

# Global Concepts in Residential Fire Safety

Part 3 - Best Practices from  
Canada, Puerto Rico, Mexico,  
and Dominican Republic

**July 2009**



**SYSTEM PLANNING CORPORATION**

**TriData Division**



1000 Wilson Boulevard, Arlington, Virginia 22209 • (703) 351-8300 • (703) 351-8383 fax • [www.sysplan.com/TriData](http://www.sysplan.com/TriData)

# **Global Concepts in Residential Fire Safety**

## **Part 3 – Best Practices from Canada, Puerto Rico, Mexico, and Dominican Republic**

Prepared by:

TriData, a Division of  
System Planning Corporation  
1000 Wilson Boulevard, 30<sup>th</sup> Floor  
Arlington, VA 22209  
(703) 351-8300

For:

Centers for Disease Control and Prevention  
National Center for Injury Prevention and Control  
Division of Unintentional Injury Prevention  
4770 Buford Highway, NE  
Mailstop F-62  
Atlanta, GA 30341

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## PREFACE

In the United States, as 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 fire casualties, the Centers for Disease Control and Prevention's National Center for Injury Prevention and Control is identifying promising fire safety programs—best practices—around the globe that could be used in the United States. Established best practices in other countries can provide examples of successes to stimulate improvements in prevention practices in the United States.

This report is the third, and final, in a series of reports that aim attention at best global practices in residential fire prevention. The first study, entitled *Global Concepts in Residential Fire Safety, Part 1*, undertaken in 2007, focused on the European nations of England, Scotland, Sweden, and Norway. The second study (*Part 2*), conducted in 2007–2008, focused on the Pacific Rim nations of Australia, New Zealand, and Japan. This third study (*Part 3*) was carried out in 2008–2009 and focused on the North American nations of Canada, Mexico, and the Dominican Republic as well as the Commonwealth of Puerto Rico. All of these reports may be downloaded at no cost from [www.sysplan.com/tridata/publications/international](http://www.sysplan.com/tridata/publications/international).

System Planning Corporation's TriData Division was selected to undertake this study of best global practices primarily because of its long experience in this field. From 1982 to 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.<sup>1</sup> In 2003–2004, TriData did a survey for the International Association of Fire Rescue Services (also know by its French acronym CTIF) of the best programs in residential fire safety among its member nations. The present series of reports updates the previous research.

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<sup>1</sup> *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; and *International Concepts in Fire Protection: Ideas from Europe that Could Improve U.S. Fire Safety*. 1982. TriData Corporation, Arlington, VA.

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K. Bev Gilbert, Manager, Public Education and Media Relations, Office of the Fire Marshal

Bernard Moyle, Fire Marshal (retired), Office of the Fire Marshal

#### **Ottawa**

Richard Larabie, Fire Chief, Ottawa Fire Services

R. Bruce Montone, Deputy Chief, Prevention, Training, Special Operations, Safety, and Communications, Ottawa Fire Services

Steve Armstrong, Division Chief, Prevention, Ottawa Fire Services

Rocco Iamello, Assistant Division Chief, Prevention, Ottawa Fire Services

#### **Toronto**

William Stewart, Fire Chief, Toronto Fire Services

Frank Lamie, Deputy Fire Chief, Toronto Fire Services

Brian Stewart, District Chief, Public Education, Toronto Fire Services

**Brampton**

Brian Maltby, Division Chief, Fire Prevention, Brampton Fire and  
Emergency Service

Matt Pegg, Deputy Chief, Support Staff, Brampton Fire and Emergency  
Service

**Waterloo**

Marc Desjardins, Chief Fire Prevention Officer and Chief Fire Official,  
Waterloo Fire Rescue

J. Paul Felhaber, Public Education/Fire Prevention Officer, Waterloo Fire  
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Art Pullan, Executive Director, Public Fire Safety Council, and NFPA Public  
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### **Santo Domingo**

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## **SUMMARY OF BEST PRACTICES**

This report summarizes best practices in residential fire safety programs from Canada, Puerto Rico, Mexico, and Dominican Republic. It is the third, and final, report in a series of reports that focus attention on best global practices. This work was funded by the Centers for Disease Control and Prevention (CDC) and the CDC also participated in conducting the research.

Canada now has a significantly lower fire death rate per capita than the United States, after having had slightly higher rates 30 years ago. Visits with Canadian fire services found many best practices that the United States and other nations might use to reduce residential fire deaths and injuries.

Site visits to three countries where Spanish is the dominant language revealed programs that may have special relevance to the large and growing United States Hispanic population.

In the authors' opinion, if fire departments in the United States use the best prevention practices we identified, then deaths, injuries, and dollar loss from residential fires could be significantly reduced within current budgets. Many of these best practices are already used in some communities in the United States, but usually on a smaller scale.

Definition: As used in this report, “prevention” includes fire safety education as well as codes and code enforcement, and safer consumer products. In Canada and some parts of the United States, “prevention” primarily means code enforcement. We use the broader definition here.

### **Best Practices from Canada**

Fire protection in Canada is provided by local city or regional fire services. Some provinces provide strong prevention leadership, and have innovative codes and laws requiring fire safety education province-wide

***Cultural Change*** – There is a sea change underway in the fire service culture of Canada to emphasize prevention and to establish a public mindset of taking collective and personal responsibility for safety.

- **More personal responsibility:** Some provinces are working to get citizens to recognize fire risks, realize that many of these risks are preventable, and assume personal responsibility to take recommended preventive measures. For example, Ontario now has a “Zero Tolerance” philosophy toward property owners and tenants who do not install or maintain smoke alarms on each story. Not complying with smoke alarm requirements can result in a fine of \$235. In

instances involving death or significant injury, fines go up to \$50,000 for individuals and to \$100,000 for corporations, and/or a jail sentence of up to one year.

- **More use of line firefighters in prevention:** The Ontario Fire Protection and Prevention Act of 1997 mandates that prevention activities be part of the every day functioning of the fire service. As a result, more firefighter time is spent on residential fire safety and school programs than used to be the case. Several Ontario fire departments use line firefighters to do home visits that check smoke alarms and provide fire safety information one-to-one. Ottawa shifted some firefighters from the suppression force to the inspection team. Vancouver redeploys selected line firefighters for a day at a time to teach fire safety education.

*New Prevention Strategy* – In addition to changing the culture of safety for the public and firefighters is a shift of Canadian strategic concepts in developing and implementing prevention programs. A common theme in successful efforts is taking a comprehensive approach that includes good data, for targeting and evaluation; partnerships to leverage resources, and multiple coordinated programs. The aim is to reach the population at large, but with a focus first on high-risk subgroups.

- **Comprehensive data collection and analysis:** Ontario legislation requires fire departments to report all fires. Volunteer as well as career departments report at close to 100 percent, and try to provide accurate information on fire causes. Data is systematically analyzed by cause, population group, geographic area, and age group to identify and prioritize risks, and to evaluate prevention programs, which are more likely to be successful if based on good data.
- **Targeted high-risk groups:** Minority groups, the elderly, and people with disabilities are at higher risk than the general population and receive targeted programs.
- **Targeted non-traditional problems:** Many Canadian fire departments target problems identified in their incident data analysis even if the problem is outside the scope of their traditional activities, so long as the programs help prevent fires or injuries. Examples were overuse of home electrical systems for growing marijuana (Surrey, BC); bike and pedestrian safety (Waterloo, ON); and earthquake preparedness (Vancouver, BC).
- **Multiple coordinated programs:** Prevention programs that use multiple, coordinated approaches and capitalize on partnerships with other government

agencies and the private sector are more likely to be successful on a large scale in a city or province. They have more outreach, more repetition, and more consistent messages and they reduce confusion across messages.

- **Private sector donations:** Many costly prevention programs are being done without tapping fire department budgets by soliciting funding from private sponsors. Canadian fire departments liberally seek money from private industry, and leverage good will by giving recognition for those contributions. To ensure fairness, some fire organizations put out a competitive offer (request for proposals) for sponsorship of programs just as they do for contract services.
- **Impact-based program goals and evaluations:** As in other nations studied, fire departments in Canada aim to reach much more of a city's population than do most United States prevention programs. Goals often are stated as reaching all schoolchildren in a specific grade or two, or all households over a time period (e.g., five years). They measure success in terms of outreach, change in knowledge, change in behaviors, and change in fires, deaths, and injuries. Some examples of their metrics: are “percent of households visited”; “percent of population reached with cooking safety messages”; “average score of schoolchildren on safety exams”; and “percent of households with working smoke alarms and completed escape plans.” In the United States many programs are measured in terms of the *number* of people reached, which is less informative than the *percent* of people or households reached. Reaching 1,000 elderly with safety messages is good outreach if the total elderly population in a community is 1,200 and less than good if it is 20,000.
- **Required risk assessments:** Ontario and Quebec require all fire departments to file a risk assessment plan with the province. Ontario fire departments must complete a municipal fire protection information survey.

Some of the best specific practices found in one or more Canadian fire departments are summarized below, and detailed in the report. Most successful prevention programs use several of these approaches.

**Home Visits** – Door-to-door canvassing by fire departments has become a crucial strategy for reducing residential fire deaths in Canada as it is in the UK. Many Canadian fire departments now do home visits on a large scale. Typically the plan is to visit all households over a specified period of time (e.g., five years) with the highest risk areas visited first. During home visits, pairs of firefighters inform residents of the legal requirements for smoke alarms, the need to test and maintain them, ways to prevent common fires, and the importance of having an escape plan. Some departments install

alarms or batteries if needed. Most leave safety literature if no one is home, and invite the occupants to request another visit when convenient. Data is collected on each household visited as to its level of risk and mitigation measures taken. In many cities these programs were followed by 40–50 percent reductions in residential fire deaths. For example, in Longueuil, Quebec, population 400,000, the fire department visited all 152,000 households with pairs of firefighters over a four-year period. Each fire company shift was given addresses to visit in its district. First priority was the oldest homes and homes in high-risk areas. No batteries or alarms were given out—just testing and information. Home fires and fire deaths dropped by 50 percent, to 3.8 deaths per million.

In Ottawa, firefighter visits are made to high-risk homes to ensure they have at least one working smoke alarm. Fire service personnel—both career and volunteer—test alarms, replace batteries as needed, and install an alarm if none is present. Volunteers are paid to make home visits at the same rates as for responding to calls. The homeowner is required to get any additional working alarms needed to comply within 10 days, or face a fine. After this program was implemented, the percent of homes without working alarms dropped from 39 percent to 15 percent in three years.

Brampton, Ontario checks smoke alarms during EMS calls to homes as well as during door to door visits. Many EMS calls involve the elderly and disadvantaged, and this approach helps reach high-risk households.

**Partnerships** – Canadian fire services make excellent use of partnerships to increase outreach of messages, identify high-risk homes, and obtain funds for campaigns and safety villages. This leverages the limited resources available for prevention.

- **City departments:** Many cities train local social services such as visiting nurses, meals on wheels, and social workers on how to test smoke alarms, look for hazards and provide fire safety information when they visit homes. The agency personnel contact the fire department to follow up fire safety problems found if not readily solved. This gains entry to some of the highest risk households that would otherwise be difficult to reach.
- **Private industry and wealthy donors:** Major companies provide goods, services, or money for prevention, e.g., Kidde Canada discounts smoke alarms; Co-operators Insurance provides money for smoke alarms; Canada Tire allows use of store parking lots in 310 locations for fire safety demonstrations; Wal-Mart provides money to buy Risk Watch; Duracell provides batteries for home visits; CTV and Global TV donate spot time and produce spots. Shell Oil and an insurance company funded 100,000 fire safety coloring books tailored to deliver Ottawa's messages to school children. Royal Bank of Canada, McDonalds, Home

Depot, Terasen Gas, and others donated money to construct a Fire Safety House in Vancouver. The Knowledge Network provided \$50,000 in production services for a fire safety video. A former Canadian Olympic ice skater donated funds to build the Brampton Fire and Life Safety Center. An owner of a real estate firm annually updates a map of the Waterloo region and sells ad space on it to private industry, with the proceeds used to buy public education resources.

***Reaching All School Children*** – School programs in Canada tend to reach a larger percentage of schoolchildren than those in the United States. Fire departments work to reduce barriers and provide incentives to facilitate school participation. One fire department provides refreshments for teachers during their lunch periods while a fire prevention officer explains the program. Teachers and school administrators are put on fire safety curriculum development committees to help blend programs with the main school curriculum.

- **Safety centers:** A strategy to increase outreach and improve quality of fire safety programs is to bring classes to safety centers instead of doing the training in classrooms. Waterloo region’s fire and police services teamed to develop and staff a Children’s Safety Village that includes realistic-looking, but scaled down buildings; streets with intersections, parking and sidewalks; and a railroad crossing. The village has an educational center where classes in grades 2, 4, and 6 attend fire safety lessons. The children first watch and discuss a fire safety film. They then have safety lessons further explained using a “hazard house” (like a large doll house). Finally the children go to full-size mock-ups of rooms to identify and discuss safety issues and practice safety skills.

Brampton’s Fire and Life Safety Center is a centrally located building that houses the public education staff and contains mock-up rooms for teaching fire safety. Students in grades 1–4 visit the center each year. The curriculum is designed with input from teachers. The ability to bring classes to the public educators dramatically increases the number of students who can be taught by a small prevention staff. It also provides a much better teaching environment than a typical classroom.

- **High school interns:** Brampton and Waterloo expand their public education resources with high school interns to provide instruction at the safety centers or during school visits. Interns receive community service credits needed for graduation.
- **Safety homework:** Following class sessions, many school fire safety programs reinforce messages by giving students exercises to do with their families, such as

testing smoke alarms and making an escape plan. Some programs send home a survey for parents asking if their children brought home safety ideas, and the parents' perception of the program. Teachers who bring classes to the safety village also are asked to evaluate the experience.

***Reaching Elderly and People with Disabilities*** – Most Canadian cities have safety programs for the elderly, often a Canadianized version of NFPA's "Remembering When" program or the Ontario Fire Marshal "Older and Wiser" program. Toronto has three key approaches:

- Training care providers to check on fire safety when they visit homes of the elderly.
- Transporting homebound elderly to safety presentations.
- Distributing a safety calendar to seniors, to help remind them of basic safety practices for seniors, throughout the year.

***Reaching Immigrants and Ethnic Groups*** – Most Canadian cities have tailored fire safety programs for their growing immigrant and ethnic populations. Some innovative strategies:

- **Community "ambassadors":** Ottawa uses volunteers active in their ethnic community to go door-to-door with firefighters during home visits. They supplement firefighter staffing for the home visits, help firefighters gain access into households by showing a familiar face, and translate if necessary.
- **Native councils:** In some Native Canadian cultures the tribal council plays a major role in safety issues, so the fire department provides safety information for the council to pass on, instead of approaching individual tribal members directly.
- **Inner city bus ads:** Because high-risk populations often use buses, Ottawa purchases smoke alarm ads on inner-city bus routes.
- **Ethnic media:** Many fire departments put fire safety messages in local ethnic newspapers, radio and television stations to reach specific groups.
- **English classes:** Fire departments in Ontario partner with English as a Second Language (ESL) schools to provide basic home fire safety information to new Canadians taking these classes.
- **Firefighters with language skills:** Vancouver maintains a list of firefighters who speak a language other than English. They assist with interpretation of educational materials and giving presentations.

- **Translated, simplified public education materials:** Brampton, Ottawa, Toronto, and Windsor have simplified public education materials translated into the major second languages prevalent in their region.
- **Partnerships with immigrant associations:** The Office of the Fire Marshal in Ontario gets assistance from the Ontario Council of Agencies Serving Immigrants to present prevention materials to frontline workers through their settlement services.

***Reaching the General Population*** – Most cities and some provinces have fire safety campaigns throughout the year. Some of their innovative approaches:

- **Budget for TV and radio ads:** Many Canadian provinces and cities have budgets for buying air time for fire safety messages, typically 15–30 second advertisements during popular programs. They do not depend on free, late-night public service announcements which often miss the majority of their target audiences. The air-time budgets are augmented by industry donations and TV station discounts.
- **Subsidized fire safety literature:** The Public Fire Safety Council, established under Ontario law, is empowered to raise funds from private organizations to develop fire safety campaign materials. The Council subsidizes sale of NFPA and other materials to the fire service, giving them a 75 percent discount that results in much wider use of the materials.
- **Media events and news conferences:** Provincial fire marshals and fire chiefs hold media events and news conferences to demonstrate safety issues such as unattended cooking, drinking and smoking, alarm maintenance, and to announce the latest safety statistics. Some of these media events are held in fire stations.
- **Innovative dissemination venues:** Ottawa firefighters hand out home safety brochures in supermarkets and grocery stores, and use parking lots of businesses that sell smoke alarms for safety demonstrations. Ottawa makes presentations in on-campus residences.
- **Featured fire station:** While citizens can visit any fire station, Brampton steers them to a particular fire station whose firefighters are handpicked for their ability to provide safety education. This enhances the likelihood that information will be properly communicated, and memorable.
- **Cooking safety trailer:** Unattended cooking is the leading cause of residential fires. In partnership with Coldwell Banker Realty and the Kitchener Fire Department, Waterloo built a trailer to dramatically demonstrate with live fire

how cooking with oil can be dangerous if left unattended, and what happens if one attempts to put out the fire with water. The trailer is taken to many venues, and provides an unforgettable demonstration.

- **Firefighter union-sponsored campaigns:** The British Columbia Professional Firefighters Burn Fund has developed large-scale burn awareness campaigns including poster contests that involve two-thirds of the schools in the province.
- **“Superboarding”:** Vacant homes in Surrey, BC are boarded up extra securely to reduce arson. Ontario Fire Code requires that vacant homes must be secured against entry, and they enforce it.
- **Fire crew messages:** Ontario firefighters are expected to be the first point of contact with the public. Fire trucks are equipped with a set of 24 message cards that address the most common fire safety issues, which helps crews give impromptu presentations in the field with consistent and correct messages.

***Required Residential Sprinkler Systems*** – The ultimate long-term solution to most of the residential fire problem is sprinklering all residences, not only high rises but also single-family dwellings. A 1990 Vancouver bylaw required sprinklering of all new residential units and all residences remodeled at 50 percent or more of their cost. By 2009 almost half of all Vancouver residences were sprinklered, and residential fire deaths decreased dramatically. Damage to non-sprinklered homes was 13 times higher than for equivalent sprinklered homes over a ten-year period. The Vancouver sprinkler ordinance also facilitates denser, greener development” to reduce traffic and pollution. Over 20 other jurisdictions in British Columbia, including some with volunteer and combination fire departments, also require home sprinklering. This reduces the need to increase fire department size as the communities grow, and supports volunteerism, because longer fire response times can be tolerated where sprinklers exist.

## Best Practices from Puerto Rico

Puerto Rico has a national fire service serving the entire island. After the DuPont Plaza Hotel fire in San Juan in 1986, which killed 100 people and injured 150 others, a commission on fire safety recommended changes in public safety education, codes and laws, building retrofits for fire safety, and an overhaul of the national fire service.

***Cultural Change*** – As in many nations visited, the safety culture of the fire service and society have been changing.

- **Increasing fire service involvement in prevention:** Following the Dupont Plaza Hotel fire the fire service placed greater emphasis on fire prevention and

public education. Fire Headquarters created a division of residential fire education that studies risk factors and plans programs to mitigate those risks. Prevention programs are funded by the Puerto Rican Emergency Management Agency, the U.S. Department of Homeland Security, and occasionally the private sector. Line firefighters are trained to assist in classroom presentations on fire and burn dangers and how to escape from a fire.

- **Correcting misconceptions about safety of homes:** Many residents had mistaken ideas that because homes in Puerto Rico generally are built of concrete, they were not vulnerable to fire. A high priority has been to help people understand that a home's contents and interior finishes are what burn and that anyone could suffer a serious fire if they are not careful.

An assumption of residents in high rises was that if a fire were to occur, they could evacuate by getting to the roof where a helicopter could rescue them. The public had to be made aware of the need to plan escape in other ways and practice what is planned. Also, the combination of alcohol, smoking, and living alone factors in many fatal fires, so messages to older residents targeted this risk syndrome.

***Safer Consumer Products*** – A common cause of home fires in Puerto Rico is electrical arcing from frayed or broken electrical appliance cords, especially when plugged into overloaded outlets with combustibles near by. These fires increase during the holiday season as residents decorate homes with lights, electric candles, and displays. The fire service now urges residents to install arc fault circuit interrupter breakers, which stop electrical current before conditions reach the point where they produce sparks and high heat. New homes must have these devices.

***Reaching School Children*** – Preschool and early elementary school children are considered the highest priority target audience for residential fire education in Puerto Rico. The fire service had seen an increase in the number of children who died in fires, many started by the victims. Much hope for the future lies with educating the current generation.

- **Adapted NFPA programs:** The fire service uses a widely accepted NFPA school fire safety curriculum, *Mis Primeros Pasos*, with a few changes made to reflect specific risks in Puerto Rico and to be more culturally relevant to Puerto Rican children. This included developing their own mascot; a little fire hose named *Manguerita*, and adding a puppet theatre as another vehicle for teaching the lessons.

