



Global Concepts In Residential Fire Safety

Part 2 - Best Practices from
Australia, New Zealand
and Japan

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SYSTEM PLANNING CORPORATION

TriData Division



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Australia, New Zealand and Japan

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PREFACE

In the United States and in most western industrial nations, the majority of civilian fire deaths and fire injuries occur in the home. As part of its mission to reduce residential casualties, the National Center for Injury Prevention and Control within the Center for Disease Control and Prevention (CDC) is identifying effective global community fire safety programs—best practices—that could be used in the United States. Proven best practices can be used as examples of successes to stimulate improvements in prevention practices in the United States, though they sometimes require adaptation to our culture.

The TriData Division of System Planning Corporation was selected to undertake the study of best global practices for reducing residential fire injuries discussed in this report. TriData has undertaken research on global concepts in fire protection for over 25 years. From 1982–1993 TriData produced a series of reports entitled *International Concepts in Fire Protection*. The reports were widely disseminated and led to many articles in fire journals and presentations at fire conferences in the United States and internationally.¹

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

This report is the second of a new series of three reports to identify best global practices in residential fire prevention. The first study, undertaken in 2007, focused on Europe—the nations of England, Scotland, Sweden, and Norway. This second study, conducted in 2007–2008, focuses on the Pacific Rim nations of Australia, New Zealand, and Japan. A third study in 2008–2009 is planned to focus on Canada and Latin America.

¹ *International Conception in Fire Protection: New Ideas from Europe*. July 1993. TriData Corporation, Arlington, VA; *International Concepts in Fire Protection: Practices from Japan, Hong Kong, Australia and New Zealand*. 1985. TriData Corporation, Arlington, VA; 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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SUMMARY OF BEST PRACTICES

This report summarizes best practices in community fire safety programs from Australia, New Zealand, and Japan. Those nations have significantly lower accidental fire death rates in residences compared to the United States. Visits to their fire services found many best practices that we might use for reducing residential fire deaths and injuries.

Fire protection in Australia is provided largely by state fire services, which allows for consistent state-wide prevention practices that reach a large percentage of the population. New Zealand has a national fire service with the same advantage. Japan's fire service is entirely local.

Below are highlights of best practices that are more fully described in the report. Many of these concepts are being used somewhere in the United States, but often not as widespread or with different implementation approaches. Most of the best practices are being used in several fire services; the Australian and New Zealand fire service do an outstanding job of coordinating programs and sharing good ideas through the Australian Fire Authorities Council (AFAC) committees. Japanese cities have good exchange of ideas and quite similar prevention programs, but with some important variations. However, the “best practices” cited here by nation are not necessarily used in every city in their nation.

Best Practices from Australia/New Zealand

Prevention programs are developed and evaluated at the state or national levels in Australia and New Zealand. The programs are delivered largely by line firefighters trained for specific programs. Volunteer and career firefighters participate. More firefighter time is spent on prevention than in the United States.

Prevention programs are targeted to high risks groups that are identified from geographic information systems (GIS) analysis of fire experience and socioeconomic data. Prevention programs are evaluated annually, and dropped or reshaped if not working.

Prevention programs reach large percentages of the populations targeted. The result is fewer deaths, injuries, and dollar loss.

Reaching School Children

- **Fire Safety Lessons Tailored to Existing Curriculum:** Fire safety programs are aligned with state or national education curricula to fit better with teaching needs and hence increase their acceptance by the schools and teachers.

- **Passing Information to Parents:** Students are explicitly encouraged to pass what they learn to their parents. This is especially important where the parents are not literate in English.
- **Assigned School Coordinators:** Prevention units appoint a coordinator who is the liaison with the school system. Local fire stations solicit and maintain contacts with local schools. Coupled with tailoring them to the curriculum, the result is that the majority of schools accept the fire safety programs.
- **High Outreach:** Almost all children in grades K–1 receive fire safety programs that cover simple basics; most children in grades 5 and 6 are reached with more advanced information. Some programs focus on third and fourth grades.
- **Programs Delivered by Trained Firefighters:** Firefighters are selected and trained on how to deliver school programs, and are given written guidelines on each program. The training includes practice under supervision in delivering the program. Volunteer as well as career firefighters deliver the programs. In one fire service, a volunteer company has been organized solely to do prevention.
- **Follow-Up Visits:** Some brigades revisit schools 2–6 weeks after their initial visit to reinforce the messages.
- **Mobile Home Fire Safety Van:** A van called a “Mobile Education Unit” has compartments simulating rooms in a home. It is brought to schools to vividly demonstrate the fire safety issues in each room of the home.
- **Class Visits to Stations:** Some brigades bring first graders to the station for a presentation, instead of firefighters visiting the schools, which is more efficient for the fire service and more developmentally appropriate for the kids.
- **Class Visits to Fire Safety House:** School classes and also adults visit a donated house equipped to demonstrate fire dangers and good fire protection features.
- **Children with Disabilities:** Fire safety strategies and materials are available in Braille, simplified English, and large print. Programs are delivered to special schools and to individuals with disabilities attending regular schools.
- **Workshops for Parents of Pre-Schoolers:** It is difficult for fire safety to be taught effectively to pre-schoolers because of their limited intellectual development. Instead, programs are addressed to their parents and professionals in nursery schools, child health care centers, and other venues.
- **Periodic Evaluation and Redesign:** Focus groups assess prevention materials. Surveys of parents and teachers assess whether the school lessons changed the behavior of the child or the household members. Evaluations have led to

discarding previous school programs that were too passive. New programs incorporate more hands-on training, videos, and interactive approaches for the current generation of media savvy children.

Reaching Juvenile Fire-Setters

- **Selected and Trained Firefighters:** Firefighters who volunteer to deliver programs to juvenile firesetters receive psychological screening. Those who pass are trained and then conduct an intervention under supervision before being allowed to conduct sessions on their own. Psychologists periodically meet with the program deliverers to mentor and monitor them.
- **Home Sessions:** Pairs of firefighters conduct a four-visit program in homes of children who set fires. Parents must be present within earshot.
- **Serious Offenders:** Longer, more intensive programs lasting from 4 sessions to 12 weeks are used for juveniles brought to the attention of the juvenile justice system. This can be an alternative to jail time. The programs strive to replace destructive behavior with positive fire safety practices.

Reaching Elderly and People with Disabilities

- **Training Professional Care Providers:** Case workers and professionals who provide in-home services to elderly and people with disabilities are trained to look for fire safety problems when in the homes, especially the lack of working smoke alarms. This training is now part of the nationally accredited certification process for community care workers in Australia, which means they all receive it.
- **Training Families of Patients:** Because family and friends provide much of the care for the elderly and people with disabilities, they are offered the same fire safety training as the professional caregivers.
- **Smoke Alarm Maintenance for Elderly:** A special battery replacement program is directed to the elderly who do not have friends or family that visit them. The program is widely advertised. Community assistance personnel identify the elderly to participate. The community assistance personnel inform the fire service if the caregivers themselves cannot check the smoke alarms on a regular basis. The program installs special smoke alarms for the hard-of-hearing.
- **People with an Intellectual Disability:** Caregivers in agencies whose clients have an intellectual disability are trained not just on hazards to look for, but how to teach fire safety basics to a clientele group with learning difficulties.

Reaching Immigrants and Ethnic Groups

- **Ethnic Media:** Fire safety ads are run in ethnic newspapers and radio stations or on programs favored by target ethnic groups. Fire safety spokespersons with the right language skills work with ethnic radio talk shows.
- **Translated Literature and Website Information:** Key fire safety materials are translated into the major languages spoken in the jurisdiction. Websites list materials and programs available in each language, using the alphabet and script of the language.
- **Ethnic Liaison Officers:** Fire brigades appoint liaison officers whose sole duty is to work with minority and ethnic groups in the community on improving their fire safety.
- **Ethnic Volunteers:** Brigades identify a member of an ethnic group who is willing to serve as a volunteer liaison with their community. The liaisons inform the fire brigade of opportunities for presentations, help deliver programs in their language, and help translate materials.
- **Fire Safety in English Language Classes:** Fire safety is used as a topic when teaching English to foreigners. Young people in English classes are asked to pass on the fire safety concepts to their families.
- **Indigenous Caretaker Training:** Some brigades train indigenous caretakers to pass on safety information and check smoke alarms for their indigenous clients.

State and National Campaigns

- **Programs Developed at State or National Levels:** Costs are reduced by not having each community develop its own program. This also provides consistency of messages and makes affordable the use of experts to develop educational materials. And this approach facilitates evaluation of programs by having fewer to evaluate and larger numbers of participants in each.
- **Research and Evaluation:** Campaigns are evaluated, and then reshaped if needed. New Zealand undertakes two 1000-person surveys a year. One tests recall of specific campaign spots, the other checks knowledge of safety awareness and practices. Australian brigades, too, use surveys and focus groups to evaluate campaigns, attitudes toward fire safety and how best to promote awareness.
- **Seasonal and Year-Round Programs:** Campaigns are run year-round, with seasonal themes. The winter campaigns focus on home fires and the summer campaigns on wildfires. The traditional Fire Prevention Week has been dropped

as taking too much time, not reaching the right people, and not conveying the right message to citizens and firefighters that prevention should be year-round. It also does not come at the best time of year to provide information for peak fire seasons.

- **Purchased Media Time:** Television and radio ads are purchased to run during prime time or when programs are most likely to be watched by the targeted high risk groups. Ads on sports channels are used to reach middle-age male drinkers. Ads on soap operas are used to reach the unemployed. A television spot innovatively used a person who cares for burn victims to deliver a fire safety message.
- **Coverage on Public Affairs Programs:** The fire services provide spokespersons to television and radio talk shows for interviews. They also provide scripts and news to be covered. A fire brigade specialist with a background in marketing coordinates this with the media.
- **Media Kit for Stations:** Rather than tell firefighters not to deal with the media and pass all contacts to the public affairs office, firefighters are encouraged to contact local media within the constraints and advice provided in a media guidebook. The result has been expanded media coverage and dissemination of fire safety information.
- **Corporate-Sponsored Campaigns:** The fire service develops an annual list of prevention programs that can be sponsored by industry. McDonalds, Subaru, major banks, and other companies have provided millions of dollars for specific prevention programs. One brigade hired a full-time liaison for dealing with industry. A guide booklet sets out the ground rules for sponsorship, and for appropriate interaction with the fire service.

Home Visits

- **Smoke Alarm Focus:** Home visits are made by firefighters, primarily to check on the existence and maintenance of smoke alarms, especially in areas with high poverty or joblessness.
- **Door-to-Door Visits:** Some programs go door to door to visit every household in a small village or target area, such as rural Maori villages in northern New Zealand. About 60–70 percent of households are reached in the selected areas. The fire brigade also helps the household develop an escape plan and provides safety advice.

- **Hiring Unemployed for Installations:** Local ethnic unemployed people from the community are hired to help install smoke alarms. This has a triple benefit: local installation knowledge is left behind; the program is more acceptable to local ethnic groups; and some unemployed receive a step toward employment.
- **Arranged Visits:** Queensland widely advertises availability of visits by firefighters to train homeowners on how to do safety checks. Visits can be booked by phone or on-line, by tenants or owners. Pre-visit questionnaires are completed to prepare the firefighters for the visit; e.g., with information on the age and native language of the occupants. The households are left with a safety checklist to use on their own.

Homes in Wildland/Urban Interface Zone

- **Stay and Defend:** Australia has developed a successful approach to dealing with wildfires that threaten homes. It is radically different from the approach used in the United States. The policy is to “leave early before road travel becomes dangerous, or stay and defend your home.” The policy is based on research by CSIRO, the Australian national research laboratory. There are many things residents can do to prepare their home to make ‘staying to defend’ a reasonably safe option. By reducing the number of people fleeing at the last minute and increasing the number of people staying to defend their home, lives and houses have been saved.
- **Codes Governing New Interface Homes:** National codes dictate what can be built in areas of high wildland fire danger. Potential home sites are rated on their proximity to high risk vegetation and the slope of the land. Depending on the assessed level of risk, requirements vary for building materials and structural features such as the materials used in the roof and floor supports, the thickness of windows, the need for screening against flying embers, or changes in landscaping.
- **Assessing Risk of Existing Homes:** GIS maps show which existing houses are in the highest danger areas. In some Australian states, homes are inspected to see if they are likely to withstand a fire if the occupants stay and fight.
- **Rural Fire Campaigns:** Heavy media coverage, local meetings, direct mailings, and other approaches inform people in fire-prone areas on the best practices for dealing with wildfires. Residents who choose to remain with their home are given information about staying safe and saving their home. Residents are encouraged to prepare their homes and to extinguish ember fires before and after the fire front

arrives. To stay safe residents may need to take refuge in the home while the fire passes.

- **Making Existing Homes Safer:** Preparations such as screening openings, clearing brush, altering landscaping, adding drenching systems and other measures are used to make existing homes safer before a wild fire occurs. During active defense, as a fire threatens, residents undertake further activities such as cleaning up debris and flammables from exterior grounds and roofs, adding plugs to gutters and filling them with water, and patrolling for burning embers.
- **Alerting During Fires:** Public media, hotlines, and websites are used to keep neighborhoods and individuals informed about the status of fires and their predicted speed and direction. Citizen groups in areas expected to be in the path of fires are given briefings to remind them how to defend their home and the need to leave early if they choose to evacuate.
- **Community Firefighting Units:** Able-bodied civilians are organized into small firefighting units for their block or immediate vicinity. They are equipped and trained to use personal protective equipment, small pumps, and even brooms and pails of water to extinguish embers and fight small fires in their home. In one Australian state, 3000 community firefighting groups have been organized.

Codes and Standards – Codes and standards for home fire safety generally are similar to those in the United States, other than homes built in the urban/wildland interface. Some differences:

- **Public Housing Sprinklering:** All living units of high rise apartment buildings must be sprinklered, not just the common areas. Public housing must be sprinklered and compartmented.
- **Smoke Alarms:** Legislation requires working smoke alarms in every home. Some states require them on every level of a home. Some require all new residences to have hard-wired alarms.
- **Electrical Circuitry:** Use of high voltage has led to strong electrical safety requirements, including mandatory ground fault interrupts and circuit breakers on home electrical systems. These safety features also reduce electrical fires.

Consumer Products for Safety

- **Fire Blankets:** Their use is actively promoted, especially for kitchen fires, such as flaming oil pans on stoves.
- **Fire Extinguishers:** Their use in the home is encouraged but not mandated.

