Fire Services Master Plan
Corporation of the Town of Kirkland Lake

December 2017

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CONSULTING

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Section 1 Summary

At the outset of this report we want to thank some key Town of Kirkland Lake staff members who offered guidance, patience, and openness. Wilfred Hass, the Director of Economic Development and Tourism, helped to establish a low-pressure working environment from the outset of the project, yet always underlined the importance of the Fire Services Master Plan. Fire Chief Rob Adair provided information quickly and without reservation, and was always available on short notice to answer questions, and, more recently, Chief Administrative Officer Peter Avgoutis shared his interest in ensuring the master plan was objective and informative.

We also thank Town Planner, Ashley Bilodeau; Information Manager, Jenna McNaughton; and Brittany Ronald from Treasury, who assisted us to understand budgets and expenditures.

We extend our appreciation to everyone who took time to talk to the consulting team during our visits to Kirkland Lake. We met with elected officials, the fire chief, and supporters of the fire master plan, examined the fire station, fire apparatus, and equipment, and met with front-line staff to gain an understanding of the town, and operational aspects of the fire service.

The following stakeholders were included in the consultations:

- The Mayor, and members of council
- Ontario Office of the Fire Marshal and Emergency Management (OFMEM) representative
- Kirkland Lake Fire Service officers
- Kirkland Lake Fire Service firefighters—full-time and volunteer
- International Association of Fire Fighters (IAFF) local 573 representatives

A more thorough outline of the expectations of the master plan is found in Section 2 of this report, but primarily the intent of this document is to

- provide the town with a systematic and comprehensive approach to evaluating risk and existing capabilities within the municipality and its fire services capabilities;
- formulate and communicate a strategic direction for the department, and highlight opportunities for optimizing service delivery;
- provide an objective basis to support decision-making with respect to community fire protection and prevention needs.

The project goal was to identify and provide the optimum level and range of fire protection and rescue services appropriate to the needs and circumstances of Kirkland Lake, and the scope was to

- conduct a review and analysis of the community's fire and public emergency history;
- measure the community's risk against statute, legislation, and best practices, specifically as they pertain to comparable communities; and
- make recommendations.

Issues to be addressed included

- an environmental scan to consider the projected development of the community over the next five years, and service demand impact;
- governance;
- administration;
- human resources such as staff levels;
- service delivery (three lines of defence; service delivery strategies that prioritize public education and fire prevention with an aim to reducing the need for fire suppression);
- emergency response;
- facilities (fire stations);
- apparatus and equipment; and
- fire prevention (inspections, investigations, and code enforcement).

Considering how positive our dealings were with all the town's and firefighter association's representatives, we wish we could deliver some good news in this master plan report, whether in the form of possible cost saving or avoidance, or reporting that community risk is low, or suggesting that the fire department is operating at a high degree of efficiency, but we can't.

The fire department is currently operating at the lowest possible cost and—not to be sensational—probably at an unsafe level; evidence indicates that the town is not in compliance with the *Fire Prevention and Protection Act*, and the fire department is not returning much value to the town, other than the very critical service of emergency response.

The fire department is not wholly responsible for this situation. Fire services, in general, have entered into a very competitive evolutionary cycle. Public service expenditures continue to increase, putting pressure on municipal administrators and elected officials to balance service delivery with costs and find ways to work more efficiently within available resources. Our interviews with elected officials gave us the distinct impression that their primary concern was to find ways of operating the fire department at a lower cost, and that is admirable considering the pressure to provide municipal services while not increasing taxes. But the reality is that the only way to reduce the cost of the fire service is to lay off full-time firefighters and replace them with volunteers, which will increase community risk. However, the challenges of trying to operate a volunteer fire service are becoming more profound because of volunteer health and safety and training issues that have similar requirements to those for career firefighters, and because of the difficulty of finding enough people who will volunteer. Additionally, a 2014 arbitration award involving the town of Deep River and the Deep River Firefighters' Association, wherein the town wanted to add volunteers to its fully career firefighting organization, allowed the inclusion of volunteers but permitted a reduction of only one full-time firefighter to compensate for the additional cost of volunteers (please see Section 4.3.1, Composition of the Fire Department). Based on that award, it is unlikely that Kirkland Lake would be able to reduce its full-time cadre; however, the town could seek legal advice on that matter. We

identify, in Section 4.3.1 that a restructuring of the fire service to make it mostly volunteer could result in an estimated annual savings of almost $390,000, but we don't recommend that reorganization.

Firefighters and fire departments have contextual value. That is, when no emergencies are occurring yet funds are being incurred for equipment, station, and staff, it is sometimes difficult to rationalize costs with service provision. However, when a building is on fire, someone is trapped, or other emergencies occur—particularly if it happens to be our house or a relative—the cost of a fire department is easy to accept. Nevertheless, fire departments should be able to consistently return value to the community even when they are not engaged in emergency response. This can be accomplished by reducing the likelihood of fires and other emergencies through public education and prevention efforts, and realigning and coordinating the fire department's responsibilities with other municipal services such as property standards and social services.

Kirkland Lake's fire department is not busy. On average, it responds to fewer than 0.8 calls per day. We acknowledge though, that emergency incidents occur sporadically rather than "on average."

Statistically, we found the following:

- Annual call volumes have declined by over 200 since the peak of 500 in 2014 (Table 2, page 14), mostly due to a medically based change in policy with respect to those times when fire assistance is needed at a medical incident.
- At the same time, anticipated municipal growth has not materialized, and there are no indications that significant drivers of fire resource requirements, or call volume, will occur in the next five or more years.
- Since 2014, working fire responses have been within four kilometers of the fire station, and overall response time for the first arriving vehicle has been within seven or eight minutes of being notified of an incident.
- There is no statistical information to suggest that there will be resource pressure on the fire department for the period of the master plan.

This means the fire service and firefighters have time to assume responsibilities such as public education, prevention and inspection, and property standards education and enforcement at little additional cost and perhaps no net cost, and with no negative effect on emergency response. However, the department cannot take on these roles without proper staff education, and the town should not be falsely frugal by not investing in this regard (please see Appendix F for training estimates). Although we can't identify expected monetary return on training investment in Kirkland Lake, there is ample evidence in Section 4.4.5 and Appendix G that delivering education and prevention services to the public returns good value in improved safety and lower risk.

First though, the town and fire department need to ensure compliance with the *Fire Prevention and Protection Act* because in 2003 the Ontario Fire Marshal indicated that the Kirkland Lake fire service—and therefore the town since the town is responsible for conforming to legislation—was not compliant.

Specifically, the Fire Marshal indicated that the municipality was unable to furnish statistical or other documentation to demonstrate the delivery of educational or inspection programs as required by Part II of the *Fire Protection and Prevention Act*. Unfortunately, our review of the town and fire department does not reveal a noticeable improvement since that time. Section 2.1.1.1 lays out the substantial assistance in legislation, and within the OFMEM guidelines, that is available to fire departments in the province to ensure they meet the *Fire Protection and Prevention Act* and provide value to the public.

In addressing governance of the fire service, we explain in Section 4.1 how the responsibility for fire protection services, within the *Fire Protection and Prevention Act, 1997*, resides with council, and that includes the delivery of public education, fire prevention, and other fire protection services. However, there is evidence of a variance in training and other fire department divisional and functional area programs (Sections 4.1 and 4.1.1), which indicates inconsistency in firefighter and volunteer training, and program application. This is because each platoon chief fulfills their responsibility in these areas as they see best. As noted in the report, it is as if there are four separate fire departments.

Also with respect to training, there is evidence that the Kirkland Lake fire department and its chief have been isolated from the greater fire department environment in Ontario and should have the benefit of mentoring from an experienced fire department leader(s) (Section 4.4). Our recommendation includes contracting, on a part-time basis over 12 to 18 months, with a retired fire chief who can assist with refocusing the fire department in areas such as policy, procedure, prevention, education, and mutual objective accomplishments with other municipal departments, such as social services and property standards. This contract position would be intended not to take over the fire chief's role but rather to act as a mentor or "executive chief." We estimate that attracting the right person as an executive chief for approximately 625 hours over a one-year period will require an investment of $110,000. This amount could be quickly recovered by making the fire chief and fire department responsible for property standards.

We understand that the chief is currently responsible for corporate health and safety and is, or soon will be, the municipal emergency management coordinator. We explain in Section 4.4.6 why we recommend against the fire chief assuming either of those roles. The fire department requires a full-time fire chief, and having the incumbent split time with other town duties will jeopardize the department's recovery. Additionally, there are operational implications. However, transferring property standards responsibility to the fire department dovetails with the fire department functions of prevention and education and negates the need for a separate property standards position. That cost avoidance can be used, initially, to offset the cost of a mentor for the first year and then possibly reduce overall future corporate staff costs.

The fire station is 80 years old, requires structural repair to part of the apparatus floor since it is not able to properly support the weight of existing trucks, and needs maintenance and repair to doors, windows, and weather stripping (Section 5.1). Our recommendation is to plan for station replacement within five years and to undertake maintenance and repair in the interim.

A 10,000-square-foot station at a cost of $400 per square foot will require capital funding of $4,000,000 plus land costs. However, fire stations can be expected to have a 40-year service life if properly planned and designed. In the interim, the floor structure of the present station should be reinforced immediately, and the repair of the weather stripping, windows, and doors should also be undertaken immediately. There are several unknowns with respect to maintenance of the current building, but initial costs could be in the range of $50,000 or more.

Some of the fire department apparatus is old and should be replaced during the term of this master fire plan (Section 5.2). The 1988 aerial platform truck, 1997 pumper, and 1999 Chevrolet pickup truck need to be retired over the next five years, starting as soon as possible. Replacement with previously owned apparatus is expected to cost $200,000 or more.

Primary Conclusions

Evidence within this report leads to the conclusion that Kirkland Lake's fire department lacks direction and cohesiveness: it is missing that purpose of a united organization trying to fulfill a clear commitment to prevention and protection rather than response to fire suppression and emergencies only. While we don't wish to be harsh, there seems to be dearth of vision and leadership as to how the service goes about providing training, education, inspection, and prevention programs. We don't believe this to be a new paradigm; in fact, it seems to be entrenched as culture and was perhaps precipitated by the corporate objective of avoiding expenditures combined with the missed opportunity by the fire department to demonstrate its critical value in ways identified within this report.

Operationally, the department needs to reinvent from the ground up, with council and administration providing strong support to the fire chief by directing, assisting, and giving him permission to fulfill the town's responsibilities under the *Fire Prevention and Protection Act*. The chief also requires an experienced fire service manager, acting as an external mentor, who can offer the benefit of imparting that experience over a period of a year or more.

The town has to be seen to offer its support to the fire department, in the same manner as it should offer it to other municipal departments. The town should also clearly state the value that the fire department is expected to bring to the municipality. We will be forthright in stating that during our discussions with councillors—admittedly only an hour or so in duration—their focus appeared to be on reducing the cost of the fire department rather than achieving value from it in the form of making use of the staff. As noted, the reality is that it is unlikely that saving money through a reduction in staff levels would be successful,[1] so the only way to moderate fire department cost would be to avoid expenditures on equipment, education, and public protection. Not only is it possible that a strategy of that nature could be contrary to the *Fire Prevention and Protection Act*, but it would be an avoidance rather than cost reduction. At some point a truck would have to be purchased, equipment replaced, or substantial repair or replacement of the current station would be necessary (as it is now).

[1] Please see Deep River arbitration; also, article 32 of the local 573 collective agreement.

Municipal administrators and elected officials are keenly aware that the cost of public safety is something that is being struggled with across Ontario and Canada. But in Kirkland Lake the current situation is likely the reality for the foreseeable future. Greater value should instead be provided to the public by effectively utilizing firefighters for the purpose of fire avoidance, thus reducing overall municipal costs to some extent.

Another initiative that is crucial for Kirkland Lake fire department is to complete a risk analysis (Section 4.4.1). Clearly, a risk analysis is a best practice but not mandatory. However, a well-executed risk assessment enables a municipality to make decisions based on fact and determine the resources required within its fire department. Resources in this case include personnel, apparatus, equipment, and training.

Primary Recommendations

Numerous recommendations are found within this report, and this summary offers cross references to many of them. In addition to item-specific advice, we make three primary recommendations that are crucial to the success of the master plan.

1. That council accepts this master fire plan and uses it as the basis for achieving greater value from the fire service in the form of public education, prevention, and property standards initiatives, in addition to its traditional response role.
2. That the content of the master fire plan should serve as the mandate for municipal administration to restructure the purpose of the fire department from primarily a response agency to one of education and prevention as well as response.
3. That the fire chief, fire department members, and the firefighters' association support the master plan and recommendations.

Section 2 Introduction

2.1 Project Background

A master fire plan is a strategy for providing fire services to a community over a specified period, often 5 to 10 years. The strategy is formulated based on an objective review of the circumstances within a community, which then results in a risk profile, combined with sufficient information for decision-makers to determine whether to accept the recommendations within the master plan report.

The Town of Kirkland Lake's original request for proposals, issued in late 2016, identified a master fire plan as

> *a strategic blueprint for the provision of local fire protection services that addresses legislative requirements, local needs and circumstances, 'best practices' for comparable communities while taking into account the community's ability to fund and support the level of service determined by Town Council. The Master Fire Plan also makes significant findings and presents options and/or recommendations relating to fire risks and hazards, fire protection capabilities, public education, fire risk reductions and management, community preparedness and response, and funding and fiscal measures relating to fire protection.*

A further expectation of the master plan was that it would

- provide the Town of Kirkland Lake with a systematic and comprehensive approach to evaluating risk and existing capabilities within the municipality and its fire services capabilities;
- help formulate and communicate a strategic direction for the department, and highlight opportunities for optimizing service delivery;
- provide an objective basis to support decision-making with respect to community fire protection and prevention service needs through the participation of members of the public, council, the department, and staff from other municipal departments.

The project goal was to identify and provide the optimum level and range of fire protection and rescue services appropriate to the specific local needs and circumstances of Kirkland Lake. The project scope was to

- conduct a review and analysis of the community's fire and public emergency history;
- do a current community risk assessment and analysis of the municipality's existing capacities and capabilities (measured against statute, legislated, and best practices in Ontario, specifically as pertain to comparable communities); and
- make recommendations
  - for service level standards, staffing, scheduling and apparatus deployment, facility management, implementation strategies, and timetables; and
  - referencing the OFMEM Public Fire Safety Guidelines, OFMEM "Operational Planning: An Official Guide to Matching Resource Deployment and Risk" document, OFMEM Fire Safety Inspections and Enforcement technical guideline (TG-01-2012), and NFPA 1710 and 1720 standards.

Issues to be addressed included

- an environmental scan to consider the projected development of the community over the next five years, and the potential impact to service demands and operations of the fire services department;
- governance;
- administration;
- human resources such as staff levels;
- service delivery (three lines of defence; service delivery strategies that prioritize public education and fire prevention with an aim to reducing the need for fire suppression);
- emergency response;
- facilities (fire stations);
- apparatus and equipment;
- fire prevention (inspections, investigations, and code enforcement).

2.1.1 Context for the Master Fire Plan

This section offers context with respect to the master fire plan report. It gets a bit theoretical at times and readers may ask themselves what some of it has to do with fire services. It is important to read, though, because it sets the stage for risk-based decision-making, by the town, based on the consultants' recommendations. Failing to read this section is analogous to not "reading the directions" and simply "pushing the start button to see what happens." Please read carefully.

Master fire plan reports, and requests for proposal, often refer to best practices, industry standards, the National Fire Protection Association, the Fire Underwriters Survey, risk or risk analysis, legislation, and statute. For the purpose of clarity, this section explains those concepts as they apply to the context of this report.

2.1.1.1 Legislation

In Ontario, the *Fire Protection and Prevention Act, 1997*[2] identifies municipal responsibilities for providing public fire protection services, and the *Occupational Health and Safety Act, R.S.O. 1990*,[3] guides municipal responsibilities regarding firefighter health and safety.

Part II of the *Fire Protection and Prevention Act, 1997*, Responsibility for Fire Protection Services, states

2. (1) Every municipality shall,
   (a) establish a program in the municipality which must include public education with respect to fire safety and certain components of fire prevention; and
   (b) provide such other fire protection services as it determines may be necessary in accordance with its needs and circumstances.

[2] www.ontario.ca/laws/statute/97f04
[3] www.ontario.ca/laws/statute/90o01

The same section of the *Fire Protection and Prevention Act* goes on to say that

> (2) In discharging its responsibilities under subsection (1), a municipality shall,
>
> (a) appoint a community fire safety officer or a community fire safety team; or
>
> (b) establish a fire department.

It's notable that the *Fire Prevention and Protection Act* requires municipalities to appoint a community fire safety officer or fire safety team but doesn't require establishing a fire department. In fact, a fire department is optional. However, Section 7 says that

> *The Fire Marshal may monitor and review the fire protection services provided by municipalities to ensure that municipalities have met their responsibilities under this section and, if the Fire Marshal is of the opinion that, as a result of a municipality failing to comply with its responsibilities under subsection (1), a serious threat to public safety exists in the municipality, he or she may make recommendations to the council of the municipality with respect to possible measures the municipality may take to remedy or reduce the threat to public safety.*

And Section 8 says

> *If a municipality fails to adhere to the recommendations made by the Fire Marshal under subsection (7) or to take any other measures that in the opinion of the Fire Marshal will remedy or reduce the threat to public safety, the Minister may recommend to the Lieutenant Governor in Council that a regulation be made under subsection (9).*

Section 9 says

> *Upon the recommendation of the Minister, the Lieutenant Governor in Council may make regulations establishing standards for fire protection services in municipalities and requiring municipalities to comply with the standards.*

Section 9.1 (d) of the *Fire Protection and Prevention Act, 1997,* enables the Office of the Fire Marshal and Emergency Management to issue guidelines to municipalities with respect to fire protection and related matters, including recommendations for fire protection such as the development of a fire master plan.

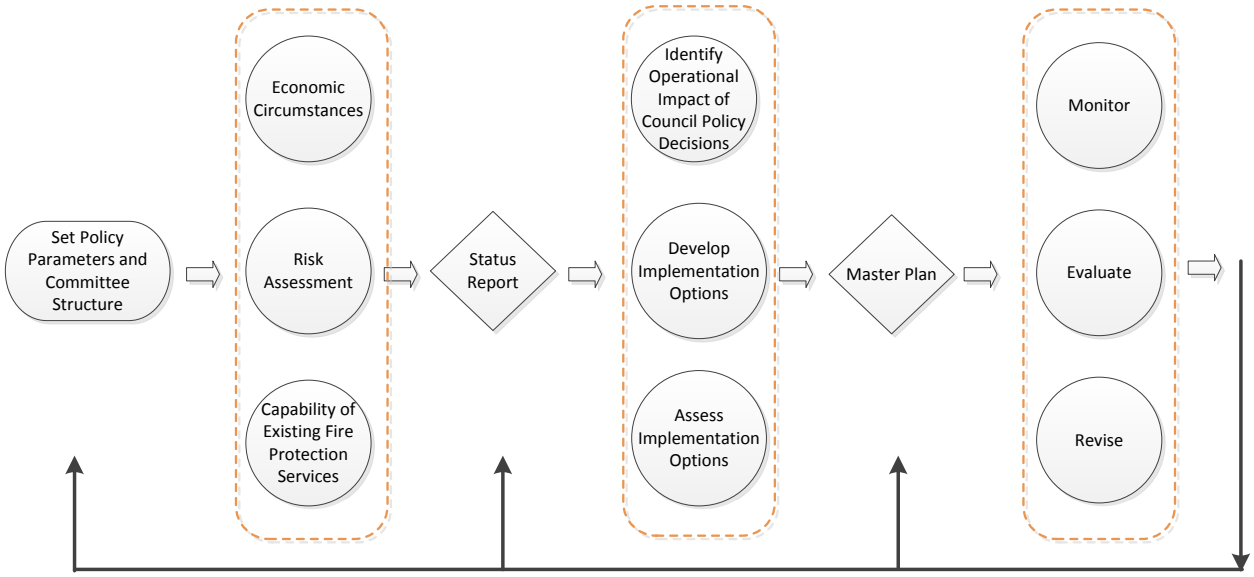
The legislation outlined above means that a municipality must have in place a form of fire prevention and public education, but it need not have a fire department. Nevertheless, if the Fire Marshal believes that there is a serious threat to the public, the Fire Marshal can take steps that may lead to regulations requiring a municipality to comply with standards. In reality, a municipality can have any form of fire protection it wishes—or not—as long as a program is in place in the municipality that includes public education with respect to fire safety and certain components of fire prevention. In almost all respects then, a municipality is the **authority having the jurisdiction** to decide the level of fire protection it wishes to provide based upon local needs and circumstances.

Nevertheless, if a municipality wishes to have a fire department, and decides to implement a fire master plan, the Office of the Fire Marshal and Emergency Management has issued a guideline[4] for municipalities to follow during preparation, the purpose of which is to

- *provide a description of a simple and practicable system to enable decision makers to make informed choices,*
- *ensure formal interaction between council with its policy setting responsibilities, the municipality with its corporate management objectives, and the fire department with its operational expertise.*

The Fire Protection Review Process guideline suggests several stages as depicted in Exhibit 1.

