

Savary Island
Fire Insurance Grade Update Report

2017

FINAL

September 2017 - Final



Municipal
Consulting
Services

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Table of Contents

TABLE OF CONTENTS	1
APPENDICES	2
TABLES AND FIGURES	2
1. SCOPE OF OUR ENGAGEMENT	4
1.1. ACKNOWLEDGEMENT.....	4
1.2. DISTRIBUTION OF USE	4
1.3. RELIANCE AND LIMITATION	5
2. EXECUTIVE SUMMARY	6
3. FIRE UNDERWRITERS SURVEY	7
3.1. FIRE INSURANCE GRADING CLASSIFICATIONS.....	7
3.2. DWELLING PROTECTION GRADING SYSTEM.....	8
3.3. PUBLIC FIRE PROTECTION CLASSIFICATION SYSTEM	9
4. PROJECT SCOPE AND METHODOLOGY	11
4.1. PROJECT OBJECTIVES.....	11
5. SUMMARY OF SAVARY ISLAND	12
5.1. SAVARY ISLAND	12
5.1.1. <i>Island Description</i>	12
5.1.2. <i>Economy and Development</i>	12
5.1.3. <i>Access and Roadways</i>	13
5.1.4. <i>Fire Risk Assessment</i>	14
5.1.4.1. <i>Structural Fire Risk</i>	14
5.1.4.2. <i>Wildland Urban Interface</i>	14
5.2. SAVARY ISLAND VOLUNTEER FIRE DEPARTMENT	15
5.2.1. <i>Fire Department Administration</i>	15
5.2.2. <i>Fire Stations</i>	16
5.2.3. <i>Fire Apparatus and Equipment</i>	17
5.2.4. <i>Staffing</i>	17
5.2.5. <i>Training and Level of Service</i>	17
5.3. WATER SUPPLIES FOR PUBLIC FIRE PROTECTION OVERVIEW	18



5.3.1.	<i>Pressurized Water Distribution Systems</i>	18
5.3.2.	<i>Alternate Water Supply Points</i>	19
5.4.	EMERGENCY COMMUNICATIONS OVERVIEW	20
6.	DWELLING PROTECTION GRADE REVIEW	21
6.1.	DWELLING PROTECTION GRADE	21
6.1.1.	<i>Required Fire Flow Assessment</i>	21
6.1.2.	<i>Fire Department</i>	22
6.1.2.1.	<i>Organization</i>	22
6.1.2.2.	<i>Membership</i>	22
6.1.2.3.	<i>Training</i>	23
6.1.2.4.	<i>Fire Fighting Apparatus and Fire Station</i>	23
6.1.2.5.	<i>Fire Apparatus Equipment</i>	25
6.1.3.	<i>Alarm Notification System</i>	25
6.1.4.	<i>Water Supply</i>	26
6.2.	DPG - FIRE INSURANCE GRADING SUMMARY	27
7.	FIRE INSURANCE GRADING CLASSIFICATION POTENTIAL REASSIGNMENT	29
7.1.	FIRE INSURANCE GRADING REASSIGNMENT	29
8.	MAINTENANCE OF RECOGNITION AND FUTURE PLANNING	30
8.1.	MAINTAIN FIRE INSURANCE GRADING RECOGNITION.....	30
8.2.	FUTURE PLANNING	30

Appendices

Appendix A – Dwelling Protection Grade Summary of Basic Requirements

Appendix B – Fire Underwriters Survey – 1999 – Water Supply for Public Fire Protection

Appendix C – FUS – Insurance Grading of Used or Rebuilt Apparatus

Appendix D – Apparatus Extension Request Form

Appendix E – Superior Tanker Shuttle Service Accreditation Handbook

Tables and Figures

Table 3.2-1 FUS Grades Correlation to Commonly used Insurance Terminology and Simplified Grades	9
Table 6.2-1 Dwelling Protection Grade Summary	28
Table 7.1-1 Savary Island Fire Insurance Grading Classifications - DPG	29
Table 7.1-2 Savary Island Fire Insurance Grading Classifications - PFPC	29



Figure 5.1-1 Final Overlay of Probability and Consequence from the Wildfire Risk Management System 15

Figure 5.2-1 Savary Island Fire Protection Area..... 16

Figure 5.3-1 Savary Shores Improvement District Service Area and Hydrants..... 19

Figure 5.3-2 Storage Tanks on Savary Island for Public Fire Protection 19



1. SCOPE OF OUR ENGAGEMENT

The Powell River Regional District contracted the services of Opta Information Intelligence (formerly IAO) to evaluate Savary Island's public fire protection programs. The purpose of the assessment is to determine whether the community's current fire insurance grading classifications are representative of the fire protection programs and fire protection resources that are currently in place within the community. A fire insurance grading review is a key part of the assessment process.

The significant findings of the Fire Underwriters Survey review were requested to be outlined within a report format. The report will provide an update on Savary Island's fire insurance grading assignments and make recommendations aimed at improving the level of public fire protection and improving the fire insurance grading classifications.

1.1. Acknowledgement

Opta Information Intelligence and Fire Underwriters Survey wishes to thank the Savary Island Volunteer Fire Department and Powell River Regional District for their valuable assistance in conducting this survey and preparation of this report.

1.2. Distribution of Use

This report, along with the findings and conclusions, contained herein, is intended for the sole use of the Powell River Regional District and Savary Island Volunteer Fire Department to assist in the public fire protection planning needs of the community.

Judgments' about the conclusions drawn, and opinions presented in this report should be made only after considering the report in its entirety. This report is Private and Confidential and is intended for the exclusive use of the Powell River Regional District and Savary Island Volunteer Fire Department.

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1.3. Reliance and Limitation

We have relied on the general accuracy of information provided by stakeholders including Powell River Regional District and Savary Island Volunteer Fire Department without independent verification. However, we have reviewed this information for consistency and reasonableness. The accuracy of our conclusions is dependent upon the accuracy and completeness of this underlying data. Therefore, any discrepancies discovered in this data by the reader should be reported to Fire Underwriters Survey and this report amended accordingly, as warranted.



2. EXECUTIVE SUMMARY

This report outlines the significant findings of the Fire Underwriters Survey carried out for Savary Island. The Powell River Regional District requested Fire Underwriters Survey to conduct a survey to evaluate the current public fire protection programs and fire protection resources on Savary Island for the purpose of updating the fire insurance grades. In addition, the report provides recommendations to maintain and further improve fire insurance grading classifications.

In order to determine the fire protection needs on the Savary Island, a fire hazard and life safety assessment was carried out. The purpose of this review was to identify and quantify fire risk, fire hazard and life safety issues related to public fire protection. The Basic Fire Flow of Savary Island was set at 700 lpgm in 2017.

The Dwelling Protection Grade of Savary Island has been improved to 4 from a 5. The Public Fire Protection Classification of a portion of Savary Island has been improved to an 8 which applies to the Savary Shores Improvement District and the rest of the island achieved a 9.

Savary Island is to be congratulated at improving its Dwelling Protection Grade and Public Fire Protection Classification.



3. FIRE UNDERWRITERS SURVEY

Fire Underwriters Survey is a national organization that represents more than 85 percent of the private sector property and casualty insurers in Canada. Fire Underwriters Survey provides data to program subscribers regarding public fire protection for fire insurance statistical and underwriting evaluation. It also advises municipalities if they desire to review the current levels of fire defence in the community and provide direction with recommendations where improvements will enable them to better deal with fire protection problems.

Fire Underwriters Survey offices maintain data from surveys on fire protection programs throughout all municipalities across Canada. The results of these surveys are used to establish the Public Fire Protection Classification (PFPC) and Dwelling Protection Grade (DPG) for each community. The PFPC and DPG is also used by underwriters to determine the amount of risk they are willing to assume in a given community or section of a community.

The overall intent of the grading system is to provide a measure of the ability of the protective facilities within a community to prevent and control the major fires that may be expected to occur by evaluating in detail the adequacy, reliability, strength and efficiency of these protective facilities.

3.1. Fire Insurance Grading Classifications

Public Fire Protection Classification

The PFPC is a numerical grading system scaled from 1 to 10. Class 1 is the highest grading possible and Class 10 indicates that little or no fire protection is in place. The PFPC grading system evaluates the ability of a community's fire protection programs to prevent and control major fires that may occur in multifamily residential, commercial, industrial, and institutional buildings and course of construction developments.

Fire Underwriters Survey also assigns a second grade for community fire protection, referred to as the Dwelling Protection Grade (DPG), which assesses the protection available for small buildings such as single-family dwellings.



Dwelling Protection Grade

The DPG is a numerical grading system scaled from 1 to 5. One (1) is the highest grading possible and five (5) indicates little or no fire protection is provided. This grading reflects the ability of a community to handle fires in small buildings such as single-family residences.

3.2. Dwelling Protection Grading System

Dwelling Protection Grades are based on a 1 to 5 grading system; DPG 5 indicates little or no fire protection being available. Most small and midsize communities that have a gradable emergency water supply are assigned a DPG 3A rating, which the insurance industry has termed fully protected. DPG 3B refers to communities, or portions of communities, that have a recognized fire department but are not protected with a recognized water supply. The insurance industry has termed this 'semi-protected'. Within the Fire Underwriters Survey grading, a grade of 3B indicates that the fire department is equipped, trained, prepared and adequately staffed to provide "Standard Shuttle Service" to a fire event within a reasonable response time (i.e. utilize a pumper, tender and various related equipment to deliver water to a fire site and provide structural firefighting at the fire event).

The protected assignment refers to DPG 1 to DPG 3A. An unprotected designation refers to DPG 5. DPG 3B and 4 are given the semi-protected designation. The lower the DPG assignment is, the larger the discount given in fire insurance rates. The discounts given for an identical property considered fully-protected over those considered unprotected can be approximately 60 percent. Where there is sufficient population and sufficient taxation base, the savings generated can more than offset the operating and capital costs of an effective fire service.

A summary of the requirements for the Dwelling Protection Grade system is provided in Appendix A.

Many insurers have simplified the Dwelling Protection Grading system to a simple three tier system. This is typical for setting insurance premium rates for detached single-family residences only.

Different insurers utilize the Dwelling Protection Grades differently to set their own rates based on the marketplace and their own loss experiences. The three-tier system that is typically used by many insurers is shown in Table 3.2-1 FUS Grades Correlation to Commonly used Insurance Terminology and Simplified Grades.



Table 3.2-1 FUS Grades Correlation to Commonly used Insurance Terminology and Simplified Grades

Fire Underwriters Survey Dwelling Protection Grades	System Used by Many Insurance Companies “3 tier” system	Insurance Companies typically refer to this grade as
1	Table I	Fully Protected, Career
2	Table I	Fully Protected, Composite
3A	Table I	Fully Protected, Volunteer
3B	Table II	Semi–Protected, Career or Volunteer (Shuttle)
4	Table II or III	Limited–Protection, Career or Volunteer
5	Table III	Unprotected

The fire insurance industry has minimum requirements that communities must meet in order for their fire protection program to receive recognition. The fire insurance industry sets benchmarks for:

- Fire Department Organization
- Membership
- Training
- Apparatus Requirements
- Fire Suppression Capability, and
- Alarm Notification

3.3. Public Fire Protection Classification System

The Public Fire Protection Classification grading system is a measure of a community’s overall programs of fire protection. The ability of a community’s fire defences are measured against recognized standards of fire protection relative to fire hazard and fire/life safety risk present within the community. The following areas of fire protection are reviewed in the survey and have the following weights within the PFPC grading system:

- Fire Department 40%
- Water Supply 30%
- Fire Safety Control 20%
- Fire Service Communications 10%



The above classifications are conveyed to subscribing companies of Fire Underwriters Survey. FUS subscribers represent approximately 85-90 percent of the fire insurance underwriters in Canada. Subscribers use this information as a basis in their fire insurance underwriting programs to set limits in the amount of risk they are willing to assume within a given portion of a community, and to set fire insurance rates for commercial properties. Improved fire protection grades may result in increased competition for insurance underwriting companies to place their business within a community. Our analysis indicates that an improved fire protection grade has a positive effect on fire insurance rates.

In addition, PFPC classifications are a measure of the public fire protection within a community. Many progressive communities use the classification system to assess the performance of their public fire protection programs, and to plan the direction of public fire protective services for the future of the community.

Improvements that would have a cumulative positive effect in fire insurance grading classifications and fire protection ability are discussed within this report. The intent of identifying areas where improvements can be made is to provide the Savary Island direction in their community public fire protection planning, if so desired and supported by the community.



4. PROJECT SCOPE AND METHODOLOGY

4.1. Project Objectives

The scope of this assignment was to conduct an assessment of Savary Island for the Powell River Regional District public fire protection program, for two purposes being:

1. To evaluate the community's public fire protection needs, and
2. To evaluate whether the fire insurance grading classifications need updating based on the current level of public fire protection available to the community.

