

Volume

2

FIRE UNDERWRITERS SURVEY

A Service to Insurers and Municipalities



Alternative Water
Supplies for Public Fire
Protection

AN INFORMATIVE REFERENCE GUIDE FOR USE IN

Fire Insurance Grading

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a subsidiary of SCM Inc.

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1.0 General

1.1. Introduction

Fire Underwriters Survey evaluates fire protection service levels and fire risk levels in communities across Canada and publishes the Fire Insurance Grading Index for Personal Lines and Commercial Lines insurers. To provide fire protection, the majority of communities across Canada utilize water as the primary extinguishing agent. In areas without pressurized, municipal-type water supply systems, alternative water supplies are used in fire fighting operations. When developed and executed with a high level of proficiency, systems of shuttling water to and from alternative water supply sources can be as effective as municipal type water supplies, although typically more labour intensive.

1.2. Purpose And Scope

This document is intended to define the terms for fire departments to deliver water supply through alternative services that will be recognized for fire insurance grading purposes.

1.3. How To Use This Document

Chapter 2 provides a summary of the theory and objectives of alternative water supplies, shuttle operations and common problems with service delivery. Chapter 3 summarizes the accreditation protocol. Chapter 4 presents the procedure and the associated form is included in Appendix A. References are provided throughout this document for additional information on specific issues.

1.4. Equivalency

Nothing in this document is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety in place of those described in this document, provided technical documentation is submitted to the Fire Underwriters Survey to demonstrate equivalency and the system, method, or device is approved for the intended purpose.

1.5. Glossary

Accreditation body: for Alternative Water Supply Accreditation (including Superior Tanker Shuttle Service and Large Diameter Hose Lay) refers to Fire Underwriters Survey™.

Approved: acceptable to the authority having jurisdiction.

Auditor: a Certified Applied Science or Engineering Technologist, Professional Technologist or Professional Engineer carrying appropriate Errors and Omissions insurance who is versed in the provision of water supplies for public fire protection utilizing Alternative Water Supplies and Shuttle methods and who is accepted by the accreditation body as being qualified to conduct Alternative Water Supply Accreditation Tests.

Authority Having Jurisdiction: an organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

Alternative Water Supply: water supplies provided where no municipal-type water system exists or to supplement an inadequate municipal-type water supply.

Approved Water Supply Point: Any water supply source used to meet the requirements of this standard shall be of a quality approved by the AHJ, for purposes of accreditation, water supply points must be approved by Fire Underwriters Survey.

Automatic Aid: a plan developed between two or more fire departments for immediate joint response on first alarms.

Building: any structure used or intended for supporting any occupancy.

Certificate of Accreditation: a document issued in accordance with this protocol that is sealed by Fire Underwriters Survey™.

Clock Start: the time at which the fire department has arrived to the incident scene (also known as wheel stop); at this time, the test timer starts

Commercial Lines Insurance: a distinction marking property and liability coverage written for business or entrepreneurial interests (includes institutional, industrial, multi-family residential and all buildings other than detached dwellings that are designated single family residential or duplex) as opposed to Personal Lines.

Dry Hydrant: an arrangement of pipe(s) permanently connected to a water source other than a piped, pressurized water supply system that provides a ready means of water supply for fire-fighting purposes and that utilizes the drafting (suction) capability of a fire department pump. To be recognized for fire insurance grading purposes, a dry hydrant must be designed and maintained in accordance with NFPA 1142, Chapter 8.

Dwelling: any building that contains not more than one or two dwelling units intended to be used, rented, leased, let, or hired out to be occupied or that are occupied for habitation purposes.

Dwelling Unit: one or more rooms arranged for the use of one or more individuals living together, providing complete, independent living facilities, including permanent provisions for living, sleeping, eating, cooking, and sanitation.

Dwelling Protection Grade (DPG): the fire insurance grade or grades utilized by Personal Lines Insurers in Canada. The DPG is a number between 1 and 5 that is calculated by comparing the fire risk in terms of required fire flows to available resources. Unlike the PFPC system, within the DPG system, the benchmark required fire flow is a constant, and is typical for a Detached Dwelling. The DPG for communities across Canada is determined from a basic survey of the

available resources related to fire risk reduction and fire protection capacity.

Exposure Hazard: a structure within 15.24 m (50 ft) of another building and 9.3 m² (100 ft²) or larger in area.

Fire Department (Public): a legally formed organization providing rescue, fire suppression, emergency medical services, and related activities to the public.

Incident Scene: the location where activities related to a specific incident are conducted. This shall include the entire area subject to incident-related hazards and all areas used by fire department members and equipment in proximity to the incident.

Large Diameter Hose: a hose of 76 mm (4 in.) size or larger.

Lift: the vertical height that water must be raised during a drafting operation, measured from the surface of a static source of water to the centerline of the pump intake.

Minimum Water Supply: the quantity of water required for fire control and extinguishment.

Mobile Water Supply Apparatus (Tanker, Tender): a vehicle designed primarily for the safe and effective pickup, transport, and delivery of water to fire emergency scenes where other apparatus or pumping equipment provide tactical fire stream application.

Municipal-Type Water System: a system having water pipes serving hydrants and designed to furnish, over and above domestic consumption (maximum day consumption), a minimum flow of 1000 L/min (200 Igpm or 250 USgpm) at 139 kPa (20 psi) residual pressure for a 2-hour duration.

Mutual Aid Agreement: a pre-arranged agreement developed between two or more entities to render assistance to the parties of the agreement.

Personal Lines Insurance: insurance covering the liability and property damage exposures of private individuals and their households as opposed to Commercial Lines. Typically includes all detached dwellings that are designated single family residential or duplex.

Public Fire Protection Classification (PFPC): the fire insurance grade or grades utilized by Commercial Lines Insurers in Canada. The PFPC is a number between 1 and 10 that is calculated by comparing the fire risk in terms of required fire flows to available resources. The PFPC for communities across Canada is determined from an extensive survey and analysis of the fire risk in the built environment and the available resources related to fire risk reduction and fire protection capacity.

Required Fire Flow. The rate of water flow, at a residual pressure of 20 psi (138 kPa) and for a specified duration, that is necessary to confine and control a major fire in a specific 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.

Rural: those areas that are not unsettled wilderness or uninhabitable territory but are sparsely populated with densities below 200 persons per square km.

Storey: means that portion of a building situated between the top of any floor and the top of the floor next above it, and if there is no floor above it, that portion between the top of such floor and the ceiling above it.

Structure: that which is built or constructed; an edifice or building of any kind.

Suburb or Suburban: those moderately inhabited areas with population densities of at least 200 persons per square kilometre but less than 400 persons per square kilometre.

Water Delivery Rate: the minimum amount of water per minute (in L/min, Igpm or USgpm), required by this standard or the AHJ, to be delivered to the fire scene via mobile water supply apparatus, hose lines, or a combination of both.

Water Supply Officer (WSO): The fire department officer or designee responsible for providing water for fire-fighting purposes.

2.0 Background on Alternative Water Supplies

Water supplies are known to be an effective extinguishing agent, but what can be done if there is no hydrant system?

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 (if designed for fire protection) are provided through a network of distribution pipes, storage and pumping facilities. The entire arrangement should be designed to provide adequate water supplies for domestic demand (at the Maximum Daily Rate) simultaneously with Fire Flow Demand.

In areas without municipal-type water supplies, fire fighting presents a significantly greater challenge. Historically various methods have been utilized including the bucket line to deliver water from some source location to the fireground. Generally speaking these types of water supplies were not effective with respect to reducing property damage.

Since the advent of automotive fire apparatus, the capacity to move water from a source location to the fire ground has improved dramatically. The fundamental steps in a shuttle operation are as follows:

- set up pumper apparatus at fire event and deliver water from temporary water storage location (pool) through fire pump to fire;
- draft water (from a location where water supplies are known to be reliable and accessible) into a mobile water supply apparatus

- move water from source location to fire event using mobile water supply apparatus
- dump water into temporary storage facility (ex. portable tank) at fire event location.



Levels of Service

An infinite number of levels of service are available and the level of service provided to the community should be one that the fire department is equipped, trained and prepared to provide.

It is important that property owners and insurers realize that providing water supplies for fire protection utilizing shuttle operations requires specialized equipment training and practice to shuttle water safely and reliably.

From the perspective of the insurance industry, there are three important levels of shuttle service

2.1. Unrecognized Shuttle Service

If the level of shuttle service provided by a community does not meet the minimum benchmarks set out in NFPA 1142, then the level of service will not be recognized for fire insurance grading purposes.