Exhibit 1: Optimizing Public Safety



PFSG 01-01-01 can be found in Appendix A and refers to three other public fire safety guidelines to define local needs and circumstances:

1. Public Fire Safety Guideline 02-02-03, Fire Risk Assessment, lays out considerations for persons conducting fire risk inspections and addresses issues such as
   a) municipal and historical factors;
   b) geography and demographics;
   c) building stock and occupancies;
   d) prevention and public education programs;
   e) public and private protection systems;
   f) related functions such as economic circumstances and capabilities of existing fire protection services; and

[4]Public Fire Safety Guideline (PFSG) 01-01-01, Fire Protection Review Process
http://www.mcscs.jus.gov.on.ca/english/FireMarshal/FireServiceResources/PublicFireSafetyGuidelines/01-01-01.html

g) public and political resolve.

Item g) public and political resolve is an important consideration since it takes into account public and political perceptions, expectations, and climate, such as

- the perceived awareness of fire safety by the general public and the corporate sector;
- the expectations for fire protection by the general public and the corporate sector;
- the general tone of press and media coverage of fire-related matters;
- how fire prevention, fire safety, and public education programs are generally received and accepted by the community;
- the local political climate respecting
  - cost cutting/no budget increases,
  - preserving the status quo, and
  - maintaining/improving essential services such as the fire department.

Public Fire Safety Guideline 02-02-03 can be found in Appendix B.

2. Public Fire Safety Guideline 02-04-01, Capabilities of Existing Fire Protection Services, identifies factors that should be used to accurately assess capabilities of available fire protection services, such as
   - the organizational model;
   - services delivered;
   - emergency response and operations;
   - training, vehicles, water supply;
   - risk management planning; and
   - financial planning and management.

Public Fire Safety Guideline 02-04-01, Capabilities of Existing Fire Protection Services can be found in Appendix C.

3. Public Fire Safety Guideline 02-03-01, Economic Circumstances, suggests factors to be considered in assessing local economic circumstances, such as
   - assessment values;
   - tax rates;
   - municipal debt;
   - total fire protection costs;
   - assets, such as development charge accounts and reserve funds; and
   - potential loss impacts for major employers.

Public Fire Safety Guideline 02-03-01, Economic Circumstances, can be found in Appendix D.

Recommendations within this report follow the intent of these Public Fire Safety Guidelines, with the understanding that they are currently under review.

2.1.1.2 Firefighter Health and Safety

In Ontario, firefighter health and safety are governed by the general provisions of the *Occupational Health and Safety Act, R.S.O. 1990*, with some exceptions related to emergency response. Section 21 of the Act provides for the establishment of specific job sector advisory committees. The Ontario Fire Service Section 21 Advisory Committee is the body appointed to advise the Minister of Labour about firefighter health and safety matters and issue Guidance Notes.

Section 21 of the Act states:

> *The Ministry of Labour in collaboration with fire service stakeholders develops Guidance Notes. Guidance Notes outline recommended equipment and procedures to be used by workers in the fire service to prevent injury or illness and will comply with the intent and provisions as outlined in the* Occupational Health and Safety Act*. The Ministry of Labour refers to the guidelines, guidance notes, alerts, etc. for enforcement under the* Occupational Health and Safety Act*, and is considered by the Ministry in determining if reasonable precautions for the protection of a worker are being taken under Clause 25.2(h) of the* Occupational Health and Safety Act*.*

The Guidance Notes are consolidated in a Section 21 Fire Service Health and Safety Manual, available on various websites including those of the Ontario Association of Fire Chiefs,[5] the Ontario Professional Firefighters' Association, and the Fire Fighters' Association of Ontario. The Guidance Notes assist municipalities in their responsibility to "take every precaution reasonable in the circumstances for the protection of the worker," as required by the Act. They provide advice on such matters as incident command, communications, vehicle maintenance, personal protective equipment, training requirements, and documentation of training and procedures for conducting operations. The Section 21 Guidance Notes were reviewed and considered during development of Kirkland Lake's fire master plan.

2.1.1.3 Industry Standards

At times, within this section, readers may wonder what some of the information and explanations presented have to do with the delivery of fire services. The purpose is to explain where misconceptions may occur within the responsibility of municipalities in delivering fire protection, and the variation in understanding of what is often considered common terminology but is frequently interpreted differently. Please persist through some of these explanations because it is important to understand the definitions of a standard, best practices, industry standards, and other terms.

The Oxford English Dictionary says that a standard is "a document specifying nationally or internationally agreed properties of manufactured goods, principles for procedure, etc."

The International Organization for Standardization / International Electrotechnical Commission (ISO/IEC) Guide 2 states that a standard is a

[5] http://www.oafc.on.ca/section-21-manual

> *document, established by consensus and approved by a recognized body, that provides, for a common and repeated use, rules, guidelines, or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context.*

ISO indicates that it "creates documents that provide requirements, specifications, guidelines or characteristics that can be used consistently to ensure that materials, products, processes and services are fit for their purpose." Other commonly known entities such as the Standards Council of Canada (SCC), the American National Standards Institute (ANSI), and the European Committee for Standardization are represented on the International Organization for Standardization. But, while those organizations publish standards, and sometimes codes, none of the publications are law or requirements until referenced into legislation or regulations.

The National Fire Protection Association is also a standard-setting body relative to fire and related emergency services. Going to the link http://www.nfpa.org/News-and-Research/News-and-media/Press-Room/Reporters-Guide-to-Fire-and-NFPA/About-codes-and-standards offers the background to the way the NFPA approaches standards. Some of the content within the link above relates how the NFPA was founded as a result of automatic sprinkler systems coming into use in the late 19th century. At the time there were nine different pipe sizes in use, so a group of people involved with sprinkler manufacturing and fire insurance joined forces to develop a uniform standard for the installation of sprinklers. Many of today's building codes have adopted NFPA 13 (Standard for the Installation of Sprinkler Systems) and other NFPA standards as requirements. But some standards are different while accomplishing similar outcomes. For example, NFPA 285 is required compliance within the International Building Code (USA) as a means of regulating combustible components in exterior wall assemblies of multi-storey buildings. But in Canada the standard is CAN/ULC-S134. **The point we are making** here is that standards are issued by various bodies but are not a requirement until adopted by a government, and there are varying standards in different countries, all which have the purpose of protecting the public. Admittedly, it is possible that some standards do a better job than others, or that governments may take dissimilar approaches to achieving similar public protection.

The following two standards are commonly referenced in fire services:

- NFPA 1710 (*Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments),* and
- NFPA 1720 (*Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations and Special Operations to the Public by Volunteer Fire Departments)*.

The most frequently discussed parts of those standards are the requirements surrounding response times and number of firefighters.

How is this relevant to Kirkland Lake? The Kirkland Lake fire department is a composite department comprising a chief, four platoon chiefs, and six firefighters—all full-time—and approximately 25 volunteer firefighters. NFPA 1720, section 3.3.15.1, defines a combination fire department as a fire department having emergency personnel comprising less than an 85% majority of either volunteer or career

membership, and there are a set of standards that NFPA 1720 recommends for combined fire departments. Kirkland Lake fire department has about a 29% to 71% split between career and volunteer firefighters. Therefore, NFPA 1720, including sections related to deployment, would apply to Kirkland Lake if the town council decides to adopt selected parts. We discuss some of those sections in Section 4.3.

2.1.1.4 Best Practices and Benchmarks

The request for proposals, within the project description, indicates that, among other things, the project is designed to

- address best practices relative to comparable communities,
- be measured against statute, legislated, and best practices in Ontario, and
- [the study] be conducted using best practices, current industry standards, and applicable legislation as the foundation for all work undertaken.

An earlier version of this report included approximately four pages of information about best practices, what they are, and why "best practices" are often based on unfounded information. In this version of the report we have moved that section into Appendix E because discussion led us to the reluctant conclusion that most people would glaze over when reading some of the research behind best practices. We hope that readers take the time to review Appendix E—because it is important—but here is the "30-second" version in case Appendix E is ignored: Best practices usually are not (best practices). It is terminology that has become part of the lexicon of many industries, including emergency services, but when faced with the rigour of examination, so-called best practices can't pass scrutiny.

If you do read Appendix E, you will find that best practice identification in fire services would not be a successful effort. For example, we are unable to show that rigorous research has been applied to prove NFPA 1720's assertion that 15 firefighters should arrive at a house fire within nine minutes of notification in 90% of incidents (please see Section 4.4.2, page 31); neither can we clearly connect a successful practice in another fire service with the circumstances in Kirkland Lake's fire department and thereby conclude that the practice is transferrable and worth the effort and cost of implementation and continued operation. We can continue in this vein to show that what has been generally accepted as "best" or "industry" practice won't survive examination if the academic rigour of benchmarking is applied, as described in the research of Druery, McCormack, and Murphy, or Arnošt Veselý.[6] But there is a process that can help municipal councillors and town administrators decide the best service level and activities that fit Kirkland Lake, which would then be best practice specifically for Kirkland Lake and its fire department. The process is one supported by the National Fire Protection Association and other organizations such as the Ontario Office of the Fire Marshal and Emergency Management. We explain the process in Section 4.4.1.

2.1.1.5 Fire Underwriters Survey

The request for proposals, within the Expectations section, indicates that the town expects "that the proponent will, to the best of their ability

[6] Read Appendix E to find out more about this research.

- Comment on how any proposed changes may impact on the municipality's score under the Fire Underwriters Survey.
- Comment on what effect, if any, the proposed recommendations would have on the cost of homeowner, industrial and commercial insurance in Kirkland Lake."

To respond to the town's expectation, we must first understand the Fire Underwriters Survey (FUS or "the survey") and its purpose. The Fire Underwriters Survey is a commercial product provided to Canadian insurance companies that subscribe to (purchase) the survey information. Opta Information Intelligence,[7] the company that owns the Fire Underwriters Survey, indicates that 85% of private sector property and casualty insurers in Canada use the survey.

The "municipality's score," referred to in the first bullet of this section (and also known as the Public Protection Classification Rating), is expressed on a scale of 1 to 10, with 1 being the highest level of protection and 10 meaning the absence of fire protection. FUS indicates that

> *Many insurers will subsequently group these classifications into "town grades" of protected, semi protected, and unprotected categories, to be used when calculating underwriting capacity. The grades indicate how well communities are equipped to combat major fires that may be expected to occur in commercial, industrial, institutional, and multi-family residential properties and are developed from a comprehensive review of all facets of the fire defense system as it relates to the level of risk present within the community.*

Interestingly, the quote above does not include single-family dwellings.

A community's fire risk is based on classification and benchmarks based on research conducted by FUS and the National Fire Protection Association into fire protection requirements for individual buildings and communities, and the corresponding number of pumper companies and response times. Ratings are based on the following:

- The fire department (40% of overall Public Protection Classification Rating) including
  - type and number of apparatus,
  - the condition and age of fire apparatus and fire suppression equipment,
  - pumping capacity,
  - the type of staffing (i.e., career firefighters vs. paid-on-call),
  - the distribution of companies relative to fire risk,
  - response to alarm protocols,
  - management of emergency services,
  - the quality of training programs for the fire fighter including specialized training, and
  - pre-incident planning.
- Water supply (30% of overall rating) including

[7] formerly CGI Insurance Business Services, formerly the Insurers' Advisory Organization and Canadian Underwriters Association

  - whether a gravity-fed or pumping system,
  - municipal storage capacity, and
  - pump capacity (de-rated by 25% to factor in age and reliability).
- Fire prevention and safety control (20% of overall rating) including
  - general fire prevention, inspection, and investigation activities of the fire department,
  - inspection procedures, and
  - continuing public education.
- Emergency communications (10% of overall rating).

How the Public Protection Classification Rating is Used

Opta indicates that the insurance companies that subscribe to FUS information use the product to

- identify opportunities for writing new business,
- achieve a financially manageable concentration of property risks,
- review loss experience in various rating territories, and
- price policies, offer coverages, and establish deductibles for individual properties.

Even though our recommendations take into account the benefit sought by the request for proposals, Opta points out that the actual cost of insurance as experienced by individual policyholders is determined by each insurance company's underwriting plans, and is affected by a number of considerations such as

- location of the risk with respect to distance from recognized water supplies (hydrants, etc.), and distance from the responding fire station;
- claims history—for example, fire, wind, hail, crime, and water damage claims (as relates to policyholder and/or geographic area);
- independent broker's insurance markets and their loss experience for that business demographic;
- types of coverage such as basic fire, comprehensive "all risks," etc.;
- type of construction, exposures, etc.;
- types of occupancies, contents; etc.;
- applicable policy deductible and/or policy sub-limits;
- age of risk building and code compliance with respect to building, fire and electrical codes, alarm systems;
- specialized content coverage—for example, fine arts, scheduled articles, jewelry, etc.;
- loss control inspection findings;
- exposures to natural hazards such as earthquake, wind, snow, and flood; and
- prevailing property insurance market conditions.

In conclusion, we recognize the desire of the town to monitor and not adversely affect the current FUS rating, but we are also aware, as a result of direct conversation with FUS representatives in the past few years, that a minor change in classification is likely to have little effect on individual insurance costs

particularly considering that, as quoted above, “Many insurers will subsequently group these classifications into ‘town grades’ of protected, semi protected, and unprotected categories.”

Section 3 Statistical Context

Understanding the statistical context, including previous demands on the emergency services system and its performance, will help to determine resource needs.

Statistics Canada reports that in 2006 the population of Kirkland Lake was 8,250, declining to 8,130 by the 2011 census (later corrected to 8,493 people). As of the 2016 census, Kirkland Lake had a population of 7,981, down by about 6% from the 2011 census count. The actual population may be higher due to census undercount. There were 4,466 total private dwellings, approximately 3,814 of which were occupied, and population density was 30.4 people per square kilometer, based on a land area of 262.13 square kilometers. However, most residents occupy the main built up area of the town of Kirkland Lake, which is a factor in service provision as discussed in Section 4.4.2, The Application of Risk to Response.

The 65 years and older cohort, which is often considered to require additional public resources, was essentially unchanged from 2006 to 2011[8] (2006: 1,595; 2011: 1,585), but then increased to 1,685 according to the 2016 census.[9] This change isn't significant enough to have an impact on fire resource demand.

Watson & Associates Economists, in their study of Kirkland Lake's Population, Housing, and Employment Forecast, presented in 2012, suggests that by 2031 Kirkland Lake will have a population of 9,940 in a low-growth scenario, up to 11,410 in a high-growth scenario. Indications at the time were that "short-term permanent population growth for the town of Kirkland Lake is forecast to be strong, followed by a moderate increase over the longer-term." The report also observed that "According to the Statistics Canada Census, Kirkland Lake's 2011 population base was 8,133. Adjusting for the net Census undercount (population missed during Census enumeration), the Town's 2011 population was approximately 8,400." In fact, the 2016 census noted that the reported 2011 population level had been adjusted from 8,133 to 8,493. But, according to the 2016 census, population declined by 512 people. Even if the decline is attributable to an undercount in the 2016 census, the anticipated strong population growth, in the short term, has not come to fruition. Therefore, we were unable to find any evidence that population or labour force changes during the period of this fire master plan will have a significant effect on resource needs.

The statistics that follow are collected from Kirkland Lake fire service's FirePro 2 record management system. We acknowledge that not all the data are accurate because of recording errors or missed time points at the call taking centre,[10] or data entry errors at the Kirkland Lake fire department, as outlined in the following examples.

- Time data are not available for each truck responding to an incident.
- Time stamps do not include seconds, which means that measurement of critical incident

[8] http://www12.statcan.gc.ca/census-recensement/2011/as-sa/fogs-spg/Facts-csd-eng.cfm?LANG=Eng&GK=CSD&GC=3554068

[9] http://www12.statcan.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=3554068&Geo2=PR&Code2=35&Data=Count&SearchText=Kirkland%20Lake&SearchType=Begins&SearchPR=01&B1=All&GeoLevel=PR&GeoCode=3554068&TABID=1

[10] Call taking and alerting is provided by Northern Communications in Sudbury, a private 9-1-1 centre.

components such as turnout, travel time, and overall response time could be underestimated by almost 60 seconds for incident components, to several minutes overall.

- Latitude and longitude of incidents is not available, making it more difficult to plot call locations.
- In 77 records, the alarm time and depart station time are the same, meaning the firefighters left the station at the same moment they were notified of an incident, which is highly unlikely. This could be partially attributable to the lack of seconds in the time fields.
- In 73 records, the depart station and on-scene time are the same, which means that the firefighters left the station and arrived at the scene at the same time. This might be true if the incident was very close to the station, since seconds are not recorded in the time data.
- In 22 records, the alarm time and on-scene time are the same, which means that firefighters were notified of an incident and arrived at the incident at the same time. This isn't possible.

Table 1: Total Calls 2012–2016

Year	Total Calls	Difference	% Difference
2012	429		
2013	474	45	10.5
2014	500	26	5.5
2015	331	-169	-33.8
2016	291	-40	-12.1

Table 1 presents the volume of all calls from 2012 to 2016 inclusive, the year-over-year difference in volume, and the percentage variance by year. The decline in 2015 and 2016 call volumes is directly attributable to a reduction in the number of medical tiered responses requested by the District of Timiskaming Emergency Medical Services. The reduction is part of a province-wide change resulting from a medical review of the need for fire response to medical emergencies.

Nevertheless, if we isolate what could be referred to as core fire responses—those incident types for which fire has traditionally been the primary response agency or, in the case of vital signs absent, one of the primary response agencies along with emergency medical services—we can see that there has not been a decline in core incident types (Table 2). In fact, there was a slight increase in 2015 and 2016. We should note that even though several of the records from the FirePro 2 record management system indicate false alarms, they were not false when the incident occurred. Although firefighters may suspect, based on experience, that many alarms will turn out to be false, they all had to be responded to as emergencies at the time of dispatch.

Table 2: High Priority Dispatches

	Response Type Description	2012	2013	2014	2015	2016
1	Fire	27	14	15	19	13
2	Overheat (no fire, e.g., engines, mechanical devices)	3	4	3		3
3	Pot on Stove (no fire)	5	1	5	5	6
4	Other Cooking/toasting/smoke/steam (no fire)	1	5	2	4	8
5	Alarm System Equipment – Malfunction	17	14	15	21	12
6	Alarm System Equipment – Accidental activation (exc. code 35)	4	12	3	9	26
7	CO false alarm – perceived emergency (no CO present)	7	9	5	8	7
8	CO false alarm – equipment malfunction (no CO present)	12	14	13	18	13
9	Other False Fire Call	3	1	3	9	4
10	Gas Leak – Natural Gas	4	9	14	7	4
11	Gas Leak – Propane			1		
12	Power Lines Down, Arcing	1	1	1	3	
13	CO incident, CO present (except false alarms)	1	3	1	6	3
14	Vehicle Extrication	2	3	2		3
15	Vital signs absent, DOA	7	11	10	7	11
	Totals	**94**	**101**	**93**	**116**	**113**

The data do tell us that some of the higher frequency incident types are those that could be controlled and reduced with public education and perhaps fire code enforcement. For example, in 2016,

- alarm system malfunction or accidental activation totalled 38 responses,
- carbon monoxide alarms (false) totalled 20 responses, and
- overheating, pot on stove, and other cooking totalled 17 incidents.

Incidents such as fires,[11] gas leaks, power lines down, carbon monoxide present, vehicle extrication, and vital signs absent totalled only 38 calls.

Table 3 presents the distribution of working fires by day and hour of the day. Days and hours on which there were no working fires are not shown. Although more incidents occurred during the hour beginning 10 p.m. (2200 hours), there is no statistically significant pattern due to the low number of incidents.

[11] Includes four false fire calls because they are not known to be false until arrival.

Table 3: Distribution of Working Fires by Day and Hour (2016)

Day	Hour								Totals
	08	1100	1200	1300	1700	1900	2100	2200	
Mon	1							1	2
Tue							1		1
Wed						1			1
Thu			1				1		2
Fri				2	1			2	5
Sat		1						1	2
Total	**1**	**1**	**1**	**2**	**1**	**1**	**2**	**4**	**13**

Of the 42 working fires during the period 2014–2016 for which we have sufficient data, 26 were 1 kilometer or less from the fire station, 13 were between 1 and 2 kilometers, and the other three at approximately 2.2, 3.3 and 4.0 kilometers. All incidents were within the main urban settlement of Kirkland Lake and the hydrant areas.

3.1 Statistical Conclusions

- Overall call volumes have declined by over 200 since the peak of 500 in 2014 (Table 2). The decline is mostly due to a medically based change in policy with respect to those times when fire assistance is needed at a medical incident.
- At the same time, anticipated municipal growth has not materialized, and there are no indications that significant drivers of fire resource requirements, or call volume, will occur in the next five or more years.
- Data are not detailed enough to determine traditional performance indicators for fire services such as call taking time, turnout (reaction) time, and response time at the 90th percentile. On the other hand, all indications are that, since 2014, working fire responses have been within 4 kilometers of the fire station, and overall response time for the first arriving vehicle has been within seven or eight minutes of being notified of an incident.
- There is no statistical information to suggest that there will be resource pressure on the fire department for the period of the master plan.

Section 4 Governance, Organization, and Operations

4.1 Governance

There are several definitions of governance, but a simple one is that governance is about making larger decisions regarding direction and roles. Processes and practices that apply within governance vary considerably depending upon the environment. In the context of municipal oversight applied to the fire service, a normally accepted practice is that municipal council makes strategic decisions with respect to the size and makeup of the fire service, the nature of service offered, and the level of expertise to which firefighters should be trained, and provides authority by way of bylaws. Council should consider the advice of the chief administrative officer and chief fire official in making these decisions.

Municipal council should then assign the responsibility for fulfilling what can now be called the "fire service mandate" to the chief administrative officer, who then passes the mandate on to the chief fire official to make it operational and effective, and offers guidance to ensure the strategy is properly applied.