- **Use of music:** Music is an integral part of Puerto Rican culture, and songs have been incorporated into the school fire safety program. The fire service created its own music for the NFPA curriculum, with lyrics set to rap and hip hop styles to increase children’s interest. The “*Bombero Rapero*” (rapping firefighter) raps about fire safety and how to escape. Youngsters love it and sing along. The music has been recorded and available to United States fire departments. This is an excellent example of customizing programs in light of the local culture.

**Partnerships with Broadcast Media** – The Puerto Rican fire service developed a home fire safety campaign which is supported by major radio stations and several television stations. Messages are carried during prime time rather than off hours. The director of residential fire safety for the Puerto Rican fire service is also its public information officer. His experience gets more attention for prevention in the media spotlight.

## Best Practices from Mexico

In Mexico, this study focused on residential fire safety in the State of Guanajuato, which is in the center of the nation. Compared to the United States fire departments, Mexico has an extremely small number of firefighters per 1000 population in most cities. As an example, the city of Silao (population 170,000) has a single, 4-bay station, 7 paid firefighters, and 38 volunteers. Because of the shortage of firefighters, prevention is viewed as especially critical. The head of safety for the State of Guanajuato says that “*El mejor departamento de bomberos no es el que mas incendios atiende; sino que el que mas incendios previene.*” Translation: **The best fire department isn’t the one that responds to the most calls but rather the one that prevents the most fires.**

**Cultural Change** – Officials from the Guanajuato state government have set as their mission to change the way future generations will regard safety --their personal responsibility for being aware of risks and preventing safety problems. Their strategy includes the following two key elements:

- **Educate** the younger generation on all aspects of safety, especially fire safety, road safety, burn prevention, and accident safety.
- **Provide** safer, more decent houses for the lowest income families and disabled persons, many of whom live in makeshift wooden shacks or broken down vehicles. The state plans to provide the building materials and know-how to construct 36,000 basic concrete dwellings for high-risk, households, with help in their construction from family and friends.

**Reaching School Children** – Like Puerto Rico, Guanajuato’s primary target is preschool and early elementary school children, and uses the Department of Education

rather than the fire service to implement the program. The bulk of fire prevention education in schools is delivered by teachers on their own or sometimes working alongside firefighters in the classroom.

- **State education office:** The state’s Department of Education is the principal organizer and deliverer of fire safety education through schools, especially pre-schools. The government’s goal is to instill a sense of personal responsibility for safety from fire at an early age. They hope that by creating a safety-focused mindset the younger generation will carry forward safety awareness and caution in the years to come.
- **Training teachers:** Guanajuato conducts an intensive 3-day fire safety training program for teachers of young children. The teachers learn how to teach students about preventing and escaping from fires, how to avoid burns, and risks in the home. The teachers also learn how to be first responders in their schools, including use of fire extinguishers, first aid, and some aspects of confined space rescue in earthquakes. The trained teachers became part of an auxiliary corps of helpers to the fire and rescue service.

**Public Campaigns** – Besides the schools program and the program to provide safer homes are the following:

- **Safer cooking:** An effort is made to encourage people to make more use of indoor ranges and stoves, and less use of outside “*comales*”—cooking over open fires, often in areas surrounded by combustible materials. The tradition of cooking with *comales* is well established and it will take time to alter cooking preferences.
- **Milk cartons:** Fire officials got a milk producer to put fire and life safety messages on the sides of milk cartons. The messages, which vary, are expressed in bright pictures and limited numbers of words to be attractive and easily read.
- **Alternatives to candles:** Candles are widely used in Guanajuato homes, especially on home altars. They may be left to burn for long periods of time. When combined with unattended children or combustibles near the altar, they are a major fire risk. Officials promote the use of battery-powered candles instead of open flame candles to reduce fires and burn injuries.
- **Alternatives to fireworks:** Each year, local and state officials see many injuries from fireworks, which are used at home to celebrate several religious and civic holidays. Guanajuato implemented a campaign encouraging families to

use alternatives like confetti, noisemakers, and streamers, and to leave fireworks to professionals at public shows.

## Best Practices from Dominican Republic

The visit to the Dominican Republic was limited to the Santo Domingo Fire Department, and was a byproduct of a vacation trip as opposed to planned research. Nevertheless, it yielded several interesting practices:

- **Neighborhood visits and talks:** The Santo Domingo Fire Department conducts public education in neighborhoods primarily by going to schools, industries, churches, and neighborhood associations to deliver fire safety education face-to-face. It uses a team of seven public educators, including several volunteers though it is a career department.
- **Fire safety brochure:** An excellent, illustrated fire safety brochure is widely distributed to adults, school children, and businesses. The brochure features the fire department logo and the name of the insurance company which sponsors the brochure. The relatively unusual feature of the brochure is its level of specificity on what to do for common local problems. For example:
  - *Cooking safety:* “Don’t turn on the gas before you light the match to ignite the burner. Never leave cooking unattended. Keep combustibles away from the burners. Wear fitted short sleeves or push sleeves about elbows while cooking. Push pot handles inside so they are not accidentally knocked over and so children can’t grab them. Keep children at least a meter away from stoves and ovens. Put a lid on the pan if cooking catches fire. Never add water to a flaming pan or carry it to the sink, because flames may flare up.”
  - *Propane safety:* “Propane cylinders can be time bombs. Replace the rubber hose on cylinders of 50–100 pounds for a metal one. Keep the cylinders above floor level to prevent rusting. Keep cylinders in good condition. The cylinders should be outside the kitchen at least five meters away from the oven.”
- **Department newsletter and magazine:** The Santo Domingo Fire Department publishes a newspaper-type periodical every three months with safety information. It is distributed by the public education program and other means to the public, not just the fire department. This guarantees that messages are repeated and exposure increased.
- **Fire station visits:** Groups of school children are brought to their neighborhood fire stations for discussions of fire prevention. The visits are documented by

photos with the fire chief or other officers that are printed in the fire department magazine.

## **Concluding Remarks**

National, state, and local fire agencies should consider the rich array of ideas found in this global research on best practices. There are many innovative prevention programs that are associated with significant decreases in residential fires and fire casualties, and that are likely to have similar effect if we use them. There also are new ways to increase outreach and impact of conventional programs. All in all, there is little doubt that major savings are possible in life and property loss if American fire departments use the best ideas from other Western cultures.

## I. INTRODUCTION

In the United States and most western industrial nations, the vast majority of fire deaths and a large proportion of fire injuries occur in the home. As part of its mission to reduce residential deaths and injuries, the National Center for Injury Prevention and Control, Centers for Disease Control and Prevention (CDC) seeks to identify promising global practices in residential fire safety—best practices—that might be transferred to the United States, or that might stimulate ideas for new approaches. Identifying and documenting best practices can stimulate and speed up improvements in prevention practices in the United States.

This report, the third in a series of three on best global practices for reducing fire deaths and injuries in the home, provides many examples of successful residential fire safety programs in Canada, Puerto Rico, Mexico, and Dominican Republic. In deciding which nations to visit, we chose Canada because it was reported to have innovative programs and is the culture most similar to the United States. The Latin American nations are the source of many immigrants to the United States, and represent the ethnic identity of many United States citizens.

### **Study Approach**

For each nation visited, we spoke to various fire officials and did internet research to identify fire services and other organizations that are conducting innovative programs to reduce residential fire casualties. We then contacted chief fire officers or heads of prevention and assessed their willingness to accept a visit to their organizations at the local, state, or provincial level. Next, we scheduled on-site visits and sent a list of our main research questions.

In addition to our on-site visits, we communicated with officials in several other cities and provinces by phone and email. All of the organizations contacted provided documented material and web-site references. We also did extensive internet research on each nation's residential fire safety programs.

**Visits Made** – We visited the fire agencies listed below. Other fire agencies were contacted by phone and email.

**Canada (December 8–13, 2008)**

Ontario

Office of the Fire Marshal

Ottawa Fire Services

Toronto Fire Services

Brampton Fire and Emergency Service

Waterloo Fire Rescue

National Fire Protection Association

Fire Marshal's Public Fire Safety Council

British Columbia

Vancouver Fire and Rescue Services

Office of the Fire Commissioner

City of Surrey Fire Service

British Columbia Professional Firefighters Fund

**Puerto Rico (January 27–28, 2009)**

National Fire Service (San Juan)

**Mexico (March 23–25, 2009)**

Guanajuato Fire Service

**Dominican Republic (November 12, 2008)**

Santo Domingo Fire Department

**Research Questions** – Below is the list of research questions we sent to each organization visited (except the Dominican Republic, whose visit was serendipitous during a vacation there). The questions were as follows:

1. **Noteworthy programs:** What noteworthy or innovative residential fire safety programs (especially public education) are being undertaken by your organization? What population groups do they target? How were they developed? How are they delivered, how often, and with what content? Have they been evaluated?
2. **Smoke alarm programs:** How have you tried to get smoke alarms installed and maintained? Any specific efforts for low-income and immigrant households?
3. **Extinguishers:** Do you promote use of extinguishers in the home?
4. **Residential sprinklers:** What is the penetration of residential sprinklers in your community? Is anything done to encourage it? Evaluate it?

5. **Cultural diversity:** How do you cope with the diversity of ethnic groups and language in developing and delivering residential safety programs? Do you tailor programs to a group, or just translate the same materials?
6. **Other targeted population groups:** Are their programs for schoolchildren? The elderly? People with disabilities? Other groups?
7. **Facilitators/barriers to program implementation:** What factors have increased and decreased the success of your efforts?
8. **Risk factor-based approaches:** Cooking, heating, electrical, smoking, children playing, and arson usually are among the leading causes of residential fires. Do you target each cause? Are your residential prevention programs multi-hazard? Do you combine fire prevention information with non-fire injury prevention, such as resilience for disasters and terrorism, or other injuries (motor vehicle crashes, falls, etc.)? Or do you have separate programs for each risk?
9. **Other prevention strategies:** Besides public safety education, are there other efforts for reducing residential fire injury, such as home inspections, increased code requirements for residences, better product safety and safety products?
10. **Roles and responsibilities:** What role is given to line firefighters for implementing residential safety programs?
11. **Data issues:** We would like data on your trends in residential fire deaths and injuries. Are there also data at the province and national levels we could have or point us to where to get it? What data are used to target prevention? How do you evaluate prevention programs? What have you found?
12. **Discontinued programs:** Have any past programs been discontinued because they were not working, too expensive, out of date, etc.?
13. **Best approach overall:** What do you consider the best, most cost-effective ways to reduce residential fire injuries?

A slight variation of these questions, in Spanish, was given to the Latin American nations visited.

We also asked each agency to provide statistics on their fire forces and residential fire death and injury rates. Providing the questions ahead of time helped assure that the agencies visited would invite people with the right knowledge to each interview and that appropriate background materials would be readied for us. This process had been used in our past international research. This preparation resulted in focused, highly productive meetings.

Following the visits, several agencies sent us additional information and we had many follow-up dialogues by phone and email. We sent the draft report to each agency we visited (except the Dominican Republic) and asked them to review the information on their organization. We do not present here everything we learned in our research. Rather, we focus on the programs and best practices likely to be of most interest and applicable to the United States. Many already are in use in the United States on a larger scale, or in a unique way, as part of a more comprehensive strategy than is usually found here.

## **Report Organization**

After this introduction the report is organized in four sections: Canada, Puerto Rico, Mexico, and Dominican Republic. Within each section we discuss the major strategies for residential fire safety and specific practices. We include a brief section discussing the fire service organization of each nation.

To keep the report at a manageable size, we tried to balance breadth of coverage—the multitude of good ideas found—with adequate detail for adopting them if desired. The level of detail varies on different topics depending on their novelty, importance, and information available.

## **Caveats**

The ideas presented here are the best practices in each city, state, or nation as identified by those we interviewed and our supplementary research. We tried to find the best, not necessarily the most typical, programs. We undoubtedly left many good ideas undiscovered. And ideas cited for one fire service may well be done in others; we did not identify all who use a particular best practice.

It is difficult to evaluate prevention programs, and the proof of effectiveness is rarely as good as one would like. We inquired about evaluations of the programs and approaches cited, and present the data where available. We did not do independent quantitative evaluations of the approaches. We did judge the innovativeness and likely usefulness of the approaches against our background knowledge of programs and our past research. The leading authorities in each nation think the programs cited here are making a difference.

Our intent is to stimulate the reader with ideas that may be adopted or adapted for use in the United States (or other nations). It is sometimes difficult to transfer good practices from one culture to another, but that should not be the excuse that limits our efforts. It should be easier to convince decision-makers and the fire service to use established ideas that have been implemented elsewhere than to use wholly untested ideas. Many of the ideas discussed here took time to implement, and a change in fire service

## **Global Concepts In Residential Fire Safety**

### Part 3 – Best Practices from Canada, Puerto Rico, Mexico, and Dominican Republic

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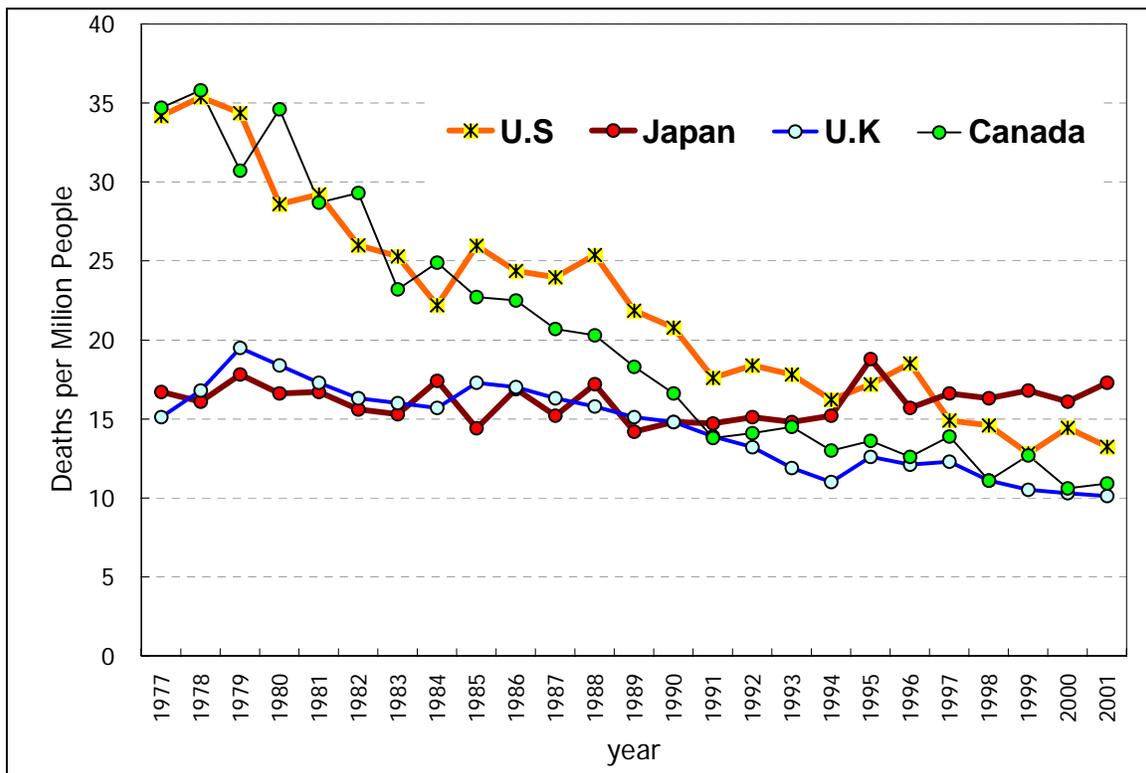
culture. One often has to be a little clever in figuring out how to apply the best practices to one's own environment, but it almost always can be done.

## II. CANADA

Canada is the second largest nation in the world by total land area and has a highly diverse population of 33 million. Besides the bilingual tradition of English and French, there are now many languages spoken—especially in large cities.

In the 1970's Canada and the United States ran neck and neck for the dubious distinction of having the highest fire death rates in the Western world. In the following 30 years, the rates in both nations declined by more than two-thirds, with Canada consistently lower than the United States since the mid-1980s. At present, some of the most populous Canadian provinces have fire deaths rates 40–50 percent lower than the United States despite a variety of risk factors including a colder, northern climate that requires more heating and lighting. Figure 1 shows trends in fire death rates for four nations. Canada's relative success in reducing its national fire death rates is at least partially attributable to many innovative fire safety practices presented in this report.

Figure 1: Comparison of National Fire Death Rates



(Courtesy: Prof. Ai Sekizawa, Tokyo University)

## **Overview of Canadian Fire Services**

The Canadian fire service is run mostly at the local city or region (county) level. About 85 percent of Canada's fire departments are volunteer departments.

Provinces, similar to states, play a significant role in developing fire-related legislation, collecting data, and developing prevention strategies. Some provinces have a strong Office of the Fire Marshal or Fire Commissioner with legislation supporting prevention and excellent fire statistics.

In the past decade, Canada has faced challenges that have made national coordination of programs and data collection difficult. There used to be a national fire service agency, similar to the U.S. Fire Administration, to coordinate data collection and undertake other roles, but the national fire commissioner position and the agency were abolished. Without a national fire data system, there has been no national fire death rate data since 2002.

The Canadian Association of Fire Chiefs and the Council of Canadian Fire Marshals and Commissioners work to disseminate ideas nationally. The National Fire and Life Safety Educators Group meets annually to discuss major fire concerns and to share best practices on how to effectively address those concerns. The Fire Marshal's Public Fire Safety Council, established under Ontario's Fire Protection and Prevention Act of 1997, also operates nationally. It has representatives from 28 organizations including the Canadian Association of Fire Chiefs, the Canadian Firefighters Union, Underwriters Laboratories of Canada, and others. The Council is allowed to partner with business on fire safety programs and can obtain funds from business for programs, which is why it was set up separate from government.

A major trend over the past decade in Canada has been the shift toward doing more prevention. Fire service leadership at the city and provincial levels—in at least some provinces—have worked to change the culture of the fire service. The change was designed not only to accept public education and prevention as the first line of defense, but also to take a more active role in delivering it similar to the efforts of the fire service in the United Kingdom, Australia, and New Zealand. Several provinces have passed legislation that changes the environment for doing fire prevention. As one small cultural indicator, the Ottawa fire chief and prevention chief no longer display in their offices pictures of big fires the department fought: they are not the major points of pride and no longer the image to be projected. This is consistent with the fire safety legislation for the Province of Ontario, which indicates that public education and prevention is the first line of defense against fire. Several other provinces have passed legislation in the past 10–15 years that increase requirements for doing prevention in the context of integrated risk management.

**Ontario** – Ontario is the most populous province in Canada with an estimated 13 million people, who constituted a third of the national population. Ontario's largest cities are Toronto, Ottawa, London, Mississauga, and Brampton, which are all 500,000 in population or larger. The number of independent fire departments in Ontario has dropped from over 500 to about 450 in recent years due to amalgamations. These amalgamations are primarily for operational efficiencies but can potentially improve fire prevention in several ways, such as having a larger pool of talent to draw upon; enabling regional campaigns more efficient than local campaigns; increasing attention to prevention in some of the amalgamated communities; and better career ladders in prevention.

**Changed Priorities:** The Ontario Fire Protection and Prevention Act of 1997 prioritizes the lines of fire protection defense as:

- Public Education and Prevention
- Fire Safety, Inspections and Enforcement
- Emergency Response

Public education is the first line of defense and is not to be considered a support service. The Act requires all fire departments to undertake fire safety education for all citizens. With this mandate, fire departments are able to put prevention at the top of their list of duties. And fire departments have legal backing to enforce codes such as the requirement for a smoke alarm on every level of every home. As a result, prevention in Ontario has teeth.

Fire departments in Ontario must provide public education and certain components of fire prevention. These components include a simplified risk assessment, a smoke alarm program, fire safety education material distributed to residents/occupants and fire safety inspections upon complaint or when requested to assist with code compliance. Even small communities without their own fire departments and volunteer fire departments must provide these functions. This strong signal of the elected leadership's intended priorities for the fire service helps prevent cities from cutting education and prevention when budget money is tight. Some city councils in United States cities have tried to eliminate prevention functions in tight budget times. The thinking in Ontario is the opposite: education and prevention are high priority and required.

Every municipality in Ontario must file a risk assessment with the provincial fire marshal in Ontario. The locality must identify high need areas and focus education efforts in them. For small municipalities without their own fire department, there must be a region (county) fire safety officer or team responsible for public education and prevention in the community.

**Strategic Plan:** Ontario’s Office of the Fire Marshal developed a strategic plan for prevention. The plan covers five areas:

- **Individuals:** Educate people on safety and how to take responsibility for it.
- **Society:** Change attitudes and the culture toward prevention.
- **High-Risk:** Focus on high-risk groups like the elderly.
- **Fire Service:** Educate the fire service about prevention and get them to help implement prevention programs.
- **Technology:** Encourage use of smoke alarms, stovetops with safeguards, sprinklers, reduced ignition propensity cigarettes, etc.

**Training Public Educators:** Ontario’s Office of the Fire Marshal trains public educators and other fire service personnel on how to reach various segments of the population including the hard-to-reach, high-risk populations such as immigrants and the elderly. The intensive course includes how to make risk assessments, how to identify the high-risk population, how to run focus groups to assist in understanding how to reach these groups, and how to do program evaluation to demonstrate the merit of prevention efforts. As of early December 2008, approximately 290 people from many fire departments had gone through this program. In addition, the Office of the Fire Marshal holds an annual Fire and Life Safety Education conference to bring ideas and people together.