- **Home Sprinklers:** There are few home sprinklers in use. New Zealand sprinklers built to their stringent standards were not cost effective. As a result, they designed a home sprinkler system with sharply lower cost that will handle 90 percent of home fires.

Managing Fire Service Prevention Resources

- **Time and Money for Prevention:** Some fire services have shifted some resources from commercial inspections to home visits. Most Australian fire services have accepted longer response times as a tradeoff for doing more prevention. It is a choice of priorities.
- **Station Management System:** In New Zealand and Queensland each fire station develops a business plan for the year, including prevention activities. The plans are entered into a web-based “station management system.” Throughout the year the station enters data into the system to report home visits, school visits, presentations, and inspections. Progress can be tracked and graphically displayed at any level of aggregation: shift, station, district, region, or national levels.
- **Fire and Demographic Data Provided To Stations:** Stations can view past fire experience in their area with demographics overlaid. This helps them to plan their prevention activities by neighborhood or even house by house, and to track results over time.
- **Building History:** Every home and other building in New Zealand is entered into a data base that records all its interactions with the fire service, including calls, inspections, and education visits. Firefighters can access this data prior to a visit.
- **Incident Reporting Completeness:** Good data leads to better evaluation and targeting of prevention. Reports are required for all incidents regardless of whether volunteer or career response. Not reporting is considered unprofessional. In New Zealand a missing incident report appears as an overdue task in the station’s task list, and is visible to their supervision.

Best Practices from Japan

Japan has perhaps the most extensive public fire safety education programs among developed nations. The result is a relatively low accidental fire death rate despite having a disproportionately large elderly population, the age group with the highest fire death rate. Japan has increasingly tied fire safety education to disaster education and training, because earthquakes lead to many fires, and are a high public concern. Highlights of the best practices found in one or more Japanese cities are summarized below. The text has fuller descriptions and more ideas.

Organization for Prevention

- **Prevention Force:** Typically 8-10 percent of fire department personnel are dedicated full time to prevention. Some are at the headquarters prevention division and some assigned to fire stations. This is half again to double the commitment to prevention of U.S. fire departments. In addition, all line firefighters are expected to participate in prevention.
- **Citizen Fire Corps:** Major cities have large volunteer fire corps trained to provide support in large scale disasters. They also participate in prevention, and carry their training to their own homes and neighborhoods.

Reaching School Children – Almost all school children in Japan receive extensive fire and disaster safety instruction in school through a variety of programs. Varied approaches keep interest high. In addition to classroom lectures are the following:

- **Outside Drills:** Schools conduct evacuation drills three times a year. Once children are outside, this is considered a teachable moment. They are given fire safety information, and practice fire safety behaviors such as using extinguishers or crawling low in smoke.
- **Poster Contests:** A novel poster contest is used to increase elementary and high school students attention to fire safety. They are asked to make posters with safety messages and pictures of firefighters or fire engines, which they draw from life. The firefighters bring their engines to the schools for the contest. Competitions are judged at the school, regional and national levels, which keeps interest up. The national fire safety campaigns use the posters judged best, which is a large incentive for children to participate.
- **Pre-School Education Clubs:** Some cities organize pre-school fire safety “clubs” for mothers and children. Clubs teach the basics of fire safety to children and /or their mothers in kindergarten and child care centers.

Reaching Elderly and People with Disabilities

- **Home Visits:** The fire service visits the elderly at home to give advice on home safety, especially smoke alarms. Elderly living alone and households with people having disabilities are the priority targets for the visits.
- **Specialized Alarm Systems:** Besides conventional smoke alarms, pendant radio alarms worn around the neck, outside bells triggered by home smoke alarms, and automatic alarms linked directly to the fire department are used in selected homes of the elderly, to get them assistance more quickly.

- **Neighbors Dispatched:** For selected elderly and people with disabilities, the fire department identifies a neighbor willing and able to assist in an emergency. The neighbors are given some training, and dispatched in parallel with a fire unit or ambulance if their assigned person calls for help.

Reaching Immigrants and Visitors – Though Japan is largely a homogenous society, there are increasing numbers of foreigners residing there. Tokyo offers their 370,000 foreign residents disaster training, how to make a 1-1-9 emergency call, how to use fire extinguishers, and basic first aid. English-speaking fire personnel are assigned to areas with many foreigners.

National and Local Prevention Campaigns – Japan has fire safety campaigns going on throughout the calendar year. It is probably the most extensive system of national fire safety campaigns in the world.

- **Spring and Fall Campaigns:** Week-long fire prevention campaigns run in the spring (March 1-7) and fall (November 9-15). The messages are significantly different from what is normally emphasized in the United States.
- **Other Campaigns:** One week in January is for volunteers practicing disaster mitigation. Hazardous materials safety week is in June. A week in September is for practicing first aid, promoting injury prevention, and explaining proper use of emergency medical services. Another week in September is disaster preparedness week. One day each year highlights the need to preserve national heritage sites. Every September 1 is National Disaster Preparedness Day. November 9 is 1-1-9 day. Various messages and public training accompanies each special week or day.
- **Radio and Television:** Local fire departments pay for spots on prime time media. Nagasaki runs fire safety spots on cable network television twice a week in the spring and fall campaigns. Osaka sponsors a one minute prevention spot every weekday on the radio.
- **Neighborhood Associations:** Most residential areas have neighborhood associations, and apartment houses have condominium associations. The associations meet once a month to discuss safety and other issues. For important safety messages, flyers are passed from one household to another, with each signing off on it. The associations also deliver fire and disaster safety education and firefighting training, and help purchase smoke alarms.
- **Women's Clubs:** A network of women's "fire clubs" exists in most cities. They meet regularly to discuss home fire safety, and train on suppressing home fires with fire extinguishers, pot lids, towels or other means. The women also

participate in prevention programs at their local fire stations and public spaces during the spring and autumn prevention campaigns.

- **Japan Fire Alarm Manufacturers Association:** To increase usage of smoke alarms, the Japan Fire Alarm Manufacturers Association (JFAMA) conducts a wide array of promotions. They support 12 symposiums a year nationwide for the fire service, women’s clubs, and community leaders. They will cover all 47 prefectures over a 5-year period. They also provide lecturers for neighborhood associations, and sponsor TV and radio advertising on smoke alarms.
- **Workplace Visits:** In Nagasaki the fire department visits every workplace to encourage employees to install fire and smoke detectors in their homes, and to train workplace fire brigades. They made over 900 workplace visits last year.
- **Street Broadcasts:** In Nagasaki, the fire service drives through neighborhoods making fire safety announcement from loudspeakers mounted on engines or vans. They announce the spring and autumn campaigns, tell the neighborhood of any local arsonist activity, and announce dry “fire danger” days. Women’s club members make some of these broadcasts.

Life Safety Learning Centers

- **Multiple Large Centers:** Major fire departments run large fire and disaster training centers equipped to give practical, hands-on training in dealing with the hazards of earthquakes and the fires that may follow. Many of the lessons apply to everyday fires and injuries. Visitors get to put out a simulated kitchen fire with a real water extinguisher, and crawl low through a smoke maze. The centers also teach CPR and first aid. Some training centers give visitors a report card on how they did on each activity, and show videotapes of their errors, which probably adds to the retention of the lessons.
- **Mass Training:** The scale of training in the life safety centers is extraordinary, reaching millions of people. Tokyo alone reached 2 million people in the last decade.

Home Visits

- **Large Scale:** Firefighters deliver safety information directly to households. Tokyo’s goal is to visit all households at least every 5 years. Osaka visited 420,000 out of 1,270,000 homes. Local fire stations decide which areas to visit. Firefighters may take along neighborhood association leaders or public welfare personnel. Visits usually stop at the door, without entering.

- **Smoke Alarm Focus:** During a visit, the firefighters talk about smoke alarms and other current safety issues, and leave literature. If requested, they test the smoke and fire alarms.

Codes and Standards

Smoke Alarms: The largest recent change in fire prevention in Japan is their new emphasis on requiring home smoke alarms, and not just one per house but rather in almost every room. The 2006 National Fire Defense Law requires smoke alarms in all new residences. They must be installed in each bedroom and the stairway to the bedrooms. Starting in 2010, existing as well as new homes must meet the standard. The larger cities go further, requiring a smoke detector in every “living room”, which includes bedrooms, living rooms and the kitchen. The kitchen may have a heat detector instead of a smoke alarm, to reduce false alarms. The new smoke alarms are self-testing and do not require monthly checking. Many emit verbal commands as well as a sound.

- **Annunciator Systems:** New apartment buildings must have an annunciation system in each unit, not just in public areas.
- **Stove Sensors:** To reduce the most common cause of fire—unattended cooking—new kitchen stoves must have a heat sensor in each burner.

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These many best practices are a major reason why Australia, New Zealand and Japan have much lower residential fire casualty rates than the United States. Their ideas should be considered as part of thinking about revising our strategy for fire prevention.

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 research program to reduce such deaths and injuries, the National Center for Injury Prevention and Control at the Centers for Disease Control and Prevention (CDC) seeks to identify the best global practices in community fire safety that might be transferred to the United States, or that might stimulate ideas for new approaches. Finding best practices can speed up innovation.

This report, the second in a series of three on best global practices for reducing fire deaths and injuries in the home, provides many examples of successful community fire safety programs in the Pacific Rim nations of Australia, New Zealand, and Japan. These nations are known to have innovative community fire safety programs that have been associated with reductions in their residential fire death rates.

Study Approach

For each nation visited, we worked with several sources to identify fire services and other organizations that are conducting innovative programs to reduce fire casualties in the home. We then arranged visits to officials of the state fire services of Queensland, New South Wales, and Victoria, Australia; the national fire service of New Zealand; and in Japan, the fire services of Tokyo, Osaka, and Nagasaki, Japan Fire and Disaster Management Agency, Japan Fire Alarm Manufacturers Association, and Tokyo University. We also did internet research on community safety programs in each nation and its fire services.

For each fire service organization that was a candidate to visit, we communicated with its chief fire officer or head of prevention on their willingness to participate, and which people within their organization and others might be best to visit. All of the fire organizations we approached enthusiastically agreed to participate.

Research Questions – We sent a list of research questions to each organization to be visited. The questions were as follows:

1. What noteworthy community fire safety programs (public education) are being or have been undertaken by your agency or others? What population groups do they target? How are they delivered, how often, and with what content? Is there any evaluation of their results?

2. How do you cope with the diversity of ethnic groups and languages in developing and delivering community safety programs? Do you tailor programs to a group, or just translate the same materials for each?
3. We are aware of many of your past prevention programs, including some discussed in our past reports on International Concepts in Fire Protection: Japan, Hong Kong, Australia and New Zealand. What programs have been discontinued because they were not working, too expensive, out of date, or for other reasons? Which approaches are still being continued because they have proven to be cost effective? How is cost effectiveness determined?
4. Regarding smoke alarms, how have you tried to get them installed and maintained, especially in low income and immigrant households?
5. Besides various forms of public safety education, are there other efforts for reducing residential fire injuries, such as home inspection programs, increased code requirements for residences, better product safety, and residential sprinkler systems?
6. Cooking, heating, electrical, smoking, children playing, and arson usually are the leading causes of residential fires. Do you target each cause?
7. What role is given to firefighters for community safety programs?
8. Are your residential prevention programs multi-hazard? That is, do you combine fire prevention information with non-fire injury prevention, resilience for disasters and terrorism, etc.? Or do you have separate programs for each risk?
9. How do you cope with the threats of wildland fires to homes?
10. Overall, what do you consider the most cost-effective ways to reduce residential fire injuries?

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. The result of this preparation was that every meeting was productive and on target.

Visits Made – The specific agencies visited are shown in Table 1. Visits to Australia and New Zealand were made November 26–December 5, 2007. Visits to Japan were made the week

of April 7–11, 2008. Interpreters were used for most of the Japanese agency visits. The individuals we met with in each agency are listed in the Acknowledgements.

Table 1: Organizations Visited in Pacific Rim Nations

Australia	New Zealand	Japan
<ul style="list-style-type: none"> • Queensland Fire and Rescue Service (Brisbane) • New South Wales Fire Brigades (Sydney) • New South Wales Rural Fire Service (Sydney) • Victoria’s Country Fire Authority (Melbourne) • Victoria’s Metropolitan Fire Brigade (Melbourne) • Australasian Fire Authorities Council’s community fire safety committee (Melbourne) 	<ul style="list-style-type: none"> • New Zealand Fire Service (Wellington) 	<ul style="list-style-type: none"> • Tokyo Fire Department • Tokyo University • Japan Fire Alarm Manufacturers Association (Tokyo) • Fire and Disaster Management Agency (Tokyo) • Osaka Municipal Fire Department • Nagasaki Fire Department

Following the visits, several agencies sent us additional information, and we had follow-up dialogues by phone and email. We sent the draft report to each agency we visited to review the information on their nation and organization.

We do not present here everything we learned. Rather, we focus on the programs and best practices likely to be of most interest. We screened out or treated briefly the ideas that are already in common practice in the United States, unless they had innovative implementation.

Report Organization

After the introduction, this report is organized in two major sections: Australia/New Zealand and Japan. Within each we discuss the major strategies for community fire safety, and specific practices within each strategy. For each nation we start with a brief section discussing its fire service organization at the national, state and local levels.

We have tried to balance breadth of coverage—the multitude of good ideas found—with adequate detail for adopting them if desired, in order to keep the report of reasonable size. The level of detail varies on different topics depending on their novelty, importance, and information available. Further information on most of the practices discussed here can be obtained on the websites or in reports available from the fire service that were visited.

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 in each fire service. 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 in a real world environment, and the proof of effectiveness is rarely as good as one would like. Australia and New Zealand are above average in evaluating the effectiveness of their prevention programs. Their fire data, and that of Japan, are as good as or better than those used in the United States, and they do much more program evaluation than we do. The leading authorities in each nation think the programs cited here are making a difference. Where there was evaluative information we include it. The collection of practices discussed here are associated with major reductions in the residential fire problem.

Our intent is to stimulate the reader with ideas that may be adopted or adapted for 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 for not trying. It should be easier to convince decision-makers and the fire service to use ideas that have been implemented effectively somewhere rather than wholly untested ideas. Many of the ideas discussed here took time and a change in fire service culture to implement in the places they were developed. One has to be clever in figuring out how to apply the best practices to one's own environment.