Governance is an important role, and even though there are no firm rules, the concept is always strongest when municipal governance, administration, and operations don't cross lines of responsibility. As a general rule and best practice, town council should maintain an arm's-length relationship from the fire service so that when it comes time for personnel and resource decisions—that is, the "level of risk determination" that balances public safety and service provision with cost of service—they can be made objectively without prior knowledge that may not be current.

We reviewed the following bylaws as part of our evaluation:

- Bylaw #13-078, which details the structure of the Kirkland Lake fire department, outlines the roles and responsibilities of positions, and the types of services that the department is authorized to provide.
- Bylaw #99-033, which prescribes the Standards for the Maintenance and Occupancy of Properties within the Town of Kirkland Lake, in particular,
  - Part II, 2.01 Yards says "(1) Every yard, including vacant lots shall be kept clean and free from
    a) rubbish, debris and objects or conditions that may create a health, fire or accident hazard;
    b) inoperable, wrecked, dismantled, discarded or abandoned machinery, vehicles, trailers or boats unless it is necessary for the operation of a business enterprise lawfully situated on the property;
    c) heavy undergrowth and noxious weeds as defined by the *Weed Control Act*;
    d) dilapidated, collapsed or partially constructed structures which are not currently under construction.
  - Section 3.04 addresses the installation of smoke alarms in dwellings, although provincial legislation with respect to smoke alarms has been in place since 2006.
  - Part IV of the property standards bylaw addresses burnt or vacant buildings:
    - 4.01 (1) In the event of fire or explosion, damaged or partially burned material shall be removed from the property, except that such material may be stored within the

barricaded fire damaged building or unit for a period not exceeding sixty days or until investigations are completed by the fire authorities.

  - (2) In the event, the building or accessory structure is beyond repair, the land shall be cleared of all remains and left in a graded, level and tidy condition.

- Town bylaw #13-012, a forest fire suppression agreement with the OMNR, dated February 19, 2013
- The tiered medical emergency agreement with the District of Timiskaming Social Services Administration Board, dated November 24, 2014, under bylaw #14-118
- The Mutual and Automatic [Fire] Aid Plan and Program for the District of Timiskaming under a municipal bylaw dated November 5, 2002
- Bylaw #07-052 to regulate the location and installation of outdoor wood burning appliances, dated July 3, 2007
- Bylaw #98-017 respecting the control of fires within the Town of Kirkland Lake between the period April 1 and October 31, dated April 7, 1998
- Bylaw #16-078, dated November 22, 2016, to appoint a fire chief
- Bylaw #08-009 authorizing the execution of an [fire protection] agreement with Northern Pressure Treated Wood Limited, dated February 5, 2008
- Bylaw #02-038, dated June 25, 2002, regulating fireworks
- Bylaw #17-032, dated 28 March, 2017, amending bylaw #07-112 to formulate a plan for protecting property and the health and safety and welfare of the inhabitants of an emergency area

We note that some of the bylaws date back to 1999 and offer the following recommendations with respect to governance, along with some comments prior to, and accompanying, the recommendations. Several of the comments and recommendations could be included in the operations section later in the report, but we have incorporated them here because they are relevant to, or influenced by, legislation and bylaws. They are also associated with the decisions of council, which significantly affect the operation of the fire department.

First comment: In the early stages of this project we had the opportunity to interview several elected representatives and senior administrators. The primary message we received was that some council members wanted to find ways to cut costs at the fire department. Let us be open and tell you we don't know how to do that without reducing the number of career firefighters and increasing risk to the public. And, although Kirkland Lake would have to consult legal counsel, an award in a 2014 arbitration between the Town of Deep River and the Deep River Firefighters Association[12] makes the possibility of a staff reduction unlikely. In fact, this report will recommend that council increase expenditures over the duration of the master fire plan to reduce fire risk to the town and several cohorts who are most susceptible to property loss, injury, or death from fire and other emergencies. The municipality may have

[12] Please see Section 4.3.1. The Town of Deep River wished to establish a composite fire department, which the arbitrator allowed, but the award was conditional on a minimal reduction in the existing complement of career firefighters represented by the firefighters' association.

to come to terms with the likely reality that fire department costs won't decrease, but there are ways to achieve greater value from existing resources.

Second comment: Our recommendations are predicated on the following part of the *Fire Prevention and Protection Act*.

Part II of the *Fire Protection and Prevention Act, 1997*, Responsibility for Fire Protection Services, states

2. (1) Every municipality shall,
   (a) establish a program in the municipality which must include public education with respect to fire safety and certain components of fire prevention; and
   (b) provide such other fire protection services as it determines may be necessary in accordance with its needs and circumstances.
   (2) In discharging its responsibilities under subsection (1), a municipality shall,
   (a) appoint a community fire safety officer or a community fire safety team; or
   (b) establish a fire department.

We quote this section several times in the report because it is important to the provision of fire protection and municipal responsibility. And we will, once again, explain what it means to the municipality.

The section says that municipalities must have a public education and prevention program ("shall establish"), and this can be done through a community fire safety officer or a community fire safety team, or by having a fire department, or by having both. The Act doesn't mean that if a municipality has a fire department it does not have to provide public education and prevention programs. Those programs must be delivered, and there are a number of best practices referenced in the Ontario Fire Marshal's guidance notes[13] and technical bulletins that should be very familiar to fire professionals.

We also acknowledge that the programs can be delivered without observing best practices, and evidence shows this is the case in Kirkland Lake. There is almost a complete absence of coordination and substance with respect to the delivery of these procedures, which likely adds to the fire and safety risk profile in the town (please see text box at the end of Section 4).

We accept that it is the responsibility of the chief fire official to advise and convince the chief administrative officer and council of the need for public education and prevention programs and, where possible, design them to be efficient and effective, but one or more of the following has occurred:

a) The program design has not been optimized;
b) the CAO and council have not been adequately advised of the need for public education or prevention; or
c) council and administration have not accepted the advice of the chief.

[13] Education, prevention, and emergency response (fire suppression) are referred to as the "three lines of defence." The third (final) line of defence is fire suppression and should be considered indicative of a failure of the first two lines of defence: to educate and prevent.

Just to be clear, we are not suggesting that the concerns noted above are a recent occurrence. The situation has signs of being systemic, dating to before the incumbents in the fire department, administration, and current council.

Recommendations with Respect to Governance Oversight

- Determine if the intent of the original agreements and/or fire protection measures made under associated bylaws remain relevant (some date back to 1999), or if liability is increased because of the age of the arrangements and changes in fire protection requirements. Update them accordingly.
- Review fire protection agreements on a regular basis to ensure the terms reflect the current needs and circumstances of Kirkland Lake. Regular review also presents an opportunity to ascertain if there are other mutually beneficial services that would enhance fire protection for the town and other municipal or provincial partners.
- Revise the establishing and regulating bylaw to clearly delineate the three lines of defence as a central operational theme around which council-approved policies are delineated. The OFMEM indicates that the three lines of defence are (i) public fire and life safety education, (ii) fire prevention activities, and (iii) authorized type and levels of fire and emergency services.
    - The existing establishing and regulating bylaw is substantially unclear regarding the type of core fire and emergency services to be provided, and there are no references to fire service standards or levels of service to be offered such as basic or awareness level, operational level, or technical–expert level, as outlined by the National Fire Protection Association and referenced by the Ministry of Labour Fire Service Section 21 Advisory Committee Guidance Notes.
    - The very broad description of rescue services, for example, should be revised and focused on core emergency rescue services for which the specific type and level are delineated.
    - The types of emergency services response (third line of defence) broadly authorized by council in the present bylaw must be accompanied by adequate and standardized initial and ongoing training for all full-time and volunteer firefighters, and equipment acquired in order to effect the approved tasks.
- Consider revising Section 4 of the establishing and regulating bylaw regarding qualification of applicants to the department.
    - For example, a requirement may be that applicants have graduated from a firefighter education and training program at a community college, or equivalent.
- Review hiring policies referenced in Section 4 of bylaw #13-078 (“The Chief of the Department may recommend, through the C.A.O. to Council, the appointment of any qualified persons as a member of the department, subject to approved hiring policies developed by the Fire Chief”).
    - Recruitment, selection, and training methods designed to assist potential employers to find the right candidates, and increase the possibility that a new employee or volunteer is successful, have advanced significantly in the last few years beyond the practice of two- or three-person interview panels. The fire department may benefit from assistance to develop hiring policies.

- Consider including response time targets to fires and emergencies in the establishing and regulating bylaw.
  - The premise supporting the inclusion of response time targets is to notify the public of the time it will take to deliver fire or rescue services. So, as an example, if the town adopts the response standards within NFPA 1720, which are categorized on population density variances, residents of the urban area will be aware that in 90% of incidents, 15 firefighters will be at a fire incident within 9 minutes of being notified of the occurrence. In rural areas, under the same standard, six firefighters would be expected to arrive within 14 minutes of being notified of the occurrence, 80% of the time.
  - Residents of various areas in the town will be aware that where they live has a bearing on the level of fire suppression and rescue services that can be expected.
  - From a liability perspective, should a resident decide to legally challenge the level of service received, the town has clearly stated the service provisions and is less likely to be held to a standard such as NFPA 1710 in the more densely populated areas.
  - The fire department and firefighters will be aware of the response time and resource performance standards they are expected to meet.
  - Alternatively, council may decide to be silent on response time parameters and offer a "best effort" service to residents and visitors. This means the fire department will arrive at an incident as soon as possible with as many firefighters as possible, to the maximum number required.
  - Our recommendation is that council choose a standard so that residents are aware of service levels, take steps to ensure individual fire protection, and are prepared to protect themselves in case of fire, until the fire department can arrive.
- The establishing and regulating bylaw should be revised to include a current process for cost recovery for fire service activities such as demolition during fires, fire operations, and fire investigations.

Standard Operating Guidelines (authority within the establishing and regulating bylaw)

- Revise the operating guidelines.
  - While standard operating guidelines (SOGs) are available, they lack detail, including specificity of scope, purpose, and responsibility. Generally, there are no references to fire service standards or other fire service industry background in the SOGs. Most are vague and do not provide adequate detail for practical implementation and use by firefighters. Guidelines that are not adequately detailed offer the potential for individual interpretation.
  - Include and expand areas not covered, such as pre-incident planning, fire and life safety education for the public, fire prevention, and fire and emergency response.
- Review, revise, or create the fire department's "general orders" or "department rules."
  - Notwithstanding being authorized in Section 9 of the establishing and regulating bylaw, there are no observed current (within last 3 years) general orders or department rules. These may

be more aptly renamed as departmental policies (Section 9 [b]) that the fire chief is authorized by council to create from time to time.

Fire Service Policies (authority within the establishing and regulating bylaw)

- Create fire service policies.
  - There are no discernable fire department policies regarding topics such as public fire and life safety education, fire prevention, fire and emergency response, discipline, hiring, etc.
  - The fire chief is authorized to create policies in Section 9 of the current establishing and regulating bylaw.

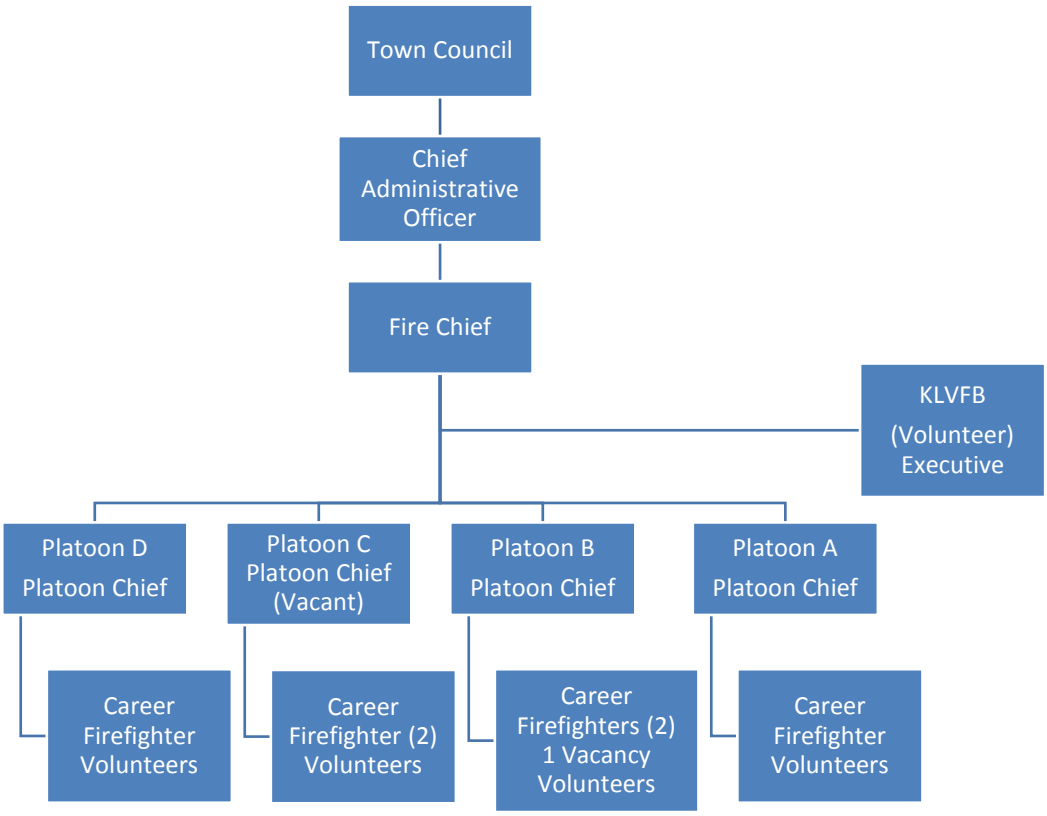
Divisional and Functional Areas (Sections 12–16 of the establishing and regulating bylaw)

- Restructure the organization and responsibilities associated with the divisional and functional areas referenced in the establishing and regulating bylaw.
  - The fire chief is responsible for the duties of each division and functional area, and may assign responsibilities in whole or in part to a member, but there is general disarray of organization and implementation of these duties and functions.
  - There is no discernable, consistent application across the four departmental platoons.
  - Each platoon chief implements and covers off fire inspections, training, and public education duties as they determine best for their platoon. In other words, it is as if there are four fire departments functioning within the one corporate fire service.
  - Of particular concern is that there does not appear to be a functional, department-wide training program (16 [d] of the establishing and regulating bylaw).
- Approve external training in fire administration and other subject matter for the fire chief and platoon chiefs.
  - Our understanding is that external training programs have been identified and included in budget requests, but they have been turned down as a cost-saving measure. Item 16 f) of bylaw #13-078 indicates that “The training and education function shall include … Planning and locating external programs and resources to provide for the training and education of members outside the department.”
  - External training has the advantage of exposing participants to the ideas and techniques of other fire departments, especially in the areas of administration, prevention, and education, and will act as a catalyst for increasing the enthusiasm of firefighters to participate in enhancing public safety. Turning down requests to attend valid external education opportunities is false economy since it reduces the value the fire service can bring to citizen safety and acts against a fire department, such as Kirkland Lake’s, that requires those external influences.
- The establishing and regulating bylaw, Section 20, recognizes the Swastika Volunteer Fire Brigade, which is no longer in existence. The reference to Swastika should be removed.

4.2 Organization

The Kirkland Lake fire department includes a fire chief, four platoon chiefs, and six firefighters, all of which are career (full-time) positions, and 25 part-time or volunteer firefighters (please see Exhibit 2). According to the 2014 Town of Kirkland Lake Departmental Briefing manual, the fire service is a part of the Department of Corporate Services, although the organization chart on page 78 of the manual shows a direct reporting relationship of the fire chief to the chief administrative officer.

Exhibit 2: Fire Services Department Organization



The fire chief is also responsible for municipal occupational health and safety and is the community emergency management coordinator.

- Notwithstanding our comments in Section 2.1.1.4 about best practices and comparators being less than reliable, we have compared six municipalities to Kirkland Lake with respect to the number of full-time and volunteer firefighters, and other staff (please see Table 4 on page 24).
- Two locations, Dryden and Parry Sound, are mostly volunteer organizations, although both employ a full-time fire prevention officer and a part-time assistant. Dryden also employs a deputy chief.
- Kenora, Elliott Lake, Kapuskasing, and Fort Frances employ a comparable number of full-time staff to Kirkland Lake.

- The number of reported structure fires in 2015 ranged from three and five in Parry Sound and Elliott Lake respectively, to 20 and 21 in Fort Frances and Kenora. Kirkland Lake fell in the middle of the pack in terms of the number of fires reported.
- Our conclusion with respect to the municipal comparators is that Kirkland Lake is comparable to the other municipalities. Nevertheless, we remind readers of the confidence, or lack thereof, we have in comparators.
- The Office of the Fire Marshal and Emergency Management, Public Fire Safety Guideline 01- 01-01, Fire Protection Review Process, indicates
  - *A thorough risk assessment can also avoid invalid comparisons between your fire department and others. A municipality with a similar population may have very different fire risks, and therefore very different fire protection needs. A good risk assessment will ensure that such comparisons are valid. By providing a valid basis for comparison, a good risk assessment can also provide confidence that innovations introduced elsewhere can be successfully applied in your municipality.*
  - When comparing the fire department in different municipalities it is important to recognize that each location is unique. An accurate comparison would have to take into account community profiles that include building stock and age, in-building fire suppression, density, industrial comparisons, demographics, water supply, apparatus, types of equipment, frequency of incident and type, public education and inspections, staff levels, training type and certifications, overall risk, and a myriad of other factors that would likely prove, from a subject matter expert's and consulting point of view, that there are no valid comparisons. An objective discussion of comparators would result in as many differences as similarities.

Table 4: Fire Service Comparators

Comparator	Full Time						Volunteers	Population	Area	Stations	Apparatus				Fires
	Chief	Deputy	FPO	Offs	FFs	Assistant					Pump	Tank	Rescue	Aerial	2015
Kirkland Lake	1	-	-	4	4	-	24	7981	262.1	1	1	1	1	1	12
Dryden	1	1	1	-	-	1	52	7749	66.2	2	2	1	2	1	12
Kenora	1	-	-	4	8		20	15096	211.6	3	8	-	1	1	21
Parry Sound	1+	-	1		-	1	35	6408	13.4	1	2	-	1	1	3
Elliott Lake	1	-	-	4	5	1*	25	10741	714.7	1	2	-	-	1	5
Kapuskasing	1	1	-	1	7	?	21	8292	84.4	1	?	?	?	?	12
Fort Frances	1	-	-	3++	3	?	16	7739	25.5	1	2	-	1	1	20

+Chief is also Town Building Inspector & CEMC

* Admin. Asst. is also CEMC

++ One Captain each assigned to Prevention, Training, & Apparatus/Equipment

4.3 Operations

4.3.1 Composition of the Fire Department

A reasonable question is "If Dryden and Parry Sound can operate with mostly volunteer firefighters, is that possible in Kirkland Lake?" The answer is yes, although there are a few considerations:

- Response time to fires, and therefore risk, is likely to increase, particularly during non-business hours when the few full-time staff would not be on site.
- Parry Sound and Dryden have hired fire prevention officers and assistants, since without full-time staff to take on some of the inspection, education, and record-keeping requirements of the *Fire Prevention and Protection Act*, additional help is warranted.
- With respect to changes in full-time and volunteer staffing, a 2014 arbitration between the Town of Deep River and the Deep River Professional Fire Fighters Association found partially in favour of the association:
  - The employer wished to establish a composite force, which the association opposed.
  - At the time of arbitration and, to the consultants' knowledge, currently, the town employed a chief, captain, and eight full-time firefighters, but no volunteers.
  - The award stated that the "no contracting out" clause would remain in effect, but the employer could establish a composite force. However, the award was conditional on a reduction of only one career firefighter to compensate for the additional cost of volunteers and, if a composite force is established, a captain or acting captain must be on duty on all shifts.

So, even if Kirkland Lake fire department could operate as a mostly volunteer organization—putting the risk consideration aside for a moment—the Deep River award appears to negate a reasonable chance of moving to that model. In any event Table 5 offers a savings estimate between existing staffing and a theoretical, mostly volunteer, model.

Assumptions include

- being able to attract and retain an acceptable volunteer cadre, which is becoming a challenge country-wide;
- an increase in the number of volunteers, from 25 to 40, to share callouts and ensure volunteers aren't used so frequently that the fire service becomes an imposition on their time;
- an increase of $25,000 a year for volunteer turnout gear;
- doubling the amount paid to the volunteer organization to assist in attracting additional volunteers, additional training costs, and possibly, additional call outs;
- a full-time complement of a chief, deputy, fire prevention officer, and part-time assistant (similar to Dryden and Parry Sound);
- personnel amounts shown in Table 5 include salaries and benefits.

The result is an estimated annual reduction of $389,437 in staff costs.