**Fire Data:** Ontario has an excellent fire data system that receives data from 100 percent of its volunteer and career fire departments. The requirement for localities to provide their data was part of the 1997 Ontario Fire Act. Complete reporting gives the province excellent capability to target prevention and evaluate prevention programs. Reasons heard in the United States for not reporting simply are not tolerated under Ontario law. Data is submitted electronically at least every quarter and sometimes monthly from local fire departments to the province. Typically, by March of each year the previous year’s data is complete.

Considerable efforts are made to investigate each fire for cause. Accurate data is considered important for targeting prevention and evaluating results. The Province investigates fires with fatalities or serious injuries, large loss fires, explosions, and fires of interest such as high rises, retirement homes, and extended care facilities. Toronto depends on the province for these investigations. Ottawa and many small communities do their own fire investigations, at least for other categories of fires. Several fire service officials stressed the importance of having quality “cause” data because good data helps them to better prioritize and target their public education and prevention efforts.

The province is expected by its fire departments to do the primary analysis of the data at the local as well as provincial levels. The province provides fire departments with benchmarks against which to compare themselves on response times, fire incidence, casualty and loss rates per capita, and even numbers of children spoken to in school programs.

In 1980 Ontario had 267 fire deaths for a population of 8.7 million, or 30.7 fire deaths per million. By 2006, fire deaths were down to 82 for a population of 12.7 million, or a rate of 6.5 fire deaths per million. This remarkable 79 percent drop was a result of many prevention measures taken during that time period, including wider use of smoke alarms, stronger public education efforts, reduction in smoking, and stronger codes and enforcement.

Fire deaths in Ontario rose in 2007 and again in 2008. In 2008 the number reached 97. The cause of these increases is not known and occurred without a reduction in prevention efforts. These findings are especially puzzling because the leading cause of fire deaths is careless smoking and 2007 was the first full year that cigarettes were required to pass a reduced ignition propensity test to be sold legally. (These issues were being analyzed further as this report went to press.)

**Ottawa** – In 2001, Ottawa, the capital of Canada (Figure 2), amalgamated with 11 communities surrounding it to become the new city of Ottawa. The city's fire department combined the career, combination, and volunteer fire departments of the constituent communities.

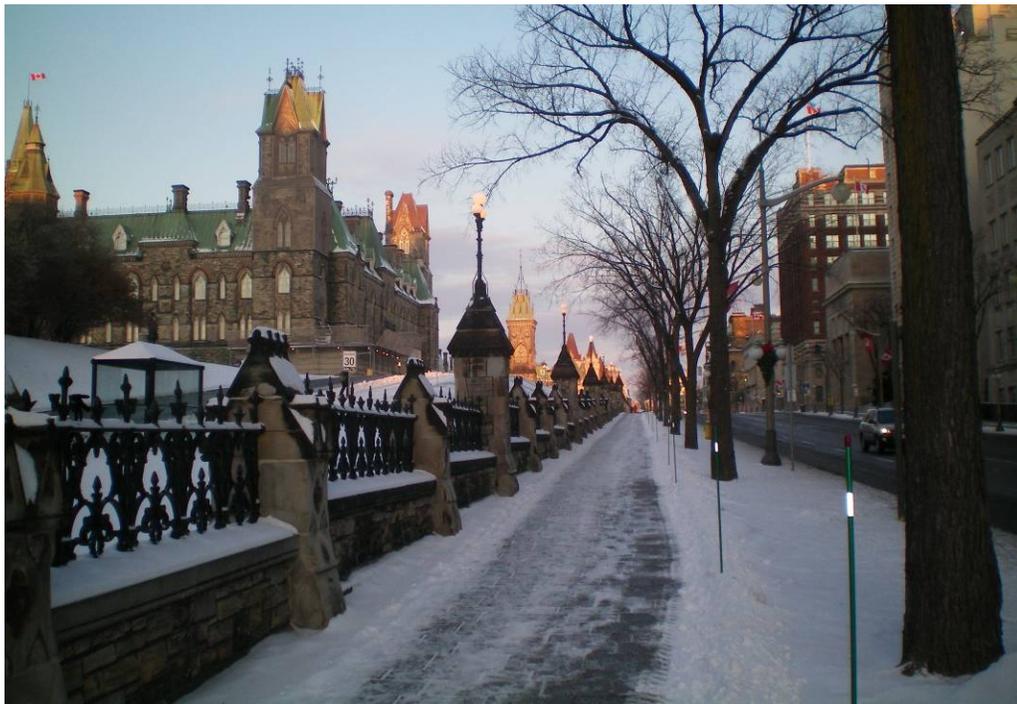
Ottawa's fire service receives about 25,000 calls a year of which 41 percent are EMS first response. They do not transport patients, which is done by a third service. Calls dropped by 10,000 a year when the fire service decided not to respond to EMS calls when a third service ambulance is on the way, and the call was not potentially life threatening. The fire service responds to critical (i.e., life threatening) calls including cardiac arrests and severe bleeding, but not broken bones, for example, unless the ambulance will have a significant delay.

**Figure 2: National Government Building in Ottawa**



Ottawa has 870,000 residents and 340,000 households. Approximately half the population is French-speaking. Figure 3 shows a typical winter scene in the old city.

**Figure 3: Downtown Ottawa**



Ottawa Fire Services has 43 stations and protects a large area of 1,060 square miles. Its 1,300 employees include 859 career firefighters, 425 volunteer paid on call, and the rest civilian support employees.

**Prevention Staffing:** Prevention has 45 (5.2 percent) of the career employees, up from 24 in June 2002. The increased prevention positions were filled from vacated suppression positions and were part of the shift in deployment priorities set by the province to increase emphasis on prevention. The prevention division includes 5 public educators.

To make even more staff hours available for residential fire safety, Ottawa Fire Services cut back on doing routine inspections of commercial properties. Provincial law no longer requires annual inspections for most commercial properties, and the majority of them now are inspected only in response to requests or complaints. Annual inspections continue for commercial properties with the most vulnerable populations, such as hospitals, daycare centers, and homes for special care. The labor saved from reducing commercial inspections is used for home visits to check on smoke alarms, referred to as the Retrofit Residential Program.

**Prevention Staff Quality:** The prevention division provides all amalgamated communities with public education, inspection/enforcement, plans review, and investigation services. The division has a section devoted to staff development. This is a novel and necessary approach that addresses the large turnover from the amalgamation (61 percent of prevention staff retired) and an expected further turnover of up to 30 percent in the next two years. The division is taking the opportunity to increase professional standards as they train new staff. Initially there was a drop in productivity from lack of experience, but the younger, new-hire staff have better information technology skills, and they reach higher productivity after 2–3 years of experience because of their IT competency. As a side benefit of raising personnel standards in prevention, there has been increased competition for its positions.

The Ottawa prevention division no longer uses firefighters who are recovering from a disability. They feel that prevention personnel who go into the field must be able to perform all property inspection activities such as climbing ladders to install smoke alarms or check hidden spaces. They use clerical personnel for clerical work associated with prevention to free more hours of the inspectors for inspections. They also want to maintain the image of prevention as being a primary duty; the prevention division is not considered a temporary R&R spot for inadequately trained personnel.

A fire protection engineer in the prevention division assists not only in the traditional plans review and inspections of complex properties, but also analyses of fire

incident data. This is in contrast to the many fire departments that invest time collecting data, but lack support capabilities to analyze and fully use that data. Ottawa clearly values the idea of using data to inform and enhance decision-making.

**City Fire Prevention Strategy:** It is unusual for a fire department to have an articulated fire prevention strategy, but many Canadian fire departments are starting to do this. Backed by the provincial laws and the policies of Ontario’s fire marshal, Ottawa has embraced the following strategies:

1. Change community attitudes toward fire safety (i.e., it is to be viewed as a community problem with each individual responsible, and not just an issue to be dealt with by the fire service).
2. Change residential safety-related behaviors (e.g. installing smoke alarms, practicing prevention of ignitions and escape procedures).
3. Provide alternative means of service delivery and funding of fire services (e.g. through partnerships with other agencies, and financial donations or donations of services or goods from private industry).
4. Communicate safety messages throughout the year and not just during fire prevention week. Use the media and conduct door-to-door firefighter blitzes in neighborhoods.
5. Communicate successes in delivering the program and their results to key stakeholders including the fire department staff, the community, and the political leadership.

This strategy was approved by the Ottawa City Council in 2001 and implemented starting 2002, with a home visit program at its core (a later section of this report describes the home visit programs in detail). A key concept of this strategy is to help residents to recognize and react properly to risks.

Another philosophical change toward prevention was to stop rejecting proposed new programs by saying “we can’t afford them,” and instead ask “how can we fund them?” which often meant seeking private funding.

**Fire Data:** Ottawa fire deaths dropped from 8–9 per year several years ago to about 3 per year at present, or a rate of 3.4 per million, one of the lowest among cities in North America. For eleven months in 2008, up to December, there had been only one fatality.

**Toronto** – Toronto is the largest city in Canada, with a population of 2.6 million. It amalgamated with the cities of Scarborough, North York, East York, York, and Etobicoke in 1996.

Toronto Fire Services has 80 fire stations and a staff of 3,300, of which 130 (4 percent) are in prevention. Of the 130, 20 are in public education. The effective strength of the fire prevention unit is somewhat larger than it might appear because all fire investigations in Toronto are undertaken by the Ontario Office of the Fire Marshal, and thus little time is subtracted from prevention for investigation.

**Recruit Training:** Toronto fire recruits receive two to three days dedicated to the public education program out of their 20–22 week training period. This is more than in most cities and conveys the message to recruits that public education is important, and they are expected to play a role in it.

**Fire Data:** Toronto once averaged about 33 fire deaths a year. This number dropped to 15–16 fire deaths a year at present, or about 6.5–7 per million population protected, which is a 50 percent drop in absolute numbers and even more per capita.

**Brampton** – Brampton is an hour drive from Toronto, and has a population of about 475,000. It was created from two communities that amalgamated a few years ago and is the second fastest growing community in Ontario. It is a highly diverse community speaking many languages. About 31 percent of the population is from Southeast Asia. The language group after English is Indian Punjabi. Part of the community is affluent but most is not.

Brampton has an “intensification initiative” that is intended to curb urban sprawl by clustering high rises around shopping areas, so more people can walk to work and shopping. Similar to other cities in Ontario, Brampton does not require sprinklering of high residential structures, though high rises are required to be fully alarmed and compartmented. This puts a premium on safe behaviors, and the fire department accordingly has a strong prevention effort in high-rises.

The Brampton Fire and Emergency Service has 11 full-time and 2 volunteer fire stations. Of 360 career staff, 20 (5 percent) are assigned to prevention, with 5 public fire educators and 15 in inspections and other duties. The public educators are located in the Fire and Life Safety Center (described below). Other prevention personnel work out of fire stations, to put them closer to the community and the line firefighters.

The Brampton Fire and Emergency Service respond to all medical calls, which comprise 60 percent of all calls.

Brampton undertakes a risk assessment every five years. This includes review of the building stock, changing demographics (including age and ethnicity), and fire statistics. The results guide changes needed in the prevention program.

New fire stations are being built with glass walls to reflect being out and visible in the community, and having them viewed as a safe haven.

The Brampton Fire and Emergency Service prevention program seems to be working; they have had no fire fatalities in the past 3 years, versus about 15 fatalities that might have been expected based on their population and the Ontario fire death rate.

**Waterloo** – The City of Waterloo (population 110,000), is a suburb 1.5 hours drive southwest of Toronto. Waterloo Fire Rescue has three fire stations and is building a fourth. It has 100 fire employees of whom 7 are in prevention (7 percent). One half of an inspector/investigator position is devoted to public education. The city is one of seven municipalities which comprise the Regional Municipality of Waterloo. Waterloo Fire Rescue cooperates on delivery of prevention programs with neighboring Kitchener (population 200,000), Cambridge (population 120,000), and four surrounding townships for the Waterloo Region’s Children’s Safety Village. Waterloo provides one staff member four days a month to operate the Safety Village. Waterloo also cooperates with Kitchener on program delivery for the Children’s Fire Safety House, and on development and use of a cooking fire demo trailer. (These programs will be discussed in more detail later.)

**British Columbia** – The Province of British Columbia, on the west coast of Canada, is developing what they call a Fire Service Model Program, which is a vision of a province-wide, integrated prevention program that would allow everyone in the province to receive consistent prevention messages. When people move from one area to another within the province the messages would be similar if not identical. The model is being developed with oversight from the Fire Services Advisory Board.

**Vancouver** – The City of Vancouver, population 650,000, is the largest city in British Columbia. It has a beautiful setting on rivers and oceanfront, with high real estate value (see Figure 4). It has been a desirable location for many immigrants from Hong Kong and a broad array of other Asian cultures including mainland Chinese, Southeast Asian and Indian populations, and many eastern Europeans. Almost half the population is comprised of 27 recognized minority communities whose major language groups are Cantonese, Mandarin, Punjabi, and Hindi.

The city historically is divided into the west side (an expensive, upscale area) and the east side (a historically low-income area that is developing rapidly). The east side still has the greater fire risk, with many houses legally or illegally subdivided for additional rental occupants and many residents living in basements.

**Figure 4: Vancouver Is Increasingly Dominated By High Rises**



The Vancouver Fire and Rescue Services has 20 fire stations, and a staff of 833. Of these, 29 are assigned to the prevention units—27 firefighters, and 2 clerical staff—and another 5 full-time employees and often 1–2 firefighters on light duty are assigned to the Community Services Division. This division also is responsible for the department’s pre-fire planning and departments’ audiovisual requirements. It has one captain and two firefighters for public fire safety education. Effectively 4 percent of department strength is involved in prevention full time.

Vancouver had high fire death rates in the 1960’s and 1970’s. In 1974 it peaked at 40 fire deaths for about 450,000 population, or 89 deaths per million population. Today, Vancouver has 5 fire deaths per million population. In 1998 and 2004 they had no fire deaths.

**Quebec** – The Province of Quebec, in eastern Canada, has a French-speaking population and major cities such as Montréal and Quebec City. Although not visited for this study, phone interviews were undertaken with several cities and the provincial fire marshal’s office.

Quebec’s Fire Safety Act (2001) requires all municipalities or regions to have a comprehensive fire risk management plan, including a site risk program. They must inventory risks and assign each structure to one of four classes of risk: low (single-family

residence), medium, high, and very high. The inspection program must be based on this analysis. The province must approve the city’s risk management plan. Once approved, the city cannot be sued if it follows the plan.

As an example of the impact of the new law, the City of Longueil (population 400,000) had five inspectors for prevention work when the law was passed. After doing their risk analysis and assessment of inspections, they found this was insufficient and now have 12 inspectors out of the estimated 24 needed for full compliance. Approximately 6 percent of the fire department staff is devoted to prevention. To cope with the shortfall in inspectors, they ask large enterprises to do their own risk plan and to hire inspectors themselves; the fire department spot checks them.

**Montreal**, Quebec is the second largest city in Canada at 2 million population. In recent years it amalgamated with 21 other nearby fire departments. The combined fire department staff of 2,600 includes 130 (5 percent) working in prevention. All prevention functions are under an assistant director of the department. Montreal has some unique bylaws that give it much more authority than most fire departments in North America, as will be discussed.

Longueil, Quebec has 400,000 population served from 11 fire stations, with 44 “teams” (the name for a group of firefighters on a shift in a fire station—like a company). Longueil has had one of the most extraordinary successes in the world with its home visit program, which is discussed below. We did not visit them but spoke to the fire chief extensively and received printed materials on their prevention programs.

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The remainder of this section on Canada is organized around the types of approaches and target groups for prevention rather than geographic areas within Canada. We also compare our findings in Canada with those of our early reports on other nations.

## **Home Visits**

As was found in the United Kingdom, Australia, and New Zealand, many Canadian fire departments have reoriented their firefighter resources to expand fire prevention programs and visit large numbers of households each year with line firefighters. Home visits are a well-established and important practice that fire departments can implement to reduce residential fatalities. The best long-term solution is home sprinklers but it takes decades to have a major impact. Therefore, this section details several home visit programs because they offer a proven, short turnaround for impact and are comprehensive in their reach.

*Longueil* – This Quebec city undertakes smoke alarm inspections by its line firefighters on an unprecedented scale. In 2002, Longueil set a goal to visit every household within a five-year period, at a rate of 30,000 residences per year, and then to repeat the cycle. They beat their goal by a year, and reached all 152,000 households within the first four years.

Since the start of their home visit program, home fires dropped by 50 percent, and fire deaths even more. Longueil experienced 530 building fires in 2002, 230 in 2007, and less than 200 in 2008. They now average an incredibly low 1.5 fire deaths per year, or about 3.8 per million.

An unexpected, but not unwelcome, side effect of the program has been a sharp increase of calls to the fire department requesting a visit to check on hazards in the home. There were about 8,000 such calls in 2008 compared with 5,000 a year when the program started. The increase is largely attributed to citizens being told they can call the fire department to have potential safety problems investigated before they cause trouble.

Longueil assigns each firefighter team with addresses it should visit, with a target of 1,000 home visits yearly per team. Priority is given in each five-year cycle to visiting the oldest homes and homes in “problem areas” first. The teams do the inspections in May, June, August, and September when the weather is favorable. The line firefighters visit single-family dwellings and other residential structures up to three stories high and with no more than 60 apartments. Larger residential buildings are visited by fire inspectors.

To keep things simple, the firefighters are told to focus on smoke alarms and cooking safety during the home visits. To prepare for the visits, firefighters each receive a pamphlet with basic fire safety information and information they should convey about cooking fires, the largest cause of home fires in Longueil as in most communities. The pamphlet also includes frequently asked questions. There is no formal training of firefighters on how to deliver the fire safety messages or about the specific pamphlet content. Instead, the firefighters encourage household members to contact the Fire Prevention Division if there are unanswered questions during the visit.

Two firefighters visit each assigned home. If the occupants are there and assent, the firefighters enter and check if they have a working smoke alarm on each floor, as required by code. No batteries or free alarms are given out- just information and the results of the test. The firefighters also deliver the message about cooking hazards.

The firefighters get into about 50 percent of the homes visited. The fire chief thinks they probably reach most high-risk homes because people on welfare, unemployed, elderly, or infirm are often home. If no one is home, they leave a fire safety pamphlet on a door

hanger. The pamphlet highlights how to prevent cooking fires such as taking care when cooking with oil on a stove, not wearing loose clothing near open flames on a stove, etc.

When the firefighters return to the station from home visits, they enter into a computer database what they found about the smoke alarms versus the number that were required, for example, “the home had two out of three required alarms, and one was working.” They also correct any information about the address or type of structure.

If a visited home does not have the necessary number of working alarms, the homeowner is required to inform the fire department when the house is up to code. If the home does not respond to the fire department within ten days, they are sent a letter saying they are in violation of the law. If the home does not respond promptly to the letter, the prevention unit will visit it again and may fine the homeowner. The department can levy a \$50 fine for non-compliance, which is more than it costs to comply. Only about 3 percent of homes that receive a violation notice do not comply voluntarily. Therefore, fines are rarely needed.

**Ottawa** – In Ottawa, the impetus for starting its home visit program was a fire that killed five of eight members in a family whose home had no smoke alarms. The department did soul searching on “what are we doing wrong,” which led to a re-focusing of its prevention program. The philosophy that emerged is that while the community has to be informed about the need for smoke alarms, it is ultimately their responsibility, and not the fire department’s, to provide this safety measure. In line with this thought, the fire department’s role was defined as informing each household of the new law and what to do.

To implement the home visit program, about \$1.3 million in funds, services, and equipment were raised through sponsorships. Among the contributors were the corporate community, professional hockey team and battery manufacturers.

The smoke alarm program was branded with the slogan “Wake Up! Get a Working Smoke Alarm.” The “Wake Up!” slogan is put on all program-related materials from the brochure shown in Figure 5 to the billboard in Figure 6. This phrase was found to have the same double meaning in most languages—both wake up to the need to have working smoke alarms, and have the smoke alarms to wake you up or alert you when there is a fire.

Initially the Ottawa firefighters gave smoke alarms or batteries to the households visited for the households to install themselves where needed. The alarms were carried on each engine and chiefs’ cars. But subsequently, firefighters responding to some fires found that some alarms they provided had never even been taken out of their wrappings. This led to the decision to install alarms where needed, not just hand them over.

Figure 5: Ottawa Multi-lingual Smoke Alarm Brochure Message



Figure 6: Ottawa Smoke Alarm Billboard Message



A barrier to starting the home visit program was concern about liability for smoke alarms that were installed and did not subsequently operate in a fire. However, attorneys found that as of 2005 there had never been a local government held liable for a problem after installing alarms, and so they proceeded with the program. There still has not been a legal problem.

Over a two and a half year period starting in 2005, Ottawa Fire Services used line firefighters to knock on 51,700 doors to provide information on smoke alarms. Upon request the firefighters also checked the status of the smoke alarms and, if necessary, added or replaced the alarms or batteries. Through June 2008, 8,774 battery-powered smoke alarms

or batteries were provided in the course of the visits. The fire department installed ionization alarms, which were purchased at discount.