II. AUSTRALIA AND NEW ZEALAND

Australia and New Zealand are former British colonies in the South Pacific that are independent but affiliated with the British Commonwealth. The two nations have formed a common market between themselves. People of either citizenship are free to move to the other nation. A by-product is that each nation has senior fire officers who have served in the other nation. This assists in dissemination of practices and a willingness to work together on research projects. For example, the current chief of the New Zealand Fire Service had been the deputy chief of the Queensland Fire and Rescue Service of Australia.

Australia and New Zealand share many practices in fire protection. Planning and research for their fire services are coordinated by 15 committees of the Australasian Fire Authorities Council (AFAC), which was founded in 1993 for this purpose. The AFAC committees coordinate the use of federal funding, but AFAC has no statutory powers. Additionally, the committees are a way to share ideas, discuss mutual challenges, and discuss national and international standards. One committee focuses on community fire safety. Because there are only 22 fire services in Australia and New Zealand, membership of these committees can truly represent the entire fire service in the two nations. AFAC shares research and speeds transference of best practices among its members. AFAC has a research budget provided by contributions from the fire service and private industry fire-related fees.

For the above reasons, we will discuss the prevention practices of the two nations together after first discussing the organization of their fire service and the fire services we visited.

Overview of the Australian Fire Service

Australia is a nation of 21.1 million population living in a land area the size of the United States. Most of the population is concentrated along the coasts. The huge central area of Australia is mostly dry desert and sparsely populated.

Australia has 7 states and territories: Queensland, New South Wales, Victoria, Tasmania, Western Australia, South Australia, and Northern territory. Almost half of the population resides in three east coast cities: Brisbane, Queensland (1.7 million); Sydney, New South Wales (4.2 million); and Melbourne, Victoria (3.6 million). Three-quarters of the national population resides in the latter three states, which were the focus of this study.

Much like the United States, Australia is a nation of immigrants and developed in the same time frame. After World War II immigration was encouraged as national policy, and the population increased rapidly. First came waves of Europeans, especially Greeks and Italians,

later Asian peoples such as the Vietnamese, Chinese, and Malays, and most recently, a wave of immigration from the Horn of Africa, primarily Somalis. Thus the fire service must deal with many ethnic groups and languages.

Australians have a strong national ethic of being self-reliant, and are health and safety conscious. Australia was among the first nations to require seat belt wearing in cars, helmets on motorcyclists, and fences around pools. This attitude provides a good environment for promoting fire safety concepts.

Australia and New Zealand provide excellent cradle-to-grave social service programs and have a variety of safety nets. They have significant low income populations, but proportionately less than in the United States or England, and that may be a significant factor in reducing fire risk.

The Australian fire service has been consolidated at the state level for many years. Each state has one or two fire services that together protect the state. When there are two, one is primarily for the rural areas and is largely volunteer. There are national building codes, but most regulation and service levels are decided at the state level.

The career firefighter workforce in Australia is highly unionized. Prevention programs need to be explicitly addressed in work contracts or may require overtime to implement. Labor and management have reached agreements on the increasing role of line firefighters in prevention, with the pay level acknowledging the productivity enhancement. Firefighters now implement school based fire safety education, programs for the elderly and programs aimed at immigrants and minorities as part of their routine job, as will be discussed.

Queensland – The state of Queensland has a single state-wide fire service, the Queensland Fire and Rescue Service (QFRS), headquartered in Brisbane. QFRS evolved in the early 1990's from an uneconomical set of independent fire brigades. It is funded mainly by a state property tax. It encompasses 150 local authorities that formally had their own fire services. The Brisbane waterfront is shown in Figure 1.

QFRS has 2056 full-time firefighters, 165 part-time firefighters, and 689 support personnel, for a total of 2625. In addition are 44,648 volunteer firefighters.² It is headed by a fire commissioner under whom are a Deputy Commissioner for Operations and an Assistant Commissioner for Community Safety and Training. The latter is responsible for developing and overseeing community risk planning. Below headquarters, QFRS is divided into seven regions.

² Report on Government Services, 2007, Table 8A.5, for 2005-2006.

Each region is further divided into areas, typically with 5–6 stations each, like battalions in the United States.

Figure 1: Residential Waterfront Homes in Brisbane, Australia



Each region has its own community safety manager, community liaison officer, and interface zone officer for wildland fire programs. Regional fire officers are responsible for most building inspections and the delivery of community education programs. The operations side is responsible for the station-level involvement in implementing most prevention programs.

New South Wales – Fire protection in New South Wales (NSW) is provided by two entities: NSW Fire Brigades in Sydney and other urban areas, and NSW Rural Fire Service elsewhere. Both report to the Minister of Emergency Services, who reports to the state’s premier (analogous to a governor in the United States). The Rural Fire Service protects about 95 percent of the land in the state, the Fire Brigades about 90 percent of the population. This form of state organization has existed since the 1990–1991 period.

NSW Fire Brigades has about 3,500 career firefighters and 3,000 part-time (retained) firefighters working from 340 fire stations. The retained stations have no in-station staff; their firefighters are on call. The fire service is divided into an urban region (Sydney and surroundings) and three rural regions (North, South, and West). The regions are subdivided into zones each with 9–27 fire stations. Each station has four shifts each with 3–12 firefighters supervised by a station officer, which is typical for all of Australia.

NSW Rural Fire Service has 73,000 pure (not retained) volunteers organized into 2,400 small brigades spread across the state.³ They have primary responsibility for large wildland fires. The two NSW fire services share responsibility for fire in the wildland-urban interface.

³ Ibid.

Under the Fire Commissioner of NSW Fire Brigades are a Deputy Commissioner for Operations, a Deputy Commissioner for Capability and Development, and a Director of Strategy and Planning. The latter is responsible for statistics and research and for developing the strategic plan. Its high placement on the organization chart shows the importance given to that function, and is a best practice itself.

The NSW Deputy Commissioner for Capability and Development has under him the Director of Community Safety and the heads of the information technology and logistics functions. Community Safety has two sections: “Built Environment and Research,” and “Corporate and Community Risk.” The latter is further divided into Environmental Risk and the Community Engagement and Development units. “Engagement” means getting the community involved in formulating and delivering the programs.

The Community Engagement and Development Unit has the following positions, which convey a sense of the organization’s priorities:

- Culturally and Linguistically Diverse (CALD) officer, who deals with ethnic groups
- Elderly Program “SABRE” officer
- Indigenous officer (who focuses on high-risk and Aborigine communities)
- Juvenile officer (who coordinates school and fire-setter programs)
- Sponsorship coordinator (who coordinates money donated by industry for prevention)

The Built Environment and Research unit includes fire investigation and research, a fire structure unit, and a false alarm reduction unit (building compliance). All play a role in apartment building safety as well as for commercial structures. The fire investigation and research unit does research on Class 1 buildings (homes) to develop codes and clarify their safety issues, giving more attention to the structure of homes than do most U.S. prevention bureaus.

Victoria – The state of Victoria has a dry climate that makes its wildland areas among the most fire-prone in the world. Victoria, like NSW, has two major fire organizations: the Country Fire Authority (CFA), which provides fire service in rural areas and outer metropolitan Melbourne, and the Metropolitan Fire Brigade (MFB), which protects inner metropolitan Melbourne.

The CFA was created about 60 years ago from hundreds of small rural fire brigades. It provides fire and emergency services but not typically emergency medical services (EMS). The exception is a life-threatening situation such as cardiac arrest, or an immediate need for oxygen, when its first response can be significantly faster than the nearest ambulance responding. The

CFA has 494 career firefighters; 837 full-time administrative, prevention, and support staff; and 59,509 volunteer firefighters. They operate 201 urban fire stations and 950 rural (unstaffed) fire stations.

MFB is headed by a CEO under whom are three major branches: Operations, with about 1700 firefighters; Community Safety, with about 100 personnel; and Support Services with about 200. Community Safety is on an equal organizational level with Operations and not considered a support service. The ratio of community safety to line personnel is much higher than found in the typical U.S. fire department. Unlike many cities in the United States, only 10–20 percent of the population lives in apartment buildings, and their rate of fire deaths is similar to single family homes.

MFB is divided into four zones with 13, 13, 13, and 8 fire stations respectively, for a total of 47. Each zone has its own commander of community safety and a multi-cultural liaison officer—features not usually found at the battalion or fire district level in U.S. fire departments.

Overview of the New Zealand Fire Service

New Zealand consists of two large islands: North Island and South Island. The land lies at the junction of two tectonic plates, which results in the North Island being highly volcanic and the South Island being highly seismic. New Zealand has 4.25 million people. Wellington, the capital, has 179,000 people (Figure 2). Auckland, the largest city, has 1.2 million people.

Figure 2: City of Wellington, New Zealand



Maoris are the indigenous inhabitants and comprise about 15 percent of the national population, including those of partial Maori descent. Pacific Islanders from Samoa, Fiji, and other South Pacific island groups comprise 7 percent. Another 9 percent are Asian, the fastest

growing group. Immigrants from the Middle East and Africa comprise about 1 percent. The remaining two-thirds are “European” (white).

Much fire safety effort is directed at the minority populations. They have disproportionately high fire incidence, in part because of more poverty, less education, and higher smoking and alcoholism rates.

Almost all fire protection in New Zealand is provided by a single national fire service, consolidated from 206 fire brigades in 1975. Small volunteer brigades in rural areas assist in wildland firefighting if the New Zealand Fire Service (NZFS) cannot extinguish them within 60 minutes, and are generally used only for the largest wildland fires.

The NZFS provides a complete range of fire and emergency services but only limited EMS. A separate ambulance service provides primary EMS care. The fire service assists with acute emergencies such as cardiac arrest, difficulty breathing, and auto accidents, especially if it is closest. About 15–20 percent of NZFS calls are for EMS-related services.

The NZFS has 2100 full-time staff of which 1700 are career firefighters. The rest are in prevention and support functions. NZFS also has 7500 volunteers, mostly in rural areas. There are 820 appliances (fire units) distributed in 450 urban fire stations nationwide. The capital city of Wellington and its suburbs, with a combined population of 350,000, are protected by 299 personnel of whom 199 are career and 56 volunteers, not counting the chief officers and two full time fire safety officers. Wellington has 9 fire stations.

The NZFS is directed by a Fire Service Commission, which reports to the Minister for Internal Affairs. The Chief Executive Officer of the Fire Service is the national commander. Under him are the Urban Commander (currently filled by the same person as the national commander), and the National Forest and Rural Fire Officer. Most of the career firefighters are under the urban commander.

The nation is divided into eight regions. Each has several districts similar in size to one or two battalions of a U.S. fire department. The regional fire commanders report to the national urban commander and are responsible for everything that happens in their region, including training, risk management and prevention, volunteers, and responses.

Also reporting to the national commander is a risk management division with branches in each region. It sets prevention policy, develops programs and educational materials, sets standards for delivering programs, and conducts research on the effectiveness of the programs. The delivery of New Zealand prevention programs is done mainly by firefighters.

Reaching School Children

Reaching school children with fire safety messages is an almost universal practice. Every fire service in Australia and New Zealand reaches the majority of students in at least one grade in elementary school. In most areas firefighters are used to deliver the school presentations, but in some the fire service provides material tailored to fit the school curriculum to teachers to use. Though optional, the majority of schools choose to accept fire safety programs.

The Australian state fire services vary in their choice of the age groups on which to focus. Some focus on K–2 (5–7 year-olds), some on fifth and sixth grades (10–12 year-olds), and some on both age groups. High school programs exist but are not used as extensively.

An AFAC study of the best media for reaching youths suggested that interactive learning methods be used for primary school children. These include fire simulations, fire drills, demonstrations by the fire service (such as shown in Figure 3), and repetition of slogans such as “Get down low and go, go, go.” As a result, many school programs now are more interactive, instead of just lecturing to the children.

Figure 3: NSW Fire Brigades Demonstrating Use of Fire Extinguishers to Kindergarten and First Grade Classes



Elementary School Programs – The Australian state-wide fire services had generally similar elementary school programs but with interesting differences.

Queensland Fire and Rescue Service: QFRS reaches every first grade student (about 55,000 per year) with fire safety messages. They also reach 38,000 children in kindergarten and pre-school classes. Self-selected groups of firefighters deliver the program. The fire stations contact their local schools to schedule the visits.

Queensland also has interactive, teacher-centered programs (Watch Out and Safe City) aimed at older primary school students and intended to promote social responsibility, injury prevention, and personal safety. That is, fire safety is part of a broader context to teach safety for non-fire as well as fire issues.

The Queensland elementary school program was evaluated by a home survey of parents and caregivers. The survey found that:

- 80 percent thought the program was effective for their child
- 45 percent of the children mentioned stop, drop, and roll at home
- 57 percent said there was a change in the child's safety-related behavior as a result of the program
- 25 percent said they conducted an exit drill as a result of the program
- 33 percent said there was a change in household behavior as a result of what the child brought home from the program

Surveying the parents is an excellent idea for evaluating the effectiveness of a school program.

NSW Fire Brigades: NSW Fire Brigades focuses on grades K–1 (see Figure 4). In 2006–2007, firefighters made 2,500 presentations, with about 30 children per class, 75,000 in total. This was up from 2000 presentations in 2005, indicating better acceptance of the program by schools. In this program teachers do most of the actual teaching though firefighters also participate. After the initial session, there is follow-up in about half the classes 6 weeks later by teachers or firefighters to reinforce the lessons. The school program was evaluated and approved by their Department of Education as fitting into the curriculum. This was key for acceptance by the schools.

The subjects covered by the school program include the following:

- Good fires/bad fires (“good” is defined as having an adult present)
- Firefighters can help you
- Crawl low in smoke
- Stop, drop, cover and roll

Figure 4: Firefighters Delivering Fire Safety Information to Kindergarten and First Graders



NSW Rural Fire Service: The NSW Rural Fire Service has taken a somewhat different, dual approach than its sister agencies for delivering school programs. It provides to teachers excellent fire safety materials that are compliant with the state syllabus, easy to use, breakable into modules, and attractively printed. Every school jurisdiction gets the materials for free. They are planning to switch to DVDs containing video and pictorial information as well as lesson plans to keep the material interesting for today’s video-oriented students, and also make the materials easier to use.

In addition to providing teaching materials to all schools, NSW Rural Fire Service has a program delivered by firefighters to third and fourth graders. The innovation here is that the program is delivered entirely by volunteer firefighters. They reach 70–80 percent of the schools in the rural areas of the state once every 2–3 years. The net results is that about three-quarters of the students are taught fire safety in elementary school in grades 3 or 4, and some more frequently than that.