2.2. Standard Tanker Shuttle Service (non-accredited)

To be recognized, for Standard Tanker Shuttle Service, the fire department must have adequate equipment, training and continuous access to approved alternative water supplies to deliver standard tanker shuttle service in accordance with NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting. A formal plan for use of alternative water supplies must be in place and available for review detailing the alternative water supply sources and characteristics. To be credited, fire department 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).

2.3. Accredited Superior Tanker Shuttle Service

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 and must exceed the requirements in several key areas:

- 2.3.1 The fire department must be able to prove through testing that the specified requirements of Superior Tanker Shuttle Service can be met.
- 2.3.2 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).
- 2.3.3 The fire department must be able to deliver the flow rate which will be accredited within 10 minutes of arriving at the test site with the first major piece of apparatus (wheel stop).
- 2.3.4 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.

2.4. Further Notes

- 2.4.1 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;
- 2.4.2 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
- 2.4.3 Fire Underwriters Survey treats dry hydrants with suction points in the same way as it treats standard (pressurized) fire hydrants. Any property 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.
- 2.4.4 Fire Underwriters Survey may extend credit beyond 300 metres of a fire hydrant when the company uses large-diameter hose, if the fire department can demonstrate a standard procedure for deployment of hose and also establish a relay operation.

2.5. Limitations

Recognition of Shuttle Service for fire insurance grading purposes is limited to the following road travel distances from the insured property:

- Commercial Lines (PFPC)
 - 5 km by road of first responding pumper AND mobile water supply apparatus; AND
 - 2.5 km by road of an approved water supply point
- Personal Lines (DPG)
 - 8 km by road of first responding pumper AND mobile water supply apparatus; AND
 - 5 km by road of an approved water supply point



Common Problems

Like all emergency services, many factors contribute to fire protection service levels being inconsistent regardless of the checks and balances that are in place. Such factors include (but are not limited to):

- response distances and associated times
- response delays (road conditions, traffic, weather)
- turn out times of responders (particularly those that are not on-duty)

Introducing mobile water supply apparatus to the fire protection equation increases the probability of issues resulting from mechanical problems and apparatus travel problems due to the increased amount of apparatus travel associated with shuttle service. Any significant mechanical issue or road delay may result in interruption in water supplies to a fire event.

2.6. Underlying Fire Protection Science

The underlying basis of the model for Alternative Water Supply Accreditation is scientifically based on peer-reviewed research, literature, international standards and fire loss experience.

The basic theory is that as time progresses, the losses resulting from a structure fire become worse and worse. It is common for the fire protection engineering community to utilize fire propagation curves to demonstrate how losses increase in relation to time. Typically, at some point between 4 minutes and 10 minutes on a fire propagation curve, flashover occurs. The property losses associated with a fire increase at a more rapid rate after flash over occurs and as such, it is desirable to intervene prior to flash over.

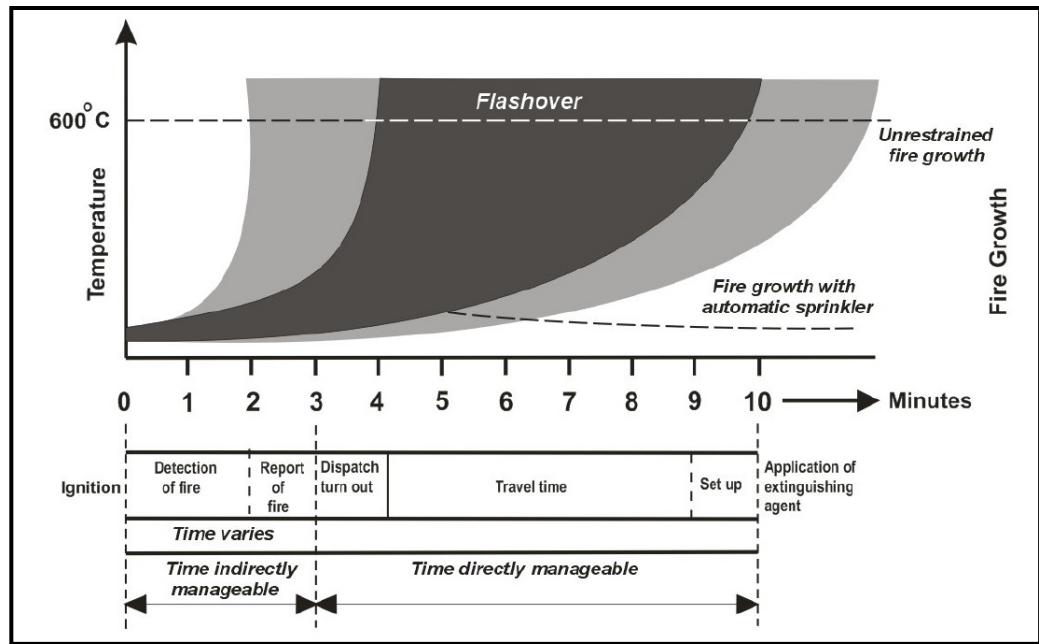


Figure 2.6-1 Example Fire Propagation Curve

The length of time a fire takes to reach the flash over state varies depending on many factors including the combustibility of the building, its contents and the ventilation of the area. As such, there is no single model of fire protection that is appropriate for all situations, however it is reasonable to state that a primary goal of public fire protection is to intervene prior to flash over.

The earlier that intervention occurs, the less resources are typically required to provide a reasonable level of response.

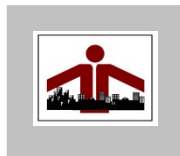
The underlying theory of the Accredited Alternative Water Supply is based on the following conditions/assumptions:

- Response is timely
 - *Emergency communications system in place and effective(dispatch time efficient)*
 - *Turn out time reasonable (auxiliary and on-duty) fire fighters respond from reasonable distance*

- *Response is from within a reasonable travel distance (less than 8 km by road)*
- Fire force is adequate

If these underlying conditions/assumptions are true and response is timely and the fire force is adequate, then it can be reasonably demonstrated that equivalent resources are available for fire fighting to fire departments with access to pressurized, municipal-type water supply systems.

It is important to state that there are many variables in structural fires and regardless of methods utilized, fire fighting operations are not always successful. The success or failure of fire fighting operations is influenced by many factors related to experience, operation, deployment, equipment and other such factors.



Conclusion

While it is up to individual insurers to determine their own level of comfort with recognizing or not recognizing the Fire Underwriters Survey Accredited Alternative Water Supply, FUS recommends that accredited services be recognized as providing a reasonable equivalency to hydrant protection. Due to the need for specialized equipment, training and practice to deliver the service, it is imperative that Alternative Water Supply be accredited according to a recognizable standard and that re-accreditations occur at a reasonable frequency.

3.0 Accreditation Protocol

The system for accrediting alternative water supplies for public fire protection

Preamble

This protocol details the establishment and administration of an accreditation program for agencies that deliver fire protection services in areas where municipal-type pressurized water supply systems do not exist.

Accreditation will be granted by Fire Underwriters Survey™ to a public Fire Department that has documented and implemented a water delivery system that meets the applicable requirements of the Alternative Water Supply for Public Fire Protection Standard for Fire Insurance Grading. Conformity with the requirements specified in this document will be assessed on an ongoing basis using Certified Engineering Technologists, Certified Applied Science Technologists, Professional Technologists or Professional Engineers.

Accreditation Process

3.1. Application for Accreditation Services

- 3.1.1 The accreditation body will prepare an accreditation program handbook that details the accreditation program including rules of accreditation and appeal procedures. The handbook will include the forms necessary for an applicant to apply for accreditation. A copy of the handbook is to be provided to a potential applicant upon written request.
- 3.1.2 The accreditation body will not process an application for accreditation unless the application includes, as appropriate, completed application forms, Fire Department endorsed operational plans for the water supply delivery system for which accreditation is sought, and all required fees.

3.1.3 The accreditation body will inform an applicant in writing of any deficiencies in an accreditation application.

3.2. Accreditation Process – General

3.2.1 The accreditation body will use the following process to consider an application for the accreditation of a Fire Department.

3.2.2 Each application for accreditation will be assigned to an auditor who will review the application in accordance with the applicable accreditation processes set out in this protocol.

3.2.3 When assigning auditors, the accreditation body will assign auditors who are not in a conflict of interest, who have experience with applications of similar complexity, and with a view towards minimizing travel costs.