A supplementary objective was to provide direction to Savary Island as to where improvements to the community's public fire protection programs could be made should fire insurance grading classifications remain status quo.

The evaluation is intended to consider both current and future fire protection needs. The tasks and methodology used to conduct the assessment are listed below:

- 1. Community Risk and Hazard Assessment including**
 - Assessment of Community Profile
 - Required Fire Flow Calculations
 - Profile and Quantify Hazard and Risk
- 2. Fire Department Assessment of**
 - Fire Department Profile
 - Apparatus and Equipment
 - Distribution of Resources
 - Pumping Capacity
 - Maintenance Programs
 - Staffing and Personnel
 - Training Programs and Facilities
 - Administration
- 3. Water Supplies for Public Fire Protection Assessment**
- 4. Emergency Communication Assessment**
- 5. Complete a Fire Insurance Grading Review of the Savary Island**
- 6. Develop a Report that Includes Findings and Recommendations**

September 2017 - Final



5. SUMMARY OF SAVARY ISLAND

5.1. Savary Island

5.1.1. Island Description

Savary Island is part of Electoral Area A of the Powell River Regional District (PRRD). Area A is represented on the PRRD Board of Directors by an elected Area Director who is elected every four years.

Savary Island is a crescent-shaped Island located in the northern reaches of the Strait of Georgia approximately 14 kilometres northwest of the City of Powell River. Savary Island is approximately 0.8 km wide and 8 km long and is currently composed of approximately 1,700 legal parcels, with the potential for additional subdivision.

The eastern point of the island is known as Mace Point, and the north-western point as Indian Point. Both the north and south shores are characterized by steep, unstable cliffs dropping down to wide sandy beaches. Savary Island is only accessible by water taxi ferries and barges.

The Savary Island community is made up of about approximately 70 permanent residents. The population on Savary Island in the summer including cabin owners, their guests, and tourists can be as high as 2,500–3,000 by some estimates, and as low as 30 full time residences in the winter months.

There is no existing centralized electricity, gas, sewage infrastructure and property owners are responsible for providing their own electricity and septic systems. Generators or solar panel systems are commonly used by residences of the island to provide electricity.

5.1.2. Economy and Development

Savary Island, despite its relatively small size (450 ha/1,111 ac), and remote location, has been subdivided into approximately 1,700 legal parcels. This works out to a gross density for the Island of 3.8 dwellings per ha (1.5 dwellings per ac). The average lot size is between 700 and 1,400 Sq.m (7,500 to 15,000 Sq.ft) in area. In most cases, a 50-foot parcel width is normal. There are only two parcels on the Island greater than 10.1 ha (25 ac). District Lot 1375 remains the only one of the five district lots on Savary Island that has not undergone subdivision.

September 2017 - Final



There are a number of small businesses on Savary Island including a bike rental, café, antique store, three small-scale mills, propane seller and cabin rentals. Community infrastructure and amenities include a government wharf, the main fire hall and two satellite fires halls. There is also a water distribution system that services the Savary Shores subdivision.

Savary Island at present has no industrial activity on the island and there are no plans for industrial development in accordance with the Savary Island Official Community Plan.

5.1.3. Access and Roadways

Three levels of roads have been established for Savary Island only and do not correspond to the maintenance levels established by the Ministry of Transportation. Maps have been created with the aid of the PRRD for fire department use. The following road levels are from the 2009 Savary Island Transportation Study:

- Level 1 - These are main rural roads which should be maintained at a standard suitable for reasonable all-weather licensed vehicle access to all parts of the Island, taking into account the relatively low levels of Island traffic.
- Level 2 - These are secondary rural roads which experience only a limited volume of licensed vehicular traffic and which are intended to primarily be used by pedestrians, bicycles, licensed utility vehicles and public transit vehicles.
- Level 3 These include local roads which experience only a very limited volume of vehicular traffic and which are intended to be used primarily by pedestrians, bicycles, licensed utility vehicles, licensed service vehicles and public transit vehicles.
 - It is noted that the only practical differentiation between Level 2 and Level 3 facilities is the distinction between “limited” and “very limited” traffic volume.

Majority of roads typically only allow one-way traffic. The Level 1 road that runs through the island as a backbone is adequate for all fire department fire apparatus. The main road is reasonably maintained and is of gravel and sand. Road Levels 2-3 may not be adequate for the fire department’s engine in some parts of the island and best suited to use the light attack vehicles for access.



5.1.4. Fire Risk Assessment

5.1.4.1. Structural Fire Risk

The structures developed on Savary Island are predominately residential dwellings. The most common type of residential structures are houses/cabins. Residential property owners also have additional structures on their property that include secondary cabins, sheds, and workshops. The average floor area of a dwelling is on the island is 102 Sq.m (1,095 Sq.ft). A limited number of dwellings exceed 185 Sq.m (2,000 Sq.ft). Dwellings are typically one to two storeys in height. Many dwellings on the island have wood side paneling to maintain a rustic island feel.

Limited commercial risks exist on the island and no industrial risks exist on the island. The highest fire risk on the island would be the bulk propane storage business.

5.1.4.2. Wildland Urban Interface

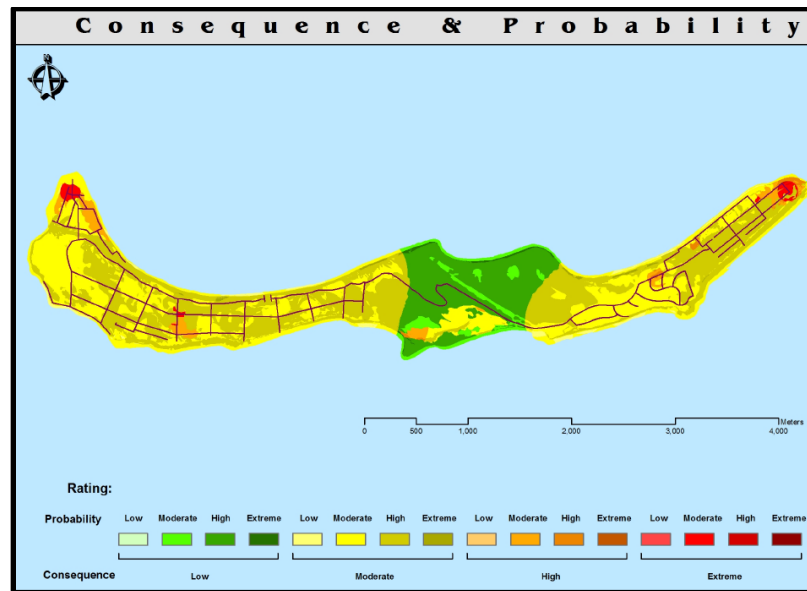
In 2009 the Powell River Regional District had a consultant complete a Community Wildfire Protection Plan for Savary Island. The 2009 study indicated Savary Island has a moderate to high probability of wildfire with moderate to high consequences as shown in Figure 5.1-1.

- The areas of highest probability and consequence are located where the wildland urban interface occurs and fuel types contribute to fire spread, particularly where interface density is higher.
- The co-owned Nature Trust Lands in the centre of the Island have low consequences (unpopulated and young forests) but high probability due to the fuel types located here.
- The areas with high consequence are primarily found where houses and older forest coexist

Figure 5.1-1. from the 2009 study shows that public safety, biodiversity, facilities and structures may be severely impacted by a major wild fire event on the Island.



Figure 5.1-1 Final Overlay of Probability and Consequence from the Wildfire Risk Management System



The Savary Island Volunteer Fire Department has purchased equipment to respond to a wild fire event and encourage residences to FireSmart their property.

5.2. Savary Island Volunteer Fire Department

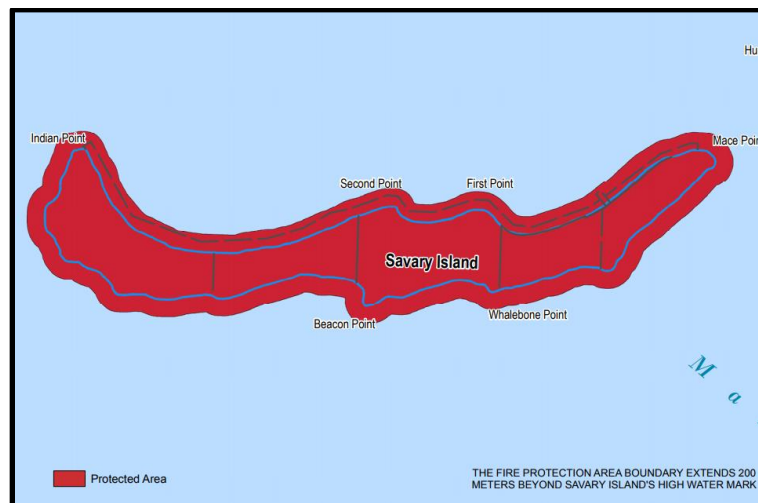
5.2.1. Fire Department Administration

The Savary Island Volunteer Fire Department is administrated by the Powell River Regional District. The fire department is funded by property owners on the island and is based on an established fire protection area bylaw. All the island is serviced by the fire department.

The Savary Island Volunteer Fire Department has a volunteer Fire Chief and volunteer Deputy Fire Chief for the general administration of the fire department. The Fire Chief and Deputy Chief assist with training and record keeping. The SIVFD is an all-volunteer fire department and the majority of personnel are seasonal.

Fire Dispatch service is provided by the North Island 9-1-1 and Campbell River Fire Dispatch. Savary Island Volunteer Fire Department members carry pagers and can respond to 9-1-1 dispatches to anywhere on Savary Island. Figure 5.2-1 shows the fire protection area of Savary Island.

Figure 5.2-1 Savary Island Fire Protection Area



5.2.2. Fire Stations

The Savary Island Volunteer Fire Department operates from three emergency response points. A main fire hall located at mid-island and two satellite halls at the East and West ends of the island.

The Main fire hall is a two storey wood frame structure. The fire hall has two single fire apparatus bays for fire apparatus and a third bay exists and is currently used for equipment storage. On the main floor of the hall has offices and storage. The second floor has meeting/training room, kitchenette and washrooms.

The West and East fire halls each have two single fire apparatus bays for housing fire apparatus. The buildings are simple and specifically built for the storage of the fire apparatus and for members to acquire the fire apparatus to respond as quickly as possible.

5.2.3. Fire Apparatus and Equipment

The Savary Island Volunteer Fire Department has one fire engine, two quick response foam vehicles, one pickup truck for transport of forestry pumps/hose, and one First Responder vehicle for medical emergencies. All vehicles except for the engine are equipped with four-wheel drive because of the various road conditions on the island.

The following fire apparatus and emergency response apparatus are used by the Savary Island Volunteer Fire Department.

Fire Hall	Unit	Year	Vehicle Type	Pump (lgpm)	Tank Imp. Gallon	Manufacturer	Age in 2017
Main	E22	2015	Light Attack	423	900	Ford F550	2
Main	E21	1997	Engine	840	800	GMC	20
East	26	1999	Utility Pick Up	-	-	Ford F250	18
East	E24	2007	Light Attack	160	500	Ford F450	10
West	E25	2008	Light Attack	160	500	Ford F450	9
West	-	2009	Ambulance Response	-	-	Ford F250	8

The Savary Island Volunteer Fire Department maintains inventory sheets for each of its fire apparatus. Inventories have been developed by the fire department to keep track of equipment stored on its fire apparatus.

5.2.4. Staffing

The Savary Island Volunteer Fire Department has a roster of 24 members. Of the 24 members:

- 12 members including the Fire Chief and Deputy Fire Chief are full time members on the island
- 8 seasonal members on the island from end of May until the start of October
- 4 seasonal members on the island from June to September

5.2.5. Training and Level of Service



The Savary Island Volunteer Fire Department has declared an Exterior Level of fire service in accordance with the Structure Firefighters Competency and Training PLAYBOOK of British Columbia.

Training is recorded by the Fire Chief and follows the minimum requirements as outlined for exterior level of service within the Playbook.

The Savary Island Volunteer Fire Department trains once a week for two hours. Additional training may occur on weekends or members may attend training opportunities off or on the island or when provided.

Of the members on the island year-round most members have attained their exterior fire fighter certificate. Members that have not attained the exterior fire fighter certificate are in the process of completing it. Majority of members have completed S-100 (Basic Fire Suppression and Safety).

Some seasonal members of the fire department have completed the exterior fire fighter certificate or are working towards completion certificate. Some seasonal members on the fire department have certification that includes NPFA Level 2 fire fighter.

5.3. Water Supplies for Public Fire Protection Overview

5.3.1. Pressurized Water Distribution Systems

A single pressurized water distribution system exists on Savary Island and is operated by the Savary Shores Improvement District. The Savary Island Volunteer Fire Department and Savary Shores Improvement District have set up storage boxes at each hydrant with a hydrant wrench, forestry hose and instructions. Training occurs with residents that are able to initiate a defense while the fire department is responding with its fire apparatus and volunteers.