Country Fire Authority: The CFA “Brigades in Schools” program uses firefighters who are trained to deliver programs to primary school students. CFA encourages students to pass their fire safety learning to their family. The school programs address:

- Personal fire safety
- Home fire safety
- Outdoor fire safety

- Wildland fire preparedness

Lessons and workshops are available for the three clusters of grades:

- Prep (kindergarten) through second grades
- Third and fourth grades
- Fifth and sixth grades

The program is delivered in the regular classroom for 30–60 minutes, with up to 30 children taught at a time. A fire truck may be brought to a school, but the focus is on the fire safety content, not general knowledge of the fire department and good will.

Volunteer and career firefighters deliver the school program in the rural areas and small towns that constitute the majority of the area protected by CFA. The volunteer and career firefighters are offered training in presentation skills for delivering the program.

CFA gave briefings on their programs for children to 600 career and volunteer personnel in 2006. Forty personnel were trained as “junior brigade support officers” to deliver the program.

Over a 3-year period CFA reaches close to all elementary schools at least once and some more often. In 2006, the Brigades in Schools program reached 47,241 students in 715 schools in 2,233 sessions to improve cooperation, each school is contacted by a CFA “community education coordinator”. CFA has 14 coordinators, one for each of 9 large regions in the state, and 4 for the 20 smaller regions in the state.

The program is tied to the state school curriculum. The CFA has collected many anecdotes where children make a difference in fires because of the current school program. They discontinued the old school program that they had been using in the 1990s that they evaluated as being ineffective.

Metropolitan Fire Brigade: The Metropolitan Fire Brigade’s program focuses on the first year of elementary school (5–6 year olds) and the final two years (10–12 year olds). The younger group is given simple basics. The older children receive more sophisticated information, which is why MFB chooses that grade level over the more commonly used third grade programs.

MFB delivers its school programs using career firefighters on shift duty. They have made the program “user friendly” for firefighters to facilitate cooperation, make delivery easier, and achieve consistency. A list of frequently asked questions and answers helps prepare the firefighters. The program now has strong endorsement and commitment from its line firefighters. There is no shortage of firefighters volunteering to train on how to deliver the program.

Two years ago MFB conducted focus group review of all its school materials and approaches. The old school program was found to be too passive for young children. They also researched other school programs, and consulted child education experts in designing the current program. Research in 2002–2003 found that retention was enhanced by longer and more frequent contact with the fire services.

The program for the youngest students now consists of two one-hour visits about two weeks apart. They teach that firefighters are your friend; what to do when a smoke alarm goes off; stay low in smoke; and stop, drop and roll. They also teach the difference between good fires and bad fires, with “good” equated to an adult being present. They have the children practice the skills being taught. Before the fire service visits, the teachers talk about them coming. After the visits, the teachers do follow-up exercises with the children. This extends the exposure to fire safety ideas beyond just the two hours time spent visiting, which makes the information more memorable.

The MFB program for sixth graders also is totally new. Based on the research cited above they totally discarded what they had been doing. (The willingness to discard a program that is not working is itself a “best ‘practice’.”) Now MFB firefighters make a 50-minute visit to sixth graders during which they discuss fire science, fire safety, and firefighter roles. They show a DVD on how fire develops and spreads. The fire safety component covers the following:

- Cooking
- Heating
- Electrical safety
- Laundry
- Smoking
- Smoke alarms
- Matches and lighters
- Escape
- Candles
- Dead locks

Under fire science they cover the usual fire triangle, then the use of fire extinguishers and fire blankets to cancel out one of the legs of the triangle.

MFB reached 600 out of 647 primary schools with its school program last year, about 98 percent of the schools in their jurisdiction. They reached 35,000 children in their first year of school and 25,000 in their last year of elementary school—about 80 percent of the fifth and sixth graders, less than the close to 100 percent first grade outreach because of the more crowded

academic curriculum in the later years. Nevertheless, the state of Victoria fire brigades are reaching an extraordinary percentage of the elementary school children.

New Zealand: New Zealand uses the “Firewise for Schools” program. Sub-programs within Firewise are targeted to four age groups:

- Pre-school and kindergarten (ages 3–5)
- Grades 1–2 (ages 5–6)
- Grades 7–8 (ages 11–12)
- Senior secondary school (ages 16–17)

Children are viewed as the key to changing fire safe behavior in homes. The program includes a home activity book that the children’s families or caretakers are to work on with the children.

The New Zealand school program was developed in partnership with teachers, and is intended to be used in the Health and Physical Education part of the national curriculum. It focuses on fire safety in the home. Teachers can teach it alone, but it is intended to be supported by a visit from the local firefighters. The materials are available in English and Maori. They have evaluated the programs in several ways, including collection of many anecdotes of children putting the lessons into practice in fires.

Every school in New Zealand is offered a Firewise program delivered by firefighters to first graders. The participation varies from 15–80 percent of schools across the 8 regions. The stations know the schools in their area and incorporate plans for delivering the program in their annual station business plan. The stations determine the best time of year to reach particular schools. The western region has the highest school participation rate. Its chief said they achieved it by taking a personal approach and meeting with individual schools to discuss the program.

The full program of Firewise for first graders includes 20 hours of teacher instruction and a final 30-minute visit by firefighters. Professional curriculum developers designed the program. The teaching materials currently are booklets, but there are plans to switch to a multimedia presentation to keep up with the interests of today’s children.

Teachers lead the pre-school, junior high, and high school programs, which involve much less time than the first grade program. The pre-school program is just one hour, the others just two hours. Where feasible, the fire service sends a fire unit to the pre-school program to supplement the teacher.

Secondary School Programs – While much smaller than its elementary school programs, CFA has formed 38 “partnerships” with secondary schools to provide fire safety

education to high schools, using a combination of school and fire brigade personnel. The novelty here is getting the high schools to agree to help deliver fire safety as a partner of the fire service. This puts a different slant on how the message about safety is conveyed to the student, and incentivizes the schools to participate.

QFRS, too, conducts a major safety program for high school students that includes fire safety, but its focus is on road safety and social responsibility. They annually reach about 33,000 of 40,000 17 year olds, an extraordinary outreach for the high school level.

NSW Rural Fire Service has a 10-week course for high school students that they can take instead of physical education. The program teaches fire safety and firefighting skills, and is a recruiting ground for the fire service. The program has proven to be a means to reach high school students who often are disinterested in safety per se. The program involved 40 schools in 2007. NSW Rural Fire Service also provides free materials for teaching fire safety to all 1,200 of the high schools it protects.

School Children with Disabilities – In Australia and New Zealand, students with special needs may attend either regular schools or special needs schools. These students tend to have higher fire risk and need to know about fire safety even more than other students.

MFB conducts fire safety programs in schools for students who are blind, deaf, or intellectually disabled. MFB adapted the delivery mode, materials and content of their regular program to the needs of this audience. For example, they developed school program materials using Braille, symbolic communications, simplified English, and large print. Of the 32 “special needs” schools in the MFB area, 24 use the program.

Mobile Fire Safety Demonstration Vehicles – Having an attractive vehicle to bring to schools, fairs, and other venues for teaching fire safety is a common practice, but MFB developed a refined, a second-generation version of a mobile safety unit. It is used at schools, fairs, senior citizen clubs, festivals and other venues to teach fire safety in the home. It is colorful and excellently designed outside and in. It catches people’s attention and attracts them in. Figure 5 shows the exterior of the vehicle, which includes the DVD viewing screen located between the two sets of steps.

Figure 5: Metropolitan Fire Brigade Mobile Fire Safety Demonstration Unit



CFA has their own “Mobile Education Unit,” which they describe as an exciting education experience on wheels. On board, a trained CFA presenter delivers a fire safety program targeted to third and fourth grade students. This highly sought-after program visits over 10,000 students in approximately 200 schools each year. It is an interactive presenter-based program enhanced with multimedia and exciting displays and activities.

The interior of the van has small, simulated rooms of a house with examples of common hazards. There are also positive safety features such as smoke alarms on the ceiling, and a fire blanket and fire extinguisher mounted on a kitchen wall. The mobile unit has expandable sides that give more room for displays. The interior handles two groups of six people at a time, one group in the front room while the second is in the rear. It takes only 7 minutes to go through while listening to a recorded presentation.

While people are waiting in line to go inside the mobile unit, short fire safety messages are played on a large, high definition television screen mounted on the outside wall of the unit. MFB found that films longer than 3–4 minutes lost the audience’s attention, so they play several dramatic short spots that are like television ads.

The van’s recorded program can be run in several languages other than English, including Arabic and Mandarin Chinese. The additional languages are provided through individual headsets. This is an unusual feature; while print materials are often available in multiple

languages, recorded demonstrations are not. Appliance safety, a particular problem for new immigrants, is featured in the van, so the multi-language feature is especially relevant.

Each year the van visits about 200 schools and is seen by 10,000 students. In 2007 this increased to 14,000 students in 543 sessions. It was partially subsidized by private industry donations. While targeted to students in the third and fourth grades, it can be used for adults and a wider age range of children.

Home for Fire Safety Demonstrations – Queensland Fire and Rescue has an interactive fire and safety demonstration house called the “Safe Home Fire Education Center.” The center is based in the residence of a former fire chief, located next door to a fire station and in close proximity to public transportation. Classes are taken to it for safety demonstrations.

Preschool Children – Children under 5 are a high-risk group. They cannot appreciate consequences, cannot see potential dangers, are vulnerable to burns and scald, and are curious about fire. For these same reasons, and because children confuse fantasy and reality, Australia researchers think children in this age group should not be given safety lessons.

Also, research undertaken by MFB and Melbourne’s Royal Children’s Hospital in 1994 strongly indicated that fire safety lessons for children of pre-elementary school age may actually increase fascination with fire for some children. They also found there was a potential for message confusion and low retention of information in this age group.

Therefore, Australian fire safety programs for children under 5 are directed at their parents, caregivers (e.g., daycare workers, child health nurses), and health professionals dealing with new parents (e.g., nurses). The CFA and MFB co-developed a program that provides workshops of 1–2 hours for these groups. The groups are reached in maternal health centers, kindergartens, child care centers and other places. The presentations to them include common causes of fire in the home, child-set fires, and ways to prevent and deal with fires.

Reaching Juvenile Fire-Setters

Juvenile fire-setters cause many residential fires. The Australian and New Zealand fire services have similar programs targeted at reorienting the fire interest of children who have set fires or are thought to be high risk for doing so. The programs deal with youths aged 4–17 years old. As in the United States, they include programs for both curious fire-setters and malicious fire-setters.

All the juvenile fire-setter programs were said to have low recidivism rates. Evaluations are based on the percent of treated youths who are referred to the program a second time or who come to the attention of authorities for fire-setting behavior; however, privacy rules for juvenile

records interfere with the data collection and make it difficult to collect comprehensive data. Nevertheless, youth specialists in each brigade judge the following programs to be effective.

Juvenile Fire Awareness and Intervention Program – CFA and MFB together developed a juvenile fire-setter program in collaboration with clinical psychologists. Parents must agree to participate in the program along with their child, or the child does not participate. Firefighters who have been selected and trained for this purpose implement the program in the child’s home. A parent or guardian must be within earshot, but not in the same room. The typical “treatment”, as they call it, is a series of three or four one-hour visits over a period of several weeks. The first visit assesses what approach will work best. The goal is to work in partnership with the parents to reward positive behavior and teach fire safety. Rewards may include movie tickets, motorcycle racing events, and fire station visits. The police, schools, fire service personnel, and parents refer youths to this program.

In the New Zealand version, a youth program coordinator is assigned to each region. There are 110 firefighters trained to deliver the program. The trainees conduct a supervised intervention with an experienced partner and then a supervised intervention themselves before they are allowed to go out on their own. Every 6 months the firefighters meet in a group with a psychologist, who answers questions and reinforces warnings about diagnosis errors.

New Zealand found that among treated youths, the recidivism rate for the 12 months following treatment was low. They are not sure about long-term effectiveness. When the program started, they had 900 referrals per year. That has dropped to 600 per year, though the program is better known to the referring agencies and has a larger group of firefighters trained for intervention, so the drop might be due to lasting effects and not from lowered willingness to make referrals to it.

Fight Fascination with Fire – Queensland’s juvenile fire-setter program, called “Fight Fascination with Fire” is similar to that in New Zealand. The program uses trained firefighters who make home visits to youths who are engaging in fire play and fire-setting. QFRS gives a week of training to 70 firefighters. They are selected from across the state by a screening process that includes a psychological profile and interview. The firefighters do several assessments under supervision. Two firefighters are sent to “treat” each child to avoid any accusations of misconduct or doing harm.

They categorize the juvenile fire-setter by risk level: curiosity (low risk), experimental (medium risk), and malicious (high risk). Those deemed to have psychological problems are referred to other government agencies that specialize in these issues. Each fire-setting program child receives three visits of 30–60 minutes each. As in the Victoria program, the Queensland

program also wants the parents to be home within earshot but not in the same room when meeting with the child.

The Queensland FFF program has been evaluated by surveying the families of the juveniles treated. They found that:

- 91 percent of the juveniles did not return to firesetting behavior
- 98 percent would recommend the program to other families
- 49 percent said their child had a more positive view of life after the program

The non-recidivism rate of this program was 93 percent. Over the past 5 years the program treated 180–360 youths annually.

The treatment of juvenile fire-setters in Queensland is evolving into a more sophisticated, strategic consideration of the problem. They are calling the approach the “juvenile risk intervention program,” which recognizes the individual needs of clients and how they can best be addressed. This approach first classifies youths into primary, secondary, and tertiary groups.

The “primary” group is youths who express interest in fire. For them, school-based fire safety education programs suffice.

The “secondary” group includes youths who are starting to show more dangerous behavior. They receive the Fight Fascination with Fire (FFF) program.

The “tertiary” group has more entrenched problems that have come to the attention of police and the juvenile justice system. They receive the program described next.

More Serious Offenders – Youths who are 14 or older and have come to the attention of the juvenile justice system are given a different program from the one for younger children. In Victoria, these youths get four sessions on fire safety, including the following topics:

- How quickly fire spreads
- The danger and tragedy of burns (often taught by a burn survivor)
- Evacuation, especially from smoke-filled rooms or corridors
- Community safety
- Ladder truck uses
- Use of extinguisher and fire blankets.

The Victoria program is called “Juvenile Justice Education.” The concept is to replace destructive behavior with positive fire safety practices, and to turn interest and experience in fire-setting into an asset. The MFB firefighters who deliver this program are taught a variety of intervention techniques but are not intended to be practicing as psychologists. They are warned

to avoid inadvertent harm to the child. The program is delivered in a custodial setting (youth detention centers) through consultation with the manager of the facility, who helps decide the best time and the key issues on which to focus.