3.2.4 Application for accreditations will be considered for accreditation from external auditors who are not representatives of Fire Underwriters Survey conditionally when:

- (a) auditors have appropriate credentials (AScT, P.Tech or P.Eng) and carry Errors and Omission insurance;
- (b) auditors can demonstrate comprehensive knowledge of the process of delivery of water supplies for public fire protection through alternative methods;
- (c) all appropriate documentation of process and testing as detailed in this protocol is provided to the accreditation body for review; AND
- (d) documentation of test results bearing the professional seal of the approved auditor and all relevant details of test are provided to the accrediting body for review.

3.3. Accreditation Process – Standard

3.3.1 The accreditation body will use the following process to consider a standard application for an Alternative Water Supply Accreditation made directly to Fire Underwriters Survey.

3.3.2 The accreditation body will require that applicable forms, maps and documentation of practice test results be submitted, reviewed and accepted prior to scheduling the on-site test.

3.3.3 The accreditation body will require the applicant to provide written confirmation that adequate resources will be in place to respond to emergency calls such that emergency services provided by the fire department are not adversely affected during the on-site test.

3.3.4 If the requirements of sections 2.3.2 and 2.3.3 are met to the satisfaction of the accreditation body, a Alternative Water Supply Accreditation test will be scheduled at a time that is agreed upon with the Fire Department.

3.3.5 If the fire department successfully meets all of the requirements of the on-site test, a Certificate of Accreditation will be issued.

3.4. Accreditation Process – Evidence Based Application

3.4.1 The accreditation body will use the following process to consider an Evidence Based Application for a Superior Tanker Shuttle Accreditation made directly to Fire Underwriters Survey.

3.4.2 The accreditation body will require that applicable forms, maps and documentation of practice test results be submitted, reviewed and accepted prior to consideration being given to accreditation based on evidence.

3.4.3 The accreditation body will require that comprehensive records of actual responses to structure fires wherein shuttle methods and alternative water supplies were utilized to suppress and extinguish fire with successful reduction in property losses and/or exposure protection. All records must be signed as being accurate and true by the responsible official (Fire Chief).

3.4.4 If the requirements of sections 2.3, 2.4 and 3.4 are met to the satisfaction of the accreditation body, a Certificate of Accreditation will be issued.

3.5. Accreditation Process – External Auditor

3.5.1 The accreditation body will use the following process to consider an External Auditor Application for a Superior Tanker Shuttle Accreditation.

3.5.2 The accreditation body will require that applicable forms, maps and documentation of practice test results be submitted, reviewed and accepted.

3.5.3 The accreditation body will require that test results be sealed by a Certified Applied Science or Engineering Technologist, Professional Technologist or Professional Engineer.

3.5.4 If the requirements of sections of sections 2.3, 2.4 and 3.5 are met to the satisfaction of the accreditation body, a Certificate of Accreditation will be issued.

3.6. Certificate of Accreditation Procedure

3.6.1 Where this protocol requires that the certificate of accreditation procedure be conducted, the procedure in this section will be followed.

3.6.2 The accreditation body will issue a Certificate of Accreditation to the applicant, for the appropriate accreditation level, subject to the accredited Fire Department agreeing to continuously maintain and practice Alternative Water Supply Delivery and be capable of delivering this service at all times.

3.7. Reports by Auditor

3.7.1 Notice of Non-compliance

- a) The accreditation process developed by the accreditation body shall contain the necessary procedures to ensure compliance with this protocol and NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting, 2007 Edition, Chapters 7 and 8. Where the applying Fire Department is found to be non-complying, written notice will be provided to the Fire Department detailing the non-compliance item and relevant article of reference.

3.8. Notification

3.8.1 Accreditation Test Reports

- a) Within 30 days of any accreditation test conducted by a Fire Underwriters Survey auditor, the accreditation body will provide an electronic copy of the accreditation test results, to the applicant Fire Department.
- b) Within 60 days of any passed accreditation test conducted by a Fire Underwriters Survey auditor, the accreditation body will make available to the insurance community the results of the accreditation test through submission to the online fire insurance grading index.
- c) Within 60 days of receiving complete documentation and results of any passed accreditation test conducted by an external auditor, the accreditation body will make available to the insurance community the results of the accreditation test through submission to the online fire insurance grading index.
- d) Within 90 days of receiving complete evidence documentation of the capacity to deliver Alternative Water Supply for Public Fire Protection, the accreditation body will make available to the insurance community the results of the accreditation review through submission to the online fire insurance grading index.

3.9. Insurance Industry Notification

3.9.1 The accreditation body will maintain a registry, sorted by Fire Department that contains the following information:

- (e) the name of the Fire Department;
- (f) the number, type, and age of apparatus owned and utilized in the delivery of Alternative Water Supply for Public Fire Protection;
- (g) the number, type, and age of Automatic Aid apparatus utilized in the delivery of Alternative Water Supply for Public Fire Protection;
- (h) the accredited water flow capacity of the Alternative Water Supply for Public Fire Protection accreditation;
- (i) the applicable accreditation certificate number and date for each accreditation;
- (j) any decisions related to the revocation or suspension of an accreditation;
- (k) any audit results made available to the insurance community in accordance with section 3.8; and
- (l) any other information required to be provided to the public in accordance with this protocol.

3.9.2 The information required to be maintained in accordance with section 3.9 shall be made available on a secure website¹ on the Internet and shall be kept current.

3.10. Audit Cycle

3.10.1 Periodic Audits

- a) The accreditation body will audit the Alternative Water Supply for Public Fire Protection capacity of a Fire Department with a Certificate of Accreditation, in accordance with the following schedule:
 - (a) in the second or third year following the year in which the certificate was issued, the accreditation body will undertake a surveillance audit in accordance with the surveillance audit procedure of this protocol; and
 - (b) in the fifth year following the year in which the certificate was issued and every fifth year thereafter, the accreditation body will undertake a re-accreditation audit in accordance with the re-accreditation audit procedure of this protocol.

¹ The secure website required for the hosting of the registry of information related to Superior Tanker Shuttle Service must be accessible to insurers who participate in funding the Fire Underwriters Survey program and the Fire Insurance Grading Index.

3.11. Surveillance Audit Procedure

3.11.1 Where this protocol requires that the surveillance audit procedure be conducted, the procedure in this section will be followed.

3.11.2 An auditor will remotely collect information and evaluate the ongoing capacity of the fire department to deliver Alternative Water Supply for Public Fire Protection. The remote audit will include consideration of the results of the most recent on-site test undertaken in accordance with this protocol and the following:

- (a) the documentation of all shuttle operation practices (frequency and results);
- (b) the documentation of historical responses where shuttle operations were used in structural fire fighting and the relevant outcomes of such events;
- (c) the documentation of apparatus maintenance and replacement programs including specifications of any newly acquired apparatus that will be used in shuttle service;
- (d) the documentation of water license agreements and arrangements and any changes to access to water supplies (municipal-type and alternative) that would affect the capacity to deliver shuttle service; and
- (e) any changes to the capacity to deliver shuttle service including roster strength (fire fighters), training of fire fighters (and drivers), emergency response points and boundaries.

3.11.3 The auditor will prepare a brief report detailing significant changes and providing a recommendation on whether the accreditation of the Fire Department should be continued, suspended, or revoked.

3.11.4 The accreditation body will review the surveillance report prepared by the auditor.

3.11.5 At any time during the course of the audit, an auditor may request further information from the Fire Department; or, with the permission of the accreditation body and after appropriate notice is given to the appropriate parties (Fire Department, Water Purveyor, etc.), an auditor may attend at the subject location to verify information for the purposes of the audit.

3.12. Re-Accreditation Audit Procedure

3.12.1 Where this protocol requires that the re-accreditation audit procedure be conducted, the procedure in this section will be followed.

3.12.2 An auditor will conduct a standard audit or surveillance audit in accordance with the appropriate procedure of this protocol as it applies to an application for accreditation. The audit will include consideration of the results of the most recent audit undertaken in accordance with this protocol and any of the following that have occurred subsequent to that audit:

- (a) the documentation of all shuttle operation practices (frequency and results);
- (b) the documentation of historical responses where shuttle operations were used in structural fire fighting and the relevant outcomes of such events;
- (c) the documentation of apparatus maintenance and replacement programs including specifications of any newly acquired apparatus that will be used in shuttle service;
- (d) the documentation of water license agreements and arrangements and any changes to access to water supplies (municipal-type and alternative) that would affect the capacity to deliver shuttle service; and
- (e) any changes to the capacity to deliver shuttle service including roster strength (fire fighters), training of fire fighters (and drivers), emergency response points and boundaries.

Note: in cases where the entire system of delivery of alternative water supplies remains the same (or virtually the same), including the personnel involved, and it can be shown that the fire department regularly practices the operation (as previously accredited), a surveillance audit may be conducted in place of a standard audit for purposes of re-accreditation.