Figure 5.3-1 Savary Shores Improvement District Service Area and Hydrants



5.3.2. Alternate Water Supply Points

Alternate water supplies have been developed by the Savary Island Volunteer Fire Department and community as the roads throughout the island may not be adequate for water shuttle operations. Storage tanks of 2,000 to 5,000 Imperial Gallons have been placed throughout the island to improve water availability. The storage tanks are required to be refilled after each use and are equipped with a fire department connection to draft from. Approximately 28 storage tanks have been established. Larger storage tanks are added throughout the island when funding is available and contain 5,000 Imperial Gallons.

Figure 5.3-2 Storage Tanks on Savary Island for Public Fire Protection



5.4. Emergency Communications Overview

Emergency communications for the Savary Island Volunteer Fire Department are provided through North Island 9-1-1 and Campbell River Fire Dispatch.

Landlines through Telus and a single telephone booth exists in the Indian Point area of the island. Cellphone reception is possible on the island but can be sporadic depending on the location.



6. DWELLING PROTECTION GRADE REVIEW

6.1. Dwelling Protection Grade

For a community to achieve a Dwelling Protection Grade a review of the four key items are reviewed for recognition within the Dwelling Protection Grade system. The following items have minimum requirements that a community must be surpass to qualify for insurance grading recognition:

1. Fire Risk Assessment
2. Fire Department
 - a. Organization
 - b. Membership
 - c. Training
 - d. Fire Fighting Apparatus and Fire Station
 - e. Fire Fighting Equipment
3. Alarm Notification
4. Water Supply

6.1.1. Required Fire Flow Assessment

A Required Fire Flow assessment was conducted throughout the Savary Island community to aid in determining the community's fire protection needs and to assist in assessing the adequacy of the Water Supply and Fire Department.

To develop Required Fire Flows on Savary Island, the methodology described in the Fire Underwriters Survey Water Supply for Public Fire Protection, 1999 edition was used. Refer to Appendix B.

Required Fire Flows may be described as the amount and rate of water application required in firefighting to confine and control the fires possible in a building or group of buildings which comprise essentially the same fire area by virtue of immediate exposures. Within the Dwelling Protection Grade system, a typical single-family dwelling of 185 Sq. m (2,000 Sq. ft) with no exposures has a Required Fire Flow of 700 Igpm.

Required Fire Flows were calculated for some of the single-family dwellings on Savary Island to provide an accurate idea of the level of structural fire risk on the island. Required Fire Flows ranged from 700 Igpm to 1,300 Igpm.



6.1.2. Fire Department

6.1.2.1. Organization

For a fire department to qualify for fire insurance grading recognition it must be on a sound permanent basis under applicable local or provincial laws. The fire department's bylaws should outline requirements for services, boundaries of response, provision of funding for the fire department and a formal appointment of an individual to the role of Fire Chief by the involved local government.

The Savary Island Volunteer Fire Department met the requirements for recognition within the Dwelling Protection Grade system.

6.1.2.2. Membership

For a fire department to qualify for fire insurance grading recognition, a fire department must have an active membership which is capable of promptly providing a normal response of a least four trained members to fire alarms. One of the four trained members required to respond to fire alarms can be the Fire Chief. Fire department members should respond from within a reasonable travel distance to the fire station. An auxiliary fire fighter should live and work within 8 km of the fire station to receive full recognition for crediting purposes.

Minimum requirements have been established within the Dwelling Protection Grade system for a fire department and municipality/community to achieve a desired level of recognition. Adequate roster levels for a recognized fire department.

- DPG 1 – On duty: 3 career fire fighters, plus duty fire chief or other officer
- DPG 2 – On duty: 1 career fire fighter, plus 15 auxiliary fire fighters
- DPG 3A – 15 auxiliary fire fighters
- DPG 3B – 15 auxiliary fire fighters
- DPG 4 – 10 minimum auxiliary fire fighters

The Savary Island Volunteer Fire Department has a total fire department roster of 24 members which consists of year-round members and seasonal members. The fire department has a minimum of 12 members year-round to qualify for fire insurance grading recognition. The 12 seasonal members on the fire departments roster cannot be fully credited due to the seasonal nature of their attendance on the

September 2017 - Final



island for fire insurance grading purposes. However, the additional seasonal members aid the fire department in maintaining a response during summer months when full time members may be off the island.

6.1.2.3. Training

A fire department must conduct regular training for all active members to ensure that they can function effectively on the fire ground. A minimum of 48 hours per year is considered the minimum requirement for fire insurance grading recognition. A fire department should have an established training program and a system of record keeping. Training for fire fighters should be commensurate with the level of fire risk in the community. Training should be in accordance with provincial guidelines/requirements or industry standards such as NFPA 1001.

The Savary Island Volunteer Fire Department's training program was reviewed and the amount of training that occurs is adequate for fire insurance grading recognition.

The Powell River Regional District has declared the Savary Island Volunteer Fire Department as an Exterior Operations Fire Service in accordance with the Office of the Fire Commissioner's structural fire fighters Playbook.

A training program has been implemented by the Savary Island Volunteer Fire Department that enables its firefighters to meet the competencies for exterior operations. Training is recorded in a records management system.

The Savary Island Volunteer Fire Department met the requirements for recognition within the Dwelling Protection Grade system for its training of its firefighters.

6.1.2.4. Fire Fighting Apparatus and Fire Station

For a fire department to receive fire insurance grading recognition, a fire department must be able to respond to fire alarms with a self-propelled piece of fire apparatus that is suitably designed and equipped for fire service and complies with:

- Underwriters' Laboratories of Canada (ULC) S515 Automobile Fire Fighting Apparatus, or
- National Fire Protection Association (NFPA) 1901 Standard for Automotive Fire Apparatus



In addition to fire apparatus being suitably designed and equipped, for fire apparatus to receive full credit for fire insurance grading purposes:

- must be stored in a suitably constructed and arranged fire hall, and
- be reasonably maintained.

Within the Dwelling Protection Grade system, the following minimum fire apparatus requirements apply for recognition:

- When a recognized water distribution system with hydrants exists in the fire response area, a minimum of one triple combination engine that is designed and equipped in accordance with CAN-ULC S515 or NFPA 1901 is required.
 - Engine - 625 lgpm (3,000 LPM) pump minimum and 250 l.gal (1,125 L) storage tank minimum
- When no recognized water distribution system with hydrants exists in the fire response area, a minimum of one triple combination engine and one mobile water supply apparatus that are designed and equipped in accordance with CAN-ULC S515 or NFPA 1901 are required. The minimum water carrying capacity between two fire apparatus for recognition is 1,500 l.gal (6,820 L).
 - Engine - 625 lgpm (3,000 LPM) pump minimum and 250 l.gal (1,125 L) storage tank minimum
 - Mobile Water Supply

The Savary Island Volunteer Fire Department was reviewed. Engine 21 that is in service qualifies for recognition within the Dwelling Protection Grade system. The mobile water supply apparatus (E22) may not be designed in full accordance with CAN-ULC S515 or NFPA 1901 but has been designed to meet the unique road conditions of Savary Island to respond effectively. The light attack vehicles at the East and West Halls aid in providing an effective response in combination with E21 and E22. Many secondary roadways on the island may not allow great access for the engine so the light attack vehicles are in first and then supported by the engine and storage tanks.

The three fire stations on Savary Island are well maintained and are commensurate with the level of fire risk on the island. The fire stations are adequate for fire insurance grading purposes.

The fire station and fire apparatus met the minimum requirements for fire insurance grading recognition within the Dwelling Protection Grade system.



Engine 21 is at 20 years in age. The maximum age for recognition for fire insurance grading purposes is 20 years as per the document in Appendix C, Insurance Grading Recognition of Used or Rebuilt Apparatus.

Fire Departments can submit an application to FUS to extend the credit of a fire apparatus for fire insurance grading purposes. To ensure credit is maintained for fire insurance grading purposes the Powell River Regional District and Savary Island Volunteer Fire Department should submit an application to extend the creditable life of the fire apparatus to 25 years. Within Appendix D an Apparatus Extension Form (AX4) is attached and should be reviewed. The form should be completed and submitted with an application request for a credit extension for fire insurance grading purposes.

6.1.2.5. Fire Apparatus Equipment

For a fire department to qualify for fire insurance grading recognition a sufficient amount of equipment on fire apparatus and personal protective clothing and equipment is required for fire fighters to be able to safely perform duties on the fire ground.

To qualify for fire insurance grading recognition fire apparatus should be equipped with at least the minimum equipment listed in:

- Underwriters' Laboratories of Canada (ULC) S515 Automobile Fire Fighting Apparatus, or
- National Fire Protection Association (NFPA) 1901 Standard for Automotive Fire Apparatus

Equipment includes, but is not limited to ground ladders, hose, self-contained breathing apparatus, rope, cutters, fire extinguishers, nozzles, first aid equipment, wrenches, generators, salvage tarps, etc.

The equipment inventory sheets were reviewed for the fire apparatus in service by the Savary Island Volunteer Fire Department. The Savary Island Volunteer Fire Department had a sufficient amount of equipment for fire insurance grading recognition within the Dwelling Protection Grade system.

6.1.3. Alarm Notification System

For a fire department and a municipality/community to receive recognition for fire insurance grading purposes an adequate and reliable means of receiving alarms of fire and dispatching fire fighters is necessary (ex. public fire number, pagers etc.). There must be a reliable means of receipt of fire alarms and the immediate notification of fire fighters required to respond to these fire alarms, 24 hours/day, 365 days/year.



The alarm notification system in place through North Island 9-1-1 and Campbell River Fire Dispatch is adequate and surpasses the minimum requirements within the Dwelling Protection Grade system for recognition.

6.1.4. Water Supply

For a water distribution system to receive recognition for fire insurance grading purposes must be able to deliver adequate water control major fires throughout the municipality/community on a reliable basis via sufficient and suitable hydrants. Water supplies for public or private protection should be designed in accordance with the Water Supply for Public Fire Protection.

The minimum requirement for recognition as indicated in the Water Supply for Public Fire Protection is that a water distribution system must be capable of delivering not less than 1,000 LPM (200 Igpm) for two hours or 2,000 LPM (400 Igpm) for one hour in addition to any domestic consumption at the maximum daily rate.

The Savary Shores Improvement District was reviewed by FUS during the project and the water distribution system qualified for fire insurance grading recognition as being designed in accordance with the Water Supply for Public Fire Protection.

As the scope of the project did not include an in-depth narrative summary of the water distribution system no additional comments are provided in the report. However, the Savary Shores Improvement District has been informed to inform FUS of any improvements or decreases in the level of public fire protection to ensure fire insurance grading recognition can be maintained for the water distribution system.

The storage tanks do not qualify for recognition as alternative water supply sources as the storage amount in a single tank is below 24,000 Imperial Gallons. However, the amount of storage tanks and position of them throughout the island may aid the fire department in providing Superior Tanker Shuttle Service if a system could be developed to draft and shuttle from to maintain a continuous fire flow.



6.2. DPG - Fire Insurance Grading Summary

Fire Underwriters Survey's evaluation of Savary Island has determined a Dwelling Protection Grade 4 (limited protection) is achieved for the whole island. The following table summarizes the review. The minimum requirement for the Dwelling Protection Grade system is provided in Appendix A.

An update to the Public Fire Protection Classification of Savary Island occurred. Improvement occurred since the previous assessment. Based on the recognition of the Savary Island Volunteer Fire Department and the Savary Shores Improvement District's water distribution system a PFPC 8 was achieved in that area of Savary Island and a PFPC 9 for areas not within 150 m of hose lay of a recognized hydrant.