Table 5: Cost Estimate, Volunteer-Based Scenario

Composite Operations	
Operations – Staff Cost Breakdown	
# Fire Chiefs	1
Annual Cost per Fire Chief:	
Fire Chief	$143,045
# Deputy Fire Chiefs	1
Annual Cost per Deputy Fire Chief:	
Deputy Fire Chief	$140,181
# Fire Prevention Staff	1
Annual Cost per Fire Prevention Staff:	
Fire Prevention Staff	$120,000
Assistant	$32,000
# Volunteer Firefighters	40
Annual cost per Volunteer Firefighter	$3,917
Total Annual Cost – Volunteers (times 40)	$156,683
PLUS 10 new sets – Firefighter Turnout Gear	
(10 sets @ $2,500/set)	$25,000
Final Cost – Volunteers	$181,683
Total Staff Cost – Operations	**$616,910**
SUMMARY	
Current Staff Costs – Operations	$1,006,347
New Staff Costs – Volunteer-based Operations	$616,910
Estimated Savings	**$389,437**

4.4 Fire Protection Responsibility and Risk

In Section 2.1.1.1, Legislation, we outlined the responsibilities of municipalities within the *Fire Protection and Prevention Act* and the *Occupational Health and Safety Act.* These are worth repeating here:

Part II of the *Fire Protection and Prevention Act, 1997*, Responsibility for Fire Protection Services, states

2. (1) Every municipality shall,

(a) establish a program in the municipality which must include public education with respect to fire safety and certain components of fire prevention; and

(b) provide such other fire protection services as it determines may be necessary in accordance with its needs and circumstances.

The same section of the *Fire Protection and Prevention Act* goes on to say that

(2) In discharging its responsibilities under subsection (1), a municipality shall,

(a) appoint a community fire safety officer or a community fire safety team; or

(b) establish a fire department.

In 2003, the Sudbury office of the Ontario Fire Marshal and Emergency Management conducted a survey of the Kirkland Lake fire department under the authority of Part III Section 9(1)[14] of the *Fire Prevention*

[14] "The Fire Marshal has the power, (a) to monitor, review, and advise municipalities respecting the provision of fire services and to make recommendations to councils for improving the effectiveness of those services."

and Protection Act. The Fire Marshal indicated that the Kirkland Lake fire service—and therefore the town since the town is responsible for conforming to legislation—was not compliant. Specifically, the Fire Marshal indicated that the municipality was unable to furnish statistical or other documentation to demonstrate the delivery of educational or inspection programs as required by Part II of the *Fire Protection and Prevention Act,* 2 (1) (a) *establish a program in the municipality which must include public education with respect to fire safety and certain components of fire prevention.* Several recommendations and suggestions were made by the Sudbury office. Unfortunately, our review of the town and fire department does not reveal a noticeable improvement since 2003.

The following statement has a degree of subjectivity because it is based on impressions we received during visits and interviews. Evidence for this statement is not direct but is supported by statements already made in Section 4.1, Governance (see text box, end of this section).

Kirkland Lake's fire department lacks direction. It serves the purpose of fire suppression, but there seems to be dearth of vision and leadership as to how it goes about providing training, education, inspection, and prevention programs. While we don't wish to be harsh, the department should be providing much greater value to the community. We don't believe this to be a new paradigm; in fact, it seems to be entrenched as culture in the department.

Operationally, the department needs to start from the ground up with council and administration providing strong support to the fire chief by directing, assisting, and giving him permission to fulfill the town's responsibilities under the *Fire Prevention and Protection Act*.

There is evidence that the Kirkland Lake fire department and its chief have been isolated from the greater fire department environment in Ontario and should have the benefit of mentoring from an experienced fire department leader or leaders. Our recommendation includes contracting, on a part-time basis over 12 to 18 months, with a retired fire chief who can assist with refocusing the fire department in areas such as policy, procedure, prevention, education, and mutual objective accomplishments with other municipal departments, such as social services and property standards. This contract position would be intended not to take over the fire chief's role but rather to act as a mentor or "executive chief." We estimate that attracting the right person as an executive chief for approximately 625 hours over a one-year period will require an investment of $110,000. But this amount can be quickly recovered by making the fire chief and fire department responsible for property standards.

The town has to be seen to offer its support to the fire department, in the same manner as it should offer it to other municipal departments. The town should also clearly state the value that the fire department is expected to bring to the municipality. We will be forthright in stating that during our discussions with councillors—admittedly only an hour or so—their focus appeared to be on reducing the cost of the fire department rather than achieving value from it in the form of making use of the staff. The reality is that it is unlikely that a reduction in staff levels will be successful (see Deep River arbitration), so the only way to moderate fire department cost would be to avoid expenditures on equipment, education, and public protection. Not only is it possible that a strategy of that nature could be contrary to the *Fire Prevention and Protection Act*, but it would be an avoidance rather than cost reduction. At some point a truck would

have to be purchased, equipment replaced, or, as is the case now, substantial repair to or replacement of the current station would be necessary.

Municipal administrators and elected officials are keenly aware that the cost of public safety is something that is being struggled with across Ontario and Canada. But in a municipality the size of Kirkland Lake that is already at minimum staffing, other than moving to a mostly volunteer organization[15] there is little room for reducing costs short of refusing approvals of very important expenditures such as those related to firefighter education, replacement of apparatus and equipment, and station maintenance, repair, or replacement. The current situation is the likely reality for the foreseeable future, so greater value should be provided to the public by effectively utilizing firefighters for the purpose of fire avoidance, thus reducing overall municipal costs to some extent.

Statements made in Section 4.1, Governance.

Standard Operating Guidelines (authority within the establishing and regulating bylaw)

- While SOGs are available they are found wanting for details, including specificity of scope, purpose, and responsibility. Generally, there are no references to fire service standards or other fire service industry background in the SOGs. Most are vague and do not provide adequate detail for practical use/implementation by firefighters.
- Notwithstanding being authorized in Section 9 of the E&R, there are no observed current (within last 3 years) “general orders” or “department rules.” These are more aptly to be renamed as departmental policies (Section 9 [b]) that the fire chief is authorized by council to create from time to time.

Fire Service Policies (authority within the establishing and regulating bylaw)

- There are no discernable fire department policies regarding topics such as public fire and life safety education, fire prevention, fire and emergency response, discipline, hiring, etc.
- The fire chief is authorized to create policies in Section 9 of the current E&R bylaw.
- While the Chief is responsible for the duties of each division and functional area, (Sections 12–16) and may assign responsibilities in whole, or in part, for any division or functional area to a member, there is general disarray of organization and implementation of these duties and functions. Each Platoon Chief carries out the assigned duties generally outlined in Sections 12–16 as they determine to be the best manner feasible. There is no discernable coordination and facilitation of consistent application across the four departmental platoons. Essentially each PC implements and covers off their duties for responsibilities such as fire inspections, training, and public education as they determine best for their platoon. In other words, it is as if there are four fire department functioning within the one corporate fire service.
    - Of particular concern, there does not appear to be a functional and department-wide training program (16 [d] of the establishing and regulating bylaw).

[15] Again, please see arbitration between the Town of Deep River and the Deep River Firefighters’ Association; also, please see article 32 of the local 573 collective agreement.

4.4.1 Risk Analysis

Another initiative that it is crucial the Kirkland Lake fire department undertakes is a risk analysis. The Fire Marshal's Office refers to it as a simplified risk analysis. Clearly, a risk analysis is a best practice but not mandatory. However, a well-executed risk analysis enables a municipality to make decisions based on fact and to determine the resources required within its fire department. Resources in this case include personnel, apparatus, equipment, and training.

The International Organization for Standardization defines risk as "The effect of uncertainty on objectives – uncertainties include events, which may or may not happen, caused by ambiguity or lack of information." Risk analysis can be expressed as the control of uncertainty, compounded by probability, multiplied by the outcome or impact of an occurrence.

A risk analysis exercise is not a short process. It involves visiting multiple commercial, residential, and industrial sites including strip malls, apartment buildings, and seniors' residences. Risk appraisal should include cataloguing products and the quantity of materials susceptible to supporting fire such as paint thinners, fertilizers, cleaning products, oils, and cooking materials, as well as cataloguing the infrastructure. The fire department should be able to estimate the fire load represented by these and similar items as part of a risk evaluation. Additionally, noting fire suppression systems such as fire sprinklers, standpipe availability, and automatic fire extinguishers (in commercial kitchens), and their maintenance history, contributes to an objective assessment beyond the limitations of a paper exercise consisting of filling out a high-level risk matrix based on best knowledge.

Concurrently, the fire service can devise pre-incident plans or what is referred to in fire jargon as "pre-plans." The National Fire Protection Association defines a pre-incident plan as "a document developed by gathering general and detailed data that is used by responding personnel in effectively managing emergencies for the protection of occupants, responding personnel, property, and the environment" (NFPA 1620).

There are several models and tools of risk analysis available. For example, the Commission on Fire Accreditation international, the Ontario Fire Marshal's Office, and the Office of the Fire Commissioner in British Columbia all have examples of risk analysis processes that could be employed. But one of the "risks" of risk analyses is that emphasis is often placed on impact *if* an incident occurs rather than an objective assessment of probability. So, even though a fire—should one occur in a large occupancy—may result in requiring additional resources through mutual aid or automatic aid, the probability of one occurring might be quite low. Certainly, it would be difficult to suggest that resource allocation should be based on the impact of a fire occurring at a large occupancy if the history of such an occurrence is rare to non-existent and if all the appropriate steps have been taken to properly assess the likelihood and impact of a rare occurrence.

In Kirkland Lake where the average call volume is less than one a day, properly trained firefighters, under the direction of a platoon chief with substantial risk analysis experience, could conduct risk analyses and occupancy visits while on duty, thereby increasing their public profile and value to the community.

Unfortunately, to the best of our knowledge, Kirkland Lake has neither firefighters nor a platoon chief with the applicable credentials. Therefore, council has three options before them:

1. Provide training (with the associated costs) to firefighters and one or more platoon chiefs.
2. Don't provide training and don't conduct risk analyses.
3. Don't provide training yet instruct the fire service to conduct risk analyses anyway (this option may present a health and safety violation since staff will be expected to perform duties without adequate training).

- Option 2 is the least expensive but continues the current practice of laissez-faire fire protection.
- Option 1 is the recommended option but requires the leadership of the fire chief and monetary support from council.
    - Option 1 also contributes to a reduction of risk to the public, which is enhanced when combined with fire prevention and public education activities.

Recommendations – Risk Analysis

- Implement a risk analysis program to include, at minimum, a simplified risk analysis as defined by the Ontario Fire Marshal, and the associated training and equipment to effectively accomplish the task.
- Concurrently, implement a program to create pre-incident plans starting with higher-risk locations such as multi-storey buildings, seniors' residences, and care homes.
- Council should approve training and technology costs associated with these and other initiatives.
    - A table outlining various training and certification programs including public education and fire protection, with associated costs, is outlined in Appendix F.
    - Approximately $5,000 per year should be allocated for firefighter, platoon chief, and fire chief education programs.

Reference Material Relative to Risk and Probability

Risk

Greater Manchester Fire and Rescue Service, *Risk Model*. 2010.

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Jennings, C. R. The promise and pitfalls of fire service deployment analyses methods. In Charles Jennings (Ed.) *Proceedings of First International Conference on Fire Service Deployment.* Alexandra, VA: Institution of Fire Engineers, 1999.

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Probability

Jaynes, E. J. *Probability Theory: The Logic of Science*. Cambridge: Cambridge University Press, 2001.

Kahneman, D., and Tversky, A., Prospect theory: An analysis of decisions under risk. *Econometrica*, 47:263-91, 1979.

Kallenberg, O., *Foundations of Modern Probability*. Springer Series in Statistics, 2002.

Rosenthal, J. S., *Struck by Lightning: The Curious World of Probabilities*. Toronto: Harper Collins Publishers, 2005.

Tversky, A., and Kahneman, D., Judgment under uncertainty: Heuristics and biases. *Science*, 185, 1974.

4.4.2 The Application of Risk to Response

Under best practice circumstances, composite fire departments will meet the National Fire Protection Association Standard 1720 Section 4.3.2 for response to a fire incident. NFPA table 4.3.2 is reproduced in Table 6.

Table 6: NFPA 1720 Staffing and Response Time

Demand Zone*	Demographics	Minimum Staffing**	Response Time **(minutes) *** **	Meets Objective **(%)**
Urban	>1000 people /2.6 sq. km	15	9	90
Suburban	500–1000 people /2.6 sq. km	10	10	80
Rural	< 500 people / 2.6 sq. km	6	14	80
Remote	Travel distance > 12.8 km	4	Dependent on travel distance	90
Special Risk	Determined by AHJ	Determined by AHJ based on risk	Determined by AHJ	90
Activity	Minimum on Scene	Initial Attack Time	Document Section	
Interior Fire Suppression	4	2 minutes after assembly of necessary resources on scene	*4.6*	90
Sustained Firefighting Operations	Sufficient personnel, equipment, and resources	Determined by AHJ	*4.7*	Determined by AHJ

*A jurisdiction may have more than one demand zone.

** Minimum staffing includes members responding from the AHJs department and automatic aid.

*** Response time begins with the completion of dispatch notification and ends at the time interval shown in the table.

The main area of Kirkland Lake would fall into the urban zone as shown in Table 6, which indicates 15 firefighters responding to a fire in the typical 2,000-square-foot single-family residence, with no basement, within nine minutes of being alerted to the incident, and meeting that objective 90% of the time. Our analysis of fire responses in Kirkland Lake in 2016 indicates that the data include the number of firefighters responding, but the time component was not reliable enough to enable us to measure response time or percentile.

Table 7: Number of Firefighters Responding indicates that on only one occasion (7.7%) Kirkland Lake was able to meet the urban standard for a composite fire department, and on six occasions (46%) it was able to meet the suburban standard. As noted, we don't know how long it took to assemble the firefighter complement at the scene, but we do know how many initial personnel arrived (usually 2 or 3 on shift).

Table 7: Number of Firefighters Responding

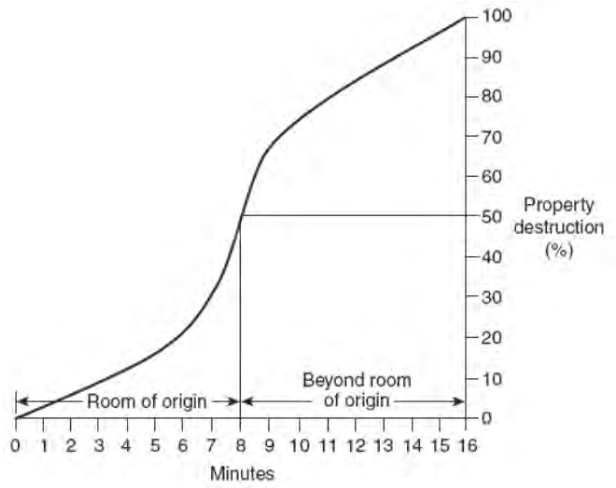
Date	First Unit	Initial Personnel	Personnel at Scene	Total Response Personnel	Personnel at Station
January 22, 2016	**#7 Rescue**	2	**7**	9	2
February 18, 2016	**#7 Rescue**	2	**10**	13	3
February 26, 2016	**#1 Pumper**	3	**16**	18	2
April 16, 2016	**#7 Rescue**	3	**12**	14	2
May 23, 2016	**#7 Rescue**	2	**6**	7	1
May 28, 2016	**#1 Pumper**	2	**8**	8	0
June 16, 2016	**#1 Pumper**	2	**6**	8	2
October 25, 2016	**#1 Pumper**	2	**11**	16	5
November 14, 2016	**#1 Pumper**	2	**6**	10	4
November 23, 2016	**#1 Pumper**	2	**12**	12	0
December 23, 2016	**#1 Pumper**	3	**8**	9	1
	#3 Pumper	3	**0**	0	0
December 30, 2016	**#1 Pumper**	2	**10**	12	2

4.4.3 What Happens in a Fire?

Let us tell you what happens in a fire and why the number of firefighters responding and the speed of response are important.

Almost everyone who has had to make decisions about resources allocated to fire departments has likely been presented with the following fire propagation curve found in Annex A of the NFPA 1710 Standard.

Figure 1: NFPA Fire Propagation Curve



The exhibit is intended to show the time available before fire spreads beyond the room of origin and, possibly, flashover occurs.

An explanation of Figure 1 can be found in NFPA A.5.2.2.2.1:

An early, aggressive, and offensive primary interior attack on a working fire, where feasible, is usually the most effective strategy to reduce loss of lives and property damage. In Figure A.5.2.2.2.1, the line, which combines temperature rise and time, represents a rate of

fire propagation in an unsprinklered room and roughly corresponds to the percentage of property destruction. At approximately 10 minutes into the fire sequence, the hypothetical room of origin flashes over. Extension outside the room begins at that point. Consequently, given that the progression of a structure fire to the point of flashover (i.e., the very rapid spreading of the fire due to superheating of room contents and other combustibles) generally occurs in less than 10 minutes, two of the most important elements in limiting fire spread are the quick arrival of sufficient personnel and equipment to attack and extinguish the fire as close to the point of its origin as possible.

The availability of in-home digital cameras and security monitors has, in the past few years, afforded many opportunities on YouTube and other social media to actually watch fires that have taken place in homes. For example, the Fort McMurray wildfire resulted in the misfortune of several homeowners being able to monitor the fires encroaching on and burning their houses even as they fled the municipality. An interesting example of fire spread can be found at the 26-minute to 33-minute mark at the following "Nature of Things" link http://www.cbc.ca/natureofthings/m/episodes/into-the-fire. Generally, we have seen and can accept that somewhere around 8 to 10 minutes after a fire has started either flashover will occur or a fire will expand beyond the room of origin.

Admittedly, some fires don't progress to flashover because a resident takes some action, the nature of a fire or fuel restricts the progress to some extent, firefighters arrive in a short period of time, or for some other reason. But the unfortunately unpredictable nature of fires is why fire professionals take the position that an adequate number of firefighters need to be available to respond quickly to stop the spread and provide rescue when necessary, while others—usually not firefighters—argue that most fires aren't "real" and don't develop into a "beyond the room of origin" situation. It is, however, reasonable to suggest that some fires might not progress because firefighters arrive in a short enough time to control them.

Another thing that firefighters cite as a factor elevating firefighting risk and risk to occupants is the construction of a building—in particular, floor joists. In the last 30 years many residential and commercial builders have used composite floor joists, like the ones in Exhibit 3, rather than dimensional lumber (Exhibit 4).

Exhibit 3: Composite Floor Joists

Composite floor joists are sometimes referred to as "lightweight construction" because of their manufacture from oriented strand board and smaller flanges. Composite joists will burn through in 25% to 50% of the time of dimensional lumber thus possibly increasing risk if response is delayed. Some building codes now require composite joists to be covered with fire-rated drywall or an E-84 intumescent coating, although most buildings that firefighters enter will not have the coating or drywall.

Exhibit 4: Dimensional Lumber Floor Joists

4.4.3.1 National Institute of Standards and Technology

Another standard pertaining to firefighting is testing of crew size and its effectiveness in firefighting. The National Institute of Standards Technology (NIST) is an independent agency of the US Department of Commerce and provides scientific measurement and standards services to a wide range of products and services. This section provides information on NIST's study pertaining to the effect of response times and number of responders in structure fire scenarios. Keep in mind that only two or three initial responders arrive at fires in Kirkland Lake.

Rationale of Response Times and Number of Responders

The critical factors to be considered for optimum response to structure fires is speed of response, equipment adequacy, and the number of trained responders.

Crew Size

The following information emphasizes the impact of crew size on effectiveness in mitigating a fire emergency. Although this information has specific relevance to response by full-time stations, it demonstrates the capability of a firefighting crew regardless of the fire crew composition (career, composite, or volunteer).

National Institute of Standards and Technology Study – Primary Findings

Of the 22 fireground tasks measured during the experiments, results indicated that the following factors had the most significant impact on the success of firefighting operations. All differential outcomes described below are statistically significant at the 95% confidence level or better.

Overall Scene Time

- Four-person crews operating on a low-hazard structure fire completed all the tasks on the fireground (on average) seven minutes faster—nearly 30%—than two-person crews.
- Four-person crews completed the same number of fireground tasks (on average) 5.1 minutes faster—nearly 25%—than three-person crews.
- On the low-hazard residential structure fire, adding a fifth person to the crews did not decrease overall fireground task times. However, the benefit of five-person crews has been documented in

other evaluations to be significant for medium- and high-hazard structures, particularly in urban settings, and is recognized in industry standards.

Time to Water on Fire

- There was a 10% difference in the "water on fire" time between the two- and three-person crews.
- There was an additional 6% difference in the water on fire time between the three- and four-person crews. (i.e., four-person crews put water on the fire 16% faster than two-person crews).
- There was an additional 6% difference in the water on fire time between the four- and five-person crews (i.e., five-person crews put water on the fire 22% faster than two-person crews).

Ground Ladders and Ventilation

- The four-person crews operating on a low-hazard structure fire completed laddering and ventilation (for life safety and rescue) 30% faster than the two-person crews and 25% faster than the three-person crews.

Primary Search

- The three-person crews started and completed a primary search and rescue 25% faster than the two-person crews.
- The four- and five-person crews started and completed a primary search 6% faster than the three-person crews and 30% faster than the two-person crews.

A 10% difference was equivalent to just over one minute.

Hose Stretch Time

- In comparing four- and five-person crews to two- and three-person crews collectively, the time difference to stretch a line was 76 seconds.
- The differences are more distinct when conducting a more specific analysis comparing all crew sizes to the two-person crews.
  - Two-person crews took 57 seconds longer to stretch a line than three-person crews.
  - Two-person crews took 87 seconds longer than four-person crews to complete the same tasks.
  - Finally, the most notable comparison was between two-person crews and five-person crews: more than two minutes' (122 seconds) difference in task completion time.