3.12.3 If a major non-conformity is identified during the standard audit, the auditor will prepare a brief report detailing all major and minor non-conformities.

3.12.4 The accreditation body will review the audit results prepared by the auditor.

3.13. Suspension and Revocation of Accreditation

3.13.1 Grounds for Suspension

- a) The accreditation body may suspend a Fire Department's accreditation where:
 - i. suspension is recommended by an auditor;
 - ii. corrective action requests are not addressed to the satisfaction of the accreditation body;
 - iii. any fees owed by the Fire Department to the accreditation body have not been paid in full;
 - iv. a condition of accreditation is not fulfilled;
 - v. a Fire Department prevents or obstructs an auditor from conducting or completing an audit; or

- vi. a Fire Department is determined to be incapable in whole or in part of continuously delivering the minimum level of service required to be accredited.

3.14. Suspension Process

3.14.1 The following process will apply to the suspension of the accreditation of a Fire Department:

- a) The accreditation body will provide notice of the proposed suspension to the accredited Fire Department. The notice will include reasons for the proposed suspension and will indicate that any submissions from the Fire Department will be considered if provided within 30 days of the date of the notice. The notice will also indicate that, if an accreditation is suspended, a failure to remedy the reasons underlying the suspension within 30 days will result in the automatic revocation of the accreditation.
- b) The accreditation body, after considering any submissions made by the accredited Fire Department, will provide its decision to the Fire Department on the suspension of accreditation within 15 days of the receipt of any submissions from the Fire Department.
- c) If a decision issued by the accreditation body under subsection b) suspends an accreditation, the decision will also indicate that a failure to remedy the reasons underlying the suspension within 30 days will result in the automatic revocation of the accreditation.

3.14.2 The notice required by subsection 3.14.1a); any decision made in accordance with subsection 3.14.1b); and any decision by the accreditation body to reinstate a suspended accreditation in accordance with section 3.17 will be provided to the accredited Fire Department in writing and published to the online Fire Insurance Grading Index.

3.14.3 In addition to the notification requirements in subsection 3.14.2, if the accreditation body suspends the accreditation of a Fire Department, the accreditation body shall immediately notify the Fire Department by telephone.

3.15. Automatic Revocation Process

3.15.1 If a decision issued by the accreditation body under subsection 3.13.1a) ii suspends an accreditation, and the Fire Department has not addressed the reasons underlying the suspension within 30 days of the date of the decision to the satisfaction of the accreditation body, the accreditation body will revoke the Fire Department's accreditation.

3.15.2 If a Fire Department's accreditation is revoked in accordance with section 3.15.1 a written notice of revocation will be provided to the Fire Department and copied to the online Fire Insurance Grading Index.

3.16. Appeals and Appeal Process

3.16.1 Decisions Subject to Appeal

- a) The accreditation body will establish a two-level appeal process and related procedures and rules consistent with the requirements of this protocol that allows an appeal, by a Fire Department, of a decision by the accreditation body to:
 - (a) suspend an accreditation;
 - (b) revoke an accreditation;
 - (c) not grant an accreditation; or
 - (d) suspend an accreditation process.

- b) The appeal process will be operated in accordance with the following:
 - (a) all appeals will be conducted in writing;
 - (b) the adjudicator for the first and second level appeals will be the accreditation body and the management committee, respectively;
 - (c) to initiate a first level appeal, a notice of appeal summarizing the reasons for the appeal and evidence supporting the reasons must be delivered to the accreditation body within 15 days of the decision being appealed from;
 - (d) all decisions on a first level appeal will be made in writing and within 30 days of the receipt of a notice of appeal;
 - (e) to initiate a second level appeal, a notice of appeal summarizing the reasons for the appeal and evidence supporting the reasons must be delivered to the management committee within 15 days of the decision being appealed from; and
 - (f) all decisions on a second level appeal will be made in writing and within 15 days of the receipt of a notice of appeal.

- c) All written decisions made in accordance with section 3.16.1 will be provided to the following persons or entities:
 - (a) the Fire Department;
 - (b) the accreditation body or management committee, as appropriate;
 - (c) the online Fire Insurance Grading Index (though promulgation); and
 - (d) the national Director of Fire Underwriters Survey.

3.17. Reinstatement of Accreditation under Suspension

3.17.1 Removal of suspension

- a) The accreditation body may remove a suspension of an accreditation where the reasons for the suspension have been addressed to the satisfaction of the accreditation body.

4.0 Accreditation Test Procedure

The standardized procedure for evaluating the capacity to deliver Superior Tanker Shuttle Service

Preamble

This procedure details the procedure for Auditors to conduct Superior Tanker Shuttle Service Tests for agencies that deliver fire protection services in areas where municipal-type pressurized water supply systems do not exist.

Accreditation will be granted by Fire Underwriters Survey™ to a public Fire Department that has documented and implemented a water shuttle system that meets the applicable requirements of the Superior Tanker Shuttle Service Test as detailed in this procedure.

STSS Accreditation Procedure

4.1. Applicable Rules of Accreditation test

4.1.1 Superior Tanker Shuttle Service (Superior Tanker Shuttle Service) accreditation districts are limited to

- (a) 5 km road distance of the tested Fire Station for properties insured under Commercial Lines, or
- (b) 8 km road distance of the tested Fire Station for properties insured under Personal Lines.

4.1.2 An adequate number of Superior Tanker Shuttle Service accreditation tests must be provided for single-family districts and for commercial districts to clearly demonstrate the capacity of the service to be delivered to all areas which will be

accredited. The number of requisite tests and test sites will be determined by the auditor.

- 4.1.3 Within 5 minutes of arrival (wheel stop) to the test site of the first major piece of apparatus, the department must produce a minimum of
- a) 1,000 LPM (200 IGPM) for Personal Lines Insurance Dwelling Protection Grade and/or
 - b) 2,000 LPM (400 IGPM) for Commercial Lines Insurance Public Fire Protection Classification.
 - c) The flow rate produced in a) and/or b) must be sustained for the test duration.
- 4.1.4 The minimum test durations will be 120 minutes for a flow rate of 1,000 LPM (200 IGPM) and 60 minutes for a flow rate of 2,000 LPM (400 IGPM) or greater.
- 4.1.5 The fire department must be able to deliver the flow rate which will be accredited (if greater than the previously mentioned minimum flow rate) within 10 minutes of arriving at the test site with the first major piece of apparatus (wheel stop).
- 4.1.6 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 specified fire durations correlating to required fire flows.
- 4.1.7 Automatic Aid apparatus and companies may be utilized if the shuttle service system is documented in formal agreements and Standard Operating Guidelines for all participating departments.
- 4.1.8 The water supply for fire fighting (including the test) must come from a source that is available and accessible year round (24 hours per day, 365 days per year). In addition, the supply source must be conveyed through fire hydrant or adequately designed dry hydrant connection. The supply source must be capable of supplying a minimum of 109,000 L (24,000 Imp. gal.). Multiple sources may be utilized.
- 4.1.9 Roads, lanes and right of ways providing access to alternative water supplies must be continuously maintained and documentation of maintenance programs must be available for review by the auditor.
- 4.1.10 Sufficient apparatus and fire fighters must be available to provide response to the service area in the event of a fire call during the Superior Tanker Shuttle Service Test.
- 4.1.11 The selected test site(s) must be located remotely from fire stations and be representative of areas where travel distances to alternative water supply refill points may be comparatively long (ex. 90th percentile). The test site(s) must be agreeable to both the fire department and the auditor. The test site must be a minimum of five kilometres from all water refill points and within eight kilometres of a fire station.
- 4.1.12 Water from the Pumper at the test site must be supplied to a deluge gun with appropriate smooth bore stacked tips to allow for measurement with a pitot gauge.