Table 6.2-1 Dwelling Protection Grade Summary

Required for Dwelling Protection Grade System		Requirement Met?
Organization	Meet the requirements for organization under the authority of the Municipal Government Act. It should establish requirements for the establishment of boundaries, provision of funding and for the formal appointment of a fire chief by the involved local government body.	Yes - Savary Island has established a bylaw for fire protection services
Membership	Adequate roster levels for a recognized fire department. Fire department members should respond from within a reasonable travel distance to the fire station. An auxiliary fire fighter should live and work within 8 km of the fire station. DPG 1 – On duty: 3 career fire fighters, plus duty fire chief or other officer DPG 2 – On duty: 1 career fire fighter, plus 15 auxiliary fire fighters DPG 3A – 15 auxiliary fire fighters credit DPG 4 – 15 or 10 minimum auxiliary fire fighters credit	Yes – 12 trained members on the island year-round
Training System	Meet minimum training levels including required frequency of training and maintenance of training records. NFPA 1001 - Fire Fighter Level 1 or equivalent.;	Yes
Fire Fighting Apparatus	Meet minimum apparatus standards and requirements. NFPA 1901 or ULC S515 listed apparatus.	Yes
Fire apparatus equipment	Outline minimum equipment requirements pursuant to local needs and operating conditions.	Yes
Fire Station	Provide a well-designed and located fire station to serve the department and the community, and house apparatus.	Yes
Alarm Notification System	Provide a reliable means of receipt of alarms and the immediate notification of fire fighters required to respond to these alarms, 24 hours/day, 365 days/year.	Yes
Water Supply	Require that a fire department has an adequate water supply for fire suppression purposes. Provide hydrant water supply designed in accordance with FUS Water Supply for Public Fire Protection.	Yes Recognized water system



7. FIRE INSURANCE GRADING CLASSIFICATION POTENTIAL REASSIGNMENT

7.1. Fire Insurance Grading Reassignment

Savary Island has been reviewed for fire insurance grading purposes. A review of the Public Fire Protection Classification occurred as part of the review but is not included in the analysis as the report pertains specifically to review of the requirements within the Dwelling Protection Grade system.

Table 7.1-1 Savary Island Fire Insurance Grading Classifications - DPG

SUB DISTRICT(S) and (contract protection areas)	DPG previous	DPG 2017	COMMENTS
Savary Island	5	4	Limited Protection – Personal Lines insured dwelling within 300 m of a fire hydrant on the Savary Shores Improvement District water distribution system and within 8 km in road travel distance of a Savary Island Fire Station
	5	4	Limited Protection – Personal Lines insured dwelling within not within 300 m of a fire hydrant on a recognized water system but within 8 km in road travel distance of a Savary Island Fire Station

Table 7.1-2 Savary Island Fire Insurance Grading Classifications - PFPC

SUB DISTRICT(S) and (contract protection areas)	PFPC previous	PFPC 2017	COMMENTS
Savary Island	10	8	Limited Protection – Commercial Lines insured properties within 150 m of a fire hydrant on the Savary Shores Improvement District water distribution system and within 5 km in road travel distance of a Savary Island Fire Station
	10	9	Limited Protection – Commercial Lines insured properties not within 150 m of a fire hydrant on a recognized water system but within 5 km in road travel distance of a Savary Island Fire Station



8. MAINTENANCE OF RECOGNITION AND FUTURE PLANNING

8.1. Maintain Fire Insurance Grading Recognition

The most difficult item viewed within the Dwelling Protection Grade system for Savary Island to maintain fire insurance grading recognition is the roster requirements. Previous FUS assessments have indicated that year-round availability of trained members on the fire department withheld granting recognition. The roster of the fire department has improved and to maintain recognition the roster should not drop below 10 trained members on the roster year-round.

Engine 21 in service is 20 years in age. It will be due for replacement if the fire department desires to maintain recognition within the Dwelling Protection Grade system. Credit can be extended up to a maximum of 30 years. However, to grant recognition up to 25 years and then to 30 years the fire department is required to submit an application to request an extension of credit and show FUS yearly through service tests that the fire apparatus is reliable and adequate.

Training of members and record keeping should be maintained and continually developed by the Savary Island Volunteer Fire Department with assistance from the Powell River Regional District. As the fire service continues to develop, the Fire Chief and Powell River Regional District should review the Office of the Fire Commissioners Playbook periodically and assess if training levels and the declaration level should be upgraded to improve the services provided to residents.

8.2. Future Planning

If the community desired to further improve its fire insurance grades to achieve a Dwelling Protection Grade 3A for the Savary Shores community, a minimum of 15 trained members on the roster year-round are required.

If the Savary Island Volunteer Fire Department desired to attain a Dwelling Protection Grade 3B a minimum of 15 trained members on the roster year-round are required. Once DPG is achieved the fire department may want to look into attempting Superior Tanker Shuttle Service (STSS) accreditation. Details regarding the requirements for STSS accreditation are provided in Appendix E.



To aid in the reduction of a structural fire spreading from one building to an adjacent building and to forested areas of the island, the Savary Island Volunteer Fire Department and the Powell River Regional District should review and determine if an update is warranted to the 2009 Community Wildfire Protection Plan for Savary Island. FireSmart measures with residences should be further encouraged to reduce the severity of wild fire negatively impacting the community on Savary Island.



Appendix A – Dwelling Protection Grade Summary of Basic Requirements





Dwelling Protection Grade Summary of Basic Requirements per Fire Stationⁱ

DWELLING PROTECTION GRADE	WATER WORKS SYSTEM	FIRE DEPARTMENT		CORRELATION WITH PFPC ⁱⁱ Public Fire Protection Classification
		EQUIPMENT	FIREFIGHTERS ⁱⁱⁱ	
1	Water supply system designed in accordance with Fire Underwriters Survey standard "Water Supply for Public Fire Protection" with a relative classification of 5 or better	Response from within 8 km by road of a triple combination pumper	Minimum Response: - On-duty: 3 career fire fighters, plus - Off-duty: fire chief or other officer	Water Supply and Fire Department must grade PFPC Relative Class 5 or better
2	Water supply system designed in accordance with Fire Underwriters Survey standard "Water Supply for Public Fire Protection" with a relative classification of 6 or better	Response from within 8 km by road of a triple combination pumper	Minimum Response: - On-duty: 1 career fire fighters, plus - On-call: 15 auxiliary fire fighters	Water Supply and Fire Department must grade PFPC Relative Class 6 or better
3A	Water supply system designed in accordance with, and meeting the minimum requirements of, Fire Underwriters Survey standard "Water Supply for Public Fire Protection"	Response from within 8 km by road of a triple combination pumper	15 auxiliary fire fighters	No Public Fire Protection Classification required
3B	Not required – however fire department must have adequate equipment, training and access to approved water supplies to deliver standard shuttle service in accordance with NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting	2 units required. Triple combination pumper <u>plus</u> a mobile water supply with a combined water carrying capacity of not less than 6,820 L (1,500 IG)	15 auxiliary fire fighters	No Public Fire Protection Classification required
4 ³	Not required – however fire department must have adequate equipment, training and access to approved water supplies to deliver shuttle service in accordance with NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting	2 units required. Triple combination pumper <u>plus</u> a mobile water supply with a combined water carrying capacity of not less than 6,820 L (1,500 IG)	15 auxiliary fire fighters	No Public Fire Protection Classification required
5	Unprotected communities or communities not qualifying for Grades 1, 2, 3A, 3B, or 4 above	Unprotected communities or communities not qualifying for Grades 1, 2, 3A, 3B, or 4 above	Unprotected communities or communities not qualifying for Grades 1, 2, 3A, 3B, or 4 above	No Public Fire Protection Classification required



ⁱ Refer to additional notes and requirements for interpretation

ⁱⁱ The P.F.P.C. is a sophisticated municipal fire protection grading system utilized for Commercial Lines insurance. PFPC fire insurance grades are scaled from 1 to 10. One (1) represents a high level of fire protection and 10 indicates little or no recognized fire protection. This system evaluates the ability of a community's fire defences to prevent and control major fires that may occur in commercial, industrial and institutional buildings and/or districts.

ⁱⁱⁱ Requirements for Dwelling Protection Grade 4 are the same as for Dwelling Protection Grade 3B, however in some cases, an allowance may be considered for Dwelling Protection Grade 4 where all of the criteria for Dwelling Protection Grade 3B have been met with one exception. If more than one criteria has not been met (ex. less than 15 auxiliary fire fighters and a single pumper apparatus) Dwelling Protection Grade 5 is applied.

Where Dwelling Protection Grade 4 is applied, a signed letter of intent from the community is to be sent to Fire Underwriters Survey indicating that improvements will be made, within an agreed timeframe, to meet the criteria of Dwelling Protection Grade 3B.

It is important to note that the absolute minimum number of auxiliary fire fighters considered within the fire insurance grading is 10 and that maximum age of apparatus that can be considered is 30.

Appendix B – Fire Underwriters Survey – 1999 – Water Supply for Public Fire Protection



**WATER SUPPLY
FOR
PUBLIC FIRE PROTECTION**

1999



FIRE UNDERWRITERS SURVEY

A SERVICE TO INSURERS AND MUNICIPALITIES

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TABLE OF CONTENTS

PREFACE	5
PART I	6
GENERAL	6
ADEQUACY AND RELIABILITY.	6
STORAGE.	6
PRESSURE.	7
SUPPLY WORKS	7
NORMAL ADEQUACY OF SUPPLY WORKS.	7
RELIABILITY OF SOURCE OF SUPPLY.	7
GRAVITY SYSTEMS.	8
PUMPING	9
RELIABILITY OF PUMPING CAPACITY.	9
POWER SUPPLY FOR PUMPS.	9
FUEL SUPPLY.	10
BUILDINGS AND PLANT	10
BUILDINGS AND STRUCTURES.	10
MISCELLANEOUS SYSTEM COMPONENTS, PIPING AND EQUIPMENT.	10
OPERATIONS.	11
EMERGENCY SERVICES.	11
PIPING	12
RELIABILITY OF SUPPLY MAINS.	12
INSTALLATION OF PIPE.	12
VALVES.	13
HYDRANTS	14
SIZE, TYPE AND INSTALLATION.	14
INSPECTION AND CONDITION.	14
HYDRANT DISTRIBUTION.	14
RECORDS	15
PLANS AND RECORDS.	15
TABLES	16
PART II	17
GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOW COPYRIGHT I.S.O.	17
Notes to Calculation	19
OUTLINE OF PROCEDURE	20
APPENDIX	21
TYPES OF CONSTRUCTION	21
OCCUPANCIES	21
EXPOSURES	23
CONVERSION FACTORS	24

WATER SUPPLY FOR PUBLIC FIRE PROTECTION

PREFACE

This guide summarizes the more significant recommendations of Fire Underwriters Survey with respect to fire protection requirements in municipal water works system design. It reflects the manner in which FUS assesses the water supply aspect of a municipality's fire risk potential during surveys on behalf of the Canadian property insurance industry and represents the accumulated experience of many years of study of actual fires. Water supply is one of a number of components evaluated by FUS in the municipal fire protection system. Recommendations applying to the fire departments and code enforcement are covered in other publications of Fire Underwriters Survey. FUS local offices are prepared to assist municipal officials or their consultants with advice on special problems, as time limits permit, in accordance with the intent of this guide. The minimum size water supply credited by FUS must be capable of delivering not less than 1000 L/min for two hours or 2000 L/min for one hour in addition to any domestic consumption at the maximum daily rate. Static suction supplies to fire department pumpers are recognized as a supplement to the piped system.

In the FUS assessment of a water supply system, the major emphasis is placed upon its ability to deliver **adequate** water to control major fires throughout the municipality on a **reliable** basis via sufficient and suitable **hydrants**. What is ultimately available to the fire department is the critical test in this fire protection evaluation.

Rates of flow for firefighting purposes are expressed in litres per minute as this is the adopted unit for the firefighting field.

In this edition all quantities are specified in S.I. units.

PART I

GENERAL

ADEQUACY AND RELIABILITY. An adequate and reliable water supply for firefighting is an essential part of the fire protection system of a municipality. This is normally a piped system in common with domestic potable water service for the community.

A water supply system is considered to be fully adequate if it can deliver the necessary fire flow at any point in the distribution gridiron for the applicable time period specified in the table "Required Duration of Fire Flow" with the consumption at the maximum daily rate (average rate on maximum say of a normal year). When this delivery is also possible under certain emergency or unusual conditions as herein specified, the system is considered to be reliable. In cities of population in excess of 250,000 (or smaller places with high fire incident and severe hazard conditions) it is usually necessary to consider the possibility of two simultaneous major fires in the area served by the system.

Fire flows are amounts of water necessary to control fires. These are determined as shown in Part II. System design should contemplate meeting the required fire flows existing or probable with the possible exception of gross anomalies where there is no fire threat to the remainder of the community. In these cases, the properties should preferably be modified in hazard to reduce the required flow as part of a coordinated community fire protection system.

The protection of buildings by automatic sprinkler systems is a significant contribution to the fire protection of the community and should be encouraged, not penalized by onerous service charges or metering requirements.

In order to provide reliability, duplication of some or all parts of the system will be necessary, the need for duplication being dependent upon the extent to which the various parts may reasonably be expected to be out of service as a result of maintenance and repair work, an emergency or some unusual condition. The introduction of storage, either as part of the supply works or on the distribution system, may partially or completely offset the need for duplicating various parts of the system, the value of the storage depending upon its amount, location and availability.

STORAGE. In general, storage reduces the requirements of those parts of the system through which supply has already passed. Since storage usually fluctuates, the normal daily minimum maintained is the amount that should be considered as available for fires. Because of the decrease in pressure when water is drawn down in standpipes, only the portion of this normal daily minimum storage that can be delivered at a residual pressure of 150kPa at the point of use is considered as available. As well as the quantity available, the rate of delivery of water to the system from storage for the fire flow period is critical to this consideration.