Industry Standard Achieved

- The "industry standard achieved" time, as defined by NFPA 1710, started from the first engine arrival at the hydrant and ended when 15 firefighters were assembled on scene.
- An effective response force was assembled by the five-person crews three minutes faster than the four-person crews.
- Based on the study protocols, modelled after a typical fire department apparatus deployment strategy, the total number of firefighters on scene in the two- and three-person crew scenarios

never equalled 15. Therefore, the two- and three-person crews were unable to assemble enough personnel to meet this standard.

Occupant Rescue

Three different "standard" fires were simulated using the Fire Dynamics Simulator model. Characterized in the *Handbook of the Society of Fire Protection Engineers* as slow, medium, and fast growth rate, the fires grew exponentially with time. The rescue scenario was based on a non-ambulatory occupant in an upstairs bedroom with the bedroom door open.

Independent of fire size, there was a significant difference between the toxicity, expressed as fractional effective dose, for occupants at the time of rescue depending on arrival times for all crew sizes. Occupants rescued by early arriving crews had less exposure to combustion products than occupants rescued by late-arriving crews.

Larger crews responding to slow growth rate fires can rescue most occupants prior to incapacitation, as can early arriving larger crews responding to medium growth rate fires. The result for late-arriving (two minutes later than early arriving) larger crews may result in a threat to sensitive populations for medium growth rate fires. NIST notes the fact that there is no fractional effective dose level so low that every occupant in every situation is safe.

Conclusion

- More than 60 full-scale fire experiments were conducted to determine the impact of crew size, first-due engine arrival time, and subsequent apparatus arrival times on firefighter safety and effectiveness at a low-hazard residential structure fire.
- The NIST report quantifies the effects of changes to staffing and arrival times for residential firefighting operations.
- While resource deployment is addressed in the context of a single structure type and risk level, it is recognized that public policy decisions regarding the cost-benefit of specific deployment decisions are a function of many other factors including geography, local risks and hazards, available resources, and community expectations. The NIST report does not specifically address these other factors.

The results of these field experiments contribute significant knowledge to the fire service industry. First, the results provide a quantitative basis for the effectiveness of four-person crews for low-hazard response. The results also provide valid measures of total effective response force assembly on scene for fireground operations, as well as the expected time-to-critical-task performance measures for low-hazard structure fires. Additionally, the results provide tenability measures associated with a range of modelled fires.

In a rapidly developing fire scenario, two critical factors impacting the outcome are

- **effectiveness of the chosen strategy, and**
- **timeliness for completion of the tasks necessary to successfully implement the strategy.**

4.4.4 Risk in Kirkland Lake

So far, we have established that the Kirkland Lake fire department

- does not comply with the *Fire Prevention and Protection Act* with respect to public education and prevention activities;
- does not have a strategic focus and requires revitalization from the most basic level;
- has not conducted a simplified risk analysis;
- does not meet NFPA 1720 if council wishes to consider that as a target standard; and
- falls into the lower end of the performance scale as determined by the National Institute of Standards and Technology.

Let's address community risk

- We have no intent to be unduly critical, but we were struck by large areas of Kirkland Lake that exhibit many of the risk attributes that it seems bylaw #99-03 Property Standards is intended to address. In particular,
  - Part II, 2.01 Yards says,

    (1) Every yard, including vacant lots shall be kept clean and free from;

    a) rubbish, debris and objects or conditions that may create a health, fire or accident hazard;

    b) inoperable, wrecked, dismantled, discarded or abandoned machinery, vehicles, trailers or boats unless it is necessary for the operation of a business enterprise lawfully situated on the property;

    c) heavy undergrowth and noxious weeds as defined by the Weed Control Act;

    d) dilapidated, collapsed or partially constructed structures which are not currently under construction.

  - Part IV of the property standards bylaw addresses burnt or vacant buildings:

    4.01 (1) In the event of fire or explosion, damaged or partially burned material shall be removed from the property, except that such material may be stored within the barricaded fire damaged building or unit for a period not exceeding sixty days or until investigations are completed by the fire authorities.

    (2) In the event, the building or accessory structure is beyond repair, the land shall be cleared of all remains and left in a graded, level and tidy condition.

We offer the following photographs that indicate

- apparent contradictions to the intent of bylaw #99-03 (Exhibit 5), and
- the proximity risk to neighbouring houses in case of fire (Exhibit 6).

Exhibit 5: Examples of Apparent Contradictions to Bylaw #99-03

Exhibit 6: Building Proximity Contributes to Fire Exposure Risk

Exhibit 7 appears to be a former commercial building converted to apartments. Buildings of this nature often lack firewalls between units resulting in rapid fire spread through an attic (please see Exhibit 8 as an example).

Exhibit 7: Former Commercial Building Conversion to Apartments

Exhibit 8: Fire in a Building with No Separations

Exhibit 9 shows two buildings that appear to contradict Section IV of the property standards bylaw. During our tour of Kirkland Lake, neighbours of both these buildings approached us to express concerns about the building remnants and a vehicle that had been left near one of the locations.

Exhibit 9: Recent Fires

We were able to take many pictures of a similar nature, which, in our experience, indicates a community at risk and a community that has not implemented methods to mitigate that risk.

Recommendations – Risks in Kirkland Lake

We recommend that town council accepts the need to mitigate fire risk by implementing a fire master plan that includes

- meeting the requirements of the *Fire Protection and Prevention Act*;
- providing training and support to the fire chief with respect to fire service management and offering mentoring;
- implementing a public education and prevention program plus the associated training;
- supporting the fire chief with assistance to implement standardized training programs for staff;
- utilizing the property standards bylaw to reduce fire risk and fire load around properties.

4.4.5 Reducing Public Risk

Fire is a largely preventable occurrence, and the effect of fire can be mitigated with the right tools, but the culture related to fire awareness and accountability has to be changed, which in turn will reduce risk. Fire and elected officials should embrace the responsibility of promoting fire avoidance.

In 2007, the TriData Division of System Planning Corporation undertook a study of best global practices for reducing residential fire injuries on behalf of the National Center for Injury Prevention and Control, within the US Centers for Disease Control and Prevention (CDC). CDC's National Center for Injury Prevention and Control attempts to identify effective global community fire safety programs—best practices—that could be used in the United States. Readers should keep in mind what we suggested about best practices in Section 2.1.1.4, Best Practices and Benchmarks, but we can present this information with some confidence considering the stature of the CDC. Besides, the techniques in use in other jurisdictions can sometimes offer good ideas if not "best practice."

One of the most important practices reported in the study—that of home safety visits—takes place in the United Kingdom (UK), and was also observed by Pomax personnel during our visits to the UK. It is a technique for reducing fire loss and casualties supported by fire marshals' offices across Canada. We quote from the TriData report:

> *Of all the best practices identified in this study, one stands out. To reduce fire casualties in the home, the British fire service is visiting large numbers of high-risk households to do fire safety inspections and risk reductions, especially to ensure they have a working smoke detector. This approach has required a major change in the culture and mission of the British fire service. It should be adapted for use in the United States. The approach is thought by the British to be a major factor in the 40 percent drop in fire deaths in the United Kingdom over the last 15 years, and it probably could have a large impact in the United States and other nations as well.*

The only comment we have about this quote is that readers should understand that the British fire service visited high-risk households because they were the highest priority. There was no intent to disregard other households.
To quote further from the report:

> *In Britain fire brigades have been required by national legislation since 2004 to engage in strong community safety programs as part of an overall national strategy for improving fire safety. Every British firefighter now is expected to participate in prevention. A national-level Community Fire Safety Center was established in the Department of Communities and Local Government to be the focal point for developing national strategies, campaigns, and materials.*

Other best practices in the UK fire services that have become part of the fire service culture include

- using risk analysis software that links fire data with socioeconomic information;
- prevention programs, which have been elevated to a line service rather than support, and fall under the responsibility of the chief or deputy;
- the aforementioned home safety visits (home safety visits promote awareness even if it is just meeting residents at their doors, providing pamphlets, asking questions about smoke and carbon monoxide detectors, and offering to do a home safety inspection);
- all firefighters participate in prevention programs during on-duty hours;
- fire safety campaigns utilize print media, radio, the internet, and talk shows;
- school programs—conducted mostly by firefighters but sometimes by teachers and prevention personnel—reach close to 100% of students in selected elementary school grades in many fire brigades, and significant numbers of students in secondary schools are also being reached;
- social service caretakers of the elderly are trained on fire safety practices they can implement or advocate during their home visits;
- partnerships with social service agencies are promoted.

One of the most intriguing observations in the report with respect to residents taking on responsibility for fire safety is that Norway requires extinguishers or hose lines attached to faucets in every home, in addition to smoke alarms. Home occupants are trained to extinguish small fires because the fire service cannot arrive within time it takes for many fires to reach flashover. In 2007, Sweden estimated that 35% of homes were equipped with extinguishers.

Other ideas from Sweden and Norway include

- Norway requires 1 prevention full-time equivalent for every 10,000 population;
- in some cities firefighters are assigned to supermarkets to show shoppers a short safety film, discuss safety issues, and hand out literature;
- movie theaters in Sweden show a one-minute fire safety spot addressing winter safety hazards;
- electrical equipment is recommended to be plugged into “power strips” and the strips turned off at night if equipment does not have to operate all night long.

The full report can be found at http://strategicfire.org/wp-content/uploads/2015/04/tri-data-global-concepts-part-1-10.07.pdf, but we have included the summary in Appendix G.

The United States Fire Administration, in the document *Public Fire Education Planning: A Five Step Process* indicates the following:

- *public education programs that successfully reduce fires and preventable injuries involve effective community planning;*
- *public education about fire has been cited … as the single activity with the greatest potential for reducing losses;*
- *the importance of evaluation as an essential part of a public education program;*
- *the need for local-level planning to identify the best approaches for reaching difficult-to-reach target audiences;*
- *public education initiatives must be based on local problems and target the people at risk. Each community must conduct its own planning process to identify specific problems and the best methods for addressing them;*
- *local initiatives must involve the entire community. One organization alone can't make a big impact in preventing fires and injuries; (Kirkland Lake could consider partnerships between the fire department, property standards, and community and social agencies).*
- *Experience shows that successful programs have the following characteristics:*
  - *There is strong individual and organizational commitment to the public education initiatives.*
  - *The program is based on a comprehensive planning process that identifies community fire and injury problems, and the people most likely to be involved.*
  - *Partnerships are established so that the community as a whole is involved in the solutions.*
  - *There is an evaluation of the program's results and processes.*
  - *Fire service leaders and public educators responsible for programs must use new educational approaches, methods, and processes, such as the following:*
    - *greater organizational focus on prevention;*
    - *improved data collection and analysis;*
    - *integrated use of prevention interventions;*
    - *improved technology;*
    - *higher level of prevention and public education training for emergency services personnel;*
    - *changing the current paradigms about the causes of fire and injuries.*

A study conducted by students from the Worcester Polytechnic Institute in Massachusetts, USA, and sponsored by the Metropolitan Fire Brigade in the State of Victoria, Australia,[16] found no evidence that the home fire safety campaigns conducted by the Metropolitan Fire Brigade had an effect on reducing

[16] Fagan, S., Greene, M., Knight, S., and Royds T., *An Evidence Based Approach to Home Fire Safety*. Worcester, MA: Worcester Polytechnic Institute, 2014. https://web.wpi.edu/Pubs/E-project/Available/E-project-050614-212157/unrestricted/An_Evidence_Based_Approach_To_Home_Fire_Safety_Final_WPI.pdf

home fire safety issues. The team used the Australian Incident Reporting System to analyze all preventable residential structure fires between 2008 and 2013.

The research concluded that

> *The Home Fire Safety Campaigns from 2009-13 focused primarily on three key messages: unattended cooking, heater fires, and smoking in bed. The team found no evidence that the campaign was effective at changing people's behaviour. Neither was there evidence that the campaign was effective at reducing the frequency of fires. Because there was no evidence of the campaigns making a difference, MFB should reconsider how to approach home fire safety issues in the future.*

It recommended that

> *Behaviour change and risk awareness are complicated fields of psychology, and many models have been developed to attempt to explain peoples' actions and motivations with the goal of influencing their behaviour. MFB should consider some of these different models in the creation of future campaigns, activities, messages, and materials.*

This recommendation is similar to the European experience that public education has to be based on research so that the most effective means of intervention can take place.

There are many articles in the British Journal of Medicine, the US National Library of Medicine, and other injury prevention sites that have used established research methodologies that prove the benefits of public education and prevention methods in preventing fire-related injuries. These are listed in the references at the end of this section. The findings of these studies fall into five areas:

1. Smoke detectors and education about maintenance and replacement have had the greatest effect on injury prevention.
2. Awareness of the effect of fire and a plan for escaping a fire situation also reduces injury.
3. Practices in other countries that have a culture of personal responsibility for fire prevention, such as unplugging appliances, turning off unneeded electrical products at night (use of power strips), availability of fire extinguishers, and robust fire education in schools, result in a lower incidence of fires and injury than the North American experience.
4. European countries with a fire prevention culture operate on a lower cost for fire services than in North America.
5. Most importantly, fire prevention cultures are promoted and supported through robust prevention and public education programs; they don't just happen.

4.4.6 The Role of the Fire Department in Reducing Risk

It is important to recognize the vital work the Kirkland Lake fire department accomplishes by responding to public emergencies. But there is also a reality that, most fortunately, the number of responses is low; less than 0.8 per day on average. We acknowledge that emergency calls don't occur on an "average" basis, but the number (0.8) does indicate that the fire department has time available to add value to community safety. We should also note that there are other duties that firefighters have to observe, other than only

responding to incidents—for example, vehicle maintenance, training, incident investigation, and others. Nevertheless, the fire department should be obligated to be proactive in implementing some of the protection and education initiatives described above.

We observed in Section 4.2, Organization, that the fire chief is the town's Occupational Health and Safety Coordinator and is, or may soon become, the Community Emergency Management Coordinator (CEMC). There is an abundance of evidence in this report that the fire department requires a full-time fire chief and having the incumbent split time with other town duties will jeopardize the department's recovery. From a practical viewpoint, a fire chief should not be the CEMC, because if a major incident occurs the chief will be at the scene, not in an emergency operations centre (EOC). In such a circumstance, the alternate CEMC could head up the EOC, but if that is the town's strategy, then the alternate may as well be the CEMC. Besides, to reiterate our earlier point, this fire department requires a full-time leader.

More appropriately the fire department and fire chief should take on the property standards role, which fits in with prevention and public education. There should be a coordinated effort—as has been successfully demonstrated in the United Kingdom and reported in the British Journal of Medicine, the US National Library of Medicine, and other injury prevention sites—between the fire department and other municipal departments, such as property standards and social services. Property standards is a good fit with fire department duties because the fire department is fully aware of property standards violations that add to fire risk. However, the approach can be one of education of risks prior to enforcement. Other advantages of assigning property standards duties to the fire service include that the department has time to fulfill the role and that, by not having to employ a property standards officer, the fire department returns value to the community in the form of cost avoidance plus enhancing public education and the community's environment.

Recommendations – Reducing Public Risk

- Adopt a culture of fire and injury prevention as part of the five-year fire master plan using models and philosophies found in other North American and international jurisdictions.
- Considering the reasonable limitations of a composite fire department, promote a practice of personal responsibility for fire prevention as has been established in some European countries. This can be accomplished with a strong, long-term public education campaign as described in this report and the referenced literature.
- Assign property standards responsibility to the fire department.
- Do not include occupational health and safety and community emergency management as part of the fire chief's span of responsibility.

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Section 5 Fire Station and Equipment

5.1 The Fire Station

Kirkland Lake has a single fire station, located at 8 O'Meara Boulevard, that is reported to have been built in 1935. The station has been upgraded over the years with external cladding and refitting of windows and doors but, nevertheless, shows its age.

The fire station is serviceable but an undesirable environment, and plans should be put in place for a major renovation, or preferably replacement, in the next five years.

- The apparatus floor space is not large enough to accommodate modern apparatus and provide adequate space to work around the vehicles.
- The aerial truck is housed at the Physical Services Department garage because it won't fit in the fire station.
- Part of the garage floor is also the basement ceiling, and the space on which the pumpers are parked is not adequate to support the load of the pumpers.
  - An engineering assessment by the Materials Joining Innovation Centre in Kirkland Lake indicates that the floor isn't at immediate risk of collapse but requires reinforcement at an estimated cost of $18,000.
- The washer and dryer used for cleaning uniforms and some turnout gear is previously owned and due for replacement (Exhibit 10).
- At a minimum, in addition to floor reinforcement, weather stripping should be repaired and replaced as should the windows (Exhibit 11).

Exhibit 10: Fire Station Washer and Dryer

Exhibit 11: Weather Stripping and Windows

As noted, with adequate maintenance the fire station is serviceable during a planning period for a new station, but as a 1930s station it should be replaced as part of a long-range master plan. Based on the age of at least two of the fire trucks, replacement apparatus will likely be purchased during the span of the master fire plan, and the size and limitations of the station will restrict purchase options, force alternate arrangements for storing the trucks (such as with the aerial), or drive a sudden consideration for station replacement.

Recommendations – Fire Station

- Put in place a plan to replace the fire station within five years.
  - a 10,000-square-foot station at a cost of $400 per square foot will require capital funding of $4,000,000 plus land costs. However, fire stations can be expected to have a 40-year service life if properly planned and designed.
- In the interim, reinforce the floor structure immediately and maintain and repair the weather stripping, windows, and doors.
  - There are several unknowns with respect to maintenance and repair of the current building, but initial costs could be in the range of $50,000 or more.

5.2 Apparatus

The station houses the following apparatus:

- A 2004 rescue van (~ 13 years' service) with 78,866 kilometers on the odometer, purchased secondhand from Minto, Ontario fire department (Exhibit 12);
- A 1988 Pierce aerial platform truck (~ 29 years' service) with 76,741 kilometers, purchased secondhand from North Bay fire in 2016; (Exhibit 13)
- A 2003 Freightliner pumper (~ 14 years' service) with 16,721 kilometers, purchased new (Exhibit 13)
- A 1997 Freightliner pumper (~ 20 years' service) with 47,315 kilometers, purchased new (Exhibit 13)
- A 1999 Chevrolet club cab pickup (~ 18 years' service) with 72,586 kilometers, purchased new (Exhibit 13)

Exhibit 12: 2004 Rescue Van

Exhibit 13: Fire Department Apparatus

Fire vehicles, because of the nature of the equipment carried and tasks performed, are very expensive and expected to last a substantial period of time. Several of the fire trucks owned by Kirkland Lake are approaching 20–30 years' service, and replacement should be expected during the master plan period.

Life expectancy for fire apparatus is influenced by many factors, including the age of the vehicle, mileage, hours of operation (i.e., engine running time, water pumping, or aerial ladder usage), and maintenance history. The guidelines most frequently applied by fire services and municipalities across North America for replacement and purchase of emergency response apparatus is the National Fire Protection Association Standard 1901, *Standard for Automotive Fire Apparatus*. Replacement considerations and timing are addressed in Appendix D of the 2016 edition of this standard. Underwriters Laboratories of Canada (ULC) standards for firefighting apparatus and equipment also have application when considering purchase of new or replacement vehicles and should be reviewed during the acquisition process for fire department apparatus and equipment.

Although there are no definitive rules and requirements as to when emergency vehicles should be decommissioned, by the end of this five-year master plan the platform truck will be approaching 35 years of service and the 1997 freightliner pumper 25 years, well beyond the 15-year age guideline for front line fire apparatus as outlined in Appendix D of NFPA 1901, 2016 Edition: *Standard for Automotive Fire Apparatus*. A strategy should be put into place to fund replacements for these two vehicles as well as the 1999 Chevrolet pickup.

To assist the town in considering the replacement of the three vehicles, the non-mandatory guidelines provided in NFPA 1901, Appendix D, 2016 Edition are summarized below:

To maximize fire fighter capabilities and minimize the risk of injury it is important that the fire apparatus be equipped with the latest safety features and operating capabilities.

Industry standards for fire apparatus are typically revised every 5 years and there have been substantial changes to upgrade functional capabilities and safety features over the last 15 years. Included in those improvements are such things as

- rollover stability;
- seat belt design for fully dressed firefighters and seat belt use warning system;
- minimum acceleration and upper speed limitations;
- cab integrity;
- enhanced work and step lighting and safety design;
- reflective striping;
- ergonomic design for accessibility to equipment such as ladders and hose lines.

The life cycle of a vehicle depends on many factors including

- vehicle mileage and engine hours;
- quality of the preventative maintenance program;
- quality of driver training;
- proper use of apparatus within design parameters;
- manufactured on a commercial or custom chassis;
- quality of manufacturer workmanship;
- quality of components used to build the vehicle;
- availability of replacement components.

Factors to evaluate and consider for the replacement timing of a vehicle include the following:

- What is the true condition of the apparatus—has it been in a major accident or required major repairs?
- What advances have been made in design safety, technology, and operational functionality since its manufacture?
- Does the vehicle still meet the needs of its service area, or is it obsolete?
- Can the vehicle carry the equipment needed to do the expected job within its weight load capacity?
- What are the anticipated annual costs to keep the vehicle in service including downtime, maintenance cost, depreciation, reliability, and safety of the users and the public?
- How available are replacement parts?
- How long can the department operate in the event of a major mechanical breakdown?
- What is the current trade-in value of the vehicle, and what is the expected depreciation rate?

NFPA 1901, Appendix D, 2016 Edition concludes:

> *A fire apparatus is an emergency vehicle that must be relied on to transport firefighters safely to and from an incident and to operate reliably and properly to support the mission of the fire*

department. A piece of apparatus that breaks down at any time during an emergency operation not only compromises the success of the operation but might jeopardize the safety of the firefighters relying on that apparatus to support their role in the operations.