4.2. Pre-Test Set up

- 4.2.1 Ensure that forms Alternate Water Supply Form (WS5) and Appendix A – Additional Information Form (WS6) are completed in full or as applicable. Ensure that Discharge-Time sheets and Fill-time sheets are completed for each tanker listed in section “Available Apparatus for Alternative Water-Supply Operations” (these can be found in WS5).
- 4.2.2 Ensure that all applicable information and exhibits specified in the WS5 form, (parts B – I), has been provided and reviewed by auditor.
- 4.2.3 The auditor will evaluate the information requested in sentences 4.2.1 and 4.2.2, as well as fire apparatus, test equipment, test site, water refill site, automatic aid agreements and test procedures; to ensure compliance with this procedure and all relevant standards and specifications are met.
- 4.2.4 Through evaluating the forms and exhibits provided, the auditor will use judgment to ensure that the Fire Department is capable of safely arranging and carrying out tanker shuttle service without adversely affecting fire protection capacity to the community being tested or to other communities involved in the test procedure.
- 4.2.5 The Fire Department being tested will have a maximum of 3 attempts to successfully achieve the minimum flow rates:
- (a) within 5 minutes of the first major apparatus arriving on scene (wheel stop), a minimum 1,000 LPM (200 IGPM) flow rate must be achieved, and
 - (b) within 10 minutes of the first major apparatus arriving on scene (wheel stop), the accredited flow rate must be achieved (if this amount is greater than the previously specified minimum).
- a) If the test does not succeed on the first, second or third attempts, then the test fails.
 - b) If the rate of flow drops below 1000 LPM (200 IGPM) for longer than 30 seconds or no water is being flowed, the test attempt will be a failure. A subsequent attempt is allowed within 30 minutes. The failed test will end and will be restarted from the very beginning of the test. (see Additional notes). A maximum of three attempts will be completed per accreditation visit.
 - c) If three successive Superior Tanker Shuttle Tests fail, then accreditation will not be granted. Re-application may be made after a period of at least 12 months.
 - d) Superior Tanker Shuttle Tests that are interrupted are considered non-tests are not counted toward the number of successive tests.

4.3. Layout of Test

- 4.3.1 Tests should be made during a period of ordinary water supply demand.
- 4.3.2 An appropriately remote site for flowing water shall be selected that is representative of the 90th percentile with respect to travel distances and response challenges. Consideration shall be given to remoteness from both water supply points and fire halls.

4.3.3 Once the test site has been selected, due consideration shall be given to potential interference with traffic flow patterns, damage to surroundings (e.g., roadways, sidewalks, landscapes, vehicles, and pedestrians), and potential flooding problems both local and remote from the test site.

4.3.4 The test shall conform to one of the following scenarios. The set-up for the test shall be discussed with the fire department to determine the appropriate scenario with respect to the fire department protocols.

(a) Fire Suppression Apparatus is situated at the test site. Mobile Water Supply Apparatus start at a designated distance from the test site, representative of actual conditions that would be expected during a fire event.

(b) Fire Suppression and Mobile Water Supply Apparatus are in motion from a designated distance from the test site, representative of actual conditions that would be expected during a fire event.

4.3.5 Necessary equipment for the test:

- Stop watch (or other accurate timing device)
- Flow testing equipment (handheld pitot device or pitot device that attaches to deluge gun)
- Relevant pressure gauges. (All pressure gauges shall be calibrated at least every 12 months, or more frequently depending on use).

4.3.6 To simulate tests accordingly, fire department personnel are required to wear personal protective clothing. The minimum Personal Protective Clothing (PPC) that shall be worn during the test includes trousers, protective boots, jacket, and helmet.

4.3.7 To be credited, personnel participating in the test must arrive on either Fire Suppression Apparatus or Mobile Water Supply Apparatus.

Exceptions may be considered where the fire department has an established alternate protocol with supporting SOG/SOP for transporting fire fighters to fire events.

4.3.8 No equipment is allowed to be situated at the test site prior to testing. All necessary equipment shall be carried on appropriate apparatus to the test site as it shall be treated like any other structural fire situation.

Exception: Auditor equipment should be attached prior to the test (ex. pitot tube with gauge if appropriate). Doing so before the test ensures no interference will come from the auditor during the test.

4.3.9 A minimum of one auditor will conduct the Superior Tanker Shuttle Service test(s); however, two auditors are ideal. If only one is present, the representative/auditor may optionally have fire department personnel to assist in recording results.

4.4. Test Procedure

4.4.1 Two conditions must be met in order to pass the Superior Tanker Shuttle Service accreditation test:

- within 5 minutes of arrival to the test site (representing a fire site) of the first major piece of apparatus, the department must produce a minimum of 1000 LPM (200 IGPM) for Personal Lines Dwelling Protection Grade or 2000 LPM (400 IGPM) for Commercial Lines Public Fire Protection Classification; AND
- the department must sustain the minimum flow rate for the test duration; 120 minutes for a flow rate of 1000 LPM (200 IGPM); 60 minutes for a flow rate of 2000 LPM (400 IGPM); or a duration that is appropriate for the flow rate accredited as determined from the Fire Underwriters Survey Water Supply for Public Fire Protection.
- Note: If a higher flow rate than the minimum will be accredited, then this flow rate must be achieved within 10 minutes of arrival of first major piece of apparatus; and

4.4.2 Before testing, ensure that as much relevant information as possible has been completed on the WS5 Alternative water Supplies form.

4.4.3 Using the Hazen-Williams formula, calculate the pitot reading and pressure required to achieve the desired flow rate (to be accredited), which is shown as Q and must be not less than 1000 LPM (200 IGPM):

$$Q = 0.0666cd^2\sqrt{p}$$

Where:
 Q= Flow (LPM)
 c = coefficient of discharge
 d = diameter of the outlet (mm)
 p = pitot pressure in (kPa)

Or (as appropriate for US or Imperial units)

$$Q = 29.83cd^2\sqrt{p}$$

Where:

Q= Flow (USgpm)
 c = coefficient of discharge
 d = diameter of the outlet (inches)
 p = pitot pressure in (psi)

$$Q = 24.84cd^2\sqrt{p}$$

Where:

Q= Flow (Ilgpm)
 c = coefficient of discharge
 d = diameter of the outlet (inches)
 p = pitot pressure in (psi)

4.4.4 Start timing based on the chosen scenario for the test as described in 4.3.4.

4.4.5 Flow rates for the corresponding pitot pressures should be prepared in advance such that the appropriate pitot readings and corresponding flow rates for the orifice being used are known. In this way, the auditor may continuously monitor for the minimum flow rate being supplied.

Where possible, it is suggested that a pitot device that attaches to a deluge gun, as well as a handheld pitot, be used to confirm readings.

4.4.6 When the minimum flow rate is reached, pitot readings and handheld pitot readings must then be taken every 5 minutes, for 2 hours, and recorded in the Test Reading Data part of the Superior Tanker Shuttle Service Accreditation Test Form (see Appendix B). Also, if a pump panel is accessible readings shall be taken from the discharge gauge, RPM gauge, suction gauge, and engine temperature gauge.

4.4.7 Data required on the last two pages of the Superior Tanker Shuttle Service Accreditation Test Form, shall also be recorded for each relevant apparatus.

4.4.8 Pitot readings shall also be constantly observed to ensure that the flow rate DOES NOT fall below the minimum flow rate and/or the accredited flow rate (if higher than the minimum) for longer than 30 seconds. If this condition is not met, the test will be considered a failure and retesting will be subject to 4.2.5.

4.4.9 If the test is considered a success, the remaining sections of the Superior Tanker Shuttle Service Accreditation Test Form must be completed and supplied to the registrar of the Superior Tanker Shuttle Accreditation Tests with forms WS5, WS6, and all relevant documentation.

4.5. Additional Notes:

4.5.1 NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting, should be used as the basic standard and primary resource for planning and executing shuttle operations. Note that to be accredited to deliver Superior Tanker Shuttle Service requires exceeding the NFPA 1142 standard in several key areas.

4.5.2 Operating mobile water supply apparatus under emergency conditions is hazardous and can result in accidents, injuries and deaths. Ensuring that drivers complete a

thorough training program prior to being allowed to operate the vehicle under response conditions can minimize the dangers associated with limited experience. The training program should ensure that all provincial operator licensing requirements are met. Additionally, NFPA 1002, Standard for Fire Apparatus Driver/Operator Professional Qualifications, and NFPA 1451, Standard for a Fire Service Vehicle Operations Training Program, should both be used (or other equivalent standards) when developing programs to train and validate drivers of emergency fire apparatus. Fire apparatus used in mobile water supply operations should be designed, constructed and maintained in accordance with CAN/ULC-S515-04 or NFPA 1901, 2009.

4.5.3 Conducting testing in the field can pose hazards to those involved in testing as well as to the public at large. All applicable Occupational Health and Safety Standards should be adhered to at all times with particular attention paid to traffic control requirements and warning of the public that fire department training activities are ongoing. Any incident or practice that is deemed to be unsafe by the auditor will result in automatic failure of the test. Re-testing should not be allowed until a full review has been completed and an incident report submitted to the Registrar.

4.5.4 Three attempts total are given for the Superior Tanker Shuttle Service accreditation test. For each attempt the fire department must:

- Put all equipment and hoses back on appropriate apparatus. That means port-a-tanks must be emptied and stowed on the original apparatus it was brought to the test on.
- Mobile Water Supply Apparatus are allowed to return to refill points and fill up to begin the test again.
- Fire Suppression and Mobile Water Supply Apparatus will return to starting positions before each test attempt.

