height	√	√	√	√	√	√		√	√	√
Ground floor area		√	√	√	√	√				√
Number of occupants	√		√			√				√
Value at risk		√	√	√	√	√	√	√		√

2.4 Fire Protection features

These variables are intended to provide information about the fire protection features of the building where the fire occurred. Table 4 shows the fire protection features matrix.

Table 4: Fire protection features matrix

Fire protection features	ON	QC	AB	BC	MB	SK	NS	NB	PEI	HRDC
Manual fire protection facilities			√	√	√	√			√	√
Sprinkler protection		√	√	√	√	√		√	√	√
Fixed system other than sprinklers		√	√			√			√	√
Automatic fire detection system	√	√	√	√	√				√	√
Fire detection devices	√	√	√	√	√	√	√	√	√	
Outside fire protection	√		√	√	√	√			√	√
Fire service			√	√	√					√
Additional variables (Non CCS)										
Fire detection device location	√					√				
Type of smoke detector			√			√				
Power source of smoke alarm device			√			√				
Fire and smoke description						√				
Reason for fire detection device inoperation	√					√				

2.5 Circumstances contributing to the outbreak of fire

Variables in this category are intended to provide information about the circumstances contributing to the outbreak of the fire. Table 5 shows the circumstances of the fire matrix

Table 5: Circumstances of the fire matrix

Circumstances contributing to the outbreak of fire	ON	QC	AB	BC	MB	SK	NS	NB	PEI	HRDC
Igniting object/ Source of ignition	√	√	√	√	√	√	√	√	√	√
Fuel or energy associated with igniting object		√	√	√	√	√	√		√	√
Energy causing ignition/form of Heat	√	√	√	√	√	√				√
Material first ignited	√	√	√	√	√	√	√	√	√	√
Act or omission/ Cause of fire	√	√	√	√	√	√	√	√	√	√

2.6 Factors relating to the origin and spread of fire

Information about the factors relating to the origin and spread of the fire are gathered using the variables in this category. Table 6 presents the factors relating to the origin and spread of fire matrix.

Table 6: Factors relating to the origin and spread of fire

Factors relating to the origin and spread of fire	ON	QC	AB	BC	MB	SK	NS	NB	PEI	HRDC
Area of origin	√	√	√	√	√	√	√	√	√	√
Level of origin	√		√	√	√	√			√	√
Flame spread - Interior finish			√		√					√
Flame spread - vertical openings			√		√					√
Flame spread - horizontal openings			√		√					√
Smoke spread avenues			√		√					√

2.7 Fire loss details

Information about the fire losses are gathered using variables in this category. Table 7 shows the fire loss details matrix.

Table 7: Fire loss details matrix

Fire loss details	ON	QC	AB	BC	MB	SK	NS	NB	PEI	HRDC
Extent of fire		√	√	√	√		√			√
Extent of damage		√	√	√	√		√			√
Dollar loss	√	√	√	√	√	√	√	√	√	√
Additional variables (non CCS)										
Insured loss	√	√	√			√	√	√		√
Claim paid			√							

2.8 Discovery of fire and action taken

Variables in this category are intended to provide information about the discovery of fire and action taken. Table 8 presents the discovery of fire and action taken matrix.

Table 8: Discovery of fire and action taken matrix

Discovery of fire and action taken	ON	QC	AB	BC	MB	SK	NS	NB	PEI	HRDC
Initial detection			√	√	√	√				√
Transmission of alarm to fire department	√		√	√	√				√	√
Action taken			√		√					√
Performance of automatic extinguishing equipment		√	√		√				√	√
Method of fire control & extinguishment			√	√	√				√	√
Performance of smoke alarm device	√	√	√			√	√		√	
Impact of smoke alarm activation on occupant response/evacuation			√							
Occupants in dwelling unit at time of fire			√	√	√	√				√

2.9 Fire casualties

This category deals with variables used to gather information about the fire casualties. Table 9 presents the fire casualties matrix.