Recommendation – Apparatus

- Replace the 1988 aerial platform truck, 1997 pumper, and 1999 Chevrolet pickup truck in the next five years.
  - Replacement with previously owned apparatus is expected to cost $200,000 or more.
  - Many municipalities set up a reserve fund for the eventuality of having to replace major equipment. An alternative is to lease, but costs are substantial with either option.

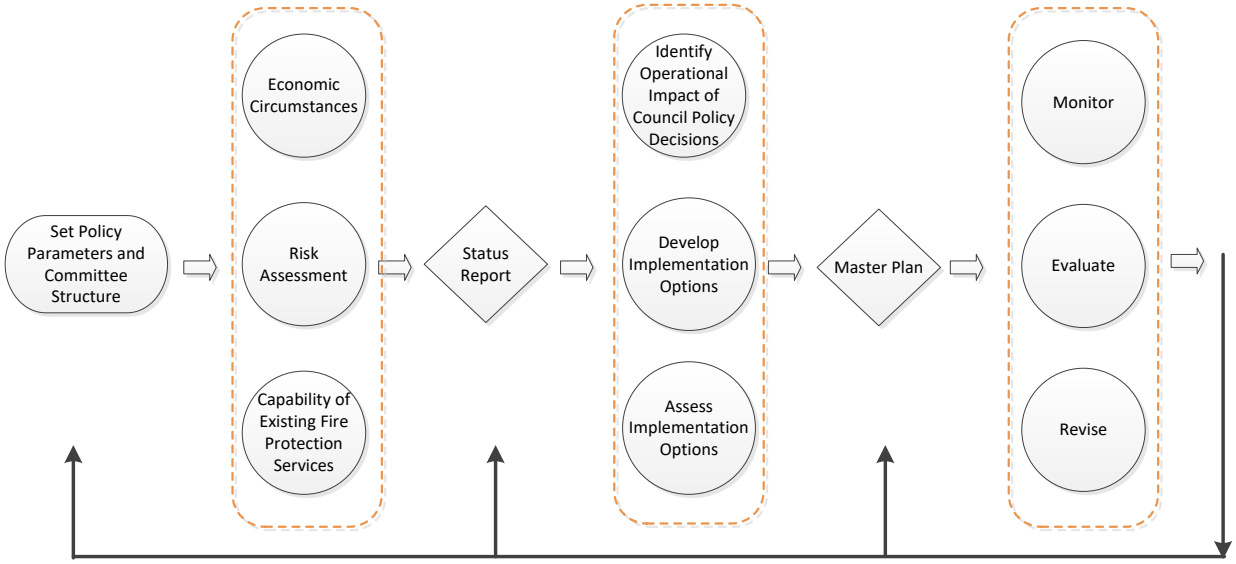
Appendix A: Public Fire Safety Guideline – Optimizing Public Safety

Fire Protection Review Process

Public Fire Safety Guidelines	**Subject Coding** PFSG 01-01-01
Section General	Date January 1998
Subject Fire Protection Review Process	Page

Under Review

- Purpose
  To provide a description of a simple and practicable system to enable decision makers to make informed choices.
  It ensures formal interaction between council with its policy setting responsibilities, the municipality with its corporate management objectives, and the fire department with its operational expertise.
- Introduction
- The overall objective of any fire protection program is to provide the optimum level of protection to the community, in keeping with local needs and circumstances.
- Extensive research has demonstrated that there are a variety of factors that will have an impact on the fire department's capacity to fulfil this objective.
- Conversely, there are many different options that a municipality may pursue to improve the efficiency and effectiveness of its fire protection system.
- Local circumstances will have a profound effect on which factors are most important for any one municipality, and what options are available for its fire protection system.
- Selecting among these options is an extremely complex task.
- Success will require a combination of specialized expertise in fire protection, and a thorough appreciation of your municipality's economic, social and political circumstances.



Overview

Stage 1: Set Policy Parameters
Stage 2: Determine Local Circumstances
Stage 3: Status Report
Stage 4: Determine Fire Protection Strategy
Stage 5: Develop Master Fire Plan
Stage 6: Monitor, Evaluate and Revise
Stage 7: Performance Measures

- Every municipality operates under a specific set of policy parameters -- basic tenets that define the role of the municipal government in the community.
- In essence, it is the political philosophy of the municipality.
- These parameters reflect the culture of the local community and will have a profound impact on the fire protection strategy that you develop.
- Policy parameters include, for example:
- *Public Expectations* -- does the public expect the municipality to address its needs or is there a fairly high level of personal self-reliance?
- *Service Delivery Strategy* -- how open is your community to alternate forms of service delivery and financing such as out-sourcing or fee-for-service?
- *Level of Satisfaction* -- are you satisfied with the level of fire protection in your community, and the efficiency and effectiveness of the fire protection system?
- *Funding Policies* -- what impacts do your funding policies and practices have on the services you deliver? How do you account for capital expenditures? Are you prepared to issue debentures?
- *Competing Priorities* -- what priority does public fire safety have in your community in comparison to the other services that you provide?
- *Receptiveness to Change* -- does the public recognize the need for change, and would they accept the implications of such change?
- It is extremely important that you work through these questions from a fire protection perspective, and that you include all of the key participants in the process.
- It need not be an excessively formal process, but everyone involved in the review should have an opportunity to discuss the broader context within which the fire department must operate.
- The results of this discussion should be reflected in the "terms of reference" for the review.
- It will help to ensure that the review remains focused.
  It will also encourage participants to be open to innovations, and conversely, it will help to ensure that staff involved in the review do not spend unnecessary time and resources analyzing options that are not viable.

Stage 2:

- Analyze Local Circumstances
  Separate guidelines are available that address each of the three main issues that define the local circumstances of a municipality:
- Assessing Economic Circumstances from a Fire Protection Perspective (PFSG 02-03-01)
- Assessing Fire Risk (PFSG 02-02-12)
- Assessing the Existing Fire Protection Services (PFSG 02-04-01)

The following is an overview of the issues that these three guidelines address.

Economic Circumstances

- What are your expectations for economic growth?
- How much development do you expect to occur?
- What type of development do you expect?
- How is your population changing? (Demographics)
- If the fire department receives the bulk of its financing from the tax base;
  - is the tax base increasing, shrinking, or relatively steady?
  - is the tax base shifting?
- Describe the assessment
- A review of your economic circumstances should involve more than just an assessment of future demand and available resources:
- A growing community creates new demand for emergency services, but the type of growth you are experiencing may require a very different kind of response. For example, growth resulting from an in-migration of newly retired residents will create very different demands than growth resulting from the recovery of the local resource industry.
- There are many more ways in which your fire protection system can address new residential development than there are for older neighbourhoods. An initial investment in sprinkler and/or detection systems when new developments are being planned can reduce the need for new fire stations in the future.
- Economic development and expansion may have a significant impact on the availability of resources for fire protection. It tends to be easier to attract volunteers in a self-contained community than in a similar-sized area that serves as a bedroom community for a large city. Is the make-up of your community changing?
- This stage of the review is the first opportunity for you to co-ordinate your planning strategy with your fire protection strategy. Accordingly, it is very important for both fire and planning officials to work closely together on this aspect of the review, perhaps by way of a sub-committee

Fire Risk

The Fire Risk in your community is a function of:

- *Potential for Loss*, which depends on the extent to which buildings comply with relevant fire and building codes, how buildings are used, the public's attitude toward fire, and the use of special measures such as automatic detection and/or suppression systems.
- *Consequences of Fire*, such as the effect of a fire at a major industry on local employment, assessment and economic activity. This also includes social impacts resulting from the loss of an historic or recreational facility, or the impact of fire on a sensitive environmental area.
- *Local Infrastructure,* such as water supply, communications, the quality of roads, and physical barriers such as rivers or railroads.
- *Building Stock*, including the age of buildings, the density and type of construction, their height, and the mix of commercial, industrial and residential uses.
- Since there are so many factors that affect fire risk, it tends to vary considerably from location to location. In fact, fire risk in one part of a municipality will often be very different from in another, particularly in rural

areas. Accordingly, there is no need for the fire department to provide a uniform level of service throughout the municipality. The service you provide should be tailored to the risks faced.

A thorough risk assessment can also avoid invalid comparisons between your fire department and others. A municipality with a similar population may have very different fire risks, and therefore very different fire protection needs. A good risk assessment will ensure that such comparisons are valid. By providing a valid basis for comparison, a good risk assessment can also provide confidence that innovations introduced elsewhere can be successfully applied in your municipality.

Existing Fire Protection System

- Examining the existing fire protection system is perhaps the most time consuming component of the assessment process. The objective is to obtain a clear picture of the nature of the fire protection system as it exists today. The following broad areas should be examined:

  Role and Mandate -- What range and scope of services is the department expected to provide (fire suppression, rescue, hazmat, etc.)? How does it relate to neighbouring fire departments (mutual-aid, automatic aid)? How does it relate to other sections of the municipality?

  Structure and Organization -- What type of department is it (full-time, composite, volunteer)? What is its total staff, facilities, apparatus and equipment? How many layers of management?

  Services and Support -- Briefly describe the services provided by the various functional sections of the fire department and describe the support mechanisms for these services.

  Emergency Operations -- Describe the types and extent of emergency operations conducted by the fire department and include such things as incident command systems and operational support.

  Financial & Resource Analysis -- Describe in detail the funding, budgeting and resource allocation of the fire department, including the individual functional divisions.

  Fire Protection and Prevention Act - indicate whether or not the department/municipality is in compliance with this Act.

Stage 3:

- Status Report
- The purpose of this stage is to assist in the preparation of a report to council outlining the findings of the analysis of the following:
- economic circumstances
- risk assessment
- capabilities of existing fire protection service
- The report will include details of the existing circumstances
- The report will also include and identify strengths, limitations, threats and opportunities respecting the existing fire protection services.
- The purpose of the report is also to elicit the expectations of the decision makers, and confirm their commitment to proceeding to the master planning process.

Stage 4:

- Determine Fire Protection Strategy

- This stage of the process involves a review team assisting council in making a determination of the future fire protection strategy.
- The procedure involves analyzing economic circumstances, risk assessment and the capabilities of the existing fire protection service (including core services). This is accomplished in three levels, as follows:
- council considerations
- administrative considerations
- fire department considerations
- Your review should consider, and perhaps emphasize the need for residents, industry and others to accept increased responsibility for the improvement of public safety.
- The review must look beyond the fire department's firefighting capability in fulfilling its responsibility to provide for public safety.
- Today's economic conditions - evidenced by reduced budgets, revenues, hiring freezes, reductions in staffing levels through attrition or otherwise, delayed apparatus and equipment purchases - forces the making of hard decisions about the resources required for local fire protection.
- Options and alternatives are therefore essential. For example, it may be considered appropriate to re-focus on developing fire prevention and public education programs rather than expanding fire fighting forces, or consider resources in surrounding communities and how those resources might be utilized to meet your needs.
- Determining the future fire protection strategy of your municipality is accomplished by way of providing options for the consideration of council.
- For this process to be successful, it is imperative that there be full and open consultation with all of the stakeholders.
- Stakeholders are the people and organizations with an interest in the fire service, including:
- fire department staff and management
- municipal staff and management
- municipal administrators
- council
- residents
- business
- industry
- planning and coordinating agencies and organizations
- provincial government ministries
- county/district/regional organizations
- other municipalities
- Schematic diagram of the model: Optimizing Public Fire Safety highlighting Stage 3.
- police
- ambulance
- other umbrella organizations:
- firefighter associations (full time and volunteer)
- AMO
- OAFC
- CAFC

- Consultation with stakeholders during the development, assessment and operational impact of various options is necessary for three reasons.
- First the review team will obtain expert advice on key elements of the various options.
  Obtaining expert advice from all stakeholders ensures that all parties to the process:
- fully appreciate why the process is being carried out
- clearly understand the strategy, initiative or option that will be evaluated
- participate in identifying potential evaluation questions or issues, and
- help shape the options
- Second, it will help ensure a surprise-free environment for all parties to the review process.
  Ensuring a surprise-free environment is necessary for the review team facilitator(s) to create a receptive, productive environment for the option evaluation process. Except in extremely rare cases, stakeholders should be aware of the option evaluation process. Nothing is more damaging to such a process than to spring it on stakeholders. They will usually react suspiciously and defensively, see the process as an intrusion, find fault with it, and actively lobby to circumvent its recommendations.
- Finally, the stakeholders will use the consultation as an opportunity to market the various options.
  Marketing the various options and their potential is essential if it is expected that they will lead to program or service changes, particularly significant ones. Change is not an event, but a process, and usually a slow process, and conditions generally needs to be cultivated. Like a building, the foundation for change needs to be laid well in advance of its construction. Stakeholders must accept the need to change before it can occur. For the review team and its facilitator(s), creating this comfort level is an essential ingredient of success.
- The review team and facilitator(s) usually consult with the stakeholders through established committees.
  Primary discussions between the facilitators and the stakeholders are usually conducted on an individual basis, with the committee acting as a clearinghouse. Facilitators, who almost always shun formal committees and attempt to consult by **only** using individual or team interviews, enjoy limited success. While individual consultation may provide a more direct and confidential input into the process, this practice has drawbacks. It often results in stakeholders seeing the process as the product and possession of the facilitator. Stakeholders often feel that they have not participated fully and equally in planning the study. And, there is the chance they can complain that the facilitators have filtered their concerns
- This review process will result in alternatives for your existing fire protection services, and options and considerations for council's vision of the future of the fire service.
- All options will be prioritized, assessed, costed where appropriate and clearly indicate the operational impact.
- Then council will be in a position to make better informed decisions for creation of your master fire plan.

Stage 5:

- Develop Master Fire Protection Plan
- Master fire plans, properly introduced, are a valuable tool in identifying management options for providing desired fire protection levels to a community. Ultimately, a good plan will lead to a more fire safe community.
- A master plan, pared to its essentials, presents the programs or projects, the costs, and the schedules for developing and maintaining the fire protection system that has been accepted and approved by council on behalf of the community, based on a price which the public can afford.

- Master planning itself is not a new concept. Many municipalities are involved in the process with varying degrees of success.
- Master planning for fire protection allows each community to determine the best allocation of resources to achieve an acceptable level of fire protection.
- An appropriate plan can only be developed under the following conditions.
- Schematic diagram of the model: Optimizing Public Fire Safety highlighting Stage 5.
- The plan forms the basis for the fire protection budget, through identification and description of time-phased programs and projects to be implemented throughout the planning period.
- The plan considers the following factors.
  • The current and future fire protection environment by establishing and maintaining a comprehensive data base.
  • The acceptable life and property risks by setting goals and objectives.
  • The fire protection system that provides the level of service commensurate with the level of accepted risk.
  • The funding required to implement the plan.
  • The assignment of authority and responsibility.
  • The procedures for carrying out and updating the plan.
  • The master fire plan defines the community fire problem and provides the future direction of the delivery of fire protection services.
  • The plan will require continuous updating to provide a current picture of the needs of the community.
  • There are several benefits to developing a master fire plan.
- Supports the risk management program by identifying programs and levels of service.
- Improves public relations and promotes interest and direct involvement within the community.
- Sets standards of service the fire department is capable of providing.
- Potentially decreases costs, for fire protection and/or insurance coverage.
- Contributes to a reduction in the number of fires, fire deaths, fire injuries and property loss.
- Makes best use of available resources.
  Defines by policy of council the types, level and quality of fire protection services to be provided to the community.

Stage 6:

- Monitor, Evaluate & Revise
- Introduction:
  This stage of the municipal fire protection review process involves three parts:
- Monitor
- Evaluate
- Revise
- Just as the type and level of fire services provided are a municipal responsibility, so are the evaluation, monitoring and revision of such services a municipal responsibility.
- They **may,** however, be subject to outside scrutiny.
- Objectives:
- The objectives of the municipality, as mirrored in the fire department master plan, are the starting point for any evaluation.

- These objectives should be consistent with the review process mission statement and express what the process is to accomplish.
- The objectives should be both specific and measurable.
- Activities:
- The activities are the operational aspects of the identified objectives.
- Activities should be logically related to objectives.
- **Immediate Outcomes** are the effects that are expected to occur as a direct result of activities. These outcomes may include changes that affect people or processes. For example, an immediate outcome might be the improved delivery of a specific service.
- **Ultimate Outcomes** include the larger societal level changes that are expected from the activities. An example would be an expected improvement in compliance with the Fire Code. Ultimate outcomes are often dependent on immediate outcomes. In this example, success might be dependent on providing an appropriate public education program.
- Monitor:
- Notwithstanding it is considered prudent for municipalities to monitor programs, services and activities, the Fire Protection and Prevention Act includes the following:

PART II (7) "The Fire Marshal may monitor and review the fire protection services provided by municipalities to ensure that municipalities have met their responsibilities under this section and, if the Fire Marshal is of the opinion that, as a result of a municipality failing to comply with its responsibilities under subsection (1), a serious threat to public safety exists in the municipality, he or she may make recommendations to the council of the municipality with respect to possible measures the municipality may take to remedy or reduce the threat to public safety." and,

PART III FIRE MARSHAL 9. (1) The Fire Marshal has the power, (a) to monitor, review and advise municipalities respecting the provision of fire protection services and to make recommendations to municipal councils for improving the efficiency and effectiveness of the services.".

- Program monitoring is a systematic attempt to measure both of the following:

a. program effectiveness -- are the programs and services reaching their intended marks? and

- Program delivery -- does the service being provided match what was intended to be delivered?
  Program monitoring need not always be complicated and complex, as it often can be as simple as keeping track of the activities involved
- Program monitoring concentrates on program service outputs rather than program outcomes
- Evaluate:
- Programs adopted and implemented through the master fire plan should have built-in evaluation procedures
- Evaluations are not simply the responsibility of municipal politicians and or administrators, but additionally, is an administrative function of the fire department.
- Internal Evaluators
- as employees of the fire department, internal evaluators have intimate knowledge of the department's policies, procedures, politics and people
- they know both the formal and informal channels for communicating and accomplishing tasks.
- this knowledge permits them to select methods that fit the unique situation of the department

- internal evaluators long term commitment to the fire department can lend credibility to their efforts and help forge positive working relationships with managers and staff
- they can build trust over time that helps reduce the anxiety normally associated with evaluation activities
- because they are employees, internal evaluators are available as an ongoing corporate resource
- this puts internal evaluators in an excellent position to communicate relevant information in a timely fashion
- it also permits internal evaluators to participate actively in long-range planning by making crucial evaluative information available for strategic planning and policy decisions
- it affords internal evaluators the opportunity to consult with and provide information to various management levels within the organization, enabling them to enhance the utilization of evaluation information
- internal evaluators are often responsible for correcting problems and advocating change rather than only identifying difficulties and making recommendations
- the focus of internal evaluation often includes not only program outcomes and processes, but also the factors that influence program performance, such as structure, operations and management
- the use of internal evaluators, some of whom could conceivably be part of the problem, then can become part of the solution
- External Evaluators
- are usually perceived as being more objective because they are not fire department employees and are therefore not subject to all of the pressures of organizational life
- Internal evaluators now often work in partnership with external evaluators to obtain the external evaluators' specialized skill and objectivity while retaining the internal evaluators' knowledge of the department
- All evaluators, whether internal or external, have their biases.
- Revise:
- Consider the benefits and results of the foregoing monitoring and evaluation processes to assist in determining if any revisions are necessary.
- Some of the principal benefits are:
- any gap between goals and performance
- cost effectiveness and efficiency of the program/service
- how is the program operating/functioning?
- issues that could jeopardize the program/service
- program/services strengths
- program/services weaknesses
- to what extent are the citizens being served
- whether desired and/or undesired outcomes have taken place
- This information is useful for:
  - clarifying the mission, purpose and goals
  - describing the programs and services
  - facilitating the refinement and modification of program or service activities
  - fulfilling accountability requirements
  - guiding allocation of resources and personnel
  - maintaining quality of services and programs
  - program decision making, such as continue, cancel, cut back, change, expand

- setting priorities
- weighing costs and benefits of alternatives

Stage 7:

- Performance Measures
- Purpose
- The purpose of this section of the guideline is to assist in developing and using performance measures.
- The guide answers the following questions:
- What are performance measures?
- How can they be used?
- What is the best way of doing this?
- Where does one start?
- Introduction
- Data and information collected and used by managers in the public sector usually pertain to inputs, outputs and processes.
- Examples of these measures are as follows:

  INPUTS

  Amount of money spent on training
  Number of staff assigned to fire prevention
  Number of staff assigned to training

  PROCESS

  Number of firefighters at O.F.C.
  Number of days to complete a project
  Length of time to conduct an inspection

  OUTPUTS

  Number of training manuals produced
  Number of inspections completed
  Number of plans reviewed
  Number of emergency responses

- Many managers judge their effectiveness by counting and tabulating these inputs, processes and outputs.
- These are measurements of the ***process*** rather than the measurement of ***performance***
- They measure what was done, rather than the impact of the action.
  Without meaningful performance measures that directly link the impact of your actions to clear goals and objectives, it may be difficult, if not impossible, to provide a sound and supportable justification for the continued existence of your program or service
- Goals and Objectives:
- It is imperative that there is a clearly stated goal and objective for every program, service, and activity.
- Once the goals are clarified in a meaningful way, specific objectives can then be made to operationalize the program.