4.5.5 Waiving of tests or parts thereof: Alternate Water Supply Accreditation Tests (or portions thereof) may be waived at the discretion of the auditor where the following conditions exist:

1. All emergency response facilities involved in the accreditation have been evaluated and accredited in a full scale and full length test within the past 5 years, or comprehensive documentation of any untested emergency response facilities is provided and is considered to meet or exceed the standard.
2. All members of fire fighting rosters involved in the accreditation have been evaluated and accredited in a full scale and full length test within the past 5 years, or comprehensive documentation of training and experience of any untested roster members is provided and is considered to meet or exceed the standard.
3. All fire apparatus involved in the accreditation have been evaluated and accredited in a full scale and full length test within

the past 5 years, or comprehensive documentation of design, maintenance, capacity and reliability of any untested apparatus is provided and is considered to meet or exceed the standard.

4. All water supply points (alternative or municipal) involved in the accreditation have been evaluated and accredited in a full scale and full length test within the past 5 years, or comprehensive documentation of design, maintenance, capacity and reliability of any untested water supply points is provided and is considered to meet or exceed the standard.
5. The accredited service area has been evaluated and determined to be less “hydraulically demanding” with respect to all issues related to delivery of hose streams (including road access, travel times, etc., etc.) than a full scale and full length test within the same service area that has been completed within the past 5 years
6. A complete coverage analysis has been conducted clearly showing the limits of coverage areas that considers the maximum coverage distance from the first responding fire hall is 8km by road and the maximum travel distance from a recognized water supply point is 5km by road
7. The fire hall and process of delivering alternative water supplies for public fire protection can be shown in all ways to comply with the intent of the Fire Underwriters Survey Standard Alternative Water Supplies for Public Fire Protection
8. All waived tests (or portions of tests) are subject to review and approval of the registrar of Alternative Water Supply Accreditations. Comprehensive documentation must be provided in all cases to clearly show the capacity to provide the alternative water supplies for public fire protection service prior to accreditation.

Large Diameter Hose Lay Test Procedure

4.6. Applicable Rules of Accreditation test

4.6.1 The fire department shall have a Standard Operational Guideline for Large Diameter Hose Lay operations. Each fire fighter at the scene shall have an assigned duty for either water supply or fire fighting operations.

4.6.2 The area to be serviced by Large Diameter Hose Lay shall be serviced by a public hydrant(s) capable of providing not less than 400 IGPM

(2000 LPM) at 20 psi residual; or a recognized dry hydrant capable of providing not less than 3700 LPM (830 IGPM).

- 4.6.3 The fire department shall continuously flow the rates of water as specified in section 4.1.3 and for the durations specified in that section.
- 4.6.4 Pumpers that are expected to be used during Large Diameter Hose Lay operations shall qualify for recognition as a 'pumper' apparatus within the fire insurance grading.
- 4.6.5 Maximum distance that can be credited for Large Diameter Hose Lay for fire insurance grading purposes is 600 meters.
- 4.6.6 Each fire station shall be capable of providing 600 meters of long hose lay from 'clock start'. If the fire station cannot provide 600 meters of long hose lay, than the amount they will be accredited will be the length of large diameter hose that the station can effectively lay.
- 4.6.7 The Fire Department will have 5 minutes to attain a flow not less than 200 IGPM and 10 minutes to attain the flow greater than 200 IGPM in which they wish to be accredited.

5.0 References

1. NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting
2. NFPA 1901, Standard for Automotive Fire Apparatus
3. NFPA 1911, Standard for Service Tests of Pumps on Fire Department Apparatus
4. Fire Underwriters Survey, “Water Supplies for Public Fire Protection”
5. AWWA, “Distribution System Requirements for Fire Protection, M31”
6. FEMA, “Safe Operation Of Fire Tankers”
7. Sardqvist, Sand Holmstedt, G, “Water for Manual Fire Suppression”, Journal of Fire Protection Engineering, Vol.11 209, 2001
8. Baldwin, R., “Use Of Water In The Extinction Of Fires By Brigades”, The Institution of Fire Engineers Quarterly, Vol. 31, No. 82, 1972, pp 163–168.
9. Heskestad, G., “The Role Of Water In Suppression Of Fire: A Review”, Journal of Fire and Flammability, Vol. 11, 1980, pp 254–262.
10. Rasbach, A., “The Extinction Of Fire With Plain Water: A Review. Fire Safety Science.” In: Proceedings of the First International Symposium, 1985, pp 1145–1163.
11. Covey, B.(1999). “The Static Water Supply Program.” New South Wales Fire Brigades, Sydney, Australia.

Appendix A





Alternative Water Supply Form (WS5)

A. Additional criteria concerning water delivery by fire department apparatus:

1. When the fire department uses a water-tender or tanker-relay system, FUS reduces the volume of the water-tender capacities by 10% for spillage and incomplete filling and discharge.
2. FUS's calculations assume that fire apparatus travel at 55 km/h on average. FUS calculates travel time according to the formula:

$$T = 0.65 + 1.05D$$

where T = travel time in minutes

D = the distance in km

FUS uses slower speeds for underpowered apparatus or apparatus laying hose lines.

3. The delivery rate of a water-tender or tanker-relay system depends on the rate of filling and discharge of the apparatus and the usable volume of the fire-site folding tanks or other fire-site storage.
4. FUS may give credit for apparatus responding from outside the community, depending upon communication facilities, handling of alarms, interdepartmental training, fire-ground communications, and time of arrival at fires.

B. Please provide the following information:

- 1) A scaled map showing:
 - a) The boundary of the community or area served by fire department
 - b) All roads usable by fire apparatus under all weather conditions
 - c) All bridges that do not have a safe weight capacity sufficient for fire department apparatus (Weight information is available from the Provincial Department of Transportation.)
 - d) The location of fire stations
 - e) The name and location of any fire station housing automatic-aid apparatus
 - f) The location and identification of each water-supply point (hydrants and/or suction supplies)
- 2) A description of each water-supply point
 - a) Include the maximum rate at 137.89kpa (20 psi) for a hydrant supplied from a water main or dry hydrant using the pumper and hose arrangement you anticipate using at that hydrant. Provide supporting test results.
- 3) For an impounded supply, lake, pond, or other storage facility:
 - a) The minimum storage available (at not over 4.57 m lift) during a drought with an average 50-year frequency (certified by a registered professional engineer, registered hydrologist, registered geologist, soil conservationist, or federal surface-water specialist)



- 4) For a supply from a flowing stream (including rivers and creeks):
 - a) The minimum rate of flow available (at not over 4.57 m lift) during a drought with an average 50-year frequency (certified by a registered professional engineer, registered hydrologist, registered geologist, soil conservationist, or federal surface-water specialist)
 - b) The maximum rate obtainable using the pumper(s) and hose arrangement you anticipate using at this point (supported by test results)
 - 5) For a cistern or tank:
 - a) The minimum storage (at not over 4.57 m lift)
 - b) The maximum rate obtainable using the pumper(s) and hose arrangement you anticipate using at this point (supported by test results)
 - 6) For each supply point and fire-site location:
 - a. The number of pumpers that can operate simultaneously
 - 7) For each water-supply point:
 - a) The distance to the water-supply point from each fire station housing the pumper or pumpers normally used at each water-supply point
 - 8) A statement signed by the owner of any private suction water-supply point authorizing its use by the fire department
- C. Please provide a description of a recent fire or demonstration where the fire-site was more than 304.8 m from a fire hydrant and the fire department delivered 946.25 LPM (250 USgpm) or more for more than one hour. Give the following information:
- 1) Location of fire or test
 - 2) Date of fire or test
 - 3) Number of water tankers or tenders (if used) discharging simultaneously
 - 4) Rate of flow delivered at the fire site
 - 5) Distance between the fire site and the water supply
 - 6) Length of time that the fire department delivered at least 946.25 LPM (250 USgpm) continuously
 - 7) Number of personnel participating, with a description of each person's function (firefighter, pump operator, water-tender or tanker operator, etc.)
 - 8) The apparatus used, with the following information for each:
 - a) Name and unit number
 - b) Pump capacity
 - c) Tank capacity
 - d) Functions
 - 9) The folding tanks used, if any, with the following information for each:
 - a) Total capacity
 - b) Usable capacity (total capacity less the volume inaccessible because of configuration of drafting device)