The Wake Up! campaign's effectiveness was measured as the "percent of homes visited each year that did not have a working smoke alarm." In 2005 it was 39 percent. It was suspected that new Canadians (immigrants) in particular were not getting the message or not understanding the requirement for alarms. By 2006, the percent of homes without working alarms was down to 26 percent; then in 2007, 23 percent, and in 2008, 15 percent.

To be more noticeable and break through public apathy about safety, the smoke alarm campaign was concentrated in six weeks in the spring and another six weeks in the fall, rather than running year-round. Two hours per crew shift, often 6 to 8 p.m., are devoted to home visits in urban areas. People tend to be home at that time. Even though it is the dinner hour, the households usually accept the visits. In the more rural areas of Ottawa, which are served by volunteers, the home visits are usually made on weekends. The public messages about smoke alarms and the home visit program are synergistic. They reinforce each other and both raise awareness.

Ottawa Fire Services targeted the highest risk homes first. Each station was asked to say which blocks or homes they thought were at highest risk. The fire department then gave the crews in each station forms with some information pre-filled, including the address for each home targeted. The crews were asked to verify the information about the home and add what they did (e.g., provide a pamphlet or install an alarm). A key piece of information gathered is whether a residence has been subdivided into smaller dwelling units, a common practice in low-income immigrant areas. If subdivided, the home must meet code requirements for rental occupancies. Though this requires an investment of time and money from the owner, it has not been much of a problem to gain compliance, and has not led to negative publicity.

To facilitate alarm installations, each crew is given an equipment bag containing a power drill, screws, a stepladder, prevention brochures, and of course smoke alarms. They go to the streets predetermined by their station and the fire prevention unit, and return the completed forms to the prevention unit when they finish each day's assignment. This information is promptly entered into a database. In addition to the standard brochure, there is a "Somali insert" and others in nine native languages, for appropriate ethnic households.

Though Ontario law requires a smoke alarm on each story of a house, the fire crews only install one alarm if there are none. The first choice location is the hall adjacent to the main sleeping area(s). They give discount coupons to the household to purchase the additional alarms needed. The intent is to change the culture so that the homeowners

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understand they are responsible for the safety of their homes, not the fire service. The fire service educates and goes one step further in helping ensure at least one working alarm, but additional safety measures (e.g., more smoke alarms) and behavior changes are up to the household.

If no one is home, the crews leave a package of literature on the door knob. Missed homes can call to request that a fire crew return at a time when they are at home.

Entry to a home is always made by either two firefighters or a firefighter and a community ambassador (a volunteer from the community). All crews in an area go out on home visits simultaneously, to increase the visibility of the program and assist in getting firefighter cooperation, as everyone is doing this together. The crews do not enter a house if no one over the age of 16 is home.

Both pumper and ladder crews participate in the program. They each have a staffing of four, and can split into two groups of two, or go as one group, or even have more than two groups if assisted by “ambassadors.” The crews are kept in their first due area and respond to calls from the field if needed. We were told this has not noticeably affected response times.

In rural areas of Ottawa, eight volunteer public education officers implement home visits instead of crews. They are paid the same hourly rate as when responding to calls.

Getting the firefighters to go door-to-door initially was met with resistance. But once started, the crews found they enjoyed being out in the community and getting appreciation from the homes visited. They want to be perceived as the good guys and this program helped do that. Now the problem was said to be getting the crews to return to station when the period for being in the field is up each day!

While the intent of the Ottawa smoke alarm program is to help change the safety culture of the community using a positive, informative approach, there is an iron fist behind the program. If the fire department returns to an occupancy in which they installed a smoke alarm and finds it not working, they will fine the owner with the equivalent of a traffic ticket that costs \$235 Canadian, as authorized in the provincial legislation. If a household without a working smoke alarm has a fire, fines can go up to \$50,000 and a year in jail for violating the life safety code. The owner (or landlord) is held responsible whether owner-occupied or not. A renter or visitor who disables a smoke alarm also is liable for fine and imprisonment under the law. No one has been jailed in Ottawa yet but a \$20,000 fine was given after one fatal fire, and there have been jail terms given in other municipalities. The threat of substantial fines may influence homeowners to install and maintain smoke alarms and certainly points to how the fire service values these safety measures.

After each home visit blitz, a standing committee comprised of selected senior officers and firefighters in prevention and suppression review the experience and determine if any tweaking of the program is needed, such as how to stock the station for the program, and what information to collect on the form after the visit. The fire chief then gives the whole department feedback on the program results. The chief also thanks the firefighters for their efforts.

The department is working with the media to publicize fires where the installed alarms probably saved lives or more extensive property damage, and also fires in which alarms were absent and might have made a difference.

The ultimate goal of the Ottawa program is to reach every household over a period of about 10 years. After dealing with the most vulnerable communities, the rest of the city's households will be visited. Ottawa has 344,000 households and is growing. The line company part of the program deals with all residences except the approximately 5,000 residential high rises covered by stricter codes, and visited as part of the fire prevention office's code enforcement program.

Ottawa has expanded its home visit program to include all types of residences. Even recreational vehicle (RV) sites are visited to check smoke alarms. RVs and mobile homes are more of a problem in the rural areas which amalgamated into Ottawa.

**Toronto** – In Toronto, the home visit program is called “Alarm for Life.” As in Ottawa and Longueuil, firefighters go door-to-door informing households of the requirement for smoke alarms and how to maintain them. They leave the household with a brochure that deals with smoke alarms and leading safety hazards. The district chief for each area of the city plans which blocks to go to. The firefighters are given materials for testing and installing smoke alarms, a set of questions to ask the household, and frequently asked questions they may be asked.

The firefighters go to the neighborhood on their pumper for an hour or two in the evening. Some units make visits as a group of four; others split into two groups of two, or leave one person at the pumper. The firefighters provide handout materials to the resident and talk about fire safety. Unlike some other home visit programs, the firefighters do not enter the households, even if invited in, and do not give away or install any smoke alarms. If no one is home, then the brochure is left at the door.

When the firefighters return to the station they complete a form on the visit, including whether people were home.

The city plans to do a pilot test using pairs of prevention staff to visit households in areas selected by the city council as areas of multiple risks, not just fires.

**Brampton** – In Brampton, the “Home Safe Home Program” is organized by the fire and life safety prevention team, but executed by line firefighters. The program provides information to households on escape planning and smoke alarms. Firefighters go door-to-door unannounced, though the existence of the program is advertised. About 20,000 out of 110,000 households are visited each year. It will take at least 5-6 years to visit all of the current homes, but new ones are being added almost as fast as the rate of visits. The program is in its first cycle.

**Waterloo** – In Waterloo, homes built before 1990 are the primary target of a home visit program, because that was the year smoke alarms became mandatory for new home construction. Before making door-to-door visits in a neighborhood, the houses are given “door knockers” (packages hung on the doorknob) announcing the program coming to the neighborhood. When visited, the home is asked if they have alarms on each floor and whether they test them regularly. If invited in the firefighters perform the tests themselves. About 2,000 of the 30,000–40,000 homes in the city are visited each year. All visited homes are given an information packet about smoke alarms and leading causes of home fires.

**Vancouver** – About 3,000 residential units of highest risk are targeted each year for door-to-door visits. Once visited, the household is tracked to see if it has any fires. As will be discussed, almost half of Vancouver homes have residential sprinklers, so smoke alarms are less of a priority except for homes built prior to 1990, when the sprinkler bylaw went into effect.

**Calgary** – Calgary has a population of 1.04 million. The home visit program, started in 1996, has reached over half the population. Through 2008 the fire department visited 185,365 households, installed 20,777 smoke alarms and replaced 13,216 batteries. At least 10 lives are known to have been saved due to this initiative. ING insurance provided much of the funding for alarms, batteries, and educational material used in the program.

**Implementation Alternatives** – In summary, to implement a home visit program requires making the following choices:

1. **Deciding where to go first:** Usually the high risk areas are identified from department-wide data analysis or local knowledge of each fire station.
2. **Selecting times of the day, week, and year to conduct visits:** Some cities take a blitz approach in concentrated periods, others go year-round.
3. **Deciding who makes the visits:** Pairs of firefighters usually make the visits. A city may also use a pair consisting of a firefighter and “neighborhood ambassador,” or a firefighter and prevention specialist.

4. **Deciding what to do during the visit:** Whether to go inside or stay at the threshold; whether to install or test smoke alarms; what verbal or printed fire safety message to deliver; and what to leave if no one is home.
5. **Equipping each fire crew:** Provide smoke alarms, tools for installing them, fire safety literature, and forms for collecting data.
6. **Evaluating the results:** Deciding on the data to collect on each home visit and the program overall. This includes the percent of targeted homes visited (outreach); the percent of homes with working smoke alarms (behavior change); and the impact on fire incidence, deaths, and injuries (outcomes).
7. **Revising the program:** Use data gathered by the crews and their insights to improve the program. Decide when to revisit each home.

## Reaching School Children

Each of the Canadian fire departments visited in this study had a program for visiting school children on a regular basis in one or more elementary school years. They all seemed to be reaching close to all schoolchildren at least once in their school careers, and often more than that.

***“Prevention Generation” and On-Line Interaction*** – The Ontario Fire Marshal wants to create a “Prevention Generation,” giving children fire safety education in school, and reaching teens and young adults through on-line media such as YouTube, Face Book, text messaging, interactive video, and internet games. This generation spends less time watching TV and reading newspapers and magazines. (Swedish fire departments, too, are starting to use these newer media, as was discussed in the first report in this series.)

Calgary has a “Think Responsibly” on-line education program that is a learning partnership between the Calgary Board of Education and the fire department, police department, emergency medical services, animal services, parks and recreation, and neighborhood services. Interactive safety and injury prevention modules for students in grades 4–7 have been developed for consequences of unsafe fire behavior, helmet safety, water safety, negative peer influence, etc. Other information is available to teachers and students through the Calgary Board of Education’s intranet learning environment. Included are lesson plans, curriculum links, learning rubrics, and project outlines. The public site for parents and children is [www.thinkresponsibly.ca](http://www.thinkresponsibly.ca).

***Learn Not to Burn*** – The Ontario fire marshal related a case history of school programs in the town of Brockville, whose population was about 20,000. In the period between 1972 and 1981, 18 people died from fires, a rate of 90 deaths per million. One

death was the chairman of the school board, which raised awareness of the fire problem among school officials. The school board approved implementation of the NFPA Learn Not to Burn program in July 1985. Since then, only two people died in fires in the 1980's and two in the period 1991–2002. While there are many factors that may contribute to the reduction, such as reduction in smoking and increasing use of smoke alarms, the program was thought to have affected fire safety in the home from educating the children and messages they brought home to parents.

***Risk Watch*** – A Canadianized version of the NFPA Risk Watch program is used in many Canadian cities. This program addresses various fire and life safety issues.

Ontario worked with teachers to make the program more relevant, fit the Canadian curriculum, and be culturally appropriate for French Canadians and others. Teacher acceptance of the Risk Watch program is important because fire safety programs rarely fare well when pushed on teachers. To address this issue, the Toronto fire department sends a public educator to meet with the teachers and school administrator in each school to discuss the importance of the program, and offer varying types of support. Usually this is done during the teachers' lunch period, with the fire department providing refreshments. Toronto feels it is important not to contact the teachers after normal class hours to avoid adding to the teachers' time burden, which is often a reason such programs get rejected by teachers. They find the degree of acceptance very high after these meetings.

Each public educator in the Toronto Fire Services is assigned 30 to 40 schools. They try to go to each of their assigned schools each year. This approach helped maintain an enthusiastic response after the first year or two of the program, whereas other cities have many schools dropping out due to burnout or dampened enthusiasm.

As a result of these intensive efforts to win over the teachers and schools, Risk Watch now is used in almost all Toronto schools from junior kindergarten to grade 8, but not every grade. Toronto has two school systems, one with 250 public schools and the other 180 Catholic schools. By the end of 2009, the fire department expects to implement Risk Watch in all schools in both systems.

Risk Watch in Toronto is delivered primarily by the regular teachers with a combination of police, ambulance, public health and fire personnel, depending on the subject of a particular lesson. The Toronto fire department is usually the agency to get schools to participate in the program, and usually goes first in delivering the lessons. The degree of fire department assistance is up to the teacher. The fire department may send a fire unit to the school when Risk Watch lesson is being taught. Firefighters may participate in the classroom at the teacher's discretion. Alternatively, a public educator may be sent to assist the teacher.

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After the Risk Watch program is given to a class, the teacher sends home a survey to parents via the children to evaluate the program. The survey asks parents if they were made aware of the program by their children, and if so to comment on its value to themselves and the children. The Risk Watch program is intended to educate parents via their children as well as the children themselves.

**Wide-Scale Fire Drill** – In 2005, Ontario held a fire drill involving 1,300 of the 2,100 schools in the province. It was billed as the world’s largest fire drill and involved 2 million school children. It was heavily covered by TV, and intended to raise the awareness of fires in the community, not just to practice exiting. The program was repeated in 2006 and 2007, but discontinued after that because it was losing its initial attention-grabbing appeal. This demonstrated both the impact of large scale events and the need to keep things fresh to maintain interest and awareness.

**Hazard “Doll” Houses**– Several Canadian fire departments including Brampton, Ottawa, and Vancouver have “hazard houses,” which are like oversized doll houses that can be used to illustrate fire safety hazards in various areas of a house, and how to make the home environment safer (see Figure 7). Fire safety issues demonstrated with the hazard houses include storage of dangerous materials, poor housekeeping, heat sources near flammables, and planning escape routes. Often children are led in discussion using the hazard houses before practicing safe behaviors in full-size, mock-up apartments.

**Figure 7: Hazard House In Waterloo Helps Children Visualize Safety Issues**



**Fire and Life Safety Education Centers** – Several of the cities we visited had a safety house or a safety village in a permanent location, which was designed primarily to educate school children but also is used for the general public.

Brampton Fire and Emergency Service's Fire and Life Safety Center opened in May 2003. It is centrally located in a park, and was donated to the city by a foundation formed by an Olympic ice skater whose baby daughter drowned in pool. In her memory the Center's mock-up apartment is called Stephanie's Place. The foundation also contributes to having school children bused to the center, which reduces an access barrier and increases the number of children receiving this first-rate safety experience.

The Brampton public fire safety educators are all based in the Fire and Life Safety Center. This makes it extremely efficient for the staff to conduct office business and give fire safety presentations on premise, instead of having to go to the schools. The capital investment in the center reduces the cost of prevention operations over the long run.

On the first floor of the Center are lecture rooms. On the second is an almost full-scale three-room mockup of a private home, including a kitchen, family room, children's bedroom, and bathroom. The rooms have various props for teaching about fire safety hazards. Figure 8 shows the exterior of the center. Figure 9 shows one of the mock-up rooms, with a high school "co-op" student teaching the class.

The co-op students can fulfill their community service requirement for high school graduation by completing an internship which includes a four month prevention tour. The co-op students assist fire educators with prevention activities and sometimes teach the school children.

Most Brampton school children in grades 1 and 4 are brought to hear safety lectures, and then try to identify hazards in the full-scale mock-up of rooms. They discuss various aspects of safety in the home, including fires, poisons, and other hazards. The Center also is used for fire and life safety training for special needs people from grade 1 to adult, such as people living in social housing where they are independent but require some supervision. It also is used for girl guides and scouts. Children who take the class at the Center meet an Ontario requirement for fire and life safety education. It is a fun way for both teachers and students to meet the requirement. The visit requires little to no teacher preparation, though many teachers offer pre-trip lectures.

**Figure 8: Brampton Fire and Emergency Service’s Fire and Life Safety Center**



Schoolchildren who visit the safety center are given safety-related homework which they have to return to their teachers. It includes developing a home fire safety plan with their parents or guardians.

**Figure 9: Co-op High School Student Delivers Fire Safety Lesson in Brampton’s Fire and Life Safety Center**



The lessons taught at the center are reinforced by an interactive, award-winning DVD called “Stephanie’s Place Safety Tour.” It is available for teachers to use before or after bringing their students to the center, and reinforces the messages. Children enjoy seeing in person what they saw on the DVD, which makes the lessons even more memorable. The DVD is also available to classes that cannot visit the center, and for

Canadians learning English. Copies of the DVD have been given to all libraries in Ontario, and all schools in the Province of Nova Scotia. The DVD also is used as part of a “New Moms Program” to teach them fire safety in the home while they are concerned about their newborn’s safety.

The Fire and Life Safety Center has become the focal point for Brampton prevention. It changes how they approach planning for public education, and is the hub around which the program is built. They can bring children to the Center in large numbers each year instead of solely scheduling visits to classrooms. The building is literally a concrete way of manifesting public safety education, making it more tangible and high profile.

***Children’s Safety Village*** – The regional municipality of Waterloo includes seven member communities who jointly developed a Children’s Safety Village for teaching fire, police and other life safety programs. The Children’s Safety Village serves the entire region. It has several buildings and streets that constitute a small village. Different buildings are used to teach various safety principles.

The Education Center in the village is used for teaching fire and police-related safety to children. Fire safety education is delivered to grades 2, 4 and 6. The police teach stranger awareness, pedestrian safety, bicycle safety and internet safety to the alternate grades 1, 3, and 5. Great efficiency is obtained by sharing the facility between police and fire, and among the seven jurisdictions. The village physically conveys the notion of integrated safety as a culture for children to learn.

About 75 percent of schoolchildren in the three target grades are reached by the fire safety program each year. Most children attend the fire program in at two of the targeted three grades, which provides reinforcement of the messages because the higher grades start with a review of the previously taught fire safety basics.

Each class lasts 70 minutes and is taught by a full-time safety center employee who is usually assisted by a high school co-op student. A detailed lesson plan ensures consistent and comprehensive coverage of approved messages. The co-op students’ prevention internships last four months and meet their public service requirement for graduation. The children relate well to these young high school students. The co-op students double the delivery capacity of the Safety Village at little extra cost.

Typically, the children start each session by watching a fire safety education video and then discuss it. It usually is a video from the NFPA Risk Watch program. Next, they move to a different room for fire safety instruction using a mini-hazard (doll) house that shows many fire safety hazards and solutions (Figure 7). Finally, they go to full-size mock-ups of a kitchen and bedroom (Figure 10) where they are shown various hazards and how to

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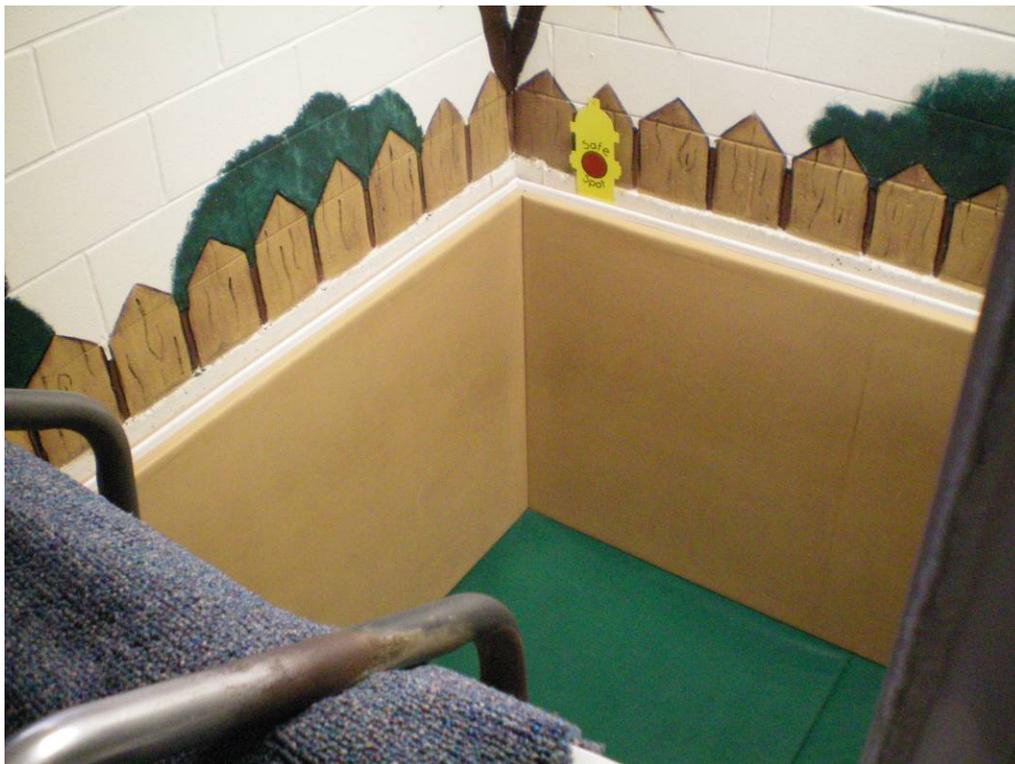
prevent or deal with them. This session includes a fire simulation where the next room fills with smoke. The children have to first check for a hot door, then open it a crack and see the escape path full of smoke, and finally practice climbing out a window and down an escape ladder from which they go to a pre-planned meeting place (Figure 11). The repetition using film, discussion, props, and hands-on practice is excellent pedagogical practice.