In Queensland, the “Juvenile Arson Offender Program” treats juveniles who have been arrested for arson. They enter the program only if a magistrate accepts entry to the program as an alternative to sentencing. The program lasts 12 weeks and is designed to try and turn their behavior around. It is based heavily on experiential learning techniques and relies on specifically trained firefighters working with small groups of offenders at QFRS facilities and government owned recreation facilities. The program includes in-depth discussion or display of the effects of fire, and training on extinguishing fires. The youth are required to conference with a magistrate, both as a form of plea bargain (going into the program instead of jail) and to demonstrate the seriousness of their actions and the choices they have in life. Only senior FFF practitioners are allowed to deal with the tertiary group of youths.

Reaching Elderly and People with Disabilities

As we found in the United Kingdom and Scandinavia, the elderly in Australia and New Zealand are thought of as falling into two groups: the moderately high risk (relatively healthy and mobile), and the very high risk (least mobile, disability-laden shut-ins), They require different prevention strategies.

Similarly, persons with various disabilities may also be divided into two groups, one a more mobile, healthier group and the other a group that generally must be reached at home or in institutions. The disabilities that receive special attention for fire safety include impairments in mobility, mental capabilities, vision, and hearing.

As was also found in the United Kingdom and Scandinavia, the number of people receiving home care has been increasing both from population growth of the elderly and because elderly and people with disabilities are being returned to the community to live on their own or in small groups instead of being institutionalized. Most of their care now is delivered in private homes.

Queensland has a larger than average number of elderly; its climate makes it the Florida of Australia, said state officials. They have many retired “gray nomads” who drive around the state in mobile homes. Firefighters try to reach this group through pensioners clubs, the “Returned Services League,” and other organizations where the active elderly may be found. This group also receives safety literature. One region in Queensland developed a program called “Fire Able” that focuses on ways for people of all ages with disabilities to escape from their homes in a fire.

New Zealand research found that the elderly fire death rate may be understated. Many elderly who experience a fire die in the months after it, but not directly from the physical effects of the fire so they are not included in the count of fire casualties. These victims often have emotional issues stemming from the fire, loss of independence from the loss of their home, and poor attitudes about life after the event.

The main strategy for providing fire safety information to shut-ins and people with disabilities in Australia and New Zealand is to train their care providers, whether they are families of the elderly or social services agency personnel. Sweden, Norway, England, and Scotland are also training the care providers. What is novel here is training the families who provide care to elderly, and the wider scale of training the professional care providers than was the case even in the United Kingdom and Scandinavia.

MFB estimated that about 1,000 organizations in their state provide community services such as home care for the elderly. About a million people are estimated to receive community services across Australia, so the potential outreach to high fire risk groups through community services organizations is huge.

“In-Home” Paid Community Care Workers – AFAC members have successfully argued for basic home fire safety information to be embedded soon into the national training qualifications for all “in-home” community care workers. These workers include people who work with the elderly, disabled, children and youth, those with alcohol and drug problems, those receiving mental health services, immigrants, indigenous, and other culturally diverse groups. The fire safety training the care workers receive includes identification of high-risk groups and behaviors, simple prevention concepts, and smoke alarm installation and maintenance.

The above program will supersede the current program that was co-developed by CFA, MFB, and QFRS. The current program provides information on fire safety to carers and service providers to the elderly in partnership with elderly care organizations. Specifically this applies to home care workers, district nurses, “Blue Care” nurses (in-home carers), and palliative carers. The two-hour training includes a guide and fire safety literature regarding factors that make the elderly vulnerable to fire. Carers are taught to tailor strategies to individual clients. The carers check smoke alarms, look for unsafe appliances (e.g. those with frayed wiring, visible burns, or lint in dryers), and keep exit paths free from clutter.

Senior Community Care Workers – MFB is developing a course targeting senior community care workers including program managers, certified nurses, and case managers. This comprehensive fire safety training course will include information additional to that included in the national qualifications.

Family and Friends of Elderly– Family and friends often provide care to the elderly and the disabled. There are about 2.5 million of these “informal” carers in Australia, over 10 percent of the national population. They receive small allowances for providing this decentralized care. They are often members of “Carers Australia,” an association which has 200 groups in Victoria alone. Carers Australia arranges for the fire service to provide the same safety training for the informal carers as the professional carers receive. In some cases, training is arranged by other associated organizations. An AFAC group has been formed to develop and deliver a fire safety program to informal carers nationally.

Intellectual Disability Programs – Fires caused by people with intellectual disabilities are growing in numbers as more people are released from institutions to live on their own. The Queensland fire service thought this was a factor in the increasing number of what they call “mental health” fire deaths, including more suicides by fire and more intentionally set fires.

CFA has a special program for staff of “adult training support services” who work with clients that have an intellectual disability. Their clients often are less aware of dangers and have a reduced or inappropriate response capability. Instructors experienced in working with this clientele teach the program.

New Zealand has a program in which firefighters speak to caregivers of people with mental or physical disabilities. It was developed by the Eastern Region of New Zealand, and is an example of how the national fire service exhibits flexibility in allowing districts or regions to tailor programs to their local populations.

MFB considers the population at risk as falling into three groups. The primary population copes well, and is the target of general campaigns. The secondary population consists of people who they describe as not doing too well but progressing. Fire safety is targeted at particular groups within the secondary population. The tertiary group is the highest risk population and most difficult to reach. It includes people with physical or mental illnesses or with a social disadvantage who may live alone and have difficulty coping with life. These issues often are from illness or congenital problems. Many are elderly or hoarders, which increases fire risk from flammables and impedes rapid escape. Often people in the tertiary group refuse long term care by social services. However, MFB found that many people in the tertiary group have had contact for a short time with some help agency. Therefore, MFB has been meeting with nursing, psychiatric, and health services that visit homes to alert them to the high fire risk of the tertiary group. The aim is to establish a partnership to deliver a minimum level of fire safety to these households. The in-home service providers are to do basic fire safety checks such as installation, maintenance, or testing of smoke alarms in the short time during which they have contact. The

fire service backs them up to visit the households if follow-up is needed, or provides further information. In the process, local fire crews become aware of high-risk households and their circumstances.

Smoke Alarm Program for the Elderly – NSW Fire Brigades have a program for the elderly entitled SABRE, or Smoke Alarm and Battery Replacement for the Elderly. The program installs alarms and replaces batteries. The focus is on reducing the frequency and severity of fire in senior citizens private homes, especially elderly who have limited support from family or friends. They reach about 10,000 elderly per year. A key concern is how to get the elderly to accept the messages and act on them. To assist in spreading the knowledge about the program and gaining acceptance, the program is promoted through the media, and through Department of Age, Disability and Home Care articles in its journal. Elderly candidates for the SABRE program are often identified by community assistance programs like Meals on Wheels, home nursing, home modification for disabilities, and others. NSW also identifies and focuses efforts on geographical areas that have disproportionately high numbers of senior citizen residents. The SABRE program also provides special alarms for households with hearing impaired elderly. The alarms are used selectively and cost \$500 Australian vs. \$25 Australian for regular alarms. New Zealand also has firefighters install smoke alarms for the elderly, as illustrated in Figure 6.

Figure 6: New Zealand Firefighter Installing Smoke Alarm for Elderly Person



Reaching Immigrants and Ethnic Groups

The Australian and New Zealand fire services have extensive programs to provide fire safety education to immigrants and ethnic groups with limited English skills or high deprivation (poverty) rates. The urban indigenous populations (Maoris, Aborigines) receive special attention. The indigenous population is not a large percentage of the total population, but has significant numbers. For example, in NSW the indigenous population numbers 135,000. They generally reside in less urbanized areas spread throughout the state, which adds to the difficulty in reaching them. The same is true of Maoris in New Zealand.

Many immigrants from third world nations are not familiar with Western appliances such as stoves, toasters, and heaters. They need to be taught the basics about proper appliance use, in addition to the usual lessons on home fire safety. We heard anecdotes of one immigrant cooking a goat on top of several stove burners, and another who tried to use a toaster to heat milk.

If their locations are not already known by the local fire service, ethnic population clusters can be identified through the census. Nevertheless, the Australian and New Zealand fire services said they had some difficulty in reaching their minority communities, especially the indigenous community. There are barriers of trust, language, and customs. The fire services have made special efforts in both cities and rural areas with programs tailored to overcome these issues.

Both Victoria and NSW call these groups “Culturally and Linguistically Diverse” (CALD). Each fire service has a full-time CALD coordinator who helps fire officers and other agencies contact culturally diverse community groups, provides cross-cultural strategies for fire officers, and increases CALD community awareness of fire safety issues. The CALD coordinator works with community groups to find out needs and how best to deliver messages. This also helps build trust. Messages must be tailored to the culture of each ethnic group until they are assimilated. Research has shown that one-to-one communication is needed in addition to campaigns using the mass media.

The NSW CALD program has fact sheets translated into 28 languages, including Arabic, Vietnamese, Chinese, and Dinka (Sudanese). They hire an external company to do their translations. They advertise the availability of the materials on their website in various languages, often in the script of various languages, as shown in Figure 7.⁴ This makes it easier for someone not familiar with English to find the appropriate materials. NSW also has translation services always available through its radio communications.

⁴ <http://www.nswfb.nsw.gov.au/page.php?id=207>

Figure 7: Languages on the New South Wales Website

Arabic	معلومات عن السلامة من خطر الحرائق
Bosnian	INFORMACIJE O ZAŠTITI OD POŽARA (BOSANSKI)
Chinese	消防安全說明書
Chinese Simplified	住宅火警安全清單
Croatian	INFORMACIJE O ZAŠTITI OD POŽARA
Dari	اوراق معلوماتی محافظت از حریق
Filipino	MGA POLYETONG PANG-IMPORMASYON KAUGNAY NG KALIGTASAN SA SUNOG
French	Fiches documentaires de sûreté de feu
German	Feuersicherheit Tatsache Blätter
Greek	ΕΝΗΜΕΡΩΤΙΚΑ ΦΥΛΛΑΔΙΑ ΓΙΑ ΤΗΝ ΑΣΦΑΛΕΙΑ ΑΠΟ ΤΗ ΦΩΤΙΑ
Hindi	अग्नि सुरक्षा यथार्थ विवरण
Indonesian	LEMBAR INFORMASI TENTANG BAHAYA KEBAKARAN
Italian	FOGLI INFORMATIVI SULLA SICUREZZA CONTRO GLI INCENDI
Japanese	火災安全のファクトシート
Khmer	ក្រដាសព័ត៌មានអំពីគោលការណ៍សុវត្ថិភាពដៃគ្រឿងឆេះ
Korean	화재안전 점검요령
Macedonian	БРОШУРИ ЗА ЗАШТИТА ОД ПОЖАРИ
Persian	برگه های اطلاع رسانی پیرامون ایمنی در قبال کتش سوزی
Polish	ARKUSZE INFORMACYJNE O BEZPIECZEŃSTWIE PRZECIWOPOŻAROWYM
Portuguese	FICHAS INFORMATIVAS DE SEGURANÇA CONTRA O INCÊNDIO
Russian	ИНФОРМАЦИОННЫЕ ЛИСТКИ ПО МЕРАМ ПОЖАРНОЙ БЕЗОПАСНОСТИ
Serbian	ЗАШТИТА ОД ПОЖАРА – ОСНОВНЕ ИНФОРМАЦИЈЕ
Somali	XAASHIDA-XAQIIQDA AMAANKA DAB-DAMISKA
Spanish	HOJAS INFORMATIVAS SOBRE LA SEGURIDAD CONTRA INCENDIOS
Thai	คำเตือนด้านความปลอดภัยจากอัคคีภัย
Turkish	YANGINDAN KORUNMA KONUSUNDA BILGILER
Vietnamese	TỜ THÔNG TIN VỀ AN TOÀN HOẢ HOẠN

Fire Safety in English Language Classes – The CFA has a “Fired Up English” program for adults studying English as a second language. The idea is to use fire safety as a topic while teaching English. Adult students are taught about:

- Fire brigade services
- Home hazards and prevention
- What to do in the event of a fire
- The meaning of outdoor total fire ban (“fire exclusion”) days

Teachers of English are given activities and materials to incorporate in their lessons. The program does not require use of fire service personnel. QFRS has a similar program that instructs teachers of English on what to teach immigrants about safety.

MFB has a program called “FLAMES” for English language schools and centers. It is delivered in 10 English language schools (immigrant children 12–19 years old are given 600 hours of free lessons in English). Firefighters and English teachers present fire safety information to the children just before they graduate and go to mainstream schools. About 50 MFB firefighters have been trained to deliver the FLAMES program, which is a 1.5 hour presentation. The program addresses how to call for help, the speed of flames, and other topics. To make it easier to call the fire service when one does not know English well, people are trained to dial “000” (their 9-1-1) and just say “fire”. As another part of this program, MFB developed a simplified version of their home fire safety brochure using basic English. It is available in 12 languages. The intent is to have the youths pass this fire safety information to their parents as well as to use the information themselves. They also are asked to do fire safety checks in their homes.

MFB reviews immigration statistics to see which groups and languages are coming into their community, to stay ahead of the game in preparing brochures in the most needed languages. About 2–3 percent of their population is foreign.

Ethnic Newspapers and Radio Programming – Some newspapers, radio stations, and specific radio programs cater to minority or ethnic populations. Fire safety advertisements are often placed in these media to reach their audiences. CFA and MFB do this and also negotiate with ethnic radio stations to do interviews on fire safety topics. CFA ethnic spokespeople conduct some interviews. Both CFA and MFB provide interview scripts in any of eight languages to ethnic radio stations and their spokespersons, to help ensure the interviews cover key home fire safety points pertinent to the target audience.

Ethnic Volunteer Liaisons – Another strategy for reaching immigrants and ethnic groups is to identify bilingual members of an ethnic community to act as a liaison for the fire service. The liaisons inform the fire service about meetings, celebrations, and other opportunities to speak on safety or hand out materials. The liaisons also help deliver programs in their native language, and assist the community to access fire department prevention programs such as smoke alarm give-a-ways. To further good relations with these communities, MFB decorated one pumper with indigenous art (shown in Figure 8) and two pumpers with Vietnamese art. These vehicles are used both operationally and for community engagement.