- c) A description of use and set-up time
 - d) Identification of each apparatus carrying a folding tank
- D. If the fire department uses different combinations of apparatus in various sections of the city, list the combinations with the data in Item C.7 and C.8 above and show the areas on the map.
- E. For each vehicle used to carry water:
- 1) Indicate the actual time to discharge the capacity of the water tender or tanker.
 - 2) Indicate the actual time necessary to fill the water tender using the pumpers normally used in the filling operation. If the department will use different pumpers for filling and they have different pump capacities, indicate the time for filling each capacity pumper. Record the time necessary for the vehicle to travel 60.9 m to the site (from a rolling start), maneuver into position, fill or discharge, and travel 60.9 m from the site.
- F. When the water supply is delivered through a large-diameter hose line, indicate the time for a pumper to travel 60.9 m to a water-supply point, connect suction and discharge hoses, and commence pumping. If the water-supply points are both hydrants and drafting sites, indicate the time for both types of water-supply points.
- G. When the water supply is delivered through a large-diameter hose line, indicate the lengths and diameter of the hose line used for the time trial, and record the time from when the pumper begins to fill the hose line until a solid stream of water emerges at the other end.
- H. When the use of a water-supply point at times depends upon creating an opening in ice, provide the maximum known thickness of ice. Provide a statement explaining the equipment used, apparatus carrying the equipment, and the estimated time necessary to create a drafting site when the ice is at the maximum thickness.
- I. A dry hydrant is a piping arrangement similar to a hydrant but designed for drafting. A dry hydrant can help give a pumper rapid access to a drafting source. In cold climates, the proper installation of a dry hydrant will eliminate the need for creating an opening in the ice. See the National Fire Protection Association "Standard on Water Supplies for Suburban and Rural Fire Fighting," NFPA 1142, as a guide. A semiannual inspection of dry hydrants should include drafting and back flushing.



Suction Water-supply Point Information

Community: _____ Region: _____ Prov.: _____

Date: _____

Location of suction water-supply point: (street address, nearest cross streets, etc): _____

Provide (if available) latitude/longitude coordinates in decimal format: Lat.: _____ Lon: _____

Map Datum used (Preferred is NAD 83): _____

Have you attached a detailed map showing the location of the suction point? Yes: No: Is the suction point located within 8 road km of a responding fire station? Yes: No: Type of body of water: Static body of water: Flowing body of water: Cistern: Other (describe): _____

Name of the body of water: _____

For bodies of water, attach certification by a registered professional engineer, registered hydrologist, registered geologist, soil conservationist, or federal surface-water specialist indicating the maximum flow rate that the suction water-supply point can provide for at least two hours during drought with an average 50-year frequency. (FUS may waive certification for very large bodies of water)

Is the certification attached? Yes: No:

Certified maximum flow rate: _____ LPM Certified available capacity: _____ liters

Ownership of site: Public: Private:

If private, attach a statement, signed by the owner of the private suction water-supply point, authorizing its use by the fire department.

Is the statement attached? Yes: No: N/A: Is a dry hydrant provided? Yes: No:

Outlet size: _____ mm Pipe diameter _____ mm Pipe length: _____ m

Are the dry hydrant hose threads compatible with pumper suction hose? Yes: No:

Indicate the permissible minimum water level over the intake: _____ m

Is a suitable hard-surfaced access provided for a pumper to draft? Yes: No:

Indicate the normal pumper that would use this site:

Pumper Name/Number: _____ Pump Size: _____ LPM

Length of suction hose needed: _____ m Size of suction hose used: _____ mm

Does this pumper respond automatically on the first alarm for structural fires? Yes: No:

Indicate the maximum performance at the site using designated pumper(s): _____ LPM

Indicate the maximum static lift at drought level: _____ m

Indicate the commercial buildings within 304.8 m of the suction supply point:

Address: _____ Building/Occupant Name: _____

Address: _____ Building/Occupant Name: _____



Available Apparatus for Alternative Water-Supply Operations

Fire-Site Pumpers	Address Where Apparatus is Housed	Pump Capacity (LPM)	Tank Capacity (liters)	Folding Tank Cap. (liters)
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
Supply or Fill-Site Pumpers				
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
Tankers				
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____



Travel Statistics from Fire Station to First Alternative Water-Supply Assignment

	Fire Company or Unit Responding	Travel Km	Travel Time
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____
7.	_____	_____	_____
8.	_____	_____	_____
9.	_____	_____	_____
10.	_____	_____	_____
11.	_____	_____	_____
12.	_____	_____	_____
13.	_____	_____	_____
14.	_____	_____	_____
15.	_____	_____	_____
16.	_____	_____	_____
17.	_____	_____	_____
18.	_____	_____	_____
19.	_____	_____	_____
20.	_____	_____	_____
21.	_____	_____	_____



Discharge-Time Sheet

Responsible Fire Department: _____

Tanker I.D.: _____

Water-tank capacity: _____ liters FUS-credited capacity: _____ liters

Operation (refer to the diagram below):

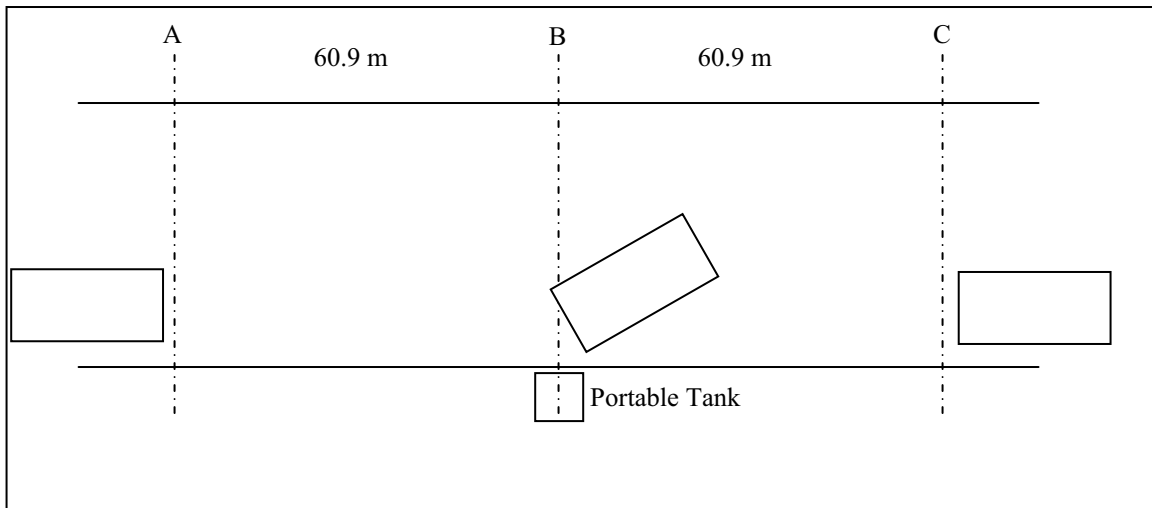
A water tender or tanker stops at location A. On a signal from the water-supply officer, the apparatus moves 60.9 m to B and discharges the water load into a portable water holding tank.* When the water discharge is complete, the tanker moves 60.96 m to C and stops.

*Off-loading of water using a mounted pump on the tanker is acceptable.