- For example, the vague goal of improved fire safety can be made more meaningful and specific as follows:
- ***"Increased number of working smoke alarms in the home"***
- With the goal specifically defined, it provides direction and guidance as to what objectives must be achieved in order to reach this goal. For example:
- Goal
  Increased number of working smoke alarms in the home
- Objectives
  Public awareness of the value of smoke alarms through media advertising
  Promotional campaign as part of Fire Prevention Week
  Provide quality smoke alarms to the public at a reduced price
- Measuring Performance
- There is merit in linking the results of programs, services and activities to clearly defined objectives.
- It is not sufficient that the goal be achieved; it is necessary to show that the activities of the program were responsible for the achievement of the goal by establishing cause and effect.
- The key questions to determine the **impact** of actions are:
  Do you have the resources to achieve the goal?
  Why are you doing this?
  Are you achieving what you are supposed to be doing?
  How do you know? "
- Managers must develop meaningful performance measures and report on their success by measuring performance.
- Decisions on program direction can then be made based on this information
- What are Performance Measures?
- The quantitative and qualitative measures which assess the effectiveness and efficiency of a product, service or process
- They are the key indicators of success.
- Performance measures generally fall into six primary categories:
  • Time
  • Effectiveness
  • Quality
  • Efficiency
  • Costs and
  • Productivity Safety

Time

• Time it takes to complete a process (cycle time) or deliver a service or product
• Effectiveness: Doing the right things, meeting corporate objectives and strategic directions
• Quality: A measure of the extent to which a thing or experience (service) meets a need, solves a problem or adds value for someone (client, stakeholder, taxpayer)
• Efficiency: Outputs relative to inputs; doing things right every time
• Costs & Productivity: Cost to provide a product or service; the relationships among costs, inputs and outputs

• Safety: The extent to which important assets (personnel, property, records) are safeguarded so that the organization is protected from danger of losses that could threaten its success, credibility, continuity, etc.

Why?

Why do you use performance measures?

- To demonstrate success
- To identify problems
- To evaluate goal achievement
- To determine whether or not there is performance improvement

Codes, Standards and Best Practices

Codes, Standards and Best Practices available to assist in establishing local policy on the delivery of this service are listed below. All are available at **http://www.mcscs.jus.gov.on.ca/.**. Please feel free to copy and distribute this document. We ask that the document not be altered in any way, that the Office of the Fire Marshal be credited and that the documents be used for non-commercial purposes only.

See also

02-04-01 & **23** Capabilities of Existing Fire Protection Services
02-03-01 Economic Circumstances
02-02-12 & **03** Fire Risk Assessment
03-01-13 Preparation of Draft Report
04-39-12 Fire Prevention Effectiveness Model

Appendix B: Public Fire Safety Guideline – Fire Risk Assessment

Fire Risk Assessment

Section 15 Public Fire Safety Guidelines	**Subject Coding** PFSG 02-02-03
Section General	Date January 1998
Subject Fire Risk Assessment	Page

Under Review

Purpose:

To identify considerations for persons conducting municipal fire risk assessments.

Ambient Factors of Risk Assessment:

The following factors should be considered in assessing the local fire risk.

the municipality:

- urban
- rural
- metropolitan
- other, such as a bedroom community, border community
- predominantly dependent upon a single employer, business, or institutional operation or activity
- describe its uniqueness
- describe its geography
- describe its demographics
  outline current development and development trends
- describe street network and traffic patterns
- describe traffic barriers
- consider applicable by-laws
- labour relations climate and history

historical

- indicate emergency call volume last year, last 5 years
- the number of fire casualties in the past year, past 5 years
- identify any trends respecting cause and location
- the fire loss for the past year, past 5 years
- indicate trends respecting call types for the past 5 years

comparisons with other like municipalities should be considered for the following factors:

- population (static/subject to seasonal or other fluctuations)
- geographical area and size of municipality

- type of municipality
- number of residential dwellings
- assessment
- development trends
- growth history and trends
- demographics
- equalized assessment and tax base
    - residential/farming vs industrial/commercial assessment

building stock

- identify, as accurately as possible, the number and percentage of the following:
    - single family residences
    - multi-unit residences
    - high-rise buildings
    - large complexes
    - farms/agricultural buildings
    - commercial buildings
    - industrial buildings
    - institutional
    - business buildings
    - storage facilities
    - other special buildings
    - hospitals
    - nursing homes
    - with respect to building type, identify specific problems, such as access, density and age
    - with respect to building type, identify significant and associated outside storage areas

building occupancies

- identify, as accurately as possible, the number and percentage of the following occupancies:
    - assembly
    - institutional
    - residential
    - commercial
    - industrial
    - business
    - storage
    - vacant
    - other

prevention and public education

- if, for example, the municipality does not have a fire department, but purchases fire suppression services, describe what fire prevention and public education initiatives, if any, are undertaken by the community. Describe the significance and impact, or lack of same, of such initiatives.

public and political resolve

- what is the perceived awareness of fire safety by the general public and the corporate sector?
- what are the expectations for fire protection by the general public, and the corporate sector?
- what is the general tone of press and media coverage of fire related matters?
- how are fire prevention, fire safety, and public education programs generally received and accepted by the community at large?
- what is the local political climate respecting
  - cost cutting/no budget increases?
  - preserving the status quo?
  - maintaining/improving essential services such as the fire department?

public and private protection systems

- independent of the assessment of (Analyzing Local Circumstances - Assessing Existing Fire Protection Services), identify and describe:
  - private fire brigades
  - industrial/commercial fire brigades
  - private water supplies and water supply systems

Related Functions:

- Economic Circumstances
- Capabilities of Existing Fire Protection Services

Codes, Standards, and Best Practices:

Codes, Standards, and Best Practices resources available to assist in establishing local policy on this assessment are listed below. All are available at **www.ontario.ca/firemarshal**. Please feel free to copy and distribute this document. We ask that the document not be altered in any way, that the Office of the Fire Marshal be credited and that the documents be used for non-commercial purposes only.
See also PFSG

01-02-01 Comprehensive Fire Safety Effectiveness Model Considerations
02-04-01 & **23** Capabilities of Existing Fire Protection Services
04-39-12 Fire Prevention Effectiveness Model

Appendix C: Public Fire Safety Guideline – Capabilities of Existing Fire Protection Services

Capabilities of Existing Fire Protection Services

Section 16 Public Fire Safety Guidelines	**Subject Coding** PFSG 02-04-01
Section General	Date January 1998
Subject Capabilities of Existing Fire Protection Services	Page

Under Review

Purpose:
To identify methods to accurately assess existing capabilities of available fire protection services.
This section is a companion to Risk Assessment Analysis and Economic Circumstances Analysis, which are used to provide policy makers with a report on existing fire services. This is a fact finding exercise only and decisions, conclusions, judgments, recommendations, and options are not to be made at this stage, nor on the basis of this section only.

Fire Department:
Is the fire protection for the municipality provided by:

- a fire department organized for the municipality?
- an unorganized community?
- a fire department jointly managed and operated with other municipality(ies)?
- an agreement to purchase protection from another jurisdiction?
- a combination of the above?

Factors Involved in Assessing the Fire Department:
Regardless of how the fire protection is organized and delivered, the following factors must be considered in assessing the protection services;

- mission statement and mandate
- goals and objectives
- organization
- administration
- by-laws and agreements
- fire prevention, public information, public education
- investigations
- communications
- emergency operations
- training and education
- vehicles and equipment
- financial management and budgeting

- automatic aid and "mutual aid"
- building and facilities
- pre-emergency planning
- disaster planning
- risk management planning
- human resources
- maintenance
- records, reports, data
- water supplies

Related Functions:

- **Fire Risk Assessment**
- **Economic Circumstances**

Codes, Standards, Best Practices:

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See also PFSG

02-03-01 Economic Circumstances

02-02-12 & **03** Fire Risk Assessment

04-39-12 Fire Prevention Effectiveness Model

04-61-12 Human Resources Practices

04-64-12 Communications/Resource Centre

Appendix D: Public Fire Safety Guideline – Economic Circumstances

Economic Circumstances

Section 17 Public Fire Safety Guidelines	Subject Coding PFSG 02-03-01
Section General	Date January 1998
Subject Economic Circumstances	Page

Under Review

Purpose
To identify considerations for analyzing municipal economic circumstances.

Introduction
Elected officials are responsible for the economic well-being of the community, and measure this in a number of ways. One such way would be with a balanced budget containing no tax increases. This does not necessarily give a complete or clear picture of the community's economic circumstances. For many years various budgetary systems, approaches, and formats have been developed in the continuing quest for political objectivity by elected officials. By the very nature of democracy, which is based on representative elections and the "politics" associated with them, mitigates against objectivity in the usual sense. Such budgeting and/or financial planning could be therefore defined as a rational decision making system working within a less than rational political process.
It is therefore essential that the economic circumstances of a community be thoroughly and objectively analyzed, in addition to the assessment of the existing fire protection system, and risk assessment, if an accurate representation is to be made of the community.

Economic Considerations
Factors to be considered in assessing the local economic circumstances, include the following:

- assessment:
- residential/farm
- industrial
- institutional
- business/commercial
- increases (decreases) in past 5 and 10 years
- tax rates:
- show local and regional/county purposes
  5 and 10-year history of increases (decreases)
- urban and rural service areas, if any
- municipal debt
- revenues
- reserve funds

- other monetary assets
  such as development charge accounts
- total fire protection system costs
- per capita basis
- assessment basis
- per household
- employment, unemployment conditions
- relationship of all of the above in the general area of the local community
- effect on the ability of the municipal tax base to fund appropriate fire protection services
- relationship of all of the above with similar communities
- past and present political philosophy respecting
- budget increases/decreases
- pay as you go
- debenturing/borrowing
  service (budget reductions) necessitated by reduced revenues
- loss impact of single employer, major industry, institution
- barriers to rebuilding, such as zoning and environmental requirements

Related Functions:

- **Fire Risk Assessment**
- **Capabilities of Existing Fire Protection Services**

Codes, Standards, Best Practices:

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See also PFSG

02-04-01 & **23** Capabilities of existing Fire Protection Services

02-02-12 & **03** Risk Assessment

Appendix E: Best Practices and Benchmarks: An Explanation

This section addresses the concepts of benchmarks and best practice, and even though it constitutes four pages of information, it is an important component of assisting the municipality to determine whatever fire department services it wishes to adopt. Please do your best to work through the next few pages.

We are going to briefly present two articles that examine the beliefs and viewpoints surrounding best practices. The first paper, from Queen's University, is titled *Are Best Practices Really Best? A Review of the Best Practices Literature in Library and Information Studies.*[17] Just to be clear, before anyone questions what library practices have to do with emergency services, while the referenced paper uses the example of best practices as found in literature in libraries, the focus of the paper is the larger picture of best practices and benchmarking in general. The second paper was authored by Arnošt Veselý and published in the *Central European Journal of Public Policy*.[18] Both papers examined the literature with respect to best practices.

The Queen's University study indicates that

> *the term "best practice" appears often in library and information science literature, yet, despite the frequency with which the term is used, there is little discussion about what is meant by the term and how one can reliably identify a best practice. This paper reviews 113 articles that identify and discuss best practices, in order to determine how "best practices" are distinguished from other practices, and whether these determinations are made on the basis of consistent and reliable evidence. The review also takes into account definitions of the term to discover if a common definition is used amongst authors.*

The researchers found that the 'evidence' upon which papers on 'best practices' are based falls into one of the following six categories:

1) opinion (n=18, 15%),
2) literature reviews (n=13, 12%),
3) practices in the library in which the author works (n=19, 17%),
4) formal and informal qualitative and quantitative approaches (n=16, 14%),
5) a combination of the aforementioned (i.e., combined approaches) (n=34, 30%), and
6) "other" sources or approaches which are largely one of a kind (n=13, 12%).

The researchers concluded that there is no widely shared or common definition of best practices amongst the authors of these papers, and most papers (n=94, 83%) fail to define the term at all. The number of papers was, for the most part, split evenly amongst the six categories, indicating that writers on the subject are basing best practices assertions on a wide variety of sources and evidence.

[17] Druery, J., McCormack, N., and Murphy, S. Are best practices really best? A review of the best practices literature in library and information studies, *Evidence based Library and Information Practice*, Vol 8, No 4, 2013. https://journals.library.ualberta.ca/eblip/index.php/EBLIP/article/view/20021/15939

[18] Veselý A., Theory and methodology of best practice research: A critical review of the current state, *Central European Journal of Public Policy*, Vol. 5, No 2, December 2011. https://www.cejpp.eu/index.php/ojs/article/viewFile/99/81

Arnošt Veselý indicates that "*One of the ways of improving public organizations is to identify, communicate and facilitate the transfer of practices that seem to work successfully somewhere else"* (he calls it "best practice research" [BPR]). This more technical article also indicates that

> *best practice research is based on the idea that instead of formulating an abstract ideal state we want to reach, we should develop what has been or is being implemented and is proven to work somewhere else. According to this approach, one should, above all, study carefully and disseminate "what works" instead of formulating hitherto unimplemented objectives and ways of attaining them. According to Overman and Boyd (1994, 69), the primary goal of BPR is "the selective observation of a set of exemplars across different contexts in order to derive more generalizable principles and theories of management.*

Straightforward definitions of benchmarking and best practice can be found in the Queen's University paper:

> *benchmarking is defined as, "the process of identifying the best practice in relation to products and processes, both within an industry and outside it, with the object of using this as a guide and reference point for improving the practice of one's own organization" (Law, 2009, "Benchmarking," para. 1).*

> *"Best practice," correspondingly, is defined as "a practice that has been shown to produce superior performance," and the adoption of best practices is viewed as a mechanism for improving the performance of a process, business unit, product, service, or entire organization (Szwejczewski, 2011, "Best Practice", para. 1).*

Veselý offers a table of different definitions (and, yes, in case anyone is wondering what the point of this information is, we are getting to a conclusion about best practices, benchmarking, and emergency services).

Table 8: Best Practice Definitions

Definition	Source
In a general sense, the term best practice refers to the most efficient way of doing something. The fastest method that uses the least resources (including labor and parts) to create the highest quality output is the "best practice." Almost every thinkable industry has adopted best practices in some aspect of its processes, but those that have made use of it successfully and publicly have typically done so in the fields of technology development, quality control, project management, teaching (on the college and secondary circuits), manufacturing, health-care, and sales.	"Best Practices." Encyclopedia of Management (2009)
The term "best practice" implies that it is best when compared to any alternative course of action and that it is a practice designed to achieve some deliberative end.	Bretschneider et al. (2005, 309)
The phrase "best practices" … is business jargon arising from the management tool known as "benchmarking." The assumption underlying this term is that production and management processes are uniform enough so that a "best practice" can be identified and then adopted more or less "as is" by another entity.	"Best Practices." Encyclopedia of Small Business. 3rd ed. Vol. 1. Detroit: Gale, 2007. 90–92. Gale Virtual Reference Library
The most precise definition of BPR is the selective observation of a set of exemplars across different contexts in order to derive more generalizable principles and theories.	Overman and Boyd (1994, 69)

So, what is the point of all this and what does it have to do with emergency services and, particularly, fire services? Both articles (Queen's University and the Central European Journal of Public Policy) came to similar conclusions. Content in italics is quoted from the articles.

Table 9: Conclusions - Best Practices Validity – Limitations and Possibilities

Limitations	Possibilities
… best practices are *rarely based on rigorous empirical methods of research and therefore generally unreliable. There is, in addition, no widely held understanding of what is meant by the use of the term.* (Druery, McCormack, and Murphy)	*… to at least partially eliminate the above disadvantages,* [those in the column to the left] *we must choose a form of mixed research design, i.e. one that combines quantitative and qualitative methods. The quantitative approach appears necessary for the identification of cases where "good practices" might exist. And the qualitative research design appears as the only choice for more in-depth analysis of selected exemplars.*
BPR has been criticized for many reasons. They can be divided into scientific (methodological) and practical reasons (Overman and Boyd 1994). … some authors have pointed to the lack of	*… in order to increase transferability,* [of best practices] *we should clearly define the purpose, i.e. what is to be achieved.* Therefore, instead of just adopting practices considered to be "best,"

Limitations	Possibilities
theory behind the approach and the implicit assumption of "let's just copy what someone else did and see what happens" (Myers et al. 2004, 6). According to this critique, BPR lacks theoretical foundations and pays little attention to discovering the reasons why a given practice works. This critique tends to be valid for quantitative econometric methods, but less so for Bardach's approach which attempts to deal with this critique by applying the term "mechanism."	but not defined as to why they are "best," clear definitions of purpose should be stated and results measured. And, *whether practices are "good" should only be assessed in view of the target site* rather than generalizing that if they are successful in some locations, practices will be successful in the target location.
… critics claim that BPR methodology does not guarantee what we know about the given case is really true. Overman and Boyd (1994, 79) consider maturation, theory testing and selection bias as particularly frequent violations of internal validity.	I*t is important to avoid mere description of successful cases. "Good practice" exemplars should help us uncover underlying mechanisms and thus formulate a theory of why they work.*
A … low level of external validity. As a rule, BPR is conducted in order to improve practice at another site. Therefore, it is very important to be able to generalize "best" practice first. The ability to extrapolate practices to a different site tends to be very problematic because the fact that a practice works "that well" is determined by the context in which it is implemented.	*… since the ways practices work do not only depend on the mechanism but also on the context in which an institution exists, we should thoroughly describe the context in which "good practices" emerge. We should do this at least because the information we have about the context helps us verify to what extent the mechanism might work independently.*
BPR is insufficiently critical and rigorous (Overman and Boyd 1994, 80). BPR usually focuses on retrospective and cross-sectional description of successful exemplars only. It tends to pay little attention to verifying the evidence obtained and discovering alternative explanations of a given practice.	*research should not be limited to positive examples, … we should also analyze "unsuccessful" cases where the implementation of a policy or program failed, in order to think about why that happened*
	"good practice" … should not end by publicizing what appears as good, or by implementing such exemplars in the target site. If we want to know whether an exemplar of "good practice" really is "good practice", we must evaluate the effects of its implementation elsewhere

The preceding information sounds quite negative for "best practice" identification in fire services. For example, we are unable to show that rigorous research has been applied to prove NFPA 1720's assertion that 15 firefighters should arrive at a house fire within nine minutes of notification in 90% of incidents, (please see Section 4.4.2, page 31); neither can we clearly connect a successful practice in one fire service with the circumstances in Kirkland Lake's fire department and thereby conclude that the practice is transferrable and worth the cost of implementation and continued operation. And, we can continue in this vein to show that what has been generally accepted as "best" or "industry" practice won't survive

examination if the academic rigour of benchmarking is applied, as described in the research of Druery, McCormack, and Murphy, or Arnošt Veselý. But there is a process that can help the municipal councillors and town administrators decide the best service level and activities that fit Kirkland Lake, which would then be best practice for the fire department. The process is one supported by the National Fire Protection Association and other organizations such as the Ontario Office of the Fire Marshal and Emergency Management. We explain these in Section 4.4.1.

We are going to close this section of the report with comments from one of the consultant team members, Chief Terry Allen, who served on the NFPA 1710 technical committee from 1997 to 2011. He notes that in cases where "scientific methodology and measurements" are difficult to assemble, then the experience and input of the practitioners becomes a resource in standards development. Terry relates that Chief Alan Brunacini, chair of the technical committee during the first discussions on 1710, said, "We have gathered over four hundred years of firefighting experience together to define what a career fire department should look like and be able to accomplish." So, sometimes, when science and measurement have not been performed, or have not been possible to quantify in order to support a conclusion and recommendation, it may be necessary to rely on the experience of trusted advisors.

The process for determining the organization and "right-sizing" of the Kirkland Lake fire department, and therefore best practice, is addressed in several places throughout Section 4 .

Reference Sources Relating to Standards, Best Practices, and Industry Practice

http://www.nfpa.org/News-and-Research/News-and-media/Press-Room/Reporters-Guide-to-Fire-and-NFPA/About-codes-and-standards
https://library.queensu.ca/research/librarian/sharon-murphy
http://www.eblip6.salford.ac.uk/presentations/PS7JackieDruery.pdf
https://journals.library.ualberta.ca/eblip/index.php/EBLIP/article/view/20021
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Appendix F: Fire Department Education, Testing, and Certification

Fire Department Education, Testing, and Certification

Under the *Fire Protection and Prevention Act (1997)*, clause 9(2)(d), the Office of the Fire Marshal (OFM) has the responsibility "to develop training programs and evaluation systems for persons involved in the provision of fire protection services and to provide programs to improve practices relating to fire protection services."

To meet this obligation, the OFM developed a comprehensive fire service education and training process that supports the professionalization of the Ontario fire service that include the Ontario Fire Service Standards, developed by the Ontario Association of Fire Chiefs as well as NFPA standards.