Teachers who bring their classes to the safety village are asked to evaluate the program by completing a survey, and they distribute a parent survey for the children to bring home. The parents are asked how many smoke alarms they have, the result of testing each, their opinion of the training, and whether the students discussed the information at home. Students who bring in a completed survey are given a gift certificate for French fries at McDonalds, one of the industry sponsors supporting the safety village.

**Figure 10: Kitchen Mock-up in Waterloo Region’s Children’s Safety Village**



**Figure 11: Children Practice Climbing Down This Escape Ladder in the Waterloo Region’s Children’s Safety Village**



The curriculum taught at the safety village receives input from both school boards, who have members on the village programming subcommittee. This improves teachers' acceptance and coordination with the school curriculum. Each session has a detailed lesson plan to ensure consistency and coverage of all the approved points. The training is hands-on, realistic, and safe. The philosophy is that children who see and do will retain information and engage in safe behaviors better than those who only hear about the right things to do.

Grades 2 and 4 receive information on fire prevention and fire survival., with the fire triangle introduced in grade 4. Grade 6 gets a reprise of the previous basics, and information on consequences and peer pressures aimed at heading off arson. Grade 6 children also participate in an interactive game in which they compete to answer fire safety questions. Children from each group are scored on their fire safety knowledge.

The Children's Safety Village is fully booked for the next school year before the end of the previous one. Announcements of its availability are made simultaneously to all schools in the district via the school board each February. It is then first come, first served. Because demand is higher than supply, the village maintains a waiting list of 50–70 classes to replace any classes that cannot attend their previously booked trip. Teachers are called at the beginning of the school year and confirmation is made a week before each class is

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scheduled to visit, to confirm attendance and avoid an empty class slot. Three fire safety classes are taught each day: two in the morning and one in the afternoon. Classes are carried out during the entire school year.

One month each summer is used for scouts, pre-schoolers, adult groups, and other groups wanting the safety village experience. The second summer month is reserved for maintenance.

The police side of the safety village started in 1992 and the fire program in 1996. The addition of the Fire Education Center cost \$700,000. This new partnership, combining police and fire safety education at the Waterloo Region Children's Safety Village, was the first of its kind in Canada. There are now over 20 safety villages in Canada, including Ottawa and York.

Soon an entire generation will have had this training. It is highly thought of by the teachers, parents, and students. Anecdotes show it has saved lives.

**Figure 12: High School Intern at Waterloo Region's Children's Safety Village Discussing Kitchen Safety**



**Mobile Fire Safety Houses** – Many Canadian fire departments have a fire safety house mounted on a towable trailer, or built into a mobile home. In Waterloo, visits to the Children's Safety Village are supplemented by taking the mobile fire safety home to classrooms. A presentation is made by a public educator, usually accompanied by a fire unit

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and sometimes a co-op high school student too. Two to four schools are visited each year in Grades 1–3. Each Waterloo schoolchild is likely to see at least one of these visits. They get a lecture, video, and some fire safety lessons in the fire safety house.

Vancouver constructed its own mobile safety house to use in a program delivered to children in the third grade. About 5,000 children are reached each year at 114 schools with about 20 students per class plus teachers and some parents. Lessons focus on making an escape plan and practicing how to escape. The Vancouver school board participated in the development of the program and there is a detailed lesson plan. It meets the planning and safety portion of the education requirement, which make it more attractive to the schools. Each class spends approximately an hour and 20 minutes at the house.

**Figure 13: Mobile Safety House Constructed by Vancouver, BC**



Two firefighters deliver each class lesson. They are selected from a pool of 45 trained firefighters who volunteer for the assignment. Where possible, they match the ethnicity of at least one of the firefighters to that of the school's neighborhood. The public education officer goes if needed to fill in. There is a script that can be read by a firefighter if they are not comfortable working more loosely from the outline of materials in the lesson plan. A video is shown at the beginning of each class. Following the class, each student is asked to complete an escape plan and safety checklist with their family. If they do, they receive a sticker indicating successful completion. The percent of students who get a sticker is one measure of the program's outcome.

Ottawa has three transportable fire safety houses that can be taken to schools or other community events. Each has three simulated rooms of a house, living room, kitchen and bedroom with hazards and safety features to be illustrated.

Longueil, Quebec visits schools with firefighters and provides public education in grades 1–6, and again in high school. The schools are required to complete six safety

exercises a year of which the fire department is present at one. They bring along a smoke-machine in a trailer and have the children practice crawling low in smoke.

**Poster Contests** – Longueil, Quebec has a city-wide fire prevention contest in which 28,000 school children participated in 2007. The winners (56 children) were brought to a fire station as a reward.

British Columbia has a poster contest run by the professional firefighters Burn Fund, in cooperation with the schools. About two-thirds of the schools in the province participate. The schools of winners receive a stipend from the fund.

**Localized Coloring Book** – Ottawa developed its own coloring book for use in its school programs, rather than use an off-the-shelf coloring book, Ottawa engaged a local artist to draw the prevention scenes that were likely to appeal to children in their area. The book is bilingual in French and English, a requirement for Canada's capital.

**Fire House Tours** – Vancouver encourages pre-school groups to visit local fire halls. They not only get to interact with firefighters, see fire vehicles, and understand firefighting better, but also are taught some fire safety basics. This program is thought to be particularly useful for the large Asian population of the city, because many come from nations where the fire service is not trusted. Establishing trust among children early is helpful for accepting various prevention programs later in life, and also helps immigrant parents improve trust of the fire service.

**Block Parties** – Port Coquitlam, British Columbia, has developed an innovative program to take advantage of block parties held in many neighborhoods each summer. The parties often require a city permit. The fire department asks the party organizer if they would like fire department participation. Firefighters attend about one of these parties a week during the summer. The program is called “Hot Summer Nights.”

Firefighters assigned to the party talk with attendees and discuss fire safety tips. They also offer to go to the attendees' homes nearby to test smoke alarms, and may demonstrate use of fire extinguishers right then. The department brings a mobile propane fire system to the parties, which allows firefighters to train citizens to practice use of extinguishers on live fires. The fire chief reports that the parties have turned out to be a good way to reach teenagers, their parents, and senior citizens. It also enhances communication with, and visibility of, the fire department.

**Home Economics Classes** – High school students in Brampton are given a program on cooking safety and dryer safety by the fire department as part of home economics classes. These subjects fit naturally into the curriculum of that course.

***Home Alone and Babysitter Programs*** – Brampton fire department teaches fire safety to teenagers as part of the city’s Parks and Recreation Department programs for a) teens left alone during the day while their parents are still working and b) teenage babysitters.

## **Reaching Juvenile Fire-Setters**

In Canada, juvenile arsonists—children aged 2 to 17 years old who intentionally set fires—represent a significant fire problem. The Canadian juvenile firesetter programs are generally similar to those in the United States and therefore not covered in depth here.

**“TAPP-C”** – The Arson Prevention Program for Children (TAPP-C) is a collaborative program that involves the fire service and mental health professionals working together to ensure that all children involved with fire have the best chance possible for a safe and healthy future. Fire service educators visit the child’s home to ensure that they have working smoke alarms and a home fire escape plan. They follow up with three additional fire safety education sessions for the child and the caregiver. At the same time, the children are assessed by a local mental health professional.

The children may be referred to the program from multiple sources, including parents, schools, police, social agencies, health agencies, and the fire service. In Ontario, the trigger often is a phone call or email about a child that is sent to the fire department by one of these sources.

There is a key difference in the Canadian approach. Mental health professionals often evaluate children referred to the program in conjunction with a firefighter, though some programs have the initial evaluation made by firefighters alone.

**“WRAPP-C”** – A variation on TAPP-C was developed by a group of fire and police departments, corrections, and family and children’s services in the Waterloo Region, hence the WR. Children referred to this program have only a 5 percent recidivism rate. Because it is a collaboration of several agencies, they find fewer juvenile fire setters fall through the cracks. In fact, some children are coming to the program before going to court, and some children are referring others.

## **Reaching Elderly and People with Disabilities**

As with many nations, Canada’s population is aging. People over 65 are a high-risk group. The Canadian fire service has its emphasis on providing safety information and smoke alarms to this population group.

***Remembering When*** – A Canadianized version of NFPA’s Remembering When program for older adults is widely used in Ontario. Brampton uses it as part of the program administered by its Region of Peel committee called the Adult Injury Prevention Network.

***Older and Wiser*** – The Ontario Office of the Fire Marshal developed a program used in Toronto and many other Ontario fire departments that focuses on older adults. Its main delivery mode is presentations to older adult groups, usually at their invitation. A novel accommodation is that the department will arrange transportation of shut-ins to the presentations, which enables the fire department to reach a particularly hard to reach, high-risk group.

***Training Social Service Organizations*** – Toronto trains social service personnel on how to test and install smoke alarms in homes they visit. Installations are only done if both the occupant and social service person are willing. This is part of a 10-year old program called BASIC, or Bring Awareness to Seniors Issues in the Community. The BASIC program is led by a steering committee which has representatives from the fire department and several other city agencies, seniors organizations, and public health. BASIC assists in getting safety messages to older adults. The program disseminates safety calendars to every older adult in Toronto. An insurance company pays for printing about 50,000 calendars a year. Between its steering committee and the private industry donors, BASIC is a good example of partnerships to leverage resources.

***Seniors Network*** – Calgary Fire Department joins with social and health service and established senior networks to reach more older adults. “SeniorConnect” is a collaborative effort assisting older adults to proactively deal with health and safety concerns so they may continue to live constructive and independent lives. Built on the premise of existing “Gatekeepers” programs, all participating agencies offer both educational and response capabilities.

Calgary also works closely with the Kirby Center, an organization that coordinates many seniors groups and senior activities. Through the Kirby Center, the department can share fire safety and injury prevention information using an established seniors’ network. This is often done by attending senior safety fairs or lectures.

***Firefighter Training about Disabilities*** – Montreal trains its firefighters on how to interact with people with various disabilities, including how to best assist them in an emergency evacuation. For example, they practice how to lead a blind person out of a building.

## Reaching Immigrants and Ethnic Groups

Every large Canadian city and many smaller ones have increasingly diverse populations. They must have programs that meet the specific cultural and language needs of these populations.

***Community Ambassadors*** – Ottawa has identified nine major and many minor language groups among its population. They have enlisted the aid of “community ambassadors” who speak these languages to assist with their door-to-door home visit program. The ambassadors also provide a familiar face to overcome the potential unfamiliarity of having a firefighter at the door. The people used as ambassadors usually are known in their ethnic community. They are like “lay health advisors” or “natural helpers” in public health.

***Native Councils*** – In Canadian First Nation culture, the band council often is considered responsible for the safety of the group. Therefore it is thought to be preferable for the fire service to get information to the councils rather than directly to individuals on topics such as the need to install smoke alarms in homes.

***Multi-Language Programs*** – Ottawa’s “Wake Up! Get a Working Smoke Alarm” campaign’s main goal is to educate the public about the program regardless of linguistic or cultural background. To that end, the materials are available in the nine major languages spoken in Ottawa—English, French, Chinese, Vietnamese, Cambodian, Somali, Arabic, Greek, and Italian.

***Door-to-Door Outreach*** – Many Ontario fire departments including Ottawa go door-to-door in the vulnerable communities to spread the word about smoke alarms and verify smoke alarm operation.

***Community Association Meetings*** – Ottawa’s outreach to ethnic populations includes presentations and workshops at multicultural community association meetings.

***Inner City Bus Ads*** – Ads are used as part of the Ottawa smoke alarm campaign on the exterior and interior of buses, and at bus stops in areas with vulnerable populations. Buses tend to be used more than other modes by individuals in low-income households. The ad space in the buses is purchased, and the ads are professionally designed and printed.

***Public Health Assistance*** – Ottawa coordinated with its Public Health Department to promote its smoke alarm program among vulnerable households, and to inform the fire department of households where fire department should install a smoke alarm.

***Police Assistance*** – Ottawa police provide multilingual dispatchers for all emergency calls. The police also report occupancies in need of smoke alarms or safety visits to the fire department.

***English as Second Language Classes*** – Many fire departments participate in English as a Second Language (ESL) classes to deliver fire safety messages to new Canadians, and have them take the messages home to their families. Ottawa Fire Services ha arranged to be contacted to speak at every ESL class. New Canadians are educated on basic fire prevention messages and basic fire code regulations regarding smoke alarms and open air burning. Simple language, props, and pictograms are used to convey the messages.

***Language Support to Campaigns*** – The Vancouver firefighters' union maintains a list of firefighters who speak a language other than English. They are called upon when needed for translating materials, or for interpretation in prevention programs or other purposes.

***Partnerships with Immigrant Associations*** – The Ontario Office of the Fire Marshal has sought the assistance of the Ontario Council of Agencies Serving Immigrants (OCASI) to present public education and prevention materials to frontline workers through their settlement services, including presentations at conferences and their Web site, [www.settlement.org](http://www.settlement.org), available to both workers and new Canadians.

## Codes and Laws for Home Safety

Canada has several innovative code-related programs to make good use of the two most significant technologies that affect residential fire safety since the mid-70's: sprinklers and smoke alarms. They also have innovative laws regarding fireworks and open fires.

***Residential Sprinkler Systems*** – Vancouver is the largest city in the world with codes that require all new residences to be sprinklered, including single-family dwellings. It probably was the first large city to have this regulation, which has been in effect since 1990. The regulation also applies to any structure upgraded by more than 50 percent of its value, which is significant in a growing city that is converting many old structures and industrial space to modern residential units. In 1996, Vancouver went to the maximum measure of requiring sprinklering of all new structures except sheds.

By 2000, Vancouver found that 26 percent of single-family dwellings and 38 percent of multifamily dwellings were sprinklered. Current data are not available, but the Vancouver prevention staff estimate that close to half of all homes or dwelling units are now sprinklered. Some parts of the city, such as Yale Town and Coal Harbor; with much newly redeveloped low-cost housing, are approaching 100 percent of sprinklered residences.

The few fatalities in sprinklered residences over the past 18 years occurred mainly in situations which the fire immediately engulfed the victim. At present Vancouver has a rate of about 5 fire deaths per million population. Vancouver had no fire deaths in 1998 and 2004, and experienced about 3–4 deaths a year recently. The lower fire death counts reflect not only sprinklers but also smoke alarms and public education. The fact that Vancouver is lower than many other cities with only smoke alarm programs suggests that residential sprinklering is the major difference.

The impetus for the sprinkler program started with high fire death rates in the 1970s. In 1974 there were 40 fire deaths for a population of about 450,000, which translated to a rate of 89 per million population. This was almost triple the national rates in the United States and Canada at the time.

Many cities have tried, and failed, to get residential sprinkler laws passed. Vancouver was no exception. From 1980 to 1990, legislative efforts were blocked, primarily by the home building industry. When the city's building official joined with the fire department in advocating residential sprinkler legislation, the elected officials finally agreed with their recommendation.

The Vancouver sprinkler codes facilitate the green policy of “eco-density,” which refers to increasing the residential density in urban areas to reduce traffic and hence energy consumption and pollution. (A similar policy is called “intensification” in some areas of Canada). Also, by having all new structures sprinklered, the existing fire suppression force does not have to increase to handle fire calls related to population and density increases, though other types of calls may require additional staffing.

In addition to Vancouver, 35 municipalities in British Columbia now require home sprinkler systems. Many of the 35 communities requiring residential sprinklers have volunteer fire departments. The adjoining city of Burnaby (population 150,000) has the same sprinkler law as Vancouver. Port Coquitlam, a city of 55,000 population near Vancouver, also requires all new homes to be sprinklered. While inadequate installations have led to some water leak problems, there have been no significant fires in the sprinklered homes in Port Coquitlam. Sprinklered homes are still a small part of the total single-family home stock in Port Coquitlam, perhaps 5 percent, but are increasing in number each year. Pitt Meadows, a community of about 9,000, has required sprinklering since 1996.

When structures are sprinklered, citizens can pay less tax per capita in the long run for fire services. One reason is that response time standards can be somewhat relaxed, which is especially beneficial to volunteer fire departments. Response can be as slow as 20 minutes because the sprinklers will usually hold a fire in check in the room of origin, if not

totally extinguish it. Spatially growing communities may not have to add as many stations to keep up with growth, a major advantage of sprinkler requirements that is rarely touted.

In Ontario, the building code has not required high rise apartment buildings to be sprinklered, but that is about to change. As of September 2010 the Ontario Building Code will require all new residential buildings of 4 stories and above to be fully sprinklered. Without a requirement, few have been sprinklered in the past. Also strengthened is Part 9 of the Ontario Fire Code, which requires buildings built before the latest Ontario Building Code to be upgraded for fire safety, including separations and suppression and alarm systems.

***Smoke Alarm Requirements*** – In 2006 Ontario passed a regulation requiring smoke alarms outside sleeping areas and on every story of all homes, including existing ones. The requirement to have an alarm on each story is intended to give maximum warning time and to raise the probability that at least one alarm will be working. An immediate result of the Ontario legislation in Ottawa was reducing the number of homes without smoke alarms from 39 percent in 2005 to 15 percent 2008. Fire deaths dropped from 8–9 per year to about 3 per year. As noted earlier, there had only been one fire death in 2008 in the first 11 months of the year, when our visit was made in December.

The British Columbia codes similarly require one smoke alarm per story, but add that they be interconnected. In new construction there is often one per room.

The home visit programs described earlier accelerate compliance with smoke alarm regulations. Ontario further accelerates compliance by increased enforcement of smoke alarm regulations. Penalties are stratified according to severity of the situation. In the least severe circumstance, a ticket of up to \$235 is issued to the owner of a building where smoke alarms are missing. As noted earlier, in the most severe circumstance, such as when a fire occurs, fines can reach \$50,000 and up to a year in jail for an individual property owner. Corporations can be fined up to \$100,000. Brampton has lobbied to expand the concept of tickets to other fire violations such as missing or faulty exit signs.

In Ottawa, if firefighters making a home visit find that a smoke alarm is not present or not working, a battery or a smoke alarm is installed so that the home has some immediate protection. The owner is notified and warned that any further violation in the same or other homes owned by the owner will be charged under the Ontario Fire Code.

***Rental Housing Inspections*** – Calgary has a program to enforce fire codes in rental properties in small as well as large properties. Usually high rises and large multiple unit housing get the main attention of fire inspectors, but many fires are found in smaller rental properties. Calgary’s “Safe Housing Inspection Program” (SHIP) is a collaborative

effort between the Calgary Fire Department and other municipal and provincial agencies to identify unsafe residential rental housing through comprehensive, joint inspections. Partners include the Calgary Police Service and City of Calgary Animal and Bylaw Services, among others. Buildings are selected for inspection by the various agencies involved in SHIP.

***Anti-Marijuana Electrical Code*** – A significant and growing cause of home fires in Surrey, British Columbia, and the whole Vancouver region, is electrical fires associated with grow lights for growing marijuana in homes. It is estimated that about 1,000 households in the area are growing marijuana. Growing operations accounted for 8.7 percent of the fires in Surrey in 2003.

To combat the problem, the Surrey Fire Department worked with police and courts to pass a law that allows the fire department to 1) review electrical usage of homes and 2) inspect any residences that have over triple the community average usage. The argument supporting this legislation was that extreme overuse of electrical systems beyond their intended capacity posed a serious fire danger. Today, households caught growing marijuana have to pay for an upgraded electrical system, a test for mold, and fines. Occupants are given 24-hour notice of the inspection, and many then clear the house of the illegal plants, or vacate the premises. They know they will be watched thereafter. To date, \$3 million was raised in fines, which fully supports the electrical inspections and assists with other activities.

Surrey arranged for a local graduate student in criminology to evaluate the program. (Use of local universities to assist in analyzing fire data and designing evaluations can be helpful to fire departments not having their own data analysts.) The analysis indicated that fires associated with growing operations had dropped from 15 to 5 a year since the program started.

***Immediate Regulatory Follow-Up to Correct New Problems*** – Montreal has some extraordinary bylaws that allow its fire service to follow up immediately when a new fire safety problem is discovered. The department takes great pride in doing thorough investigations and making immediate use of the results.

Fires are investigated to determine not just the reported cause, but whether or not there is an immediate danger to which others facing similar hazards should be alerted. Some examples:

- A residential fire caused by faulty fireplace installation led the department to order 600 homes that had similar installations to stop using them until the installation was corrected. This was not a recommendation, but an order

forbidding further use. The fireplace installer told the department where he had made other installations. Inspectors did spot checks of a sample of the installations and found them faulty, which sufficed to issue the order.

- The outside light on some homes was found faulty, with flammable insulation too close to the heat of the light. Another 40 units with the same lighting installation were ordered not to use it until the problem was repaired.
- An imported brand electric extension cord marked as passing UL tests turned out to be dangerous and not tested. Further sales were immediately stopped.
- An alarm system in a multiunit residential complex was found to be faulty. The residents were ordered to evacuate until the problem was fixed, or until a fire guard posted on each floor, with radio connection to the fire department, at the owner's expense.

Orders to property owners receive much more adherence than mere recommendations or advice. If the property owner with a hazard cannot be located, the Montreal fire department has the power to make the repairs and charge the owner in absentia, or even seize the building. New fire safety bylaws proposed by the department usually are passed promptly by the city's legislators.