PRESSURE. The principal requirement to be considered is the ability to deliver water in sufficient quantity to permit fire department pumpers to obtain an adequate supply from hydrants. To overcome friction loss in the hydrant branch, hydrant and suction hose, a minimum residual water pressure of 150 kPa in the street main is required during flow. Under conditions of exceptionally low suction losses, a lower residual may be possible. This includes the use of 100 mm and larger outlets for fire department pumper use and hydrants with large waterways.

Higher sustained pressure is of importance in permitting direct continuous supply to automatic sprinkler systems, to building standpipe and hose systems, and in maintaining a water plan so that no portion of the protection area is without water, such as during a fire at another location. Residual pressures that exceed 500 kPa during large flows are of value as they permit short hose-lines to be operated directly from hydrants without supplementary pumping.

SUPPLY WORKS

NORMAL ADEQUACY OF SUPPLY WORKS. The source of supply, including impounding reservoirs, and each part of the supply works should normally be able to maintain the maximum daily consumption rate plus the maximum required fire flow. Each distribution service within the system should similarly support its own requirements. In large cities where fire frequency may result in simultaneous fires, additional flow must be considered in accordance with the potential. Filters may be considered as capable of operating at a reasonable overload capacity based upon records and experience. In general, overload capacity will not exceed 25 percent, but may be higher in well designed plans operating under favourable conditions.

The absolute minimum supply available under extreme dry weather conditions should not be taken as the measure of the normal ability of the source of supply such as supply from wells. The normal or average capacity of wells during the most favourable nine month period should be considered, or the normal sustained flow of surface supplies to the source.

RELIABILITY OF SOURCE OF SUPPLY. The effect on adequacy must be considered for such factors as frequency, severity and duration of droughts, physical condition of dams and intakes; danger from earthquakes, floods, forest fires, and ice dams or other ice formations; silting-up or shifting of channels; possibility of accidental contamination of watershed or source; absence of watchmen or electronic supervision where needed; and injury by physical means. Where there is a risk of disruption, special precautions or alternate supplies should be arranged.

Where the supply is from wells, some consideration should be given to the absolute minimum capacity of the wells under the most unfavourable conditions; also to the length of time that the supply from the wells would be below the maximum daily consumption rate, and the likelihood of this condition recurring every year or only at infrequent intervals. It should be recognized that some water is generally available from wells and that the most extreme conditions are not as serious as a total interruption of the supply, as would be the case in the breaking of a dam or shifting of a channel. The possibility of clogging, salinity, and the need for periodic cleaning and overhauling must be considered. Dependence upon a single well, even where records are favourable, may be considered a feature of unreliability.

Frequent cleaning of reservoirs and storage tanks may be considered as affecting reliability.

Continuity of, and delay in implementing water supplies obtained from systems or sources not under the control of the municipality or utility should be considered also from these aspects.

GRAVITY SYSTEMS. A gravity system delivering supply from the source to distribution directly without the use of pumps is advantageous from a fire protection point of view because of its inherent reliability, but a pumping system can also be developed to a high degree of reliability.

PUMPING

RELIABILITY OF PUMPING CAPACITY. Pumping capacity, where the system or service is supplied by pumps, should be sufficient, in conjunction with storage when the two most important pumps are out of service, to maintain the maximum daily consumption rate plus the maximum required fire flow at required pressure for the required duration. For smaller municipalities (usually up to about 25,000 population) the relative infrequency of fires is assumed as largely offsetting the probability of a serious fire occurring at times when two pumps are out of service. (The most important pump is normally, but not always, the one of largest capacity, depending upon how vital is its contribution to maintaining flow to the distribution system.)

To be adequate, remaining pumps in conjunction with storage, should be able to provide required fire flows for the specified durations at any time during a period of five days with consumption at the maximum daily rate. Effect of normal minimum capacity of elevated storage located on the distribution system and storage of treated water above low lift pumps should be considered. The rate of flow from such storage must be considered in terms of any limitation of water main capacity. The availability of spare pumps or prime movers that can quickly be installed may be credited, as may pumps of compatible characteristics which may be valved from another service.

POWER SUPPLY FOR PUMPS. Electric power supply to pumps should be so arranged that a failure in any power line or the repair or replacement of a transformer, switch, control unit or other device will not prevent the delivery, in conjunction with elevated storage, of required fire flows for the required durations at any time during a period of two days with consumption at the maximum daily rate.

Power lines should be underground from the station or substation of the power utility to water plants and pumping stations and have no other consumers enroute. The use of the same transmission lines by other consumers introduces unreliability because of the possibility of interruption of power or deterioration of power characteristics.

Overhead power lines are more susceptible to damage and interruption than underground lines and introduce a degree of un-reliability that depends upon their location and construction. In connections with overhead lines, consideration should be given to the number and duration of lightning, wind, sleet, and snow storms in the area; the type of poles or towers and wires; the nature of the country traversed; the effect of earthquakes, forest fires, and floods; the lightning and surge protection provided; the extent to which the system is dependent upon overhead lines; and the ease of, and facilities for, repairs.

The possibility of power systems or network failures affecting large areas should be considered. In-plant auxiliary power or internal combustion driver standby pumping are appropriate solutions to these problems in many cases, particularly in small plants where high pumping capacity is required for fire protection service. When using automatic starting, prime 'movers' for auxiliary power supply and pumping should have controllers listed by Underwriters' Laboratories of Canada to establish their reliability.

FUEL SUPPLY. At least a five day supply of fuel for internal combustion engines or boilers used for regular domestic supply should be provided. Where long hauls, condition of roads, climatic conditions, or other circumstances could cause interruptions of delivery longer than five days, a greater storage should be provided. Gas supply should be from two independent sources or from duplicate gas-producer plants with gas storage sufficient for 24 hours. Unreliability of regular fuel supply may be offset in whole or in part by suitable provisions for the use of an alternate fuel or power supply.

BUILDINGS AND PLANT

BUILDINGS AND STRUCTURES. Pumping stations, treatment plants, control centres and other important structures should be located, constructed, arranged, and protected so that damage by fire, flooding, or other causes will be held to a minimum. They should contain no combustible material in their construction, and, if hazards are created by equipment or materials located within the same structure, the hazardous section should be suitably separated by fire-resistive partitions or fire walls.

Buildings and structures should have no fire exposures. If exposures exist, suitable protection should be provided. Electrical wiring and equipment should be installed in accordance with the Canadian Electrical Code. All internal hazards should be properly safeguarded in accordance with good practice. Private in-plant fire protection should be provided as needed.

MISCELLANEOUS SYSTEM COMPONENTS, PIPING AND EQUIPMENT. Steam piping, boiler-feed lines, fuel-piping (gas or oil lines to boilers as well as gas, oil or gasoline lines to internal-combustion engines), and air lines to wells or control systems should be so arranged that a failure in any line or the repair or replacement of a valve, fuel pump, boiler-feed pump, injector, or other necessary device, will not prevent the delivery, in conjunction with storage, of the required fire flows for the specified duration at any time during a period of two days with consumption at the maximum daily rate.

Plants should be well arranged to provide for effective operation. Among the features to be considered are: ease of making repairs and facilities for this work, danger of flooding because of broken piping; susceptibility to damage by spray; reliability of priming and chlorination equipment; lack of semi-annual inspection of boilers or other pressure vessels; dependence upon common non-sectionalized electric bus bars; poor arrangement of piping; poor condition or lack of regular inspections of important valves; and factors affecting the operation of valves or other devices necessary for fire service such as design, operation, and maintenance of pressure regulating valves, altitude valves, air valves, and other special valves or control devices, provision of power drives, location of controls, and susceptibility to damage.

Reliability of treatment works is likely to be influenced by the removal from service of at least one filter or other treatment unit; the reduction of filter capacity by turbidity, freezing or other conditions of the water; the need for cleaning basins; and the dependability of power for operating valves, wash-water pumps, mixers and other appurtenances.

OPERATIONS. Reliability in operation of the supply system and adequate response to emergency or fire demands are essential. Instrumentation, controls and automatic features should be arranged with this in mind. Failure of an automatic system to maintain normal conditions or to meet unusual demands should result in the sounding of an alarm where remedial action will be taken.

The operating force should be competent, adequate, and continuously available as may be required to maintain both the domestic and fire services.

EMERGENCY SERVICES. Emergency crews, provided with suitable transportation, tools and equipment, should be continuously on duty in the larger systems and be readily available upon call in small systems. Spare pipe and fittings, and construction equipment should be readily available. Alarms for fires in buildings should be received by the utility at a suitable location where someone is always on duty who can take appropriate action as required, such as placing additional equipment in operation, operating emergency or special valves, or adjusting pressures. Receipt of alarms may be by fire alarm circuit, radio, outside alerting device, or telephone, but where special operations are required, the alarm service should be equivalent to that needed for a fire station.

Response of an emergency crew should be made to major fires to assist the fire department in making the most efficient use of the water system and to ensure the best possible service in the event of a water main break or other emergency. The increase of pressures by more than 25 percent for fires is considered to increase the possibility of breaks.

PIPING

RELIABILITY OF SUPPLY MAINS. Supply mains cut off for repair should not drastically reduce the flow available to any district. This includes all pipe lines or conduits on which supply to the distribution system is dependent, including intakes, suction or gravity lines to pumping stations, flow lines from reservoirs, treatment plant piping, force mains, supply and arterial mains, etc. Consideration should be given to the greatest effect that a break, joint separation or other failure could have on the delivery of the maximum daily consumption rate plus required fire flow at required pressure over a three day period. Aqueducts, tunnels or conduits of substantial construction may be considered as less susceptible to failure and equivalent to good mains with a long history of reliability.

INSTALLATION OF PIPE. Mains should be in good condition and properly installed. Pipe should be suitable for the service intended. Asbestos-cement, poly-vinyl chloride (PVC), cast and ductile iron, reinforced concrete and steel pipe manufactured in accordance with appropriate Canadian Standards Association or ANSI/AWWA standards, or any pipes listed by Underwriters' Laboratories of Canada for fire service are considered satisfactory. Normally, pipe rated for a maximum working pressure of 1000 kPa is required. Service records, including the frequency and nature of leaks, breaks, joint separations, other failures and repairs, and general conditions should be considered as indicators of reliability. When mains are cleaned they should be lined.

Mains should be so laid as not to endanger one another, and special construction should be provided to prevent their failure at stream crossings, railroad crossings, bridges, and other points where required by physical conditions; supply mains should be valved at one and one half kilometre intervals and should be equipped with air valves at high points and blow offs at low points. Mains should not be buried extremely deep or be unusually difficult to repair, though depths to ten feet may be required because of frost conditions.

The general arrangement of important valves, of standard or special fittings, and of connections at cross-overs, intersections, and reservoirs, as well as at discharge and suction headers, should be considered with respect to the time required to isolate breaks. The need for check valves on supply or force mains and for other arrangements to prevent flooding of stations or emptying of reservoirs at the time of a break in a main should also be considered, as well as the need for relief valves or surge chambers. Accessibility of suitable material and equipment and ease of making repairs should be considered.

Arterial feeder mains should provide looping throughout the system for mutual support and reliability, preferably not more than 1000 metres between mains. Dependence of a large area on a single main is a weakness. In general the gridiron of minor distributors supplying residential districts should consist of mains at least 150mm in size and arranged so that the lengths on the long sides of blocks between intersecting mains do not exceed 200 metres. Where longer lengths of 150mm pipe are necessary 200mm or larger intersecting mains should be used. Where initial pressures are unusually high, a satisfactory gridiron may be obtained with longer lengths of 150mm pipe between intersecting mains.

Where deadends and a poor gridiron are likely to exist for a considerable period or where the layout of the streets and the topography are not well adapted to the above arrangement, 200mm pipe should be used. Both the ability to meet the required fire flows and reliability of a reasonable supply by alternate routing must be taken into account in this consideration.

VALVES. A sufficient number of valves should be installed so that a break or other failure will not affect more than 400 metres of arterial mains, 150 metres of mains in commercial districts, or 250 metres of mains in residential districts. Valves should be maintained in good operating condition. The recommended inspection frequency is once a year, and more frequently for larger valves and valves for critical applications.

A valve repair that would result in reduction of supply is a liability, but because of the probable infrequency of occurrence, it might be considered as introducing only a moderate degree of unreliability even if it resulted in total interruption. The repair of a valve normally should be accomplished in two days. Valves opening opposite to the majority are undesirable and when they do occur they should be clearly identified.

HYDRANTS

SIZE, TYPE AND INSTALLATION. Hydrants should conform to American Water Works Standard for Dry Barrel Fire Hydrants or Underwriters' Laboratories of Canada listing. Hydrants should have at least two 65mm outlets. Where required fire flows exceed 5000 l/min or pressures are low there should also be a large pumper outlet. The lateral street connection should not be less than 150mm in diameter. Hose threads, operating and cap nuts on outlets should conform to Provincial Standard dimensions. A valve should be provided on lateral connections between hydrants and street mains.