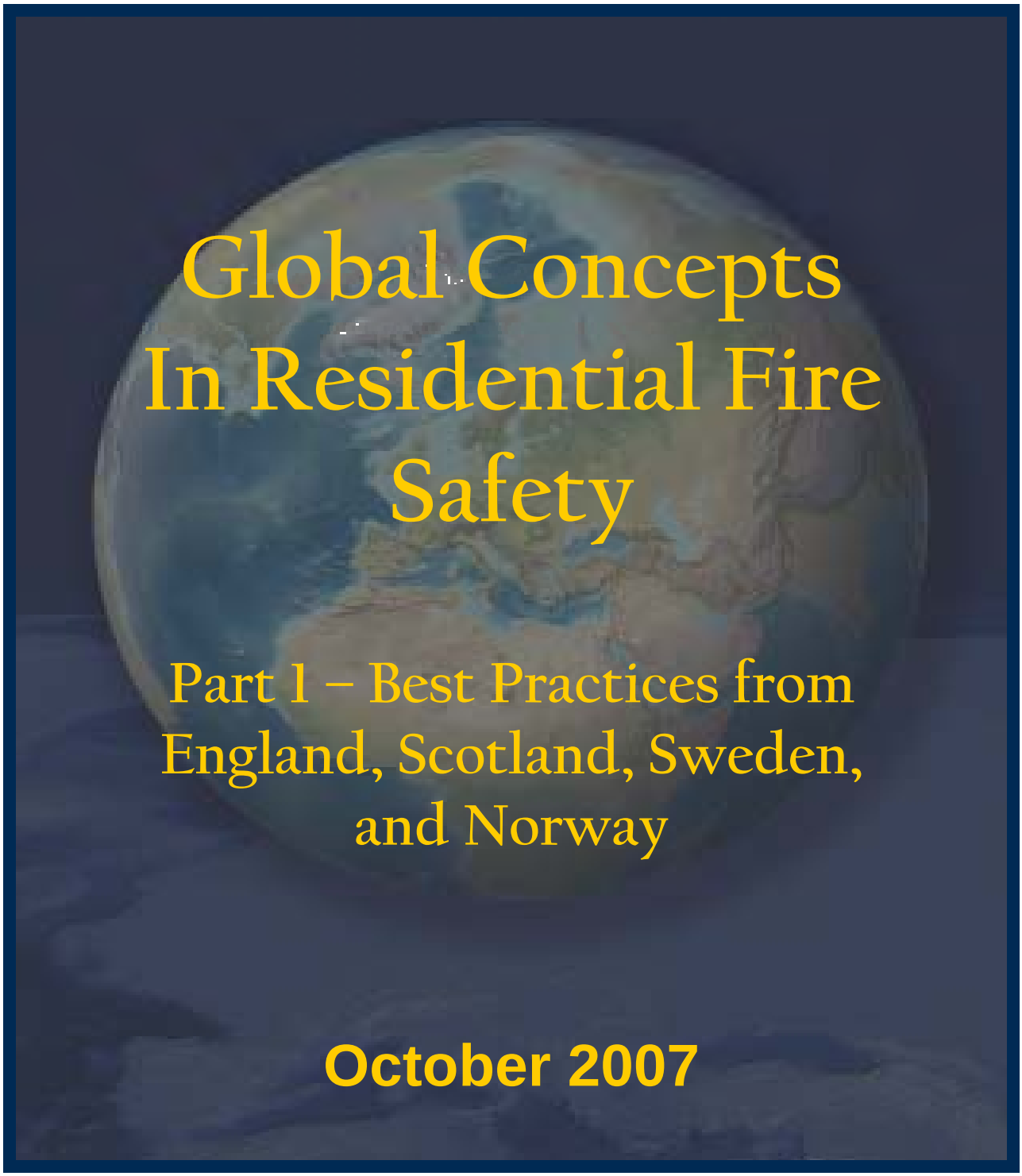
The OFM is accredited by the International Fire Service Accreditation Congress (IFSAC) and the National Board on Fire Service Professional Qualification (ProBoard). This third-party accreditation allows OFM to offer certification to candidates who successfully complete designated programs and courses.

The Ontario Fire College offers courses to members of Ontario municipal fire departments. There are also various other third-party training organizations that offer NFPA training and courses, some of which can be taken online, that give firefighters the ability to take the OFM certification exam. Please see table overleaf for examples.

Training and Certification[19]	Recommended For	Estimated Course Fee[20]
	Firefighters	$1,350, 10 days (level 1)[21] $675, six days (level II)
	Volunteer Firefighters	
	Firefighters	
	Officers	$750, 10-day course
	Senior officers, chief, deputy chief	$500, five-day course
	Public education officer	$150, three-day course (Level 1) $200, four-day course (Level II)
	Public education officer	$50, one-day course
	Public education officer	
	Public education officer	
	Fire protection officer	$250, five-day course
	Fire protection officer	
	Training officer	$425, five-day course
	Specialized training	$65, one-day course
	Specialized training	
	Current fire service mid-level or management position	$4,795, 12 compulsory courses $2,190, six elective courses

[19] This is not a comprehensive listing of courses offered.
[20] The estimated course fees are based on training provided by third-party educational institutions. Estimates do not include travel, accommodations, taxes, textbooks, or other costs.
[21] Additional courses are required to test for NFPA 1001 Firefighter 1 Certification

Appendix G: Reducing Public Risk – TriData Global Concepts



Global Concepts In Residential Fire Safety

Part 1 – Best Practices from England, Scotland, Sweden, and Norway

October 2007

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Assistance to Firefighters Grant Program
Office of Domestic Preparedness
Department of Homeland Security

October 2007

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PREFACE

The TriData Division of System Planning Corporation was selected to undertake this study of best global practices for reducing residential fire injuries by the National Center for Injury Prevention and Control within the Centers for Disease Control and Prevention (CDC). In the United States and in most western industrial nations, the majority of civilian fire deaths and fire injuries occur in the home. As part of its mission to reduce residential injuries, CDC's National Center for Injury Prevention and Control attempts to identify effective global community fire safety programs—best practices—that could be used in the United States. Proven best practices can be used as examples of successes to stimulate improvements in prevention practices in the United States, though they sometimes require adaptation to our culture.

TriData has undertaken research on global concepts in fire protection for over 20 years. In 1982–1993 TriData produced a series of reports entitled International Concepts in Fire Protection. The reports were widely disseminated and led to many articles in fire journals and presentations at fire conferences in the United States and internationally.[1]

In 2003–2004, TriData did a survey for the International Association of Fire Rescue Services (CTIF) of the best programs in community fire safety among its 40 member nations; 20 European nations contributed program descriptions.

This report is the first of a new series of three reports to identify best practices in residential fire prevention. The first report in this series focuses on Europe—more specifically the nations of England, Scotland, Sweden, and Norway. The second study, in 2007–2008, will focus on the Pacific Rim nations of Australia, New Zealand, and Japan. A third study in 2008–2009 will focus on Mexico and South America.

[1] *International Conception in Fire Protection: New Ideas from Europe.* July 1993. TriData Corporation, Arlington, VA.
International Concepts in Fire Protection: Practices from Japan, Hong Kong, Australia and New Zealand. 1985. TriData Corporation, Arlington, VA.
International Concepts in Fire Protection: Ideas from Europe that Could Improve U.S. Fire Safety. 1982. TriData Corporation, Arlington, VA.

ACKNOWLEDGEMENTS

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McKing Consulting Corporation, a contractor to CDC, provided support to this project, including all the complex travel arrangements. Joe Durbin was the contract manager for McKing. Trisha Charles was the principal travel consultant.

The authors and sponsors wish to thank all those listed below in the nations visited who either assisted with meeting arrangements or provided information to the project. Those with asterisks were interviewed.

United Kingdom

London Fire Brigade

*Paul Oughton, Area Manager; Head of Community Safety
*Jill Carey, Senior Manager; Community Safety (Deputy Head)
*Sara Foster, Manager, School Team, Community Safety
Trudi Hayes, Events Team

Department for Communities and Local Government (National Government)

*Sir Graham Meldrum HM Chief Inspector of Fire Services
*Mike Larking, Manager, "Fire Kills" Media Campaign, Fire and Resilience Policy Division
*Terry Pretious, Head, Community Fire Safety/Arson Reduction Team
Jim Mann, Fire Inspector

Kent Fire and Rescue Services

*Jon Chapman, Development Manager, Community Safety
*John Pereira, Area Manager for Community Safety
*Alan Stark, Youth Diversion Team Leader, Community Safety
*Stuart Skilton, Divisional Officer; Head. Community Safety
*Andy Bigginton, Education Team Leader, Community Safety

*David Wells, Community Safety Strategy

Merseyside Fire and Rescue Service

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*Deputy Chief Fire Officer Michael Hagen, Service Delivery
*James Berry, Media Relations Manager
*John Moorcroft, Area Manager; Director of Community Safety
*Mark Broderick, Head, Home Safety Program
*Richie Davis, Group Manager, Youth Engagement
*John L. Curtis, Manager, Business Intelligence and Performance Measurement
*Andrew Best, Chief Fire Officer (Ret.), Merseyside; former President, Chief and Assistant Chief Fire Officers Association
*Dave Robinson, General Manager, World Firefighter Games
Advocates for Community Fire Safety

West Midlands Fire Service

*Chief Fire Officer Frank Sheehan; also Service Delivery Director (Prevention and Protection), Chief Fire Officers Association (CFOA)
Elfyn Edwards, Assistant Divisional Officer, Community Protection (assisted with the study arrangements for CFOA)
*Tim Gardiner, Sandwell Borough Commander
*Bob Deeks, Corporate Support Officer
*Alison Newis, Public Relations Manager
*Tim Smyth, Centre Manager, Handsworth Community Fire Center
*John Brown, Assistant Chief Fire Officer
*Tony Prosser, Head, Fire Safety and Fire Prevention

Chief Fire Officers Association (CFOA)

David Brown, Chief Executive

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*Ally Boyle, Area Manager; Deputy Director, Community Safety
* Jackie Dawson, FSEC Manager, Corporate Development, Strategic Planning Directorate
*Paul Stewart, Group Manager
* Alistair Macintosh, Strategic Youth Development Officer

*Kevin Hughes, Watch Manager, Community Safety
*Tom Courtney, Watch Manager, Community Safety
*Gemme Sim, Community Planning Officer
*Scott Lee, head of fire investigations

Scottish Executive, Justice Department

*Graeme Fraser, Fire and Civil Contingencies Division
*John Russell, Community Safety Coordinator, Scottish Fire and Rescue Services
*Brian Mackenzie, HM Assistant Chief Inspector of Fire Services
*Jon Roper, Service Marketing Manager

Sweden

*Ake Jacobsson, CTIF program manager; former fire chief and present city administrator Gotenberg, Sweden

Stockholm Fire Brigade

*Anders Bergqvist, Senior Divisional Officer/Fire Safety Engineer, HQ Prevention
*Stefan Jidling, Senior Divisional Officer/Fire Safety Engineer, HQ Prevention
*Liisa Honkaranta, Senior Divisional Officer/Fire Safety Engineer, HQ Prevention
*Berit Wahlgren, Information Officer, HQ Prevention

Nykoping Fire Brigade

*Tomas Barrett, Fire Engineer; Head Prevention Department
*Elinor Anderson, Risk and Fire Engineer
*Lars Ahlgren, Safety Coordinator

Swedish Fire Protection Association

*Goran Schnell, President

Sundsvall Fire Brigade

*Mikael Scheele, Fire and Risk Engineer
Leif Fallman
*Tommy Forsberg, Fire Protection Engineer; Accident Prevention

Umea Fire Brigade

*Lars Tapani, Fire Chief
*Christer Bjorkman, Head, Prevention
*Henrik Ostlund, Head, Operations

Swedish Rescue Services Agency (Karlstad)

*Mette Lindahl-Ohlsson, Prevention. She was the principal coordinator for the visits to fire agencies in Sweden and Norway, and we especially wish to acknowledge her outstanding contributions.
*Bjorn Albinson, Fire Protection Engineer
*Josefin Gullstrand, Fire Protection Engineer
*Birgitta Johansson, Information Officer
*Ulf Erlandsson, Fire Investigator
*Hakan Sten

Norway

Oslo Fire Brigade

*Jon Myroldhaug, Fire Chief
*Kjetil Bratile, Head Public Information

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*Lars Haugrud, Senior Engineer, Preventive Public Measures
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SPC/TriData

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Paula Offord, Executive Assistant

SUMMARY OF BEST PRACTICES

This report provides examples of successful best practices in community fire safety programs from England, Scotland, Sweden, and Norway. The programs have helped reduce fire injuries and fatalities in the home.

Of all the best practices identified in this study, one stands out. To reduce fire casualties in the home, the British fire service is visiting large numbers of high-risk households to do fire safety inspections and risk reductions, especially to ensure they have a working smoke detector. This approach has required a major change in the culture and mission of the British fire service. It should be adapted for use in the United States. The approach is thought by the British to be a major factor in the 40 percent drop in fire deaths in the United Kingdom over the last 15 years, and it probably could have a large impact in the United States and other nations as well.

Best Practices from the United Kingdom

In the last decade, there has been a sea change in the prevention strategy used by the British fire service that is just short of being revolutionary. The fire brigades have been required by national legislation since 2004 to engage in strong community safety programs as part of an overall national strategy for improving fire safety. Every British firefighter now is expected to participate in prevention. A national-level Community Fire Safety Center was established in the Department of Communities and Local Government to be the focal point for developing national strategies, campaigns, and materials.

The best practices that have arisen out of the new prevention strategy fall into eight major categories: identification and analysis of high risk households; increased staffing and training of prevention programs; making home safety visits; coordinating national and local fire safety campaign; conducting extensive school and youth programs; directing programs to the high-risk elderly population; developing safer consumer products; and increasing the use of fire stations for community fire safety programs. Highlights of the best practices are given below. Additional practices and more details on these practices are given in the text.

Risk Analysis

- Local fire brigades use nationally developed risk analysis software that links fire data with socioeconomic data to estimate areas of high risk and to target fire safety programs to high-risk groups and households. The nationally developed risk models have been disseminated to all local fire brigades.
- Integrated risk analysis is undertaken by local fire brigades to decide on the best mix of prevention and suppression for their community.

Fire Brigade Staffing and Training for Prevention

- Prevention now is considered a line service, not a support service. The prevention function is often supervised by the deputy fire chief for operations, and makes extensive use of line firefighters.
- More fire department resources (person-hours) are being devoted to prevention than in past years. National standards of cover (response times) have been dropped in favor of local discretion, to allow local tradeoffs between reduced fire coverage and more attention to prevention.
- All firefighters are expected to participate in prevention. Recruits are advised that prevention will be a significant part of their job. Recruit training includes practice delivering community fire safety programs.

Home Safety Visits

- The British fire service is making visits to a large percentage of high-risk homes, using a combination of line firefighters and prevention specialists. The visits include installation and testing of smoke alarms, inspections for hazards, mitigation of hazards, and one-on-one education.
- Community safety specialists called “advocates” join firefighters in visiting ethnic or high-risk households. Their specialties include foreign languages, problems of the elderly, problems of alcoholics, and problems of the hearing or mobility impaired.
- Home visits are scheduled via call centers established in the brigade, not by dispatchers.
- Home visits often scheduled after referrals from social services or other agencies, or by households already visited who suggest others.

Fire Safety Campaigns

- National and local public safety campaigns use paid, prime-time television and radio spots, print media, and the internet. They do not rely on free public service announcements shown late at night.
- Selected local radio stations and newspapers are used to reach ethnic populations who are the prime target audience for these media.
- Television and radio advertisements are run at times that people are implementing the behavior addressed, e.g., cooking safety at dinnertime.
- Fire safety campaigns include getting coverage of the targeted issues on news and talk shows.

- Strategic partnerships between fire and other local government agencies such as health, social services, and police are used to develop, fund, and deliver fire safety programs.
- Besides use and maintenance of smoke detectors, national campaigns call for a bedtime fire safety check of the household by some member of the family.

School and Youth Programs

- School programs reach close to 100 percent of students in selected elementary school grades in many fire brigades. Significant numbers of students in secondary schools are also being reached. The school programs are conducted mostly by firefighters but sometimes by teachers and prevention personnel.
- Special programs are targeted at youths who have demonstrated anti-social behavior such as fire-setting, attacks on firefighters, or vandalism.
- Firefighters receive special training for delivering safety programs to schools. The firefighters take on graduated responsibility for program delivery.

Programs for the Elderly

- Social service caretakers of the elderly are trained on fire safety practices they can implement or advocate during their home visits.
- Homes of high-risk elderly are visited by the fire service.
- Partnerships with various social service agencies increase resources and provide more ways to disseminate safety information to the elderly.

Safer Products for the Home

- 10 year, tamper-proof, battery-powered smoke alarms are being installed by the fire service, and are available for purchase by the general public.
- Hard-wired smoke alarms are required in all new residential premises and major residential refurbishments.
- Flame and cigarette-resistant upholstered furniture and bedding are required by national law.
- Portable home sprinkler systems are used for extreme high-risk households.

Community Fire Stations

- New fire stations are designed to make them community fire safety centers as well as stations from which to respond to calls. The new stations include reception areas from which to obtain safety literature; live fire demonstrations; and viewing areas to observe firefighter training and response.

The residential fire death rates in England and Scotland dropped in the past 15 years by 41 percent and 44 percent, respectively. The residential fire death rate dropped from 9.7 deaths per million population in 1990 to 5.7 deaths per million in 2005-2006. While it is difficult to attribute cause and effect to particular programs, the data suggests the new approaches are working, and the British fire service believes that to be the case.

Best Practices from Sweden and Norway

The current fire protection strategy in Sweden and Norway shares many similarities with the United Kingdom, though arrived at independently. Some of the best practices we found fall into nine categories: shifted responsibility for building fire safety; increased fire department staffing for prevention; expanded home safety visits; increased seasonal and year-round national and local safety campaigns; employee safety education; broad school safety programs; safety programs for the elderly; required use of home fire extinguishers; and improved consumer product safety.

Building Owner Responsibility

- Sweden and Norway emphasize the responsibility of building owners to ensure safety of their buildings, and not to depend on fire service inspections.

Fire Brigade Staffing and Training for Prevention

- Sweden and Norway are developing highly educated “fire engineers” to form the cadre for risk management and resource planning in local fire brigades.
- The proportion of fire department staff to prevention is much higher than in the United States. In Oslo, a city of 540,000, there are 40 fire prevention personnel and another 50 firefighters in stations on a typical weekday.
- Norway requires 1 prevention FTE for every 10,000 population.
- Swedish fire recruit training lasts two years, with 25 percent of the time spent on prevention and risk management.
- Umea takes a group of firefighters off shift duty for 3.5 weeks each year to deliver school programs.

Home Safety Visits

- In Sweden and Norway, homes with chimneys must be inspected by licensed chimney sweeps/fire inspectors from 4 times a year to once per four years, depending on fuel and frequency of use. The home inspectors check heating systems and also do broader home safety inspections.

- The Oslo Fire Brigade annually visits all of its old, high-risk apartment buildings (on 3,000 blocks) to meet with occupants to discuss fire safety. Posters in the buildings advertise when the fire service is coming.
- Oslo condominium associations are given safety checklists to pass on to unit owners.

Fire Safety Campaigns

- The Swedish fire service gives a fire safety calendar to school children and households. The calendar shows two days per month on which every household should take specific safety actions, such as testing smoke alarms, checking fire extinguishers, and practicing escape plans.
- The fire service trains children in schools and then designates the children as the 'fire marshal' for their homes, with specific responsibilities.
- Winter safety advice is tied to the Advent holiday in December; children participate in safety events scheduled for Advent and other winter activities.
- Supermarkets are visited by almost every household. The Umea Fire Brigade stations firefighters in them to show shoppers a short safety film, discuss safety issues, and hand out safety literature.
- Movie theaters in Sweden show a one-minute fire safety spot addressing winter safety hazards.
- A "Safe Home" campaign is aimed at builders. If they comply, they can advertise that "we build homes that are fire safe".

Employee Safety Education

- Some Swedish and Norwegian fire brigades provide instruction to municipal workers and some private industry workers on fire safety at work and at home. There is a multiplier effect from this instruction on the households of the workers.

School Programs

- The Swedish and Norwegian fire service reaches most schoolchildren twice during their school years.

Programs for the Elderly

- Caretakers are trained in fire safety by the fire service.
- Fire resistant "smokers' aprons" are given to elderly who insist on smoking.
- Emergency egress features are promoted for homes of the elderly.
- Safety efforts focus on the shut-in elderly and the "old elderly".

Home Fire Extinguishers

- Norway requires extinguishers or hoselines attached to faucets in every home, in addition to smoke alarms. Home occupants are trained to extinguish small fires because the fire service cannot arrive within the 2–4 minutes it takes for many fires to reach flashover.
- Sweden estimates they have 35 percent of homes equipped with extinguishers.

Safer Products for the Home

- To reduce fires from unattended cooking, timers are being built into stoves in Norway or, less expensively, stoves are plugged into timers. The timers shut the stoves off if the person cooking forgets to do so or falls asleep. The use of timers is advocated especially for households with elderly people.
- Electrical equipment is recommended to be plugged into "power strips" and the strips turned off at night for whatever electrical equipment that does not have to operate all night long.
- Use of safety candles is promoted; the wicks in the candles do not go down to the bottom, and so the candles "self-extinguish" before reaching a flammable surface.

Inflatable Cushions for Jumpers

- Oslo Fire Brigade has deployed large, rapidly-inflatable cushions in all fire units to rescue people trapped in residences (or other buildings) up to the fourth floor. A trapped victim can jump onto the cushion. In the first year deployed, 13 people were saved by the cushions.

Scandinavia has slightly lower residential fire death rates than the United States, achieved with fewer firefighters per capita than in the United States. They get better results with smaller fire departments by emphasizing prevention.

Concluding Remarks

The United Kingdom succeeded in changing its fire service culture over the past decade, and transferring practices from a few innovative brigades to many. The Scandinavian fire service also is changing its culture to focus on risk management. While it is sometimes difficult to transfer good practices from one culture to another, that should not be the end-all excuse for not trying. American fire chiefs and prevention leaders need to figure out how to apply best practices in their own communities. Adapting these best practices may help continue reduction in the fire injury and death rates in American homes, especially those at highest risk.