**Open Fires** – In Vancouver, open fires are not permitted within the city limits even on residential properties. The sole exception is open fires for religious festivals, such as Chinese New Year and Hindu Divali, and shows using pyrotechnics. The exceptional situations must have a permit.

**Fireworks** – In Vancouver, BC fireworks are allowed to be used only on Halloween, the traditional Canadian day for fireworks, and only if a permit has been issued. The permits can be obtained on-line by successfully completing a 10-question test. Fireworks safety information is included in the on-line process. The test raises awareness of firework dangers, and one must get a perfect score to get the permit. Alternatively, one can go to the prevention office and apply for the permit there. The use of on-line questions is innovative. While the test is easy, and the applicant can repeat it until they pass, it does require the applicant to know 10 points about fireworks safety.

## Provincial and Local Campaigns

Every Canadian province and city contacted in this study had 1) an ongoing campaign to promote working smoke alarms in every residence and 2) campaigns to reduce leading causes of fire and instruct people on what to do in case of a fire. Data in many cities

and provinces show that many fatalities still occur in homes without a working smoke alarm.

A key practice in Canada is using consistent messages in multiple cities and whole provinces or the nation if possible. Repeating consistent messages on a variety of fronts increases their recognition and retention.

Below are ideas for residential public safety programs in addition to the ones discussed above that are targeted to schoolchildren, the elderly and disabled, and ethnic groups. More details are provided for some programs that were briefly mentioned earlier.

***Public Fire Safety Council Programs*** – The Public Fire Safety Council in Ontario puts together materials for spring and fall provincial and local campaigns across Canada. It “Canadianizes” prevention materials from NFPA, such as Risk Watch. The Council’s materials were used in most communities visited in this study. By having the Council solicit industry funding, which it is uniquely empowered to do by law, fire departments pay only about 25 cents on the dollar for purchasing prevention materials. This savings greatly increases use of the best materials.

***Zero Tolerance Campaign*** – The Ontario Fire Marshal encourages a balance between public education and enforcement of fire safety laws regarding smoke alarms. The homeowner, landlord, and tenant are educated on the requirements for smoke alarms, and may even get one alarm installed by the fire service in some cities. But on the other hand, the homeowner, landlord or tenant may be fined or imprisoned for non-compliance.

The new provincial watchword is “Zero Tolerance.” While this is a relatively unusual philosophy for residential fire safety in North America, it is a common philosophy for dealing with drunk driving. Zero tolerance for code violations long has been the policy in as diverse nations as Switzerland, Germany, Japan and China for serious fire safety lapses that lead to casualties. Ontario’s efforts are no less than an attempt to change cultural attitudes toward fire. Instead of sympathy toward the homeowner or tenant who experiences a tragic fire, but neglected to provide or maintain smoke alarms, the new policy is to hold them accountable just as one might do for a drunk driver who killed someone. Societal attitudes in the United States and Canada have changed over the last several decades toward drunk drivers: they are socially condemned and usually punished if they kill people. But, if the same individual has a preventable house fire that kills children, he or she might get sympathy and rarely a penalty. Ontario is trying to change this attitudinal and cultural inconsistency.

The zero tolerance policy receives support from prosecutors, the courts, and political leadership who push for penalties despite an already crowded prosecutorial environment.

The Ontario Fire Marshal said that this policy was backed by the courts when he was chief in Niagara Falls, Canada, and it led to \$1.2 million in fines collected the first year it was implemented there.

***Provincial Support to Local Smoke Alarm Programs*** – The Ontario Office of the Fire Marshal has developed a program called “*Alarmed for Life*,” to help fire departments in the province run and evaluate their own smoke alarm programs under a common, province-wide umbrella program. By mid-2008, 393 of the 415 municipalities in Ontario had smoke alarm programs, and the rest were expected to have them by year end. They are provided with details of how to run a program, the materials for the programs, and guidance on how to evaluate the program. They are asked to do spot audits to evaluate compliance by homeowners and are provided with the survey questionnaire to do so. The most innovative concept here is that the Office of the Fire Marshal is requiring communities not just to have smoke alarm programs but to evaluate them.

***Purchased or Donated TV Time*** – TV is often used by the fire service to reach large numbers of the public with safety messages, whether as part of a campaign or spot announcements. Typically, the messages are run free of charge and the stations chose the times at which to run them—mostly late at night. Newer thinking is to buy or obtain better ad time slots to reach more of the target audiences. In Ottawa, fire safety ads are run during the most popular programs of targeted subgroups.

Ottawa received donations from private sponsors of \$600,000 in a recent year for developing and broadcasting fire safety messages. The paid ads yield much higher viewership than the usual public service announcements. Ontario has found that many businesses want to be associated with the fire service’s high reputation and gain trust with the public.

Toronto, Ontario has an annual budget of \$20,000–\$30,000 for prevention ads. To leverage resources, the city teams with other cities in its metropolitan area of 8 million, which comprise half of Ontario’s population—a huge TV market. The cities together purchase media time that reaches all of the area.

The fire safety ads can be short “interstitials” of about 15 seconds duration that run in the middle of selected TV programs. The short messages are well-crafted. One interstitial stated the requirement for smoke alarms and then showed what can happen when one is absent. The scenario was a home filling with smoke while a father slept. The interstitial ended with cries of “Daddy, help me! Daddy, help me!” from his children in nearby rooms. It gets across an important reason for having smoke alarms by using a strong emotional appeal.

**News Conferences** – The Ontario Fire Marshal takes a highly visible role in prevention education by going on TV shows with information about fire prevention issues. For example, in December 2008, he collaborated in a news conference with the fire chief of Toronto to promote cooking and seasonal fire safety. He publicized the fact that the province had reached 100 fire deaths in the year to date. During the news conference fire prevention officers demonstrated safe cooking—not leaving cooking unattended—the dangers of cooking while intoxicated, smoker safety, and the importance of working smoke alarms.

Figure 14 shows the press conference setting, which is now in Toronto Fire Station No. 5. Small sets were erected for a playlet of someone cooking and then being distracted by a phone call in another room, with the unattended cooking eventually catching fire (Figure 15). They also had a prevention official act as an intoxicated smoker. Following the press conference and demonstration, the Fire Marshal and Fire Chief gave interviews on camera and to print media (Figure 16). The well-thought out, coordinated press conference received prime time news coverage on several stations. Also present were some reporters for local ethnic newspapers.

**Figure 14: Media Coverage of Ontario Fire Marshal and Toronto Fire Chief Joint News Conference Promoting Holiday Safety**



**Figure 15: Ontario and Toronto Joint Press Conference Demonstrated Danger of Unattended Cooking**



**Figure 16: Interview of Ontario Fire Marshal After Presentations on Fire Safety**



***Media at Fires*** – Ontario encourages its fire departments to proactively engage the media. Fire investigators and the local fire service are instructed to discuss the causes of fires, the presence or lack of smoke alarms, and any safety practices from school or fire safety house lessons that were applied. Often this engagement with the media occurs at the scene of a fire.

***Use of Political Figures*** – Toronto uses political figures such as the mayor and lieutenant governor to attract media and citizen attention to prevention programs. Asking them to be involved in the publicity is also a way to raise their awareness of fire safety programs and help obtain resources for them, or at least backing of the redistribution of fire department resources to increase prevention.

***Province-Wide Messages*** – Ontario has developed a fire safety message for each leading cause of fires. The desire is to have the public receive consistent, reinforced messages at home and, work, and through various media. Each fire department does not have to have the creative talent to come up with appropriate messages and high quality education materials.

***Fire Safety Information Cards for Fires*** – Each fire vehicle in Ontario has been issued a set of large index cards developed by the Ontario Office of the Fire Marshal. Each card addresses a common cause of fire (e.g., cooking, children firesetting, smoking) or a mitigation factor (e.g., smoke alarms, extinguishers). This gives each firefighter some basic knowledge to impart at the scene of a fire or whenever asked by a member of the public. The cards help assure that consistent messages are delivered across a department and in sync with city and province-wide messages.

***Slogans/Catch Phrases*** – A hallmark of many campaigns is their slogan. As with advertising campaigns for products and services, a catchy phrase can increase awareness of a program, and help tie specific messages to a larger strategy for awareness. The slogans also can help the media to report on prevention.

Toronto's prevention division described their program to reduce fires and casualties as a "War on Fire" in 1996–1997. Prevention programs and requests for department resources were called efforts in the war on fire. New campaigns were launched as "another battle in the war on fire." This concept had traction with the media, who started asking the fire department, "What is new in the war on fire?" Despite its high-profile success, the slogan stopped being used after the start of the Gulf War. It also was observed that the same slogan seemed like old hat after a while, and attracted less media attention.

At present, Toronto is calling its public fire education program “Project Zero,” because the desired goal is to further reduce fire deaths from the present 15–16 fire deaths per year to zero deaths. While this is an ambitious goal, the slogan is clear and simple to grasp.

**Grocery Stores** – Ottawa has used supermarkets and grocery stores as a choice venue for firefighters to hand out brochures. Ottawa also use the stores’ parking lots for safety house demonstrations about how to escape from a home.

**College Residences** – Ottawa goes to on-campus college residences to educate students on the dangers of dormitory fires. The Office of the Fire Marshal produces a publication with advice on fire safety practices for college students living away from home for the first time and those returning to college or university. Titled *Safe Student Accommodations 101*, it raises awareness about potential safety hazards in apartments and other accommodations. Tip sheets for parents are also made available.

**Battery and Smoke Alarm Installation or Replacement** – Most fire departments have campaigns either throughout the year or at certain intense times at which they promote the need for smoke alarms and their maintenance. As described earlier, many of the replacement campaigns are associated with home visit programs.

**Smoke Alarm Checks During EMS Visits** – When responding to a medical call, Brampton firefighters often check if there is a working alarm on each level of a home. Since higher fire risk homes also often are more likely to use EMS services, this small extra time in the home helps reach a hard-to-reach group. The firefighters not immediately involved in the emergency can do the smoke alarm check.

**High Rise Residential Program** – Brampton makes presentations to groups of residents in high-rises, especially those with substantial numbers of elderly. The programs often are conducted by a public educator and a fire safety officer, the latter to answer technical questions about the structure’s fire safety. Presentations are given in the early evening to attract older citizens.

**Featured Fire Station for Tours** – Brampton uses one particular fire station for most tours requested by groups of children or adults. This enables the department to provide consistent and quality education because it’s easier to make sure one station provides good fire safety education than many. Moreover, some of the firefighters assigned to that station are hand-picked for the purpose.

**Joining Anti-Smoking Campaigns** – The Canadian Council for Tobacco Control has a number of smoking cessation programs. The fire service has built on the reduced smoking theme with a campaign message of “What have you got to lose?” with the tagline

that smoking is the leading cause of fire deaths in homes. The campaign recommends quitting to improve fire safety as well as health.

***Cooking Fire Demo Trailer*** – Waterloo Fire Service built a cooking fire simulator in a mobile trailer. After research on similar efforts worldwide, they borrowed a concept used in New Zealand. In the live demonstration, a pot of cooking oil is left heating unattended on the stove until it bursts into flames, showing how quickly a cooking oil fire can start. The second phase of the demonstration involves a firefighter in turnout gear pouring a glass of water into the burning pot of cooking oil, which is many people’s first reaction. The result is a near explosion of fire that quickly rolls over the entire simulated kitchen ceiling and out the front of the trailer; one immediately feels the heat even from 20 feet away. Figure 17 and Figure 18 show the sequence. After extinguishing the fire, the firefighters conducting the demonstration then relight the fire and show how to safely put a lid on such a fire, which quickly extinguishes it. The trailer can be towed to fairs, parking lots, and other places.

**Figure 17: Beginning of Cooking Oil Fire in Waterloo’s Fire Demonstration Trailer**



**Figure 18: Results After Cup of Water Is Poured Over Cooking Oil Fire**

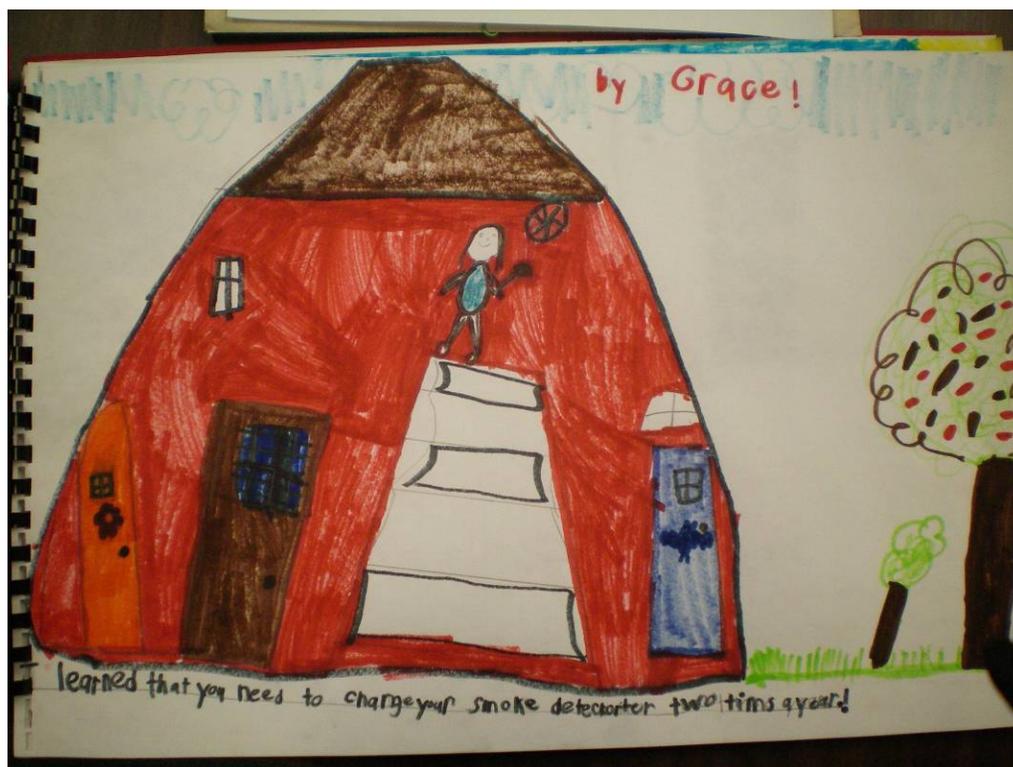


***Union-Sponsored Campaigns*** – In British Columbia, the professional firefighters organized a Burn Fund organization that undertakes a variety of activities to prevent fires and burns, and assist burn victims.

One program, called “Water Burns Like Fire,” emphasizes that scalding water can be as damaging as flames. A key target group for this campaign is new parents. A brochure and thermometric card is given to each new parent in local hospitals, as part of other giveaways they receive. The card is dipped into tap water left on hot only and indicates if the household water heater temperature needs to be reset to prevent scalds.

Another Burn Fund program is support of “Burn Awareness Week” each February. Children in grades 1–7 can use an interactive, on-line computer program to get information on topics such as scalds, kitchen fires, candles, and matches. Across the province of British Columbia, 1,400 schools have access to this program and about two-thirds actively participate via school computers. A student fire safety poster contest is associated with this program: the best posters result in cash awards to the winning students’ schools. One of the posters (Figure 19) shows someone testing the upstairs stairway smoke alarm.

**Figure 19: British Columbia Schoolchild Poster Showing Testing Of Upstairs Smoke Alarms**



***Emergency Preparedness*** – A lieutenant in the Vancouver public education unit specializes in public education for emergency preparedness, which includes fire safety in the home related to disasters. The program is called “You’re On Your Own” (YOYO). It

focuses on what you must be prepared to do if public safety services cannot reach you during an emergency situation. A two-day course that includes extinguisher use and first aid is offered to business employees. About two to six classes are taught each year, with about 22 participants per class. A premise of the program is that preparing for major disasters will help prepare one for all emergencies.

Montreal is prepared to broadcast information on what to do in emergencies, and mobilize both its inspectors and public educators to spread a message quickly in a neighborhood if communications are cut off. During an ice storm that cut power to part of the city, the fire department went on the radio to broadcast messages about using candles and portable heaters safely. If people are evacuated to shelters, the fire department goes to the shelter to ensure it is fire safe and to communicate how to reside there safely.

***Arson Neighborhood Alerts*** – When an arsonist strikes a neighborhood, the Montreal Fire Department immediately informs the 2-3 block area around the incident on how to prevent further arson, and to be on the lookout for a suspicious person. If necessary, they will flood the neighborhood with inspectors and public educators to go door-to-door to quickly spread the information, such as when an arsonist started burning sheds near homes.

***Post-Fire Neighborhood Blitz*** – Montreal may follow up the morning after a fire in a home with a neighborhood blitz if there was a correctable problem in the fire that the rest of the neighborhood can learn from, such as incurrence of a casualty where there were missing smoke alarms. Inspectors and public educators go through the neighborhood door-to-door, checking smoke alarms and even talking about alarms to people on the street.

***Superboarding Vacant Homes*** – Surrey has a program for abandoned homes called “superboarding.” They use stronger materials than the usual boarding to secure a vacant home and keep vagrants out. This reduces both incendiary fires caused by arsonists, and fires unintentionally caused by squatters.

***Fire Truck Messages*** – In Ontario, many fire vehicles are used as moving fire safety billboards. These messages on the vehicles help fire officers give impromptu fire safety lessons when kids gather near a fire truck at an incident, as well as being seen whenever the truck is out. The firefighters also have cards with messages to deliver, as noted earlier.

***Fire Station Design*** – New fire stations in Brampton, Ontario are being designed with more glass windows and walls. This is an attempt to connect with residents by allowing them to see into the fire departments and create a visual safe haven. This is in contrast to the former fire department culture of closed doors.

## Consumer Products for Safety

Some consumer products that cause fires are being replaced by safer ones. Examples are cigarettes, candles, and stoves. Other consumer products are promoted to mitigate fires or help people escape, such as smoke alarms, escape ladders, and extinguishers.

**Extinguishers** – Extinguishers for use on small home fires are actively advocated in some Canadian cities (e.g. Ottawa) and dissuaded in others (e.g., Brampton). Some Canadian fire departments provide hands-on training in the use of extinguishers, primarily to employees in the workplace, but the training carries over to the home. The general advice is to use extinguishers only on small confined fires where an escape path is open, and only if you have been properly trained to use them.

Ottawa provides a two-part training session, which includes a lecture on the use of portable extinguishers followed by a hands-on session that uses a fire extinguisher trainer. Participants practice extinguishing a propane-powered live fire, which is safely controlled via remote shut-off by the instructor. In 2007, Ottawa conducted 41 extinguisher training sessions.

Vancouver offers classes with hands-on extinguisher training for about 400 people a year. Each person is charged \$30 to attend the class to offset out-of-pocket costs for recharging the extinguishers and the fire prop. There are 10–20 people per class. The city is planning to seek out cooking classes, college and industrial labs, and shops to offer expanded extinguisher training where risk, and the potential for effective use of extinguishers, is high.

**Cigarettes** – Canada passed nationwide fire safe cigarette legislation requiring cigarettes to have the same regulations and testing protocols for reduced ignition propensity (RIP) as the State of New York, which was the first state to adopt RIP standards. As of the end of 2008, there was little evidence that the fire safe cigarettes legislation were working as expected in Canada. Ontario, which has the best fire statistics of any province, had an increase in smoking-related fires and fire deaths in 2007, the first full year the standard was in effect. In 2008, they still were higher than before the standard went into effect, but fire deaths from other causes also were up. They believe that many smoking fires are being started by contraband cigarettes bought on Native Canadian reservations or brought in from the United States. There also seems to be an increase in smoking-related fires outdoors, possibly, they speculate, from people driven outdoors to smoke. There has not yet been the expected dramatic decrease in smoking related deaths, and there have been some deaths where the cigarette was known to be of a kind tested as reduced ignition propensity. At this writing, Health Canada had a study underway (2009) to examine the results nationwide.

**Stoves** – Ontario is considering whether to recommend a requirement for stove-top devices to shut off a stove if temperatures exceed a set threshold. (Such devices are required in Japan, as discussed in the previous report in this series.)

## **Partnerships**

A crucial aspect of Canadian fire prevention is growing use of public and private partnerships to leverage resources and identify high-risk homes, with the result being greater impact at less cost.

Brampton formalizes the process with an “Accident Injury Prevention Network,” which allies the fire service with the Red Cross and other public and private agencies to leverage resources used in prevention programs.

**Private Industry** – A recurring theme across Canada is the outstanding support for prevention programs being obtained from private industry. Some examples:

Ottawa asks industry to assist in funding its prevention programs—“Who wants to be a good corporate citizen to sponsor fire prevention materials?” In response, Duracell provided 50,000 batteries for use in the home visit program. Kidde Corporation provided discounts for smoke alarms distributed by the fire department and discounts for homeowners receiving coupons from the fire department for purchasing additional alarms. Ottawa professional baseball and hockey teams donated money. Shell and a major insurance company funded publication of 100,000 copies of an elementary school coloring book. A major TV station, CTV, donated \$600,000 worth of air time, use of its advertising and production services, and a news director and anchor as host at events.

Ottawa is required to advertise opportunities for industry to make donations, just as is done to solicit bids for purchases of service or equipment. This is an effort to be fair to various businesses who want the opportunity to be associated with the high public standing of the fire service.