Figure 8: Indigenous Artwork on Metropolitan Fire Brigade Pumper



MFB has trained about 20 residents from the Horn of Africa to be liaisons with their community. Eight have become facilitators who go with firefighters to deliver community safety presentations. They help translate ideas to fit their culture as well as translate the wording of safety messages. They also pass safety information to their community. From focusing initially on Somalis, the program evolved to include Sudanese, Eritrean, people of Sierra Leone, and Vietnamese.

NSW, too, uses community liaisons. They identified five volunteers, each from a different ethnic group, whose employers are willing to release them for a few hours a week. They liaison with their communities on radio programs and at community meetings, write articles for publications, review messages and materials for suitability and clarity, and disseminate literature.

Indigenous Caretaker Training – Earlier we discussed the fire service reaching elderly and people with disabilities by training in-home care providers. In a variation of that concept, the MFB trains indigenous caretakers of indigenous people in fire safety.

Defending Homes from Wildfires

Perhaps the most shockingly innovative practice we found—shocking because it is opposite to the widespread practice in the United States—is the approach to dealing with fires threatening homes in the urban/wildland interface.

Australia has had many large wildfires. They have killed large numbers of people. The most deadly fire was on Ash Wednesday 1983 in Victoria. It killed 73 people, most of whom were fleeing their homes in the face of the oncoming fire. Many who died were aged, infirm, or intoxicated by drugs or alcohol. This incident shocked the nation.

Research on the deaths and injuries caused by the Ash Wednesday fire and other wildfires—or “bushfires” as they are called—led to a major change in policy for preventing deaths from wildfires. The Commercial, Scientific, and Industrial Research Organization of

Australia (CSIRO), which is like the National Institute for Standards and Technology (NIST) in the United States, found that when wildfires ignited homes, it often was not by radiant heat or direct flame impingement but rather by embers lodging in the house through eaves and other openings, or by windows breaking and spot fires starting from flying embers and ash that enters the home. They found that extinguishing the embers before the fire takes hold is an effective strategy. The research also showed that most fatalities and serious injuries happen to people trying to evacuate too late, when the fire is almost upon them. These people died in their vehicles or on foot, not in their homes, which could have offered protection from the fire front. Many of the houses that were abandoned survived. Houses that ignite will not burn down in the short time period during which the fire front passes over them. So even if the house ignites, there will be time for residents to shelter in them or behind them from the flames, then move to burnt ground. Well-prepared residents who stay to actively defend a well-prepared home have an excellent chance of surviving and saving their home.

Philosophy – The current wildland fire philosophy for all of Australia and New Zealand is “stay and actively defend a well prepared property or leave early well before threatened road travel becomes dangerous.” AFAC adopted this as its official position in 1994. The Australian authorities emphasize that this is not just a slogan that can be quickly adopted. Rather, there has been 20 years of planning, preparation, and implementation to get where they are today in public attitude, physical structure requirements, training of the population, and landscaping policy. It is a long-range, sophisticated policy that has taken years to get in place with all the right pieces.

The “stay and defend or leave early” policy is intended to:

- Save lives and prevent serious injuries by getting people to leave at the right time or not at all
- Recognize that firefighters cannot save every house
- Save houses by having the residents prepare them and actively defend them (e.g., by extinguishing spot fires)
- Free rural roads for rapid access of fire trucks

Having people defend their own homes where feasible has the by-product of allowing better use of firefighters to fight the main fire, or wherever they are most needed.

We were skeptical about the soundness of this policy, and asked the fire services in three different Australian states to explain what they did and their experience with the policy over the past decade. They each independently concurred that they consider this policy optimal risk management. All three states reported a decrease of residential fatalities from wildfires, and no

deaths or serious injuries attributable to implementing the new practices. Thousands of homes have been saved.

The fire service sees its role as informing and advising people, and not to insist on fighting fires or evacuating. Only in special cases will police be called to forcibly remove people from homes in the face of a fire.

Preparation of Home and Grounds – The most critical part of the Australian wildland fire strategy in the interface zone is to build houses that are appropriately constructed for the risk, site them properly, and manage the nearby vegetation to create a defensible space by clearing flammable vegetation and planting appropriate vegetation. Building codes regulate the types of homes that can be built in wildland interface areas (as discussed in the Codes and Standards section below.) To receive a permit for occupancy of a new home, its treatment plan must be presented, approved, and implemented. The construction requirements of the standards must be demonstrated to have been met by a mandatory inspection.

Residents of existing homes built post-standard are advised on the measures that can be taken to make their homes more defensible if they want to stay and fight the fire rather than evacuate. The fire brigade websites have a wealth of information on how to prepare a home for wildfires.

To assist in pre-fire planning, the NSW Rural Fire Service prepares a GIS map of each district showing its fire history, dangerously flammable vegetation, and fire “thresholds” for the various structures (i.e., their risk in a wildfire.) The map also identifies special assets to protect, including homes, cultural elements, and habitat of threatened species. The community must decide on a treatment plan for each risk identified. The treatments include:

- Area hazard reduction (e.g. burning or physical removal of brush, thinning of trees)
- Education
- Individual property planning – what can be built on hazardous unoccupied lots
- Ignition prevention (e.g. cleaning up leaves and litter, adding screening to areas of the home into which embers may fly)
- Firefighting preparedness – tools to fight a fire in or near the home; external deluge systems

Houses in fire prone areas should preferably have external cladding and roof materials that are fire resistant; gutter plugs for retaining water (and reducing ignition from embers); screening of eaves, chimneys and areas under the house to stop embers from entering; and appropriate landscaping around the house. Under the National Building Code of Australia, the

required construction features are a function of the fire risk presented by the surrounding vegetation—its nature and distance from the house.

Queensland, too, uses GIS analyses to identify homes most at risk from wildfires based on vegetations and past fire history. Queensland has surveyed the high risk homes to get the homeowners' perception of risk from fire, and to what extent they will depend on the fire service to save them in a fire.

Preparation of Home Dwellers – The Australian fire service not only advises the public on how to construct and prepare a house and landscaping in a fire prone area, but also the immediate measures to take as a fire approaches a home. Before the fire arrives, people in its path are asked to clean their gutters from flammable leaves and debris, cut back shrubs near the house, remove yard litter that might ignite, install plugs into gutters and fill them with water, check the screening over any openings and under porches to stop embers, get buckets of water, a mop, fire blankets, and other means for extinguishing small fires. They also are to be ready to shelter inside the house when the fire arrives.

As the fire front nears, people are advised to go outside and prepare to extinguish embers that land on or around the house. Then, just before the fire front arrives, people are encouraged to go inside and extinguish any embers that enter the house. During the time a fire front passes over the house, occupants are advised to stay indoors and keep watch on what is happening around them. After the fire passes they are to go outside again to continue extinguishing flying embers if necessary. Figure 9 shows some of the simple tools used by Community Fireguard groups, and people preparing their property in advance of a fire, as advocated by CFA (see the previous section on wildland fires for more information on this approach).

Figure 9: Basic Tools for Attacking Ember Fires, and People Cleaning Up Property in Advance of a Fire in the CFA Area



Alternatively, people who are not able to defend their home are encouraged to leave early or shelter in a neighbor's home.

If the residents have not prepared their homes and themselves to fight a wildfire, or are afraid and not physically and psychologically prepared to stay and fight, then they are advised to evacuate early, so they are not caught by the fire in their vehicle, and so they do not congest roads needed by the fire service to fight the main fire front.

People living in the urban/wildland interface zone are told not to count on fire trucks coming to save their home from a wildfire. The fire service may be stretched too thin to get everywhere in time. Appeal is made to the Australian national spirit of self-reliance. Individuals are advised to consider what needs to be done to save their home and whether they have the mental and physical capabilities to do so. If people feel unable to stay and defend, leaving early is a valid option.

Alerting During Fires – People in homes thought likely to be impacted by an approaching wildfire are alerted in a variety of ways. The most important medium is the radio. In Victoria, one radio network is the official emergency broadcaster. It is heard across the state and used to warn of the approach of wildfires. They alert specific communities in real time. Besides alerting to the existence, location, direction, and speed of the fire, the media remind people of the measures they should take, and to either stay and defend or leave early.

The media are kept informed by the Information Unit of the Incident Command System used by the Australian fire service. Where possible, that unit also organizes personnel to knock on doors of homes in the path of the fire, and tell the people or give them literature on measures to take. Service groups and volunteers supplement the fire service in going door to door.

In Victoria, the fire service provides a “Bushfire Information Line.” People call its free 800 number to receive up-to-the-minute information on the status, location, and forecast direction of a fire. In the 2006–2007 fire season, the information line received 40,000 calls. The information line also provides recorded safety information.

Bushfire information is posted on the internet, with maps showing the location of the fire. In the last fire season there were 5 million hits on the CFA website from Victoria residents.

An even more innovative mode of communication during fires is community meetings, some held just before a fire arrives but in time for residents to implement their bushfire survival plans. Both CFA and QFRS use these meetings. In 2006–2007 CFA held 1,208 meetings with 27,000 attendees. This was a 79 percent increase from the previous year. It was partly a result of increased publicity, but also an indicator of their perceived usefulness. The usefulness of the meetings also was proven by surveys of the rural population conducted for CFA.

Community Firefighting Units – NSW helps organize and train community volunteer firefighting units. These units are comprised of people living on the same block or near each other who plan, prepare, and fight fire together.

In the past 10 years NSW Fire Brigades has trained 6,500 unpaid volunteers in 600 community fire units. Over 1,600 of the volunteers are women. The fire service equips the community fire units with basic personnel protection gear such as overalls, goggles, and face masks, and small portable pumps and other equipment for defensive firefighting. They are trained at the local fire station on bushfire prevention, education, and preparedness. Post-fire evaluations have credited these groups with saving dozens of homes in the 2001–2002 and 2002–2003 fire seasons in NSW.⁵

In the 2006–2007 fire season, an NSW survey found that 84 percent of people directly in danger from a fire had stayed and defended their property. Respondents were individuals who had a fire approach within 100 meters of their home. Less than half (42 percent) said they were assisted by the fire service in fighting the fire near their home. Over 50 percent had implemented four or more of the eight specific preparation practices that the fire service advocates for homes at risk.

CFA, too, promotes community firefighting units. Presentations are delivered on street corners, at local venues, and outdoors in high wildfire risk areas (see Figure 10). The presentations include information about:

- Wildfire weather – recognizing the risk
- Fire behavior in the Australian environment
- How lives are lost and how to protect yourself
- How homes are lost and how to save your house
- Where you can obtain more information and support

The wildfire meeting lasts about 1–2 hours, and often leads to the formation of local community groups (“Community Fireguards”) who subsequently meet in private homes, supported by a CFA trained facilitator. Community Fireguard groups are established in all wildfire risk areas across Victoria. A large number of wildfire meetings and Community Fireguard meetings are held across the state each year with participation well into the thousands.

⁵ “Community Safety—Prevention and Preparedness”, p. 47, NSW Fire Brigades website.

Figure 10: CFA Presenting Information on Preparing for Wildfires at a Local Meeting



Codes and Laws for Home Safety

The Building Code of Australia is a national code that applies everywhere. Australian states may add requirements, such as the Environmental Planning and Assessment Act of NSW. There also are state-issued guidelines for homes of certain types or in certain areas, such as the urban/wildland interface zone that does not have the force of law but are recommendations.

Interface Home Regulation –Australian Standard 3959, “Construction of Buildings in Bushfire-Prone Areas,” sets standards for various aspects of houses built in areas likely to have wildfires. In 2002 NSW passed legislation based on this standard that regulates new development on land where bushfires occur. Standards and codes requiring construction of buildings to resist earthquakes, hurricanes, and flooding are common in the United States, but carrying the idea to wildfire fire risk is not common and mostly voluntary, with a few exceptions such as prohibiting wood shingle roofs in some areas.

While most building codes and standards address all buildings but private homes, the Australian interface standards and legislation are primarily about private homes. The legislation and codes cover the following aspects of safety:

- Design and construction of the structure
- Asset protection (assets include habitat, historic structures, homes and other buildings, or anything else a community wants to preserve from fire)
- Emergency management, especially evacuation from the area

- Landscaping, such as the type of vegetation allowed and its distance from the house
- Access to roads, water, electricity, gas

Under the national building code, the construction requirements for a new home are determined by the type and density of wildland vegetation, its distance from the home and the slope of the land. Based on these factors, each home site is classified as Level 1, 2, or 3 risk—medium, high, or extreme risk of brushfire attack, respectively. For each level of risk, the standard dictates details of construction such as the type and suspension of each floor; the type and thickness of window materials; screening of openings; and the materials and construction of external doors, roofs, eaves, and decks.

One can change the level of risk and thereby the severity of requirements by changing the vegetation around the house or the slope of its land. If there is a larger setback, there is more freedom in materials and design. For high setback, there are no requirements. For medium setback, some construction standards apply (e.g., non-combustible screening, thicker windows and special glazing). For little or no setback, the home permit may be denied, or the home must be built to highly stringent requirements. About 14 percent of new home applications in the NSW rural areas are found to be high risk and require an engineered solution such as external drenching systems, or even no use of wood. Some drenching systems are required to be installed on fences at the perimeter of the property in the direction from which wildfires might approach.

Each Australian state has slightly different ways to classify their wildland sites. Most states use on-site inspections or aerial photography and GIS to map vegetation areas of high risk. The NSW Rural Fire Service, CFA, and local authorities jointly identify which areas are considered bushfire prone and subject to regulation.

Smoke Alarm Regulation – The Australia and New Zealand fire services require smoke alarms in new homes and most existing homes. NSW regulations require one smoke alarm per floor per home, for all homes.

In Victoria, every new home built since 1996 must have at least one properly placed, hard-wired smoke alarm. Further legislation in 1997 required that all existing homes have at least one smoke alarm, but it may be battery-powered. The state of Victoria estimates that 92–93 percent of its homes now have smoke alarms. That is probably typical for much of the nation. About 35 percent of Victoria residential fires are in homes without a working smoke alarm, so the homes without alarms are higher risk.

In Queensland, smoke alarms have been compulsory in new homes since 1997, and in all homes starting 2007. In November 2006, 87 percent of homes had smoke alarms, and 79 percent

had working alarms. By 2007, a survey of 3,000 homes found over 95 percent of homes were estimated to have smoke alarms.

Sprinklering – Buildings over 25 meters high are required to be fully sprinklered. For an apartment building, each unit must be sprinklered as well as the hallways and other public areas. Public housing must be compartmented as well as sprinklered. Sprinklers and compartmentation significantly improve the safety of apartment housing. The prescriptive requirements for sprinklers can be deviated from if an alternative design is demonstrated to meet the performance requirements of the code. Australia has had performance-based codes for many years.