Hydrants that open in a direction opposite to that of the majority are considered unsatisfactory. Flush hydrants are considered undesirable because of delay in getting into operation; this delay is more serious in areas subject to heavy snow storms. Cisterns are considered unsatisfactory as an alternative to pressure hydrants. The number and spacing of hydrants should be as indicated in the table titled "Standard Hydrant Distribution".

INSPECTION AND CONDITION. Hydrants should be inspected at least semi-annually and after use. The inspection should include operation at least once a year. Where freezing temperatures occur, the semi-annual inspections should be made in the spring and fall of each year. Because of the possibility of freezing they should be checked frequently during extended periods of severe cold. Hydrants should be kept in good condition and suitable records of inspections and repairs be maintained. Hydrants should be painted in highly visible colours so that they are conspicuous and be situated with outlets at least twelve inches above the grade. There should be no obstruction that could interfere with their operation. Snow should be cleared promptly after storms and ice and snow accumulations removed as necessary.

HYDRANT DISTRIBUTION. Hydrant locations and spacing should be convenient for fire department use. Hydrants should be located at intersections, in the middle of long blocks and at the end of long dead-end streets. To allow for convenient utilization of water supplies, distribution density of hydrants should be in accordance with the required fire flows indicated in the table titled "Standard Hydrant Distribution" (page 16). The maximum recommended spacing of hydrants in commercial, industrial, institutional and multi-family residential areas is 90 metres; in single family residential areas 180 metres is recommended. In areas where fire apparatus have access (e.g. large properties, private developments, etc.), hydrants should be required by bylaw. The planning of hydrant locations should be a cooperative effort between the water utility and fire department.

RECORDS

PLANS AND RECORDS. Complete, up-to-date plans and records essential for the proper operation and maintenance of the system should be available in a convenient form, suitably indexed and safely filed. These should include plans of the source as well as records of its yield and a reliable estimate of the safe yield; plans of the supply works including dams, intakes, wells, pipelines, treatment plants, pumping stations, storage reservoirs and tanks; and a map of the distribution system showing mains, valves, and hydrants. Plans and maps should be in duplicate and stored at different locations.

Detailed distribution system plans, in a form suitable for field use, should be available for maintenance crews. Records of consumption, pressures, storage levels, pipes, valves, hydrants, and of the operations of the supply works and distribution system, including valve and hydrant inspections and repairs should be maintained.

TABLES

STANDARD HYDRANT DISTRIBUTION		REQUIRED DURATION OF FIRE FLOW	
Fire Flow Required (litres per minute)	Average Area per Hydrant (m ²)	Fire Flow Required (litres per minute)	Duration (hours)
2,000	16,000	2,000 or less	1.0
4,000	15,000	3,000	1.25
6,000	14,000	4, 000	1.5
8,000	13,000	5,000	1.75
10,000	12,000	6,000	2.0
		8000	2.0
12,000	11,000	10,000	2.0
14,000	10,000	12,000	2.5
16,000	9,500	14,000	3.0
18,000	9,000	16,000	3.5
20,000	8,500	18,000	4.0
		20000	4.5
22,000	8,000	22,000	5.0
24,000	7,500	24,000	5.5
26,000	7,000	26,000	6.0
28,000	6,500	28,000	6.5
30,000	6,000	30,000	7.0
		32000	7.5
32,000	5,500	34,000	8.0
34,000	5,250	36,000	8.5
36,000	5,000	38,000	9.0
38,000	4,750	40,000 and over	9.5
40,000	4,500		
42,000	4,250		
44,000	4,000		
46,000	3,750		
48,000	3,500		

Interpolate for intermediate figures

Area refers to surface area of blocks and bounding streets. For a street without adjacent streets, a depth of one-half block is used.

A water supply system is considered to be adequate for fire protection when it can supply water as indicated above with consumption at the maximum daily rate. Certain types of emergency supplies may be included where reasonable conditions for their immediate use exist. Storage on the system is credited on the basis of the normal daily minimum maintained insofar as pressure permits its delivery at the rate considered.

PART II

GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOW COPYRIGHT I.S.O.

N.B. It should be recognized that this is a "guide" in the true sense of the word, and requires a certain amount of knowledge and experience in fire protection engineering for its effective application. Its primary purpose is for the use of surveyors experienced in this field, but it is made available to municipal officials, consulting engineers and others interested as an aid in estimating fire flow requirements for municipal fire protection.

Required Fire Flow may be described as the amount and rate of water application required in firefighting to confine and control the fires possible in a building or group of buildings which comprise essentially the same fire area by virtue of immediate exposure. This may include as much as a city block.

1. An estimate of the fire flow required for a given area may be determined by the formula:

$$F = 220C\sqrt{A}$$

where

- F = the required fire flow in litres per minute.
C = coefficient related to the type of construction.
= 1.5 for wood frame construction (structure essentially all combustible).
= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior).
= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls).
= 0.6 for fire-resistive construction (fully protected frame, floors, roof).

Note: For types of construction that do not fall within the categories given, coefficients shall not be greater than 1.5 nor less than 0.6 and may be determined by interpolation between consecutive construction types as listed above. Construction types are defined in the Appendix.

A = The total floor area in square metres (including all storeys, but excluding basements at least 50 percent below grade) in the building being considered.

For fire-resistive buildings, consider the two largest adjoining floors plus 50 percent of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25 percent of each of the two immediately adjoining floors.

For one family and two family dwellings not exceeding two storeys in height, see **Note J**.

2. The value obtained in No. 1 may be reduced by as much as 25% for occupancies having a low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard. Those may be classified as to contents as follows:

Non-Combustible	-25%	Free Burning	+15%
Limited Combustible	-15%	Rapid Burning	+25%
Combustible	No Charge		

As guide for determining low or high fire hazard occupancies, see the list in the Appendix. The fire flow determined shall not be less than 2,000 L/min,

3. The value obtained in No.2 above may be reduced by up to 50% for complete automatic sprinkler protection depending upon adequacy of the system. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards. Additional credit of up to 10% may be granted if the water supply is standard for both the system and fire department hose lines required. The percentage reduction made for an automatic sprinkler system will depend upon the extent to which the system is judged to reduce the possibility of fires spreading within and beyond the fire area. Normally this reduction will not be the maximum allowed without proper system supervision including water flow and control valve alarm service. Additional credit may be given of up to 10% for a fully supervised system.
4. To the value obtained in No. 2 above a percentage should be added for structures exposed within 45 metres by the fire area under consideration. This percentage shall depend upon the height, area, and construction of the building(s) being exposed, the separation, openings in the exposed building(s), the length and height of exposure, the provision of automatic sprinklers and/or outside sprinklers in the building(s) exposed, the occupancy of the exposed building(s), and the effect of hillside locations on the possible spread of fire.

The charge for any one side generally should not exceed the following limits for the separation:

Separation	Charge	Separation	Charge
0 to 3m	25%	20.1 to 30 m	10%
3.1 to 10m	20%	30.1 to 45m	5%
10.1 to 20m	15%		

The total percentage shall be the sum of the percentage for all sides, but shall not exceed 75%.

The fire flow shall not exceed 45,000 L/min nor be less than 2,000 L/min.

Notes to Calculation

Note A: The guide is not expected to necessarily provide an adequate value for lumber yards, petroleum storage, refineries, grain elevators, and large chemical plants, but may indicate a minimum value for these hazards.

Note B: Judgment must be used for business, industrial, and other occupancies not specifically mentioned.

Note C: Consideration should be given to the configuration of the building(s) being considered and accessibility by the fire department.

Note D: Wood frame structures separated by less than 3 metres shall be considered as one fire area.

Note E: Fire Walls: - In determining floor areas, a fire wall that meets or exceeds the requirements of the current edition of the National Building Code of Canada (provided this necessitates a fire resistance rating of 2 or more hours) may be deemed to subdivide the building into more than one area or may, as a party wall, separate the building from an adjoining building.

Normally any unpierced party wall considered to form a boundary when determining floor areas may warrant up to a 10% exposure charge.

Note F: High one storey buildings: When a building is stated as 1=2, or more storeys, the number of storeys to be used in the formula depends upon the use being made of the building. For example, consider a 1=3 storey building. If the building is being used for high piled stock, or for rack storage, the building would probably be considered as 3 storeys and, in addition, an occupancy percentage increase may be warranted.

However, if the building is being used for steel fabrication and the extra height is provided only to facilitate movement of objects by a crane, the building would probably be considered as a one storey building and an occupancy credit percentage may be warranted.

Note G: If a building is exposed within 45 metres, normally some surcharge for exposure will be made.

Note H: Where wood shingle or shake roofs could contribute to spreading fires, add 2,000 L/min to 4,000 L/min in accordance with extent and condition.

Note I: Any non-combustible building is considered to warrant a 0.8 coefficient.

Note J: Dwellings: For groupings of detached one family and small two family dwellings not exceeding 2 stories in height, the following short method may be used. (For other residential buildings, the regular method should be used.)

Exposure distances	Suggested required fire flow	
	Wood Frame	Masonry or Brick
Less than 3m	See Note "D"	6,000 L/min
3 to 10m	4,000 L/min	4,000 L/min
10.1 to 30m	3,000 L/min	3,000 L/min
Over 30m	2,000 L/min	2,000 L/min

If the buildings are contiguous, use a minimum of 8,000 L/min. Also consider Note H.

OUTLINE OF PROCEDURE

- A. Determine the type of construction.
- B. Determine the ground floor area.
- C. Determine the height in storeys.
- D. Using the fire flow formula, determine the required fire flow to the nearest 1,000 L/min.
- E. Determine the increase or decrease for occupancy and apply to the value obtained in D above. Do not round off the answer.
- F. Determine the decrease, if any, for automatic sprinkler protection. Do not round off the value.
- G. Determine the total increase for exposures, Do not round off the value.
- H. To the answer obtained in E, subtract the value obtained in F and add the value obtained in G.

The final figure is customarily rounded off to the nearest 1,000 L/min.

APPENDIX

TYPES OF CONSTRUCTION

For the specific purpose of using the Guide, the following definitions may be used:

Fire-Resistive Construction - Any structure that is considered fully protected, having at least 3-hour rated structural members and floors. For example, reinforced concrete or protected steel.

Non-combustible Construction - Any structures having all structural members including walls, columns, piers, beams, girders, trusses, floors, and roofs of non-combustible material and not qualifying as fire-resistive construction. For example, unprotected metal buildings.

Ordinary Construction - Any structure having exterior walls of masonry or such non-combustible material, in which the other structural members, including but not limited to columns, floors, roofs, beams, girders, and joists, are wholly or partly of wood or other combustible material.

Wood Frame Construction - Any structure in which the structural members are wholly or partly of wood or other combustible material and the construction does not qualify as ordinary construction.

OCCUPANCIES

Examples of Low Hazard Occupancies:

Apartments	Hotels	Prisons
Asylums	Institutions	Public Buildings
Churches	Libraries, except Large	Rooming Houses
Clubs	Stack Room Areas	Schools
Colleges & Universities	Museums	Tenements
Dormitories	Nursing, Convalescent	
Dwellings	and Care Homes	
Hospitals	Office Buildings	

Generally, occupancies falling in National Building Code Groups A, B, C and D are of this class.

Examples of High Hazard Occupancies:

Aircraft Hangars	Linseed Oil Mills
Cereal, Feed, Flour and Grist Mills	Match Manufacturing
Chemical Works - High Hazard	Oil Refineries
Cotton Picker and Opening Operations	Paint Shops
Explosives & Pyrotechnics Manufacturing	Pyroxylin Plastic Manufacturing & Processing
Shade Cloth Manufacturing	Solvent Extracting
Foamed Plastics, Storage or use in Manufacturing	Varnish and Paint Works
High Piled Combustibles Storage in excess of 6.5 metres high	Woodworking with Flammable Finishing
	Linoleum and Oilcloth Manufacturing

Other occupancies involving processing, mixing storage and dispensing flammable and/or combustible liquids. Generally, occupancies falling in National Building Code Group F, Divisions 1 and 2 would be in this class.

For other occupancies, good judgment should be used, and the percentage increase will not necessarily be the same for all buildings that are in the same general category - for example "Colleges and Universities": this could range from a 25% decrease for buildings used only as dormitories to an increase for a chemical laboratory. Even when considering high schools, the decrease should be less if they have extensive shops.

It is expected that in commercial buildings no percentage increase or decrease for occupancy will be applied in most of the fire flow determinations. In general, percentage increase or decrease will not be at the limits of plus or minus 25%.