Waterloo and its nearby communities obtained large-scale support from local businesses to help build and maintain their joint safety village, their mobile kitchen fire display, and their mobile fire safety house, as was discussed earlier. In one innovative fundraising mechanism a well-known local realtor produces maps of the region and sells ad space on the map to businesses and organizations. He distributes the maps free of charge in quantities of 50,000 or more. In a growing community, updated maps are useful and retained.

The Public Fire Safety Council solicits money from a number of major Canadian industries. For example, Canadian Tire, an auto accessory chain, has over 310 of its more

than 400 stores participate in national campaigns. It also allows the fire service to park vehicles in their parking lots during Fire Prevention Week to promote smoke alarms, which is mutually beneficial because the chain sells the alarms and this program attracts people to their stores.

**Wealthy Donors** – Some individuals who have had personal involvement in fire or life safety emergencies are not only donors but also champions of some prevention education facilities in Canada. The Life Safety House in Brampton was funded by a famous Olympic ice skater, as discussed earlier.

**Unions** – The British Columbia Professional Firefighters Association runs a Burn Fund, and raises money for a variety of fire and burn injury prevention programs discussed earlier. Thousands of man-hours a year are donated by the professional firefighters in Burn Fund activities. One way they raise money is an annual Christmas light display they manage and staff in Stanley Park in Vancouver. They get over 200,000 visitors who are charged an entrance fee and solicited for additional donations. They also receive part of the miniature train ride fares. The fund also sells a male firefighter calendar that raises \$1 million a year, and staffs a concert and marching band that performs at many events, raising money and awareness of burn safety messages.

The Burn Fund is well along toward creating a \$25 million burn prevention building, one floor of which will be devoted to public education with interactive displays. Another floor will be a residence for families of burn survivors while they are initially treated in a hospital. A third floor will be a research lab for improving treatment of burn injuries.

**City Departments** – Many Canadian fire departments undertake prevention in partnership with other city or regional departments. Examples cited earlier include partnerships with police, public health (including visiting nurses), school systems, ambulance services, social services, and housing agencies. Usually these partnerships are for specific programs. Sometimes the partner agencies share costs of safety centers (e.g., Brampton police and fire share; Ottawa public health and fire share). In Ottawa, the fire department has a formal partnership agreement with the Community Housing Department to deliver prevention programs to residents of its housing developments.

To help maintain partnerships, Ottawa provides feedback to each partner on the outreach made with the materials they provide or other ways in which they participate.

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In summary, Canada has had many changes in fire safety education and residential fire protection in the past decade. Some important examples are the increased use of

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residential sprinklering in British Columbia; the increased use of smoke alarms and strong enforcement laws for them in Ontario; and the increased use of home visits by the fire service on a city-wide scale, especially in Ontario and Quebec. A large percentage of children receive fire safety education during their elementary school career. Associated with these programs are significant reductions of fire deaths. There is a wide range of alternatives for implementing these successful fire safety programs on a broad scale within existing fire department budgets.

### III. PUERTO RICO

Puerto Rico’s population is approximately 3.9 million. The largest city is the capital, San Juan, with a population of about 434,000, followed by Ponce, with a population of approximately 265,000. The City of San Juan is a major tourist area and contains dozens of high-rise hotels, resorts, and condominiums. There is a tropical rainforest in southern Puerto Rico, while the southwest portion of the island is dryer and prone to wildland fires during seasons of low humidity and rainfall.

#### Overview of Puerto Rico Fire Service

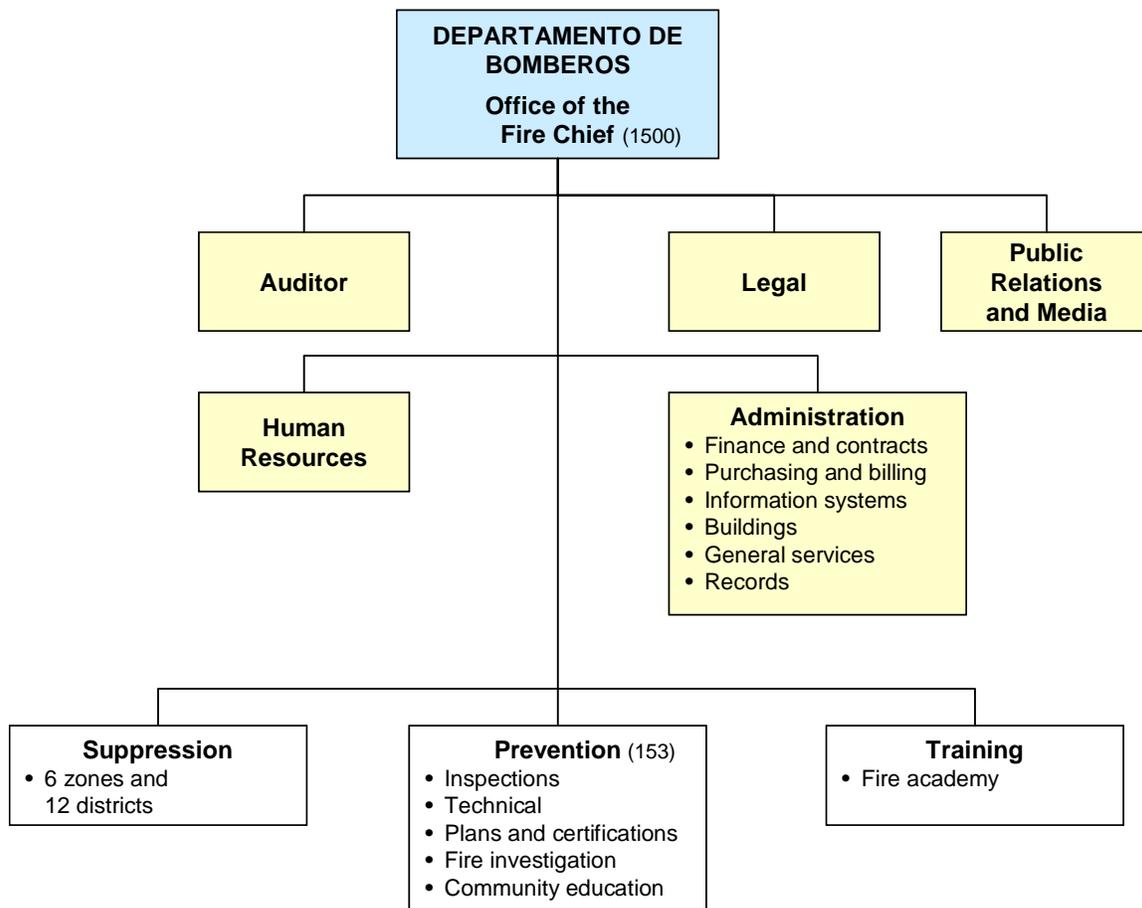
The fire service in Puerto Rico, or Cuerpo de Bomberos de Puerto Rico, is a national fire service. All training and programs derive from the headquarters located in San Juan, which is shown in Figure 20.

**Figure 20: National Fire Service Headquarters of Puerto Rico**



**Fire Service Organization** – The fire service is led by a fire chief appointed by the Governor. The organization chart is shown in Figure 21. Fire prevention reports directly to the chief, and includes the full range of prevention services, including public safety education.

Figure 21: Fire Department of Puerto Rico, Chart of Organization



The national fire service has 96 fire stations distributed throughout the island, and 1,500 firefighters. The fire service is divided into six fire zones (regions) and further subdivided into 12 fire districts. Each fire district is led by a captain and each fire zone by a battalion chief. The captains and battalion chiefs report to the fire chief at headquarters.

The prevention bureau has 16 fire and arson investigators, and 125 fire inspectors. In addition, each of the 12 fire districts has a fire prevention educator assigned to it. So there are 153 people assigned to prevention, about 10 percent of the workforce—a significant commitment to prevention.

Firefighters receive 12 weeks of training at the fire academy. One course is devoted to residential fire education—an 8-hour seminar presented by the head of fire prevention or a fire inspector. The course covers how to identify the fire education needs of the population in one’s response area, and how firefighters can design strategies and messages that are appropriate to their citizenry and which address the particular risks they represent.

**Safety Culture Change** – On December 31, 1986, 97 people died and almost 150 were injured in the DuPont Plaza Hotel arson fire in San Juan. The Governor appointed a special commission on fire safety to review the lessons learned from the fire and to assess the status of the nation’s fire safety. Three months later, in March, 1987, the commission delivered *The Commission on Fire Safety Report to the Governor*, in which they noted that: “It is a worthy legacy to instill an attitude and acceptance of responsibility towards fire safety. Puerto Rico has the ability to fulfill its leadership role with reasonable commitment and investment.”

The commission’s report was a catalyst for change that is represented in today’s fire service of Puerto Rico. The report detailed dozens of recommendations which fell into four main categories. Category 1 was *Improve public fire safety education and awareness*. The commission acknowledged a widespread cultural impediment to public fire safety in Puerto Rico: a mistaken belief that structures built of concrete, as many are on the island, ensure safety from fire. So, one priority became to educate people that fires in homes feed off the interior contents and finishes present in every home, regardless of construction type. The messages emphasize that the furniture, plastic, paint, upholstery, books and papers, clothes, and so forth are what burn, fueling a fire and creating toxic smoke and gases.

The second category of recommendations, “*Implement Immediate and Retrofit Fire Safety Measures*,” was directed at hotels and high rise residential and public assembly occupancies. Recommendations under this category featured reducing fire hazards, training employees, and promoting sprinkler legislation. The commission called for designated “Fire Safety Directors” who would develop a fire brigade and oversee occupant preparedness activities in high risk residential and other occupancies. A major goal has been to educate people, especially residents of high-rise apartments or condominiums, that they need to identify and practice escape routes and protocols in case of a fire. Many high-rise residences do not have automatic door closers or proper exit lighting.

One unfortunate outcome of the DuPont Plaza fire was that newscasts showed hotel guests being evacuated by helicopters from the roof, which left an impression among some residents that if there is a fire, all one has to do is go to the roof of your building. Public fire safety messages point out that fire escapes sometimes do not open in the right direction, and most roof tops are not suitable as helicopter landing pads.

The third category of recommendations was, “*Revise Building and Fire Safety Laws, Codes and Regulations*.” Major improvements to code enforcement and built-in protection have since been enacted. The last category from the commission’s report was *Revitalize the Fire Service*. Recommendations under this category called for upgrading the professionalism of the fire service through better training, equipment, organization, and

facilities. Emphasis was placed on the duty of the fire service to promote public knowledge about how to prevent fires.

**Fire Data** – Puerto Rico uses NFIRS, though not consistently in all districts. Death and injury data are maintained on EPI INFO, a public health surveillance software package. Fire data for the most recent year available, 2007, shows a total of 17,045 reported fires or about 4.4 per thousand population, vs. 5.2 per thousand for the United States. About 40 percent of the fires were outdoors fires, 13 percent fires in structures, and 15.6 percent automobile fires. (In comparison, for the United States, about 43 percent of fires are outdoor fires, 35 percent are in structures, and 13.8 percent in automobiles.)

Over a period of 14 years (1994–2007) the annual number of fire deaths fluctuated up and down with no apparent trend. Deaths ranged from a low of 9 in 1996 and 2007, to a high of 27 in 2001. The average number of reported fire deaths annually for that time period was 16, or about four deaths per million, about one-third of the United States fire death rate. The rate of fires is somewhat lower than in the United States, but the rate of fires in structures is much lower. Because most fire deaths occur in structures, the low structural fire rate may be one reason for the lower fire deaths rate in Puerto Rico. However, the Puerto Rican fire service said that fire deaths may be underreported, so one cannot reach a definitive conclusion about the data.

**Risk Factors and Prevention Activities** – According to the head of residential fire education, there are several key risks that have been primarily responsible for fires and fire casualties in Puerto Rico. Fire prevention educators try to target these risks in the programs they deliver. The main risk factors are:

1. Overloaded, closed-in or blocked electrical outlets with combustibles next to them
2. Electrical work not to code
3. Lack of smoke alarms
4. Lack of home escape plans and understanding how to escape
5. Lack of understanding the difference, and sometimes conflict, between security and safety
6. Lack of supervision of young children
7. A syndrome of 3 factors: alcohol, smoking, and living alone
8. False sense of security from inflammable building construction materials
9. Belief that the best way to escape high rise fires is to run to the roof.

For example, in one fire a 7-year old child with special needs was in bed hooked up to a machine that helped with her condition. She also had an air conditioner which her father had installed. The connection to the electrical socket was pressured by the bed against the wall. The socket overheated and started a fire.

Many home owners and occupants in Puerto Rico, especially in higher crime areas, protect the home from intruders by installing window bars. The bars do not open from the inside and pose a problem for escaping from a fire. Smoke alarms frequently are absent.

Unattended cooking led to a fire in a house with no smoke alarm and limited egress. The adult and several children made it to the door but could not escape because the door was locked and the adult could not find the key. The priority for residents has been on protecting homes from intruders to the detriment of protecting the inhabitants from the inside danger of fire. Noted the head of fire prevention, “We have to become as concerned with getting occupants out as we are with preventing intruders from getting in.”

The security problem appears to be based, in part, in the Spanish language. In English there are two words, security and safety, but in Spanish there is only one word, “seguridad.” According to the fire service, if one asks a Puerto Rican what security means they would be likely to say, “Protecting my house and my family from an outside attack.” They would be less likely to think about protecting the house on the inside with smoke alarms, fire extinguishers, exit plans, and easy-to-locate keys to unlock the doors.

## Home Visits

Use of home visits by the fire service has been very limited in Puerto Rico, but there is a policy change in progress. Generally, home visits are made on a case-by-case basis as well as after any major fire. Following a residential fire with casualties or significant dollar loss, firefighters canvass the neighborhood with fire prevention brochures, give safety presentations to neighborhood groups, and will go into homes to identify risks upon owner request. Figure 22 shows a home visit in progress; note the locked security fence.

**Figure 22: Puerto Rican Firefighters Conducting a Home Safety Visit**



In 2008, the fire chief made a radio announcement about the department’s plans to develop a proactive program that would identify high risk homes, conduct fire risk assessments, provide education, and install smoke alarms. The radio program encouraged listeners to contact their fire stations if they were interested in participating once the program was underway, and stations did receive calls from the public. The program was developed over a few months and in February, 2009, the program was initiated in the City of Ponce where four children had died in a fire in 2008. Officials introduced the new task force that will go to homes and help homes to be more fire safe. Residents are encouraged to purchase fire extinguishers and keep them handy, a point that is reinforced in the fire and life safety brochures that task force members give to home occupants. The program will be expanded to cover different parts of the island as it evolves.

## **Reaching School Children**

By far, the greatest emphasis in fire prevention education in Puerto Rico is with children. Following a year where Puerto Rico experienced a large increase in the number of children who died in fires, fire prevention educators decided to target the causes of these fires. In many cases the fires were started by the children themselves while playing with matches and lighters. It is through youngsters in pre-school and elementary school that the fire service sees the best chances for lasting results and safe practices that will carry into adulthood.

***Pre-School*** – Puerto Rico uses a version of NFPA’s Spanish language edition of their preschool program entitled “*Mis Primeros Pasos.*” The program covers eight basic lessons of fire and burn safety including what to do when the smoke alarm activates,

reasons not to play with matches, and how to crawl low in smoke. The eight lessons are reinforced through short musical numbers provided with the curriculum.

**Music** – Music is a big part of the Puerto Rican culture, and the fire service feels it is important that the music in the preschool and early elementary education fire safety lessons reflect the sounds and rhythms which are popular. A limitation of the songs and music that came with *Mis Primeros Pasos* was that they were not tailored for inhabitants of Puerto Rico and therefore were not as culturally relevant as they could be. To address that situation, the Department of Fire Services recorded their own music using hip hop rhythms and verses in rap to project the fire safety messages they want to teach. They experimented with groups of children who were first given safety talks and then the rap fire safety song. Children were enthralled by the song and thus was born the “*Bombero Rapero*,” the firefighter rapper. The program has drawn interest from United States fire departments, particularly those with a sizeable Puerto Rican population (there are more Puerto Ricans living on the mainland than in Puerto Rico). The creator of the music received the highest award given to public employees in Puerto Rico, a sign of the importance the government places on reducing fire casualties. The rapping firefighter (“*Pandilla de Bomberos*”) is shown in a newspaper photo in Figure 23. This figure also illustrates the picture coverage that fire prevention programs receive from the news media.

Figure 23: Newspaper Article Featuring Fire Safety Education for Children in Puerto Rico



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The Puerto Rican Emergency Management Agency has provided funding to the Department of Fire Services to purchase costumes and sound systems for the child fire safety program. Dollars from the Assistance to Firefighters Grant program and through Citizen Corps also have been provided for several fire safety initiatives.

The primary level lessons and the new music are presented at schools, day care centers, and other venues with young children as requested by the schools. Almost 1,000 requests are received annually. Most presentations are conducted by staff from the fire service headquarters. The 12 fire prevention educators located in districts throughout the island also teach the program, in addition to their other residential fire prevention duties. As noted during an interview, “12 people go out every day fighting fires in the consciousness of the people.”

The latest addition to the island’s teaching tools is a puppet theatre where mascots and puppets present fire safety dialogues, as shown in Figure 24.

**Figure 24: Puerto Rican Firefighters Using the New Puppet Theatre**



**Teaching Teachers** – The fire service has tried for many years to get the fire safety curriculum incorporated into schools on a permanent basis, but have found that to be a challenge. As an alternative, they delivered approximately 12, eight-hour training seminars on how to teach *Mis Primeros Pasos* to 250 teachers around the island.

**Mascot** – The fire service uses mascots to maintain the attention of young children when teaching fire safety. They have used NFPA’s Sparky the Fire Dog, but also have created their own costume—a little fire hose named “*Manguerita*.” A firefighter dons the

*Manguerita* costume and enters the classroom as though he is one of the students. He sits with the children and asks questions of the firefighter who is teaching the fire safety lessons, questions such as, “Can I play with matches?” This approach engenders a dialogue between the children and the instructor which in turn enhances the learning.

***Fire Safety House*** – Fire educators use a mobile fire safety house trailer that has been fitted with instructional aids, a small bedroom, a smoke alarm that sounds, and other components which allow children to practice the lessons they learn. The trailer can be used as a classroom for small groups, and has little chairs for children to sit in while hearing about safety. After the lessons, children are certified as little firefighters and given certificates.

## Reaching Juvenile Fire-Setters

The Department of Fire Services reports that there are few problems arising from juvenile firesetters in Puerto Rico, and they do not have a special program to provide education, counseling, and referral. The fire service deals on a case-by-case basis with juveniles who intentionally set fires.

## Reaching Elderly and People with Disabilities

There have been some sporadic efforts to reach the elderly and to address the special fire issues for people with disabilities.

***Smoke Alarm Giveaway*** – The Hispanic division of the International Association of Fire Fighters (IAFF) provided 1,000 smoke alarms for elderly citizens which were installed in homes around the island. Fire safety meetings were held in homes and in multi-family units for the elderly as part of the smoke alarm give away. Home Depot contributed to this effort as well. In the past, a private company, BIC, provided smoke alarms for the fire department to distribute to senior citizens during a smoke alarm giveaway program.

***Escape Training*** – The fire service has worked with the Muscular Dystrophy Association (MDA) to develop fire safety solutions for individuals who are not mobile and find themselves in a fire. The application of “Stop, Drop, and Roll” and “Crawl Low in Smoke” obviously does not work for the mobility impaired. Both the fire service and MDA found the task challenging; there is very little information and research on fire and the disabled. The fire service did develop some tips for the physically disabled who can not avoid smoke and toxic gases by exiting quickly or crawling low. Fire prevention staff suggested that wet towels be used to cover the head, nose, and mouth until escape is possible and the fire service arrives. Additional staff time and funding are needed to develop a more substantial program.

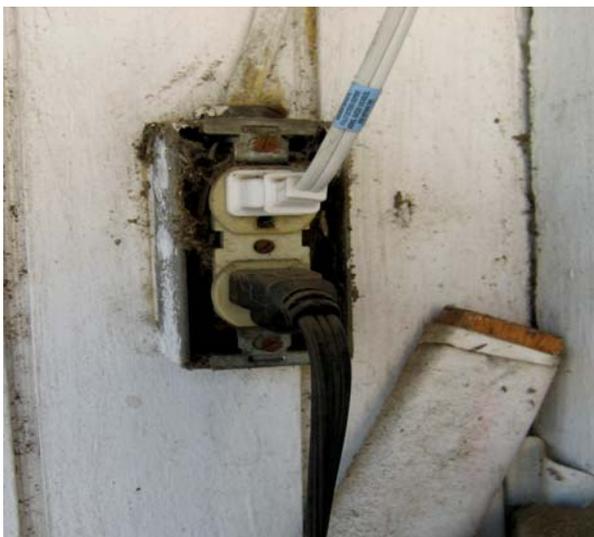
## Reaching Immigrants and Ethnic Groups

Puerto Rico is largely homogeneous ethnically. The vast majority of residents are white and of Spanish origin (80.5 percent). Other ethnicities represented are: Black (8 percent), Amerindian (0.4 percent), Asian (0.2 percent), mixed and “other” (10.9 percent). There has not been a need for special fire prevention outreach to different cultural sectors.