Management of Firefighter Resources for Prevention

Over the past decade, the fire service in Australia and New Zealand, like those in the United Kingdom and Scandinavia, has reallocated resources within their budgets to do more prevention. The majority of prevention programs now are delivered by line firefighters, not prevention staff. Each fire station is expected to participate in prevention, preparedness, and recovery programs as well as respond to emergencies.

In 1996 an amendment to the Australian National Protection of Life, Property and Business Act required the fire service to provide prevention services. However, the labor contract for career firefighters is “performance-based” and requires them to work only on the public education programs listed in the contract by name. Use of firefighters in new programs has to be negotiated for extra pay, or has to be voluntary until negotiated into a new contract.

Having the authority to use on duty firefighters for prevention programs without labor strife was a major step forward in providing resources for prevention, but that produced a need for a system to manage the firefighter resources used for prevention and to coordinate them with other prevention resources and fire service duties. A good management system helps the prevention staff and supervisors of operational firefighters jointly plan the prevention program. The management system also ensures that the planned programs are implemented by tracking prevention activities during the year. Progress and problems are reported to prevention and operations chiefs. The outstanding Queensland and New Zealand “station management systems” are discussed in a separate section below.

Centralized Prevention Policy and Materials – In Australia, the state fire service (and in New Zealand the national fire service) sets prevention policy for target populations, outreach implementation, the materials to use, the training for the program deliverers, and the method of program evaluation. Fire prevention materials are developed at the state level, and shared among states and with New Zealand.

Operational firefighters from the station level deliver most of the prevention programs. Some prevention personnel assist districts or regions with activities at the local level. Prevention headquarters personnel do not do much program delivery themselves but rather formulate policy, develop implementation procedures, evaluate results, and do research on what is needed and what is effective.

The result of this centralized approach is that the local level does not have to develop programs or materials, just deliver them. There is a large economy of scale in developing and producing prevention materials, and little reinvention of the wheel. This frees more time for delivering programs and increases the quality of the prevention programs by having state or national-level experts develop them. The results—low fire deaths and injury rates that have dropped even lower—show the effectiveness of their prevention delivery strategy.

Use of Volunteers – A striking difference in delivering prevention programs in Australia and New Zealand relative to the United States is the degree to which volunteers deliver the programs to homes, schools, and the community. Both volunteer and career firefighters deliver fire safety programs. Many volunteers find they enjoy meeting with the community one-on-one or in group presentations, especially for children.

About 30 percent of the 2,400 small, rural fire brigades within the NSW Rural Fire Service have a community education or community safety officer to organize their prevention efforts. A new idea in NSW is to recruit volunteers just to do public education, not firefighting. The Illiwarra District has a “community education brigade” that has no fire truck. It is co-located with a traditional brigade and has about 27 members. Overall, the NSW Rural Fire Service said that about 70 percent of the people delivering its community fire safety education are volunteer firefighters.

Station Management System – New Zealand and Queensland have excellent station management systems (SMS) that are similar. We discuss the New Zealand system in more detail only because we happened to have more time on-site to discuss it.

NZFS spent the equivalent of over \$3 million (U.S.) over the past 7 years to develop a computerized system for planning, managing, and tracking all station activities, including prevention. The system, which had its origins in Queensland, is remarkable in scope, reduction in paperwork, and ability to allow all levels of personnel—firefighters, station officers, district officers, regional officers, and the national fire chief—to see what has been planned, and what has been accomplished relative to the plan. The data can be aggregated at any level from a shift to the whole nation. It is a web-based design and can be logged into from home or travel as well as from the stations and headquarters. They have the ability to review this information a daily

basis. This is the best fire department management system the authors have seen over the past 30 years.

The NZFS system includes a bottom-up prevention plan. The crews or station officer in each NZFS station develop goals and sets of tasks for their station to accomplish over the next year toward meeting the national fire service goals. A key goal is the reduction of fire deaths and injuries in the home by targeting education for the groups most at risk. Each station submits its annual “business plan” to its district.

The SMS has a list of about 200 generic tasks and activities that firefighters can choose from to formulate their plan. Figure 11 shows the tasks that deal with prevention. The choice of tasks depends on the risks and needs in the station area. A station may propose to visit certain schools on certain shifts during the year. They may propose to do home visits in specific areas and specify the subjects on which to focus in the visits. They may set a goal of installing, say, 1,000 smoke alarms. The district commander reviews the draft station plans for his set of stations. He may negotiate changes in the plan with the stations if he feels they are not ambitious enough or if they have neglected some areas.

The station-level business plans are quantitative and highly specific. They can be aggregated at each level of management. The chief of the NZFS can see for the coming year how many homes, schools, and community groups are planned to receive attention in each area of the nation. He can then can monitor progress on the plan during the year, right from his desktop.

Each station reports progress daily as it accomplishes the planned tasks, or exceeds them. Progress is graphed against the goals. For example, a station may plan to visit 10 schools and deliver a program in each to 90 children in the first grade, visiting one school a month except in two summer months. During the year, they may fall behind, and visit only 2 schools instead of 5 in the first half of the year. That lag will be visible to themselves and all levels above them in the form of a rolling list of overdue tasks. They can enter an explanatory comment into the system, e.g., flooding in their area caused an unusual number of emergency and service calls, and they had to defer some prevention activity. Going the other direction, if they visit 12 schools instead of 10, their above-expected performance will also be visible. The system shows exactly what is planned, what has been done, and when necessary catch-up is planned to take place.

The SMS is tied into the GIS system. The SMS can plot incidents on a map by type of call, fire cause, or any other factor recorded on incident reports. This data can be superimposed on socioeconomic data or aerial photos. A fire station that perceives there has been an inordinate number of cooking fires in their area last year can call up the data for several years, see the trend, and plot where the cooking fires have been occurring. If the fires appear to group in one area,

they can plan to visit homes or conduct demonstrations in that area. If the problem is scattered, they may choose a different strategy. The next year they can revisit the number and location of cooking fires and see if their approach worked.

Figure 11: Station Management System – Portion of Task List for Prevention

<p>Public Education - Admin and Planning</p> <ul style="list-style-type: none"> • Evaluation of Fire Prevention/Advice Programmes • Preparation and Administration for Fire Prevention/Advice Programmes 	<p>Public Education - Advice</p> <ul style="list-style-type: none"> • Advice on Home Escape Plan • Advice Provided Using The Homeowners Guide to Sprinklers for Houses • Electric Blanket Checks • Fire Prevention Advice at Fairs • Fire Prevention Advice at Trade or Home Shows • Providing Advice on Fire Extinguishers • Providing Training on Fire Extinguishers to the Public • Smoke Alarm Advice 	<p>Public Education to At-Risk Groups (National)</p>
<p>Fire Safety Technical Advice</p> <ul style="list-style-type: none"> • Technical Advice on Compartmentation • Technical Advice on Fire Behaviour • Technical Advice on Fire Causes • Technical Advice on Fire Protection Systems • Technical Advice on How to Evacuate a Building Effectively and Efficiently • Technical Advice on Means of Escape • Technical Advice on Occupancy Ratings/Loadings • Technical Advice on People and Activity Management • Technical Advice on Safe Housekeeping Practices • Technical Advice on Safe Practice • Technical Advice to Building Owner Groups • Technical Advice to Industry Groups • Technical Papers • Technical Presentation 	<p>Firewise and Other Schools Programmes</p> <ul style="list-style-type: none"> • Adopt a Fire Fighter Programme • Be Firewise Programme Delivered to Year 1 & 2 Students • Be Firewise Programme Delivered to Year 6 Students • Be Firewise Programme Delivered to Year 7 & 8 Students • Fire Prevention Programme Delivered to Pre-Schools • Maui Tinei Ahi Programme Delivered to Kohanga Students • Maui Tinei Ahi Programme Delivered to Year 1 & 2 Students • Maui Tinei Ahi Programme Delivered to Year 6 Students • Maui Tinei Ahi Programme Delivered to Year 7 & 8 Students • Other Fire Prevention/Advice Programme Delivered to Children • Other Fire Prevention/Advice Programme Delivered to Primary Schools • Other Fire Prevention/Advice Programme Delivered to Secondary Schools • Preparation and Administration of Firewise Programmes 	<ul style="list-style-type: none"> • Delivery of Fire Safety Programme for Budget Accommodation • Delivery of Fire Safety Programme for Heritage Buildings • Delivery of Fire Safety Programme for Other Cultural Building • Delivery of Fire Safety Programmes to Other Commercial/Industrial • Delivery of Open Home Kit Programme • Delivery of Other Programme to the Elderly • Delivery of Prevention/Advice Programmes to People with Special Needs • Delivery of Programme Using The Senior Kit • Delivery of the Marae Fire Safety Programme • Fire Awareness Intervention Programme - Incident Related (FAIP) • Fire Awareness Intervention Programme - Non Incident Related (FAIP) • Fire Prevention/Advice Programme Delivered to Maori • Fire Prevention/Advice Programme Delivered to Other Ethnic Communities • Fire Prevention/Advice Programme Delivered to Pacific Communities • Fire Prevention/Advice Programme Delivered to People in Rural Communities • Fire Prevention/Advice Programme Delivered to People with Low Incomes • Fire Prevention/Advice Programme Delivered to Residents of Purpose Built Multi-story Accommodation Complexes • Fire Prevention/Advice Programme Delivered to Students • Fire Prevention/Advice Programme to Residents of Inner City Developments and Redevelopments • Other Programme Delivered to People in Rented Accommodation
	<p>Public Education - Local</p> <ul style="list-style-type: none"> • Confident Living Programme to the Elderly • Displays and Posters • Fire Safety Demo Trailer • Kitchen Demonstrator • Lectures • Media Programmes • Media Release • Other Activities: Region Promotion Plans • Other Advice and Training Programmes • Pamphlet or Letter Drop • Presentations/Talks • Road Crash Awareness Programme • Running of Street Meetings • Station Open Day • Station Visit 	<p>Public Education - National Promotions and Campaigns</p> <ul style="list-style-type: none"> • Change your Clock, Check your Battery Promotion • Guy Fawkes and Halloween Promotion • Maori Change your Clock, Check your Battery Promotion • Maori Guy Fawkes and Halloween Promotion • Maori Summer Campaign • Maori Winter Campaign • Summer Campaign • Winter Campaign • Working with Maori Communities

The stations select who they think are the most important groups in the community to reach with fire safety programs in a given year, based on local demographics, local housing, and other factors. They may change the focus from year to year, selecting the elderly this year or additional school grades next year.

They receive a “standard resource kit” for whichever programs they do, to standardize the approach and messages across the nation, and to ensure the program is based on research on what works best. That approach frees the firefighters to deliver the programs, and not spend time figuring out how to do them or where to get the materials. They use one set of first-rate materials developed by experts, instead of a variety of mediocre materials developed by well-intentioned but non-expert designers.

A daily plan of tasks to be accomplished is issued for each shift. The plan includes equipment and station maintenance tasks, training tasks, and other business as well as prevention tasks. Workloads can be re-allocated during the year from one shift to another or across stations, with their agreement. Tasks are not necessarily allocated uniformly across all shifts. For example, two shifts may do the bulk of school visits, and the other two may do inspections or home visits.

The fire problem varies in different areas of New Zealand in part due to variation in climate and where various populations have settled. The SMS allows for tailoring the prevention approach to the zone, region, or even station area. In the North Island, candle fires and open flame cooking are problems, in part because of the lifestyle of the local Maoris and Pacific Islander people. In the colder South Island, the focus of prevention is more on heating-related and chimney fires.

The SMS approach results in buy-in for the prevention program plan at the start of a year at the rank-and file level. NZFS has given a lot of thought to getting the rank-and-file to accept the system, and gives an excellent presentation to all of its firefighters. (See Figure 12 for a sample.)

Fire safety specialists—the prevention staff assigned to Headquarters and the zones—use the SMS to plan their own activities. They report as a pseudo-station. The national head of community safety can view the combined plan and the combined progress in delivering school programs or home visits from both prevention staff and line firefighters.

Figure 12: Philosophy of New Zealand Station Management System



Incident Reports: The dispatch system automatically logs emergency incidents onto the daily task list of the responding station; they are treated as unscheduled tasks. The task list shows whether the station completed the incident report for each attended incident. If not, the report stays open as an overdue task. This practice improved the quality of the data used for targeting and evaluating programs.

Prevention Detail Captured: When planning or recording the accomplishment of home visits or school visits, the firefighter records not only the visit date, but also the categories of information conveyed. For example, they report whether smoke alarms were discussed, installed, or maintained, and whether they addressed the speed of fire, cooking safety, home escape plans, night safety, heaters, and electricity. This captures aggregate data on the number of smoke alarms installed, relocated, maintained (batteries changed), or cleaned. It is extraordinary to track prevention at this level of detail. The information on what was conveyed to whom can be used to measure effectiveness of messages in more detail than is possible in most other fire services. This capability is a result of considering the head of prevention the “director of community safety and research”. The firefighters just have to check boxes on the computer form, which minimizes the reporting burden.

Building Files: Another feature of the SMS is its link to a building file. All buildings in New Zealand have been entered in the file, a total of about 1.8 million structures including single family dwellings. One can look up any address and find all activities done there by the fire service including emergency calls, inspections, and home visits. Before a fire company goes on a home visit, they can review its fire history and past interaction with the fire service. The system is easy to use and therefore more likely to be consulted. That in turn can sharpen what the firefighters look for when they visit a home or apartment building, and they can check on the status of remediation that was recommended in a prior visit, such as when the fire service installed or maintained a smoke alarm. The fire unit updates a building's file after each visit.

Risk Rating: Each building visited by the fire service is given a risk rating of 0–25 based on the sum of ratings of five components of building safety. Each component is rated 0–5, with 5 the highest risk. They intended to use a more sophisticated approach, but at present this is used for a first cut at sorting out the highest risk buildings. The building components rated include structure type, built-in protection, use of the building, number of occupants, and fire history. Socioeconomic data on the occupant is recorded.

Total Fire Station Workload – In the QFRS version of SMS, stations plan the percent of time that will be allocated to different tasks, including emergency operations, building fire safety (inspections), and community fire safety. This is done down to the shift level, with each shift assigned an area of the community for which it is responsible.

Data on fire incidents from the Australian Incident Reporting System (AIRS) are available for analysis and tied to the GIS system. Any station or higher level manager can identify the homes most in danger from bush fires or other causes in their area of responsibility.