Table 9: Fire casualties matrix

Fire casualties	ON	QC	AB	BC	MB	SK	NS	NB	PEI	HRDC
Age of victim	√	√	√	√	√	√		√	√	√
Sex of victim	√	√	√	√	√	√	√	√	√	√
Status of victim	√	√	√	√	√	√	√	√	√	√
Nature of casualties	√	√	√	√	√	√	√	√	√	√
Probable/possible cause	√		√	√		√		√	√	
Class of victim			√							
Condition of casualty	√		√	√	√	√		√	√	√
Action of casualty	√		√	√	√	√		√	√	√
Cause of failure to escape			√	√	√	√				√
Ignition of clothing or other fabrics	√		√	√	√	√		√	√	√
Type of fabric or material ignited	√		√	√	√	√				√
Additional variables (Non CCS)										
Injury (observed or suspected)	√					√				√
Injury severity	√						√			
Firefighting experience of firefighter	√					√		√	√	√
Firefighter employment status	√							√	√	√
Weight of firefighter	√							√	√	√
Height of firefighter	√							√	√	√
Firefighter clothing	√					√		√	√	√
Where fire fighter injury occurred						√				
Fire fighter activity at time of injury						√				
Familiarity with structure						√				

2.10 Variables collected for vehicle and equipment

Table 10 shows the information gathered by the jurisdictions on vehicle/equipment description.

Table 10: Information gathered by the jurisdictions on vehicle/equipment description

Variable for Vehicle/equipment	ON	QC	AB	BC	MB	SK	NS	NB	PEI	HRDC
Item type			√	√	√	√	√	√	√	
Year		√	√	√	√	√	√	√	√	
Model		√	√	√	√	√	√	√	√	
Serial #		√	√	√	√	√	√	√	√	
Manufacturer		√	√			√			√	
Make			√	√	√		√	√	√	
Vehicle primary purpose	√								√	
Vehicle fuel or energy source	√								√	
License #			√		√	√	√			
Province/State			√							

3 COMMON FIRE DATA COLLECTED BY ALL THE JURISDICTIONS

Table 11 records the common variables collected by the jurisdictions according to the CCS categories.

Table 11: Common variables to the jurisdictions by the Canadian Code Structure

CCS - categories	Common variables collected				
Incident information	Year	Month of year	Date of month	Incident location	# Casualties
Property description	Major occupancy	Property classification			
Property details					
Fire protection features	Fire detection devices				
Circumstances contributing to the outbreak of fire	Igniting object/ Source of ignition	Material first ignited	Act or omission		
Factors relating to the origin and spread of fire	Area of origin				
Fire loss details	Dollar loss				
Discovery of fire and action taken					
Fire casualties	Sex of victim	Status of victim	Nature of casualties		

4 ADDITIONAL DATA COLLECTED BY THE JURISDICTIONS

Some of the data gathered by the jurisdictions do not appear in the CCS. These data seem to be important and are presented in Table 12 by the different categories of the CCS. They suggest some ways to improve the CCS in the future.

Table 12: Additional variables according to the Canadian code system

CCS - categories	Additional variables							
Incident information	# Persons evacuated	Time to control fire	Time to extinguish fire	Response type	Police investigation	First aid	Person starting fire	
Property description	Occupant's status	Occupant's name	Occupant's address	Occupant's insurance	Insurance company	Claim company	Adjusting company	
Property details								
Fire protection features	Fire detection device location	Type of smoke detector	Power source of smoke alarm device	Fire and smoke description	Reason for fire detection device inoperation	Smoke alarm provides all warning		
Circumstances contributing to the outbreak of fire								
Factors relating to the origin and spread of fire								
Fire loss details	Insured loss	Claim paid						
Discovery of fire and action taken								

CCS - categories	Additional variables								
Fire casualties	Familiarity with structure	Fire fighter activity at time of	Where fighter injury occurred	Firefighter clothing	Weight & Height of firefighter	Firefighter job status	Firefighting experience	Injury severity	Injury (observed or not)

5 FIRE STATISTICS AVAILABILITY

The CCS provides a comprehensive list of variables that are crucial for fire statistics analysis. Some of these variables are not actually monitored by any jurisdiction. National fire statistics are usually compiled and published by the Council of Canadian Fire Marshals and Fire Commissioners (CCFM & FC) in their annual reports. Table 13 shows the statistics of the Canadian code variables available in the CCFM & FC reports. It also shows that not all common data gathered by the jurisdictions are published in the annual reports. A more complete set of information could be made available to the public. The full list of statistical tables is presented in appendix A.