Elapsed time (A to C): _____ seconds

Water-tender or tanker discharge time in minutes (seconds/60): _____ minutes

FUS-credited discharge capability (capacity/discharge time): _____ LPM





Fill-Time Sheet

Responsible Fire Department: _____

Tanker I.D.: _____

Water-tank capacity: _____ liters FUS-credited capacity: _____ liters

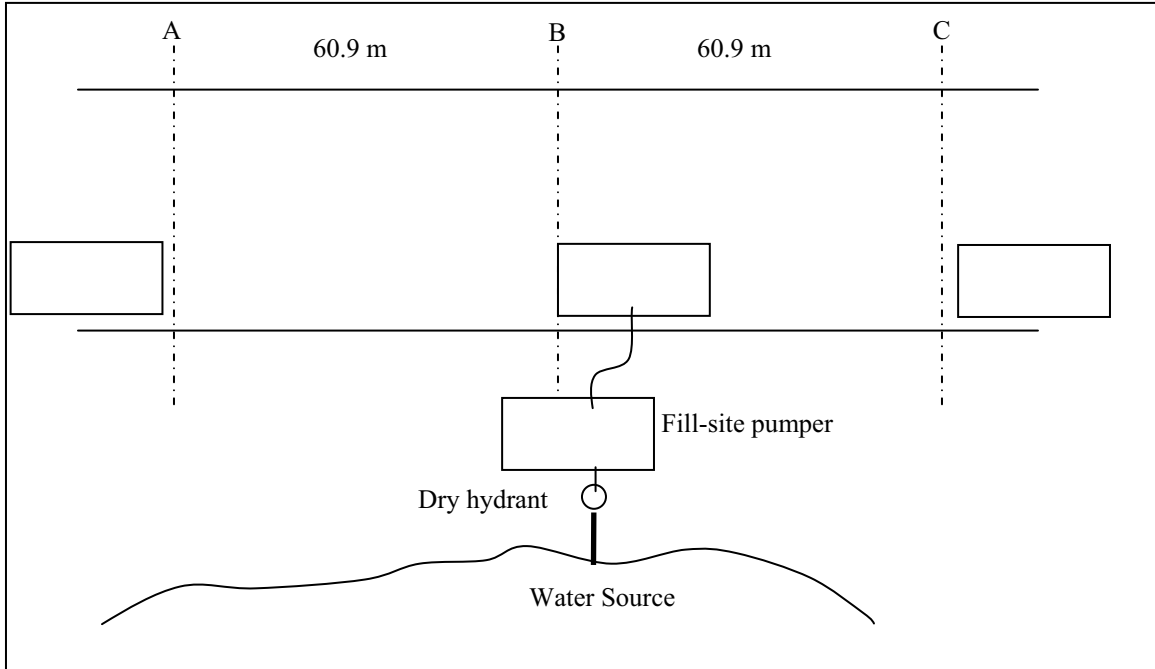
Operation (refer to the diagram below):

A water tender or tanker stops at location A. On a signal from the water-supply officer, the apparatus moves 60.9 m to B for filling according to the diagram. When the water tank is full to overflow, the fill line(s) is/are disconnected and the tanker moves 60.9 m and stops.

Elapsed time (A to C): _____ seconds

Water-tender or tanker fill time in minutes (seconds/60): _____ minutes

FUS-credited fill capability (capacity/fill time): _____ LPM





Alternate Water Supply – Portable-Tank Worksheet

Community: _____ Region: _____ Prov.: _____

Date: _____

Portable tank carried on apparatus number: _____

Manufacturer's nominal capacity: _____ liters

If the tank is "home made," provide the actual dimensions:

Length: _____ m Width: _____ m Maximum water depth: _____ m

Describe the arrangements for joining multiple portable tanks: _____

To determine the portable tank set-up time, the apparatus moves from a starting point 200' away with the portable tank stowed on the apparatus (in its normal location), proceeds (maneuvers) to the discharge site, removes the portable tank from the apparatus, and prepares the portable tank to receive water.

Portable tank set-up time = _____ minute(s) and _____ seconds



Alternate Water Supply – Fire-Site Pumper Worksheet

Community: _____ Region: _____ Prov.: _____

Date: _____

Fire Department name: _____

Fire station location: _____

Apparatus designation: _____ Year built: _____

Chassis make: _____ Body manufacturer: _____

Pump capacity: _____ LPM at 1034 Kpa (USgpm at 150 psi)

Water tank capacity: _____ liters

Suction hose size: _____ mm length: _____ m

Type of strainer used: Barrel type: Floating type: Low level type:
Other: _____

Indicate the minimum portable tank depth at which a minimum 946.25 LPM(250 USgpm) rate of flow _____ in.
can be withdrawn: _____

To determine the fire-site pumper set-up time, the apparatus moves from a starting point 60.9 m away, proceeds (maneuvers) to fire site, positions the apparatus, primes the pump, and establishes at least a 946.25 LPM (250 USgpm) rate of flow from the portable tank through a minimum of 60.9 m of 63.5 mm or equivalent hose line. The initial flow may be from the apparatus's water tank.

Fire-site pumper set-up time = _____ minute(s) and _____ seconds

Appendix B





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Superior Tanker Shuttle Service Accreditation Test Form

Basic Information:

Test Conducted by: _____ Test Date: _____

Municipality: _____ Fire Department: _____

Automatic Aid Department: _____

Describe where aid comes from and travel distance: _____

Refill Sites used during test:

Refill Site Number	Distance from Test Site to Refill Site

Refill Sites Available to the Fire Department:

	Name	Location of Refill Sites	Type of Water Source available for refill	Water Available at Source	Road Travel Distance to Fire Station (km)
1					
2					
3					
4					
5					



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Test Sites Available to the Fire Department:

Test Site	Location of Test Sites	Distance to Fire Station (km)	Latitude & Longitude	Road Travel Distance to Fire Station (km)
1				
2				
3				
4				
5				

Location of Chosen Test Site:

Why was the Test Site Chosen?

Comments/Sketches

--



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Description of Refill site(s) used during the test (noting access issues, improper turnaround, signage, loading platforms)

If pressurized fire hydrants are used as a refill site, were flow tests conducted?	
--	--

Tanker Start Point for Chosen Test Site:

Tanker	Location	Distance from Start Point to Test Site (km)	Capacity at Start of Test	Port-a-Tank Equipped



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Refill Sites used during test:

Name	Location	Distance from Test Site to Refill Site	Type of Water Source	Water Available at Source

Roadway Information:

Posted Speeds of Roadway to Refill Site(s):

Maximum Allowable Travel Speed during Test:

RCMP Notified:

Community Notified:

Lights and Sirens used during test:

Description of Roadway used during test:



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Test Data:

Initial Available Water at Test Site: _____

Test Start Time (on the day of the test): _____

Nozzle Diameter (orifice size): _____ Coefficient: _____

Time 200 IGPM was first flowed as read from the stopwatch: _____

Pitot reading: _____

Suction Hose Diameter: _____ Suction Hose Material: _____

Suction Hose Length: _____ Suction Hose Lift during test: _____

Portable Pumps and pumping capacity used during test (if any): _____

Describe how the department connects portable tanks together (if not known from Portable-Tank worksheet): _____



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Test Reading Data:

Time (minutes)	Pitot Reading	Calculated Flow Rate (IGPM)	Discharge Gauge Reading	RPM	Suction Gauge Reading	Engine Temp.	Handheld Pitot Reading
(when 200 Igpm was reached)							
+5							
+10							
+15							
+20							
+25							
+30							
+35							
+40							
+45							
+50							
+55							
+60							
+65							
+70							
+75							
+80							
+85							
+90							
+95							
+100							
+105							
+110							
+115							
+120							

Hazen-Williams Flow Calculation

Imperial results require inches and PSI. Metric measurements require mm and kPa.

$$\text{USGPM} - Q = 29.84cd^2\sqrt{P}$$

$$\text{IGPM} - Q = 24.84cd^2\sqrt{P}$$

$$\text{LPM} - Q = 0.0666cd^2\sqrt{P}$$



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T Unit #	Capacity	Station	Start Location	Refill Site

	Arrival	Departure	Quantity	Travel time	Drop time
1st Cycle					
2nd Cycle					
3rd Cycle					
4th Cycle					
5th Cycle					
6th Cycle					
7th Cycle					

T Unit #	Capacity	Station	Start Location	Refill Site

	Arrival	Departure	Quantity	Travel time	Drop time
1st Cycle					
2nd Cycle					
3rd Cycle					
4th Cycle					
5th Cycle					
6th Cycle					
7th Cycle					



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T Unit #	Capacity	Station	Start Location	Refill Site

	Arrival	Departure	Quantity	Travel time	Drop time
1st Cycle					
2nd Cycle					
3rd Cycle					
4th Cycle					
5th Cycle					
6th Cycle					
7th Cycle					

T Unit #	Capacity	Station	Start Location	Refill Site

	Arrival	Departure	Quantity	Travel time	Drop time
1st Cycle					
2nd Cycle					
3rd Cycle					
4th Cycle					
5th Cycle					
6th Cycle					
7th Cycle					



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Appendix C



Johanne Lamanque
Vice-President, Quebec

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May 28, 2012

Subject: Fire Underwriters Survey (FUS) and Insurance Grading Classifications

To whom it may concern:

The Insurance Bureau of Canada (IBC) confirms that SCM Risk Management Services Inc. (RMS) manages the Fire Underwriters Survey (FUS) program, which was previously managed and financed by the IBC.

RMS is the only organization in Canada recognized by the Property and Casualty insurance industry for the development and production of fire insurance classification gradings for Residential and Commercial properties.

Those gradings are promulgated to all insurance companies and to insurance brokers.

The IBC provides its full support to RMS' FUS program that insures that gradings assigned to communities across Canada reflect the adequacy of public water supplies, fire departments, fire service communications, fire safety codes and other aspects of a community's fire defenses that have a significant influence on minimizing damage once a fire has occurred.

Should you require further information, please contact Fire Underwriters Survey directly.

Yours truly,


Johanne Lamanque

JL/cc