EXPOSURES

When determining exposures it is necessary to understand that the exposure percentage increase for a fire in a building (x) exposing another building (y) does not necessarily equal the percentage increase when the fire is in building (y) exposing building (x). The Guide gives the maximum possible percentage for exposure at specified distances. However, these maximum possible percentages should not be used for all exposures at those distances. In each case the percentage applied should reflect the actual conditions but should not exceed the percentage listed.

The maximum percentage for the separations listed generally should be used if the exposed building meets all of the following conditions:

- a. Same type or a poorer type of construction than the fire building.
- b. Same or greater height than the fire building.
- c. Contains unprotected exposed openings.
- d. Unsprinklered.

CONVERSION FACTORS

Multiply	By	To Obtain
Centimetre	0.3937	Inches
Cubic Foot	0.0283	Cubic Metres
Cubic Metre	35.3145	Cubic Feet
Cubic Metre	219.97	Imperial Gallons
Cubic Metre	1.000	Litres
Foot	0.3048	Metres
Horsepower	0.7457	Kilowatt
Imperial Gallon	4.546	Litres
Inch	2.54	Centimetres
Kilogram	2.2046	Pounds
Kilogram of Water	1	Litres
Kilopascal	0.1450	Pounds per sq. inch
Kilowatt	1.341	Horsepower
Litre	0.21997	Imperial Gallons
Litre of Water	1	Kilograms
Metre	3.281	Feet
Metre of Water	10	Kilopascals
Pound	0.4536	Kilograms
Pound per sq. inch	6.89476	Kilopascals
U.S. Gallons	0.8327	Imperial Gallons
Imperial Gallons	1.201	U.S.Gallons

Appendix C – FUS – Insurance Grading of Used or Rebuilt Apparatus



TECHNICAL BULLETIN

FIRE UNDERWRITERS SURVEY™

A Service to Insurers and Municipalities

INSURANCE GRADING RECOGNITION OF USED OR REBUILT FIRE APPARATUS

The performance ability and overall acceptability of older apparatus has been debated between municipal administrations, the public fire service and many others for years. Fire Underwriters Survey (FUS) has reviewed experiences across Canada and in other countries and has developed a standard for acceptance of apparatus as the apparatus becomes less reliable with age and use.

The public fire service is unique compared to other emergency services in that fire apparatus vehicles are not continuously in use. However, when in use, the apparatus is subject to considerable mechanical stress due to the nature of its function. This stress does not normally manifest itself on the exterior of the equipment. It is effectively masked in most departments by a higher standard of aesthetic care and maintenance. Lack of replacement parts further complicates long term use of apparatus. Truck and pump manufacturers maintain a parts inventory for each model year for a finite time. After that period, obtaining necessary parts may be difficult. This parts shortage is particularly acute with fire apparatus due to the narrow market for these devices.

Fire Underwriters Survey lengthy experience in evaluating fire apparatus indicates that apparatus should be designed to an acceptable standard. The standard that is accepted throughout Canada by Fire Underwriters Survey is the Underwriters' Laboratories of Canada (ULC) Standard S515 (most updated version) titled, "Automobile Fire Fighting Apparatus," which was adopted as a National Standard of Canada in September 2004. Alternatively, NFPA 1901, the Standard for Automotive Fire Apparatus (most updated version) is also accepted by Fire Underwriters Survey with respect to apparatus design. Fire apparatus should be built by recognized manufacturers and tested by a suitably accredited third party.

Fire apparatus should respond to first alarms for the first fifteen years of service. During this period it has reasonably been shown that apparatus effectively responds and performs as designed without failure at least 95% of the time. For the next five years, it should be held in reserve status for use at major fires or used as a temporary replacement for out-of-service first line apparatus. Apparatus should be retired from service at twenty years of age. Present practice indicates the recommended service periods and protocols are usually followed by the first purchaser. However, at the end of that period, the apparatus is either traded in on new apparatus or sold to another fire department. At this juncture, the unit may have one or more faults which preclude effective use for emergency service. These deficiencies include:

- a. Inadequate braking system
- b. Slow pick-up and acceleration



- c. Structurally weakened chassis due to constant load bearing and/or overloading
- d. Pump wear

FUS has modified its application of the age requirement for used or rebuilt apparatus. Due to municipal budget constraints within small communities we have continued to recognize apparatus over twenty years of age, provided the truck successfully meets the recommended annual tests and has been deemed to be in excellent mechanical condition. The specified service tests are outlined below under the heading “Recommended Service Tests for Used or Modified Fire Apparatus”. Testing and apparatus maintenance should only be completed by a technician who is certified to an appropriate level in accordance with NFPA 1071, *Standard for Emergency Vehicle Technician Professional Qualifications*.

Insurance grading recognition may be extended for a limited period of time if we receive documentation verifying that the apparatus has successfully passed the specified tests. If the apparatus does not pass the required tests or experiences long periods of “downtime” we may request the municipal authority to replace the equipment with new or newer apparatus. If replacement does not occur, fire insurance grading recognition may be revoked for the specific apparatus which may adversely affect the fire insurance grades of the community. This can also affect the rates of insurance for property owners throughout the community.

Table 1 Service Schedule for Fire Apparatus For Fire Insurance Grading Purposes

Apparatus Age	Major Cities ³	Medium Sized Cities ⁴	Small Communities ⁵ and Rural Centres
0 – 15 Years	First Line Duty	First Line Duty	First Line Duty
16 – 20 Years	Reserve	2 nd Line Duty	First Line Duty
20 – 25 Years ¹	No Credit in Grading	No Credit in Grading or Reserve ²	No Credit in Grading or 2 nd Line Duty ²
26 – 29 Years ¹	No Credit in Grading	No Credit in Grading or Reserve ²	No Credit in Grading or Reserve ²
30 Years +	No Credit in Grading	No Credit in Grading	No Credit in Grading

¹ All listed fire apparatus 20 years of age and older are required to be service tested by recognized testing agency on an annual basis to be eligible for grading recognition. (NFPA 1071)

² Exceptions to age status may be considered in a small to medium sized communities and rural centres conditionally, when apparatus condition is acceptable and apparatus successfully passes required testing.

³ Major Cities are defined as an incorporated or unincorporated community that has:

- a populated area (or multiple areas) with a density of at least 400 people per square kilometre; AND
- a total population of 100,000 or greater.

⁴ Medium Communities are defined as an incorporated or unincorporated community that has:

- a populated area (or multiple areas) with a density of at least 200 people per square kilometre; AND/OR
- a total population of 1,000 or greater.

⁵ Small Communities are defined as an incorporated or unincorporated community that has:

- no populated areas with densities that exceed 200 people per square kilometre; AND
- does not have a total population in excess of 1,000.



Table 2 Frequency of Listed Fire Apparatus Acceptance and Service Tests

	Frequency of Test					
	@ Time of Purchase New or Used	Annual Basis	@ 15 Years	@ 20 Years See Note 4	20 to 25 Years (annually)	After Extensive Repairs See Note 5
Recommended For Fire Insurance Purposes	Acceptance Test if new; Service Test if used & < 20 Years	Service Test	Acceptance Test	Acceptance Test	Acceptance Test	Acceptance or Service Test depending on extent of repair
Required For Fire Insurance Purposes	Acceptance Test if new; Service Test if used & < 20 Years	No Test Required	No Test Required	Acceptance Test	Acceptance Test	Acceptance or Service Test depending on extent of repair
Factor in FUS Grading	Yes	Yes	Yes	Yes	Yes	Yes
Required By Listing Agency	Acceptance Test	No	No	No	N/A	Acceptance Test
Required By NFPA See Note 6	Acceptance Test	Annual Service Test	Annual Service Test	Annual Service Test	Annual Service Test	Service Test

Note 1: See: 'Service Tests for Used or Rebuilt Fire Apparatus' for description of applicable tests

Note 2: Acceptance Tests consist of 60 minute capacity and 30 minute pressure tests

Note 3: Service Tests consist of 20 minute capacity test and 10 minute pressure test in addition to other listed tests

Note 4: Apparatus exceeding 20 years of age may not be considered to be eligible for insurance grading purposes regardless of testing. Application must be made in writing to Fire Underwriters Survey for an extension of the grade-able life of the apparatus.

Note 5: Testing after extensive repairs should occur regardless of apparatus age within reason.

Note 6: Acceptance Tests: See NFPA 1901, Standard for Automotive Fire Apparatus

Service Tests: See NFPA 1911, Standard for Service Tests of Fire Pump Systems on Fire Apparatus, Article 5.1



SERVICE TESTS FOR USED OR MODIFIED FIRE APPARATUS

The intent of this document is to ensure that all used or modified fire apparatus, equipped with a pump or used for tanker service, essentially meet the requirements of Underwriters' Laboratories of Canada (ULC) "Standard for Automobile Fire Fighting Apparatus" S515-04 or subsequent (current) editions of the Standard. Full adherence with the following specified tests is recommended when purchasing used apparatus.

Weight Tests

Load Balance Test:

When fully laden (including a 460kg (1000 lbs) personnel weight, full fuel and water tanks, specified load of hose and miscellaneous equipment), the vehicle shall have a load balance of 22% to 50% of total vehicle mass on the front axle and 50% to 78% of this mass on the rear axle.

Distribution of mass of 33% and 67% respectively on the front and rear axles is preferable for a vehicle having dual rear tires or tandem rear axles.

For a vehicle having tandem rear axles and dual tires on each axle, a loading of between 18% and 25% on the front axle with the balance of mass on the rear axles is permissible.

Road Tests

Acceleration Tests:

- 2.1.1) From a standing start, the apparatus shall attain a true speed of 55 km/h (35 mph) within 25 seconds for Pumpers carrying up to 3,150 litres (700 gallons) of water.

For apparatus carrying in excess of 3,150 litres (700 gallons) or apparatus equipped with aerial ladders or elevating platforms, a true speed of 55 km/h (35 mph) in 30 seconds should be attained.

- 2.1.2) The vehicle should attain a top speed of at least 80 km/h (50mph).

Braking Test:

The service brakes shall be capable of bringing the fully laden apparatus to a complete stop from an initial speed of 30 km/h (20 mph) in a distance not exceeding 9 metres (30 feet) by actual measurement. The test should be conducted on a dry, hard surfaced road that is free of loose material, oil and grease.



Pump Performance Tests

Hydrostatic Test

Recent evidence of hydrostatic testing of the pump for 10 minutes at a minimum pressure of 3,400 kPa (500 psi). APPLICABLE TO NEW OR REBUILT PUMPS ONLY (see 3.3).

Priming and Suction Capability Tests

Vacuum Test:

The pump priming device, with a capped suction at least 6 metres (20 feet) long, shall develop –75 kPa (22 inches of mercury) at altitudes up to 300 metres (1000 feet) and hold the vacuum with a drop of not in excess of 34 kPa (10 inches of mercury) in 10 minutes.

For every 300 metres (1000 feet) of elevation, the required vacuum shall be reduced 3.4 kPa (1 inch mercury).

The primer shall not be used after the 10-minute test period has been started. The test shall be made with discharge outlets uncapped.

Suction Capability Test:

The pump (in parallel or series) when dry, shall be capable of taking suction and discharging water with a lift of not more than 3 metres (10 feet) through 6 metres (20 feet) of suction hose of appropriate size, in not more than 30 seconds and not over 45 seconds for 6000 L/min (1320 lgpm) or larger capacity pumps. Where front or rear suction is provided on midship pumps, an additional 10 seconds priming time will be allowed. The test shall be conducted with all discharge caps removed.

Pump Performance

Capacity Test:

Consists of drafting water (preferably with a 10 feet lift) and pumping the rated capacity at 1000 kPa (150 psi) net pump pressure for a continuous period of at least 1 hour.

Pressure Test:

Under the same conditions as in 3.3.1 above pumping 50% of the rated capacity at 1700 kPa (250 psi) net pump pressure for at least ½ hour



For additional information on the above noted tests and test procedures, the following documents provide useful data:

- Underwriters Laboratories of Canada (ULC) publication titled S515 Standard for Automobile Fire Fighting Apparatus, latest edition.
- Fire Underwriters Survey (FUS) publication titled Fire Stream Tables and Testing Data latest edition.
- International Fire Service Training Association (IFSTA) publication titled Fire Department Pumping Apparatus, latest edition.
- National Fire Protection Association (NFPA) 1901 Standard for Automotive Fire Apparatus, latest edition.
- National Fire Protection Association (NFPA) 1911 Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus, latest edition.
- National Fire Protection Association (NFPA) 1912 Standard for Fire Apparatus Refurbishing, latest edition.