Table 13: Fire statistics published by CCFM & FC according to the Canadian Code Structure

CCS - categories	Published fire Statistics		
Incident information	Year	Location/ Jurisdiction	# Casualties
Property description	Major occupancy	Property classification	
Property details			
Fire protection features			
Circumstances contributing to the outbreak of fire	Igniting object	Act or omission	
Factors relating to the origin and spread of fire			
Fire loss details	Dollar loss		
Discovery of fire and action taken			
Fire casualties	Sex of victim	Status of victim	Nature of casualties

6 CONCLUSION

The general framework has been set through the CCS to collect and analyze fire statistics. It is intended to be a flexible structure that allows for the jurisdictions specific needs. However, most of the jurisdictions do not comply with the CCS. Sometimes the questions are worded so differently that it becomes difficult to compare data collected by the different jurisdictions. The few common variables gathered by all the jurisdictions, combined with the published fire statistics, reveal the limited availability of fire statistics.

7 RECOMMENDATION

Based on the fire statistics that are available, it is not possible to undertake a detailed fire analysis. However, it is crucial to understand the sequence of events leading to the outbreak of fire. If the information contained in Table 14 is collected by all of the jurisdictions, it will be possible to conduct a fire scenario analysis for Canada.

Table 14: Variables required for a fire scenario analysis

CCS - categories	Key variables for a fire scenario analysis						
Incident information	Year/Month	Date/Time	Location	Response time	# Casualties	Distance from fire department	Type of weather
Property description	Major occupancy	Property classification					
Property details	Method of construction	Year of construction	Building height	Ground floor area	Number of occupants		
Fire protection features	Fire detection device	Fire protection device	Fire detection device location				
Circumstances contributing to the outbreak of fire	Igniting object	Material first ignited	Act or omission				
Factors relating to the origin and spread of fire	Area of origin	Level of origin	Smoke spread avenues				
Fire loss details	Dollar loss						
Discovery of fire and action taken	Initial detection	Action taken	Performance of automatic extinguishing equipment	Performance of smoke alarm device			
Fire casualties	Age of victim	Sex of victim	Status of victim	Nature of casualties	Condition of casualty	# Fires	# Fire deaths

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APPENDIX A

List of available tables in the CCFM & FC reports:

Canada fires, fire losses and fire deaths
Number of fires by jurisdiction
Fire losses by jurisdiction
Number of fires by property classification
Number of fire injuries by property classification
Number of fire deaths by property classification
Fire losses by property classification
Residential fires by jurisdiction
Residential fire losses by jurisdiction
Residential fires by occupancy
Residential fire injuries by occupancy
Residential fire deaths by occupancy
Residential fire losses by occupancy
Assembly fires by jurisdiction
Assembly fire losses by jurisdiction
Assembly fires by occupancy
Assembly fire injuries by occupancy
Assembly fire deaths by occupancy
Assembly fire losses by occupancy
Institutional fires by jurisdiction
Institutional fire losses by jurisdiction
Institutional fires by occupancy
Institutional fire injuries by occupancy
Institutional fire deaths by occupancy
Institutional fire losses by occupancy
Business and personal service fires by jurisdiction
Business and personal service fire losses by jurisdiction
Mercantile property fires by jurisdiction
Mercantile property fire losses by jurisdiction
Industrial manufacturing property fires by jurisdiction
Industrial manufacturing property fire losses by jurisdiction
Storage property fires by jurisdiction
Storage property fire losses by jurisdiction
Special property fires by jurisdiction
Special property fire losses by jurisdiction
Special property fires by occupancy
Special property fire injuries by occupancy
Special property fire deaths by occupancy
Special property fire losses by occupancy
Farm property fires by jurisdiction
Farm property fire losses by jurisdiction
Miscellaneous property fires by jurisdiction
Miscellaneous property fire losses by jurisdiction
Number of fires by source of ignition
Fire losses by source of ignition
Fire injuries by status of the victims

Fire injuries by gender of the victims
Fire deaths by status of the victims
Fire deaths by gender of the victims
Fire deaths by jurisdiction and by status of the victims
Fire deaths by jurisdiction and by gender of the victims
Fire injuries by jurisdiction and by status of the victims
Fire injuries by jurisdiction and by gender of the victims
Number of fires by act or omission
Fire losses by act or omission
Fire injuries by act or omission and by status of the victims
Fire injuries by act or omission and by gender of the victims
Fire deaths by act or omission and by status of the victims
Fire deaths by act or omission and by gender of the victims