## Consumer Products for Safety

**Circuit Breaker** – Besides smoke alarms and sprinkler systems, the most noteworthy consumer product to enhance fire safety was circuit breakers. A common fire cause in Puerto Rico residences is electrical arcing from frayed or broken electrical appliance cords and inadequate outlets, as shown in Figure 25.

**Figure 25: Dangerous Electrical Outlets Are a Common Problem in Puerto Rico**



Electric arcs can produce temperatures approaching 10,000 degrees Fahrenheit and typically set fire to combustibles in close proximity to the outlet. What they see most frequently are situations involving appliances with electrical cords that are old, worn, or otherwise compromised and which are plugged into overloaded circuits. Fires caused by arcs are especially problematic during the holiday season. In Puerto Rico, holiday decorations are put up early and maintained into January until *Dia de los Reyes* (Three Kings Day) or longer. Lights and other decorations that depend on electricity add to the dangers present from frayed cords or loose plugs. Traditional circuit breakers are not effective in preventing arcs and are not designed to protect lightweight wires and extension cords plugged into wall outlets. Several fires started by electrical arcs have been fatal.

To address the electrical hazard, the Puerto Rican fire service is promoting installation of a relatively new type of circuit breaker which is really an arc fault circuit

interrupter. The interrupters are logic devices that can detect when conditions are right for an arc to occur, and then activate the breaker to stop the electrical current *before* the sparks and heat are generated. The (United States) National Electric Code, which is used in Puerto Rico, began requiring these breakers in new construction in 2002, but the Puerto Rican fire service is trying to get homeowners to install them retroactively.

## **Partnerships**

***Radio and TV Stations*** – Two major partnerships were identified: radio and TV stations and the Safe Kids program. There are probably more radio stations per capita in Puerto Rico than in most other places in the world, and the Puerto Rican fire service uses them to great advantage. They have developed excellent working relationships with many radio stations and several television stations. The head of fire prevention is also the public information officer, which facilitates incorporating fire prevention lessons into news stories about fires.

The fire service developed a public service announcement campaign on home fire safety and the radio stations broadcast the messages frequently, once every one or two hours during prime hours that reach many people, rather than burying them in the early hours of the morning. The public service announcements tell the public to call the fire department if they want more information and many listeners have contacted the department to learn more, which at least unofficially suggests the messages are getting through.

***Safe Kids*** – Another strong partnership is with the Safe Kids Puerto Rico program, a coalition of health and safety experts, educators, corporations, volunteers, and the government. This program is part of the international Safe Kids Worldwide, which is dedicated to preventing unintentional childhood injury from accidents such as motor vehicle crashes, fires, drowning, poisoning and falls. Home fire safety lessons are promoted in conjunction with the other safety messages delivered through Safe Kids Puerto Rico. The fire service contributes to the greater child safety goals as well by inspecting car seats at fire stations as part of their service to the community.

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In summary, the Puerto Rican fire service dedicates about 10 percent of its staff to prevention, about triple the commitment in mainland U.S. fire departments. Fire incidence is lower than in the United States, especially fires in structures. The fire death rate is a third that of the United States but may be underreported. The greatest prevention emphasis is on reaching school children, and the cultural approaches they use may be

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applicable to United States areas with larger numbers of Hispanic children. Major emphasis is given to the use of circuit breakers to prevent residential electrical fires.

## **IV. MEXICO**

In Mexico, this project focused on one state, Guanajuato, and some cities within the state. The State of Guanajuato is centrally located about 240 miles northwest of Mexico City. There are 46 cities in the state. The climate is warm and dry, with an average annual temperature of 65 degrees. Though nights are cool from October to February, central heating is not commonly used or available. Thus, fire risks from heating and heating equipment tend to be related to space heaters.

Agriculture and manufacturing comprise the most significant portions of the economy in this state. Large ranches owned by wealthier families are farmed by rancheros. Some rancheros also have their own small businesses; for example, they may raise hogs or goats or manage a one-room corner grocery store that caters to the workers and nearby residents. Job opportunities increased when General Motors opened a large manufacturing and assembly plant in Guanajuato, followed soon thereafter by affiliated industries. Most of these industries are located in a new, large industrial park with built-in fire protection to United States standards and occupational safety training for all employees. Fire officials said that the safety training the workers receive at the plants has had a positive impact on home fire safety. Some of the lessons learned at work are transferred to the home environment, for example, being careful with fuels and when smoking outdoors near the structure. The industrial park has a water system and fire hydrants throughout. These are not routinely found in other areas. Residential water typically is supplied from large, roof-top water tanks; wells are the water source outside the city.

### **Overview of Guanajuato Fire Service**

The number of fire stations and firefighters per population served is miniscule compared to the United States and other industrialized nations. For example, the cities of Silao and Guanajuato, each of which has a population of about 170,000, have only one fire station apiece. The Silao station has a volunteer chief who is employed as an industrial safety professional at the GM plant. There are just 7 paid firefighters and 38 volunteers.

Many of the calls to the Silao fire department are for vehicle accidents along the major highways in and around Silao and for technical rescue (rappelling and confined space rescue) in the mountains. Firefighters must learn all aspects of fire and rescue, including hazardous materials response, emergency medical services, vehicle extrication, and structure and wildland fire suppression. They operate mostly with older, donated equipment, usually from the United States, and with limited communications equipment. Response time to fires is about 15 minutes or longer, depending on whether the fire is in the

heart of the city or in the surrounding countryside and off unpaved dirt roads. For this reason, educating the public about preventing and surviving fires is extremely important.

The director of the State of Guanajuato's safety activities includes in his responsibilities strengthening the fire service in the state. Besides his state position he serves as the President of the City of Silao Fire Department and has led an effort to obtain equipment, vehicles, and training. At the same time, he recognizes the importance of prevention, and reflects this mindset in his motto: "*El mejor departamento de bomberos no es el que mas incendios atiende; sino que el que mas incendios previene.*" Translation: The best fire department isn't the one that responds to the most calls; it is the one that prevents the most fires. The government emphasizes that people need to learn to be responsible and protect themselves from fire and other dangers.

The fire station in Silao is used to train teachers on what to do in the event of an earthquake, so they will have some knowledge of how to rescue the students at their schools.

The fire service has almost no code enforcement responsibilities because there are only minimal fire and life safety code regulations. Smoke alarms are extremely rare. Though encouraged in the primary fire safety education program, officials estimate that there are only one or two stores that sell smoke alarms and they typically may have only a half dozen alarms available for purchase.

***Fire and Burn Risks*** – It is the tradition here, and elsewhere in Mexico, to cook food on outside, makeshift units called *comales*, a ceramic or metal plate set over open fire. The *comales* can be set over open stone pits or bricks, or on top of metal containers, and are the surfaces upon which women cook tortillas, vegetables, and meat (see examples in Figure 26 and Figure 27). Note the wooden table on which the *comal* is placed in Figure 27 and the bamboo walls. Wood and dry corn husks are used to light and maintain the fire. These fuels often are found on the floor next to the *comal*, another fire risk. This traditional method of cooking continues to be popular, even though newer homes typically have a kitchen area with a small electric stove. The risks of fires and of burn injuries near the *comales* are high, especially among very young children.

**Figure 26: A Pottery *Comal* at a Public Market in Mexico**



**Figure 27: A Home *Comal***



National and religious holidays are celebrated with fireworks. Each year, those are responsible for numerous, serious injuries. They are another target of prevention campaigns.

Candles are used in family altars, and are another common fire danger and target of public education.

Smoking is not very popular in Guanajuato. As a result, fires related to misuse of smoking materials are less common than fires from other causes, according to local fire officials.

## Reaching School Children

While in the United States the fire department handles most public fire education, with so few firefighters the State of Guanajuato promotes fire safety primarily through teachers of preschool and elementary school children. There are 1.5 million students in Guanajuato, including 250,000 preschoolers.

***State-level Pre-School Curriculum*** – The Mexican Secretariat of Public Education produces a preschool curriculum used in all public preschools. The curriculum is similar to the Head Start program in the United States. The curriculum contains a section on safety which encompasses traffic safety, fire and accident prevention, poison control, and safety from strangers. The goal is to teach children about self protection and developing responsibility for oneself so that they go through life paying attention to risks and dangers, and knowing how to avoid or prevent them. Teaching children about safety is viewed as the best solution to reducing injuries and deaths from fires and other incidents. It is hoped that what they learn will be transferred to the adults at home and carry forward as the younger generation gets older and starts their own families.

***Training Teachers*** – Groups of teachers have been trained to teach young children the eight lessons in NFPA's program, *Mis Primeros Pasos* (My First Steps), as well as other related fire and burn safety tips. About four times a year, an intensive, 3-day training course is provided to teachers (see Figure 28). Day 1 of the course covers fire risks in the home, such as gas tanks, electricity, static, dangers of smoking while using aerosol products, a lighter or a pack of matches can cause more damage than a gun, heavy smoke affects the senses, and how to use an extinguisher. Confined space rescue in both dry and wet environments is taught during Day 2. Teachers try on air masks with respirators and other protective gear. Day 3 is devoted to first aid.

**Figure 28: Teachers in Guanajuato Being Trained to Instruct Fire Safety Lessons**



**Figure 29: Trained Preschool Teacher Explaining Burn Hazards and Smoke Alarms**



**Music and Mascots** – *Chispas*, a large green bird in costume, is a well-known safety friend to youngsters in Guanajuato preschools. He and some newly emerging mascots, such as *Maximo Seguro* (maximum safety), are part of the fire safety program that teaches children not to touch a hot iron, to crawl low in smoke and touch their bedroom door with the back of their hand, and to tell an adult if they find matchers or lighters. Songs and music provide the backdrop for *Chispas* as he appears from behind a closed door to the eagerly awaiting children who clap enthusiastically, anticipating his arrival.

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Different lessons are covered on subsequent visits by *Chispas*. The mascot's picture also appears weekly in a special section of the Sunday newspaper that covers safety in the home and during travel. Local newspapers are more than willing to run stories about safety programs in general and print articles showing children in the classroom learning to be safe.

**Figure 30: *Chispas*, the Safety Mascot**



**Poster Contests** – The government sponsors school poster contests that are popular and draw many entries. The themes have included celebrating without fireworks and how to escape a home fire, among other topics. Prizes are given for the winners.

**Hot Water Safety** – Lessons on burn safety include a discussion about hot water. Children are taught to start their bath or shower with cold water and then add in hot water to arrive at the desired temperature. Preschoolers learn to blow on soup to cool it before starting to eat it.

## State and Local Campaigns

There are few formal public fire safety campaigns outside of the schools, but some safety information is worked into various messages and programs.

**Candle Safety** – Candles are used in conjunction with religious practices and holidays. Mexico is a predominately and heavily observant Catholic country, In Guanajuato as elsewhere many homes have small altars. Occupants light candles at the altars and say

prayers, often leaving the candles lit as is done in churches. An example is shown in Figure 11.

**Figure 31: Example of a Home Altar with Candles**



Candles represent major risks for injuries and fires, and the government has targeted them in its education campaigns, just as Puerto Rico has done. Unattended candles are especially dangerous when small children are in the home.

**Cooking Safety** – As discussed above, the prevalent mode of cooking with *comales* is a source of fires and burn injuries. The fuels—usually corn husks and wood—typically are found on the ground around and near the *comales* and present a fire risk in and of themselves. Storage of fuels for *comales* can endanger the home.

Heat from the *comales* can burn hands, arms, and legs and caution must be used with anything flammable near the flames and heat. Mothers teach their children to be careful around cooking areas, and the risks of cooking and open flames are covered in the school-based lessons. In addition to these messages, the government housing program described below promises to have a positive impact on cooking fire and residential fire risks in the future.

**Milk Cartons** – Most children have cereal for breakfast at least several times a week, so safety officials embarked on a campaign to convince a milk packaging company to devote one or two of the four milk carton panels to fire and life safety lessons. This effort is intended to reinforce safety messages with families, and not just the children. It is an innovative venue. Figure 32 shows a milk carton with safety messages. Note that they are large and colorful, with few words, which increases the likelihood of their being read.

**Figure 32: Milk Carton with Safety Messages**



## **Safer Homes**

Going well beyond teaching fire safety behavior and installing smoke alarms for early warning is to provide homes that are inherently more fire safe than the houses many low income people now occupy in Guanajuato. The State of Guanajuato has developed a housing assistance program designed to move very low income families out of the one-room shacks or make-shift dwellings under trees or in old buses and vans. Such “dwellings” present a constant danger from the materials used in their construction), from the dry

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vegetation surrounding them, and from the inherent risks of a single tiny space that is over filled with the bedding, clothes, and other family belongings (see Figure 33 and Figure 34).

**Figure 33: Example of Dwelling to be Replaced by Safer Housing in Guanajuato**



**Figure 34: Other Examples of Makeshift Dwellings in Guanajuato**



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Through a sweat equity program called “*Mi Casa Diferente*” (My Different Home), in which very high risk population groups, such as the elderly low income families, single mothers with little or no income, individuals with visual or mobility impairments, and victims of natural catastrophes can qualify for and in some cases themselves help construct a new, rudimentary concrete block house with several rooms, including a kitchen. An estimated 100,000 families in Guanajuato live in extreme poverty, and the government hopes to enable the production of 36,000 new houses that will be safer from all hazards, including fire (see Figure 35). The concrete walls replace the pieces of wood, old blankets, or sheet rock that currently serve as walls and roofs in the homes of the impoverished. Other states in Mexico are considering setting up programs patterned after the one in Guanajuato.

**Figure 35: A “*Mi Casa Diferente*” Dwelling**



## Consumer Products for Safety

Fireworks and candles have been major fire safety problems in Mexico, and there are several approaches to deal with the problem, including alternative and safer products.

***Alternatives to Firecrackers and Fireworks*** – Safety officials are concerned about the number and severity of injuries caused by firecrackers and fireworks. They have implemented a campaign encouraging children to use confetti, noisemakers, and other items instead of fireworks to enjoy the holidays. The idea is to convey the message that fireworks should be used only by professionals who are trained on the proper discharge of fireworks at public fireworks displays. At home, families can have fun using streamers and noisemakers which are far safer.

***Alternative to Candles*** – An alternative to open flame candles that is strongly encouraged is use of battery-powered or electric candles.

## V. DOMINICAN REPUBLIC

As noted in the discussions on the methodology of this study, the Dominican Republic was not originally in the project's scope. However, information collected during a holiday visit there by one of the authors seemed of enough interest to include here, even though partial and not collected during an "official" visit.

### Overview of Dominican Republic Fire Service

In the Dominican Republic the fire service is run locally. It does not have the resources of a first world nation. Its tropical climate obviates the need for much heating, and many homes are ventilated to fresh air, which helps dissipate smoke naturally. Air conditioning is not found in the majority of homes, especially low-income households, so windows and screens are often left open, if they exist at all. Much of the residential construction materials are inherently inflammable, such as concrete or cinder blocks. There is little use of sprinklers—even the largest relatively new hospital complex in the city has no sprinklers (but it does have smoke alarms).

Santo Domingo is the capital of the Dominican Republic. The Santo Domingo Fire Department protects the National District. It operates from 12 fire stations, and protects approximately 2.5 million people. Because of the third-world economy and infrastructure, the fire department faces many more challenges than a United States fire department. It must deal with low water pressure and heavy, congested traffic on major streets and arteries.

There are few fire deaths in Santo Domingo, about 3–5 per year, according to fire department headquarters.

### Reaching School Children

***Fire Station Visits*** – Groups of school children are brought to their neighborhood fire stations for discussions of fire prevention. Many of the visits of groups of children are documented by photos with the chief or other officers, and are printed in the fire department magazine, which publicizes the visits to the firefighters as well as the public. Many adults also visit fire stations to receive information about fires.

***Department Newsletter and Magazine*** – The Santo Domingo Fire Department publishes a newspaper-type periodical every three months with safety information. It is distributed by the public education programs and other means to the public, not just the fire department.

The fire department also publishes a magazine with news of the department, including prevention news such as school children's visits to stations. The magazine is supported by ads, including ads from tobacco companies (!).

***Fire Safety Brochure*** – An excellent, illustrated fire safety brochure is widely distributed to adults, school children, and businesses. The brochure features the fire department logo and the name of the insurance company which sponsors the brochure.

The brochure is very specific as to what to do in various fire situations, and in how to prevent the leading causes of fires. While the same topics often are covered in fire safety brochures in the United States, some of the ideas here are more specific or with a slightly different twist than United States materials. Some key ideas are as follows:

- Call the fire department before trying to fight a fire. (Note that they do not dissuade people from fighting small fires, because of long fire department response times.)
- Have fire extinguishers handy and know how to use them. Extinguishers can help contain fires until the firefighters arrive. Teach people around you how to use extinguishers.
- Take care with candles and lamps—they cause the majority of fires in residences. Put candles on safe and high surfaces, out of the reach of children who might knock them down.
- Repair faulty electrical installations. Short circuits are a leading cause of fires. Check that electrical cables are in good condition, especially if taped.
- Be careful of smokers: Maintain visible ashtrays so they do not discard butts carelessly. Beware of people who smoke in bed. [Note that the safety message is directed to the smoker but to the people around smokers, which is an innovative approach.]
- Don't turn on the gas before you light the match to ignite the burner. Never leave cooking unattended. Keep combustibles away from the burners. Wear fitted short sleeves or push sleeves about elbows while cooking. Push pot handles inside so they are not accidentally knocked over and so children can't grab them. Keep children at least a meter away from stoves and ovens. Put a lid on the pan if cooking catches fire. Never add water or carry it to the sink, because flames may flare up.
- Don't leave electrical cooking and heating appliances connected when not in use. They may heat again and start a fire. This causes fires every day in the city.

- Propane cylinders can be time bombs. Replace the rubber hose on cylinders of 50–100 pounds for a metal one. Keep the cylinders above floor level to prevent rusting. Keep cylinders in good condition. The cylinders should be outside the kitchen at least five meters away from the oven.

Noteworthy is the specificity of each piece of safety advice. It does not just list dangers but says exactly what to do. While targeted especially at lower income homes that have children and smokers, it applies to everyone. It is never patronizing. Instead of giving simple, short messages they opted for clear detailed instructions targeted at the leading causes of residential fires. The program materials have not been formally evaluated, but were clearly developed with much thought.

## Local Campaigns

Despite being short on resources, the Santo Domingo Fire Department has much resourcefulness. It has a well-targeted prevention program with some noteworthy concepts.

***Neighborhood Visits and Talks*** – In Santo Domingo, the fire department conducts public education in neighborhoods primarily by going to schools, industries, churches, and neighborhood associations to deliver education face to face. It uses a team of seven public educators, including several volunteers though it is a primarily career department. Most talks are given to groups. The fire operations chief said that the fire stations know the high-risk areas in their vicinity, and target fire safety education accordingly. The public educators who go into the barrios were described as knowing how to approach and speak to the residents of these mostly low-income areas.

***Prioritized Fire Safety Topics*** – The fire department tracks the leading causes of fires. The priority topics in residential high-risk areas are:

- Improper use of propane gas
- Electrical shorts
- Unsafe use of candles
- Children left alone

Many children in low-income households are left alone while their parents work—even young children. Through lack of knowledge, they sometimes start fires with candles and other heat sources. Frequent electricity blackouts lead to almost daily use of candles for light. So the children are a much more important target group than even in first-world nations.

## **Partnerships**

***Other Local Services*** – The fire department reaches out to police and hospitals to get their aid in disseminating safety information in high-risk areas.

***Private Industry*** – Private industry is sought to fund prevention programs. For example, a leading insurance company produced an excellent brochure on the top ten fire risks and what to do about them, as discussed above.

***Sister Cities*** – Some Dominican cities have sister cities in the United States or Canada that send them surplus fire vehicles and equipment. Having more visible resources assists in raising fire safety awareness. Fire stations often run equipment with the sister city's name still on it.

***Media Assistance*** – The fire department gets assisted in public education by the major local newspaper, which at the time of our visit had a front page story on fires involving propane gas in residences.

## **VI. CONCLUDING REMARKS**

National, state, and local fire agencies should consider the rich array of ideas found in this global research on best practices. There are many innovative, proven prevention programs that will likely increase residential fire safety. There also are many ways to increase outreach and impact of conventional programs and there is little doubt that major savings are possible in life and property loss if fire departments use the established ideas.

Some ideas seem more important than others. We would single out the following:

- Home visits made to most households by firefighters, primarily to increase the percent of households with working smoke alarms.
- Partnerships with social and health services whose providers get into the hard-to-reach homes of the elderly and people with disabilities.
- Soliciting sponsorships of fire safety education from industry and wealthy individuals. The money is used to purchase air time, smoke alarms, batteries, and safety demonstration facilities, and safety trailers.
- Wide-scale programs to reach school children—most get reached.
- Mandated use of residential sprinklers (British Columbia); mandated working smoke alarms on every story of a home (Ontario).
- Tailoring fire safety programs to be culturally sensitive to their targeted audience.

Hopefully the detailed descriptions of successful prevention programs in this series of three global concepts reports will stimulate thinking and actions to improve residential fire safety, using the many proven programs from other nations.