For further information regarding the acceptability of emergency apparatus for fire insurance grading purposes, please contact:

Western Canada	Quebec	Ontario	Atlantic Canada
Risk Management Services Fire Underwriters Survey 3999 Henning Drive Burnaby, BC V5C 6P9 1-800-665-5661	Risk Management Services Fire Underwriters Survey 1611 Crémazie Blvd. East Montreal, Quebec H2M 2P2 1-800-263-5361	Risk Management Services Fire Underwriters Survey 150 Commerce Valley Drive, West Markham, Ontario L3T 7Z3 1-800- 268-8080	Risk Management Services Fire Underwriters Survey 238 Brownlow Avenue, Suite 300 Dartmouth, Nova Scotia B3B 1Y2 1-800-639-4528



Appendix D – Apparatus Extension Request Form



Fire Underwriters Survey Outreach – Apparatus Extension Form (AX4)



To request an extension to the recognized age limit for emergency apparatus, please fill out this form, save and email the form back to our office, we may also request a signed hard copy.

Local Government Legal Name: _____
 Fire Department Name: _____
 Date Completed: _____
 FUS Office Use Only: _____

Apparatus Type	Apparatus #	Year of Manufacture	Odometer	Fire Hall

Part A – Indicators of Apparatus Reliability

Please provide the following information on the apparatus history.

1. *Has the apparatus ever been out of service for mechanical failure reasons?* _____
2. *If yes, how many days has the apparatus been out of service in the last 3 years? (provide documentation)* _____
3. *Is regular preventive maintenance performed on the apparatus?* _____
4. *If yes, please provide the maintenance history with the completed form submission.* _____
5. *Is preventative maintenance conducted in the community?* _____
6. *How many days has the apparatus been out of service for preventative maintenance in the last 3 years? (provide documentation)* _____
7. *Is the apparatus maintained by a certified Emergency Vehicle Technician? (provide maintenance history for last 3 years).* _____
8. *Is the apparatus maintained in accordance with all manufacturer specifications?* _____
9. *Is the apparatus maintained in accordance with NFPA 1911?* _____
10. *Are annual Service Tests performed on the apparatus?* _____
11. *If yes, please provide the last 3 Service Tests results with the completed form submission.* _____
12. *Are full Pump Acceptance Tests performed on the apparatus at least every 5 years?* _____
13. *If yes, please provide the last full Pump Acceptance Test results with the completed form submission.* _____
14. *Is the apparatus thoroughly reviewed for criteria which may render the apparatus (or parts) "out of service" as per NFPA 1911, Chapter 6?* _____
15. *If yes, please provide the results of the last full review of "out of service" criteria completed form submission.* _____
16. *In what year will this apparatus be replaced?* _____
17. *For Mobile Water Supply Apparatus please submit signed documentation that the apparatus meets the requirements of a Mobile Water Supply Apparatus (including Water Tank) as defined by ULC-S515.* _____

Western Canada 101-3999 Henning Drive Burnaby, BC V5C 6P9 1 (800) 665-5661	Ontario 600-175 Commerce Valley Dr. W. Markham, ON L3T 7P6 1 (800) 268-8080	Quebec 255 Cremazie Boulevard East Montreal, QC H2M 1M2 1 (800) 263-5361	Atlantic Canada 220-30 Damascus Road Bedford, NS B4A 0C1 1 (800) 639-4528
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Appendix E – Superior Tanker Shuttle Service Accreditation Handbook





ALTERNATIVE WATER SUPPLIES FOR PUBLIC FIRE PROTECTION

Alternative water supplies include water supplies other than those that are defined as pressurized, municipal-type water supply systems. Generally speaking fire fighting operations are dependent on water and/or other extinguishing agents to succeed. In developed areas, water supplies are provided through a network of distribution pipes, storage and pumping facilities.

In areas without municipal-type water supplies, alternative means of delivering water supplies to a fire incident can be utilized. When the alternative method of delivering water supplies for public fire protection is shown to be well organized, and consistently available, applicable fire insurance grades denoting “Semi-Protected” status¹ are applied.

When communities with highly organized and well equipped systems of delivering alternative water supplies for public fire protection meet or exceed the minimum requirements of a municipal pressurized water supply system, then the community may apply for accreditation to deliver “Alternative Water Supplies for Public Fire Protection”. Fire Underwriters Survey publishes the Canadian Fire Insurance Grading Index and through the information in the index, indicates to the insurance community, the level of fire protection service provided to Canadian communities. Fire Underwriters Survey encourages the insurance community to improve access to reduced insurance rates in accredited communities in accordance with the improved level of fire protection service associated with the capacity to provide flow rates that meet or exceed the minimums of hydrant systems.

ACCREDITED SUPERIOR TANKER SHUTTLE SERVICE REQUIREMENTS

Accredited Superior Tanker Shuttle Service is a recognized equivalency to hydrant protection. To be accredited, fire departments must commit to maintaining a high standard of organization, and practice delivering the service regularly. The fire department must be able to show through testing and documentation that it can continuously provide water supplies in excess of the minimum required for hydranted municipal-type water supplies.

To be recognized for Accredited Superior Tanker Shuttle Service, the system of delivery of water supplies must be well-designed and well-documented. The system of delivery must meet all of the requirements specified for Standard Tanker Shuttle Service (Dwelling Protection Grade 3B) as follows:

- A formal plan for use of alternative water supplies must be in place and available for review detailing the alternative water supply points and characteristics. To be credited, fire department

¹ “Semi-Protected” or “Firehall Protected” are terms used commonly by the insurance community to indicate that there is a recognized response from a fire department with access to alternative water supply delivery apparatus and methodology. For Personal Lines insurance this is Dwelling Protection Grade 3B. For Commercial Lines insurance, this is Public Fire Protection Classification 9.





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access to alternative water supplies must be 24 hours per day and 365 days per year. Refill capacity from alternative water supplies using drafting techniques requires a pump that has a minimum capacity of 450 LPM (100 IGPM) at 275-415 kPa (40-60 psi).

- For each fire hall with a Dwelling Protection Grade 3B, fire apparatus must include:
 - a minimum of one triple combination pumper rated at not less than 3,000 LPM (625 IGPM at 150 psi), AND
 - a minimum of one mobile water supply apparatus with:
 - a minimum rated water carrying capacity of 4000 L (880 l.gal), AND
 - a permanently mounted fire pump with a minimum rated capacity of 1,000 LPM at 1000 kPa (210 IGPM at 150 psi) net pump pressure.
 - For full credit apparatus must be of a suitable age for emergency service² and designed in accordance with:
 - Underwriters' Laboratories of Canada (ULC) S515 Automobile Fire Fighting Apparatus, or
 - National Fire Protection Association (NFPA) 1901 Standard for Automotive Fire Apparatus
- The combined water carrying capacity of the 2 units (noted above) must be at least 6,800 Litres (1,500 l.gal) total and the fire department must have a transfer system capable of supplying the pumper with water as needed. This may be accomplished by pump or dump valve to a portable tank of at least 4,550 Litres (1,000 l.gal) capacity.
- Credit for fire apparatus will be based on evidence of reliability indicators including the listing of apparatus by ULC, design specifications, fire pump service test records, age, maintenance history, etc. Apparatus is evaluated from the perspective of the capacity to provide structural fire protection.
- To be credited, apparatus must be stored in a suitably constructed and arranged fire hall, with adequate protection from the elements and 24/7/365 access.
- For each fire hall with a Dwelling Protection Grade 3B, the credited available responding fire force will include at a minimum:
 - 1 Fire Chief (required to respond but not required to be on-duty)
 - 15 auxiliary fire fighters scheduled to respond in addition to the number of personnel required to conduct mobile water supply shuttle operations
- The fire department must have an adequate and reliable means of receiving alarms of fire and dispatching fire fighters is in place (ex. public fire number, pagers etc.).
- The boundary of the fire department protected area must be clearly established and registered with the Provincial Government.

To be recognized for *Accredited Superior Tanker Shuttle Service*, the system of delivery of water supplies must exceed the requirements for Standard Tanker Shuttle Service (above) in several key areas:

² See FUS Technical Bulletin - Insurance Grading Recognition of Used or Rebuilt Fire Apparatus



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- The fire department must be able to prove through documented and standardized testing that the specified requirements of Superior Tanker Shuttle Service can be met.
- For Personal Lines insurance, the fire department must be able to deliver a flow rate of not less than 1,000 LPM (200 IGPM) within 5 minutes of arriving at the test site with the first major piece of apparatus (wheel stop).
- For Commercial Lines insurance, the fire department must be able to deliver a flow rate of not less than 2,000 LPM (400 IGPM) within 5 minutes of arriving at the test site with the first major piece of apparatus (wheel stop).
- Further to the initial flow rate requirement of 2,000 LPM (400 IGPM) within 5 minutes, the fire department may wish to be accredited for a higher flow rate. In such cases, the fire department must be able to deliver the final accredited flow rate within 10 minutes of arriving at the test site with the first major piece of apparatus (wheel stop). Note: the fire department should strive to deliver the fire flow rate that would adequately address the highest required fire flow in the first response area of the fire hall being accredited.
- The volume of water available for fire fighting must be adequate to sustain the accredited flow rate for a duration in accordance with the Fire Underwriters Survey Water Supplies for Public Fire Protection.

FURTHER NOTES

1. To be recognized for fire insurance grading purposes, the protected property must be located within:
 - Commercial Lines (PFPC) - 5 km of a fire station AND 2.5 km of an approved water supply point
 - Personal Lines (DPG) - 8 km of a fire station AND 5 km of an approved water supply point
2. To be recognized for fire insurance grading purposes, the water-delivery system must be available AND accessible 24 hours per day and 365 days per year;
3. To be recognized for fire insurance grading purposes, the water capacity of alternative water supply sources must be documented for a 50-year drought cycle and documentation must be available for review. Alternative evidence of reliability of supply will be considered on a case by case basis.

PROCEDURAL NOTES

1. The specific procedure for carrying out the test of alternative water supply delivery will be determined and documented by the auditor.
2. The test procedure should closely approximate the actual response conditions of a fire event.
3. The procedures used by the fire department must be documented in the SOG/SOP document and be available for review by the auditor.
4. The timelines for response should consider delays associated with apparatus responding from halls other than the hall being tested.
5. At all times, safe operating procedures must be followed.



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TESTING NOTES

1. In advance of the test, the fire department should work through the WS5 form and submit for review by the auditor
2. All apparatus and fire fighters used in the Accreditation test must be part of the documented system of response. Companies responding from other departments must have documented Automatic Aid or Contracts for response on first alarm. Dispatch procedures must be available for review.
3. Fire halls must be staffed with on duty crews during the testing for all affected response areas contributing resources to the test, and have adequate apparatus and equipment to provide an initial response to alarms of fire.

ACCREDITATION NOTES

1. Accreditation period will be 5 years after which accreditations will expire unless renewed. Re-testing will be required unless it can be shown that
 - a. all assets and resources involved in the test would be the same as previous used test, and
 - b. documentation of practice and usage of system in fire events is submitted and considered acceptable by the auditor.
2. To maintain the accreditation, the fire department must maintain records of its ability to deliver the service including:
 - a. Records of roster changes
 - b. Records of practices of the service (and roster members involved)
 - c. Records of apparatus changes (including Automatic Aid and Contract apparatus)
3. At any time during the 5 years, Fire Underwriters Survey may request documentation of the fire department's ability to deliver the service.
4. Fire Underwriters Survey retains the right to revoke accreditation without notice if the fire department is deemed to be unable to provide the service at the accredited level.

WATER SUPPLY POINT NOTES

Fire Underwriters Survey treats dry hydrants with suction points in the same way as it treats standard (pressurized) fire hydrants. Any dwelling within 300 metres of a dry hydrant may be eligible for a Dwelling Protection Grade better than 3B, provided the building is within eight kilometres by road of a responding fire station, the fire department is recognized as meeting the criteria for a Dwelling Protection Grade of 3A or better and the fire department has adequate apparatus to effectively utilize the dry hydrant through suction. Testing of the fire department's capacity to utilize the dry hydrant and documentation of the dry hydrant design and maintenance may also be required.

Fire Underwriters Survey may extend credit beyond 300 metres of a fire hydrant when the responding fire company uses large-diameter hose, if the fire department can demonstrate a standard procedure for deployment of hose and also establish a relay operation as needed.



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For more information on any topic related to the Canadian Public Fire Protection Classification Program or the Canadian Fire Insurance Grading Index, call the Fire Underwriters Survey office in your region:

Western Canada Fire Underwriters Survey 3999 Henning Drive Burnaby, British Columbia V5C 6P9 1-800-665-5661	Quebec Fire Underwriters Survey 255 Crémazie Boulevard East Montreal, Quebec H2M 2P2 1-800-263-5361	Ontario Fire Underwriters Survey 175 Commerce Valley Drive West, Suit 600 Markham, Ontario L3T 7P6 1-800-387-4356	Atlantic Canada Fire Underwriters Survey 238 Brownlow Avenue, Suite 300 Dartmouth, Nova Scotia B3B 1Y2 1-800-639-4528
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