The stations negotiate their prevention plan with their regional coordinator for community safety. This is done in the context of what is called the Statewide Integrated Operational Planning Process (SIOPP). The annual strategic plan includes the approach to be taken for prevention. The plan has quantitative targets at the region, area, station, and shift level. The stations report progress during the year, much as with the New Zealand SMS.

QFRS is moving toward requiring the stations to spend at least a specified minimum amount of time on building and community safety programs. QFRS leadership thinks that this requires a culture change, which they are speeding along by recruiting firefighters who agree to spend part of their time delivering community safety programs. The Queensland Executive Manager for Community Education and Research has a marketing background, and did not come up through the fire service, which itself is an innovative practice.

Long-Range Strategy for Prevention – MFB visualizes its fire safety efforts as part of the “90-year plan” for the community to “connect things up from cradle to grave”. To ensure the safety of pre-school children, fire safety is taught to parents. In elementary school, firefighters and teachers teach safety. In secondary schools firefighters teach road safety as well as fire safety. Teenagers are taught general fire safety strategies that are reinforced in adulthood. The information is provided in greater detail for the elderly. A side benefit is that by providing fire safety education and opportunities to engage with the fire service throughout an individual’s lifetime, firefighters are better able to work with the community in an emergency. This approach also lays the groundwork for firefighters to engage with members of the community who have chosen an isolated lifestyle.

Training Firefighters in Prevention Delivery – A number of innovative approaches are being used to train firefighters for delivering community fire safety programs around Australia and New Zealand.

Training of Volunteers: NSW has developed three levels of certification in prevention for its volunteers: “community safety assistant”, which requires just a one day course; “community safety facilitator”, which requires a two-day course; and “community safety coordinator”, which requires another two-day course. There is follow-up of students on the job after the courses. Besides the mini-courses they must get their prevention work assessed by a Learning and Development Officer to qualify in these certifications, similar to obtaining other certifications. This system gives the volunteer recognition for learning how to deliver prevention programs. The certifications are nationally recognized and transportable. NSW now is trying to get the advanced firefighter course for career and volunteer firefighters to include the community safety assistant one-day course. NSW’s long range goal is to give prevention training to all 70,000 of its volunteers. The formal certification program is only two years old and already thousands of volunteer firefighters have been certified as community safety assistants.

Specialized Training by Zone: MFB trains a group of firefighters in each of its four zones on methods for delivering each prevention program. About six firefighters per zone are trained on the program to teach fire safety as part of English lessons for new arrivals. About 10–15 firefighters per zone are trained for the juvenile fire-setter program. About 4 per zone are trained to deliver fire safety to the parents of young children. This spreads the prevention training burden over many firefighters and involves many firefighters per zone in prevention and working with the community. It also ensures having adequate backup personnel for absences, yet allows specialization in particular programs. Some programs are simple enough to be delivered by any firefighter, so even more firefighters are involved in prevention than are taking specialized training. Some firefighters participate in more than one program.

Use of Retired Firefighters: In MFB, volunteers who are retired firefighters work with the elderly. They are trained by the community safety divisions. Retired firefighters are respected, have an age connection with the group they are addressing, and serve as a channel of information back to MFB. One retired firefighter used for outreach is 83 years old, a peer to the highest risk age group.

Statewide Training in Community Safety: Queensland and Victoria train their firefighters statewide on how to deliver community safety programs, including the process and content. Their goal is to achieve high consistency in what is delivered, and to have a large pool from which to draw for delivering programs.

Lowering Response Time Standards – Australia and New Zealand have longer response time standards than in the United States. NSW Fire Brigades had a goal of 7.1 minutes for the 90th percentile of calls in urban areas, whereas in the United States, the NFPA 1710 standard is 6 minutes. In practice, NSW achieves a 90th percentile of only 10–11 minutes. Their goal was based on time for flashover and fire growth, but flashover can easily occur now in 2–4 minutes starting with an open flame. In light of their good bottom line statistics (low rates of deaths, injuries, and dollar loss) the NSW fire service has decided to abandon response goals altogether, and is focusing more resources and time on prevention, where the leverage and payoff seem greater. They argue that the public should take more responsibility for preparedness for emergencies, and think about the risk they are willing to take. The fire service will still respond as quickly as it can to emergency calls that occur.

No one in the world, to our knowledge, has adequately quantified the expected change in casualty or loss rates as a function of the change in prevention resources or suppression resources, whether the input is measured in person-hours or dollars. Nevertheless, the Australians, British, and Scandinavians have been gradually shifting more of the work-time of operations forces to prevention activities, and achieving lower casualty levels at lower overall resource levels than the United States.

National, State, and Regional Campaigns

State-level campaigns—not local campaigns—are used to reach the general population with fire safety messages in Australia. Some campaigns are targeted at particular groups. A variety of media are used to deliver messages.

New Zealand funds national campaigns that are of the same size as an Australian state campaign. New Zealand coordinates its television campaigns through a person in the national community safety division whose background is journalism and public relations in private

industry. Both nations allow local or regional campaigns in areas where safety issues differ from the state or national ones.

Research and Evaluation – Australian and New Zealand prevention programs are generally based on research, and most campaigns are evaluated. The research reveals what the public knows about fire safety and the effectiveness of past campaign approaches. Research and evaluations are among the most important “best practices” we found. All prevention programs in New Zealand now have an evaluation component built into them.

The Australian and New Zealand fire services hire outside consultants to do campaign evaluations and surveys. They often give responsibility for overseeing the research and evaluations to a senior fire service manager whose title explicitly includes research or evaluation. For example, the head of the NZFS prevention division has the title “Director of Community Safety and Research”. In Queensland the corresponding position is “Executive Director, Community Education and Research”. For 2008, the NSW Rural Fire Service has budgeted for a full-time evaluation position in its prevention division. AFAC’s Committee on Community Safety routinely discusses research findings from the fire services and external researchers that bear on the design of programs.

National Surveys: New Zealand runs two 1,000-person national surveys each year to evaluate and guide its national campaigns. One survey determines the level of fire safety knowledge of the population, their attitudes about fire safety, and their practices. The second survey measures communications effectiveness of the campaigns. It asks questions such as “Did you see any adverts about fire safety in the last month?” and “What do you remember about them?”. The surveys over-sample high-risk groups in the population, such as Maoris and Pacific Islanders. This is a sophisticated approach to guiding campaigns and excellent practice to do on a routine, annual basis.

A serendipitous evaluation of the need for a continuous national television campaign outreach came a year ago when there was an unplanned gap in television ads because of a delay in budget approval. The annual survey showed that the recall rate for safety messages dropped from the previous 74 percent of the population, an exceptionally high rate of recall for a safety campaign, to the post-gap recall rate of 56 percent. The television ads made a difference.

CFA, too, uses surveys to determine effectiveness of campaigns. A survey of citizens living in wildfire-prone areas found that:

- 70 percent had a plan for bush fires
- 75 percent had received a warning that fire was likely in their area
- 60 percent attended at least one meeting during a fire

- 90 percent thought the meetings were useful
- 91 percent were satisfied with the level of service before, during and after wild fires

This suggests that the campaign raised awareness through its series of local meetings and publicity.

Focus Groups: MFB evaluates its campaigns and programs using focus groups. So does Queensland, as illustrated in Figure 13. As a token of appreciation and to help get lower income people to participate, MFB pays people \$50 for providing 1–2 hours of their time in a focus group.

Figure 13: Focus Group for Sudanese Community in Queensland



MFB used focus groups of people who had fires to see if their attitudes about fire had changed as a result of their fire experience. The project found, counter-intuitively, that these people did not subsequently take more fire prevention measures than people who had not had fires. The implication was that even the victims of fire underestimate the risk and danger of future fires, thinking it won't happen to them again, which demonstrates just how difficult it can be to raise awareness of fire risk and get people to act on it.

The focus groups also were asked to discuss how to promote awareness of fire risks. MFB found that most of the public associates fire safety with reactive messages (what to do in a fire) more than preventive messages (how not to have a fire), so they increased emphasis on the prevention content of messages.

Another research finding is that much of the population is recording television programs with videotape or digital recording. This allows viewers to skip over fire safety messages as well as commercials. Also, television viewing is dropping among young people. But while weaker

than it once was for outreach, television is still excellent for reaching most of the high-risk groups.

Year-Round Television Campaign – Every month New Zealand runs intense bursts of 90 30-second fire safety television spots during a two-week period. They spend the equivalent of \$3.7 million U.S. per year, mostly on television, but they also use radio time. That is a higher per capita budget for fire safety advertising than any other nation we have researched. Based on national surveys, the ads have been effective in terms of the public’s awareness and retention of the messages. The ads address topics such as:

- Speed of fire
- Unattended cooking (cause of one-third of their fire deaths)
- “Don’t drink and fry” (a play on “don’t drink and drive”)
- “C’mon guys get Firewise” (aimed at children, to get adults to practice fire safety and maintain smoke alarms)
- Heaters close to furnishings
- Electrical overloading
- Electrical faults
- Matches and lighters handled by children

Most New Zealand television messages are targeted to reach particular groups, using various shows and times of day:

- The Maori television channel is used to reach the Maoris and Pacific Islander populations
- Daytime soaps are used to reach families with high deprivation levels (low employment, high poverty), because they often home watching television.
- Sports television is used to reach middle-aged men who are heavy drinkers, because market research shows that is what they watch the most.
- Children television programs are used to reach children and through them, their parents

There are only six major New Zealand television channels. Compared to nations with hundreds of channels, they can reach larger portions of the population with fewer ads. Television messages may help anyone who views them, not just the target group. The messages aimed at middle-aged male drinkers that warn against the hazards of cooking fatty food when they get home from drinking also warn others about cooking hazards.

Seasonal Campaigns – Victoria, NSW, and QFRS each run seasonal campaigns, with a focus on weather-related activities or holidays, but with some topics assigned to a season just to spread messages out over the year. Summer and winter are the peak seasons for home fires, and get special attention.

Summer: Summer risks include Christmas-related safety programs such as lights on trees and candle safety. It also is a time for camping activity. Queensland focuses on appliance safety and not leaving equipment on after leaving the house, a problem when the mind is on getting to outdoor activities. NSW’s summer campaign focused on camping safety and Christmas safety.

CFA, MFB, and the Department of Sustainability and Environment (park and wildland firefighters) jointly conduct a summer campaign called “Fire Ready Victoria.” CFA developed two television commercials for the December 2006–January 2007 summer season. They were aired 800 times in a 4-week period. CFA also developed 4 radio spots which together ran 350 times in that period. These are much higher run rates than ever occur for public service announcements in the United States. The summer campaign targeted residents in locations with high wildfire risk and tourists traveling into high risk areas. MFB focused on the people in the urban rural interface and those vacationing in rural areas through radio and print advertising and community meetings in interface areas.

Autumn: With no particular seasonal hazards, autumn is used to focus on year-round safety issues. These include messages on senior safety and “Open Day,” when citizens are encouraged to visit fire stations. The national “Change Your Clock, Change Your Battery” campaign is conducted on April 1 to prepare homes for fires in the coming cooler weather.

Winter: CFA and MFB conduct joint winter campaigns for the state of Victoria. Winter safety focuses on heating, cooking, calling 000 and promoting Escape Day (a national day for planning and practicing evacuation from the home). The most recent winter campaign had press and radio ads that focused on heaters, electric blankets and cooking fires. A person who cares for burn victims delivered the messages—a novel, powerful approach. To grab the attention of children, a trained dog demonstrated “stop, drop, and roll”. The ads were developed and sponsored in partnership with Energy Safe Victoria, which is the State of Victoria’s authority responsible for gas and electrical safety, including safety regulations.

The television and radio ad themes were augmented by information on the fire service’s websites and in press releases. A newly revised brochure on “Your Home Fire Safety” was released.

Spring: Spring is the optimum time to prepare for bushfire, barbeque, and backyard safety. It also is used to focus on household chemical safety, which is both a fire issue and hazard of its own.

Use of the Internet – Australian and New Zealand fire services have excellent websites with a great deal of information on fire safety. Usually the site is organized by topic or program. Much if the information is available in foreign languages. The sites also give addresses and instructions on how to contact the fire service for more information.

A more specialized use of the internet is to reach young adults (15–29), who often are difficult to reach with traditional fire safety programs. They view about a third less television than older people and have “feelings of invincibility,” which lead to ignoring safety messages. A report undertaken for AFAC in Australia by students from Worcester Polytechnic Institute in Massachusetts, reported these findings and explored the potential for using the internet to reach this age group.⁶ The youths are heavy users of new electronic technology, including:

- Mobile phones
- Video games
- Internet
- iPods
- Peer to peer networks

Generation Y (born 1981–1999) is the most media savvy of all population groups and the most wired. Seventy five percent of this group in Australia uses the internet, spending an average of 12 hours a week on it.

The internet is not yet a major factor in fire safety education, but its use is growing. NSW Fire Brigades now runs ads on the Google search engine so that anyone searching for the term “house fire” and other relevant terms will see an ad about home fire safety and a website address for more information. Australia has an on-line wildfire computer game called “Stop Disaster” that teaches the dangers of wildfires and how they might be dealt with.

Localized Targeting of Campaigns – New Zealand allows its stations, districts, and zones to develop campaigns they feel are needed in their areas. The campaigns can be for any size area and can be proposed as part of the annual business plan for each station or larger area.

⁶ “Technology Delivery Methods of Community Safety Messages”, AFAC report, May 1, 2007, by a group of WPI students.

Regions can request small budgets to develop a campaign. Resources developed by a region have to be usable by at least one other region. This encourages the regions to work together, and to use a project steering committee that includes officials from other regions to ensure broader usefulness.

Interacting with Media – QFRS stretches its campaign budget by seeking coverage for fire safety campaigns on public affairs programs.

New Zealand developed a brochure to guide its firefighters in dealing with the media. It answers questions such as: What are good opportunities? What is a firefighter free to discuss? To whom should referrals of media requests be given? How should firefighters behave if interviewed?

NSW Fire Brigades and MFB give each fire station a media training kit that includes template media releases, samples of successful media coverage, and tips on media relations. Local fire officers work with their local media to distribute fire safety messages to the community. The result has been more exposure of safety messages on local television, radio, and press. In NSW Fire Brigades, station-level programs were reviewed in 2006 and continued with some revisions to the media kit. There have been mostly positive results in trusting station officers to take on this role. MFB, too, reviews and updates its media kit as each campaign rolls out. The kit is updated at each station to provide an opportunity to discuss aspects of the upcoming campaign with the station.

Corporate-Supported Campaigns – Australian fire services receive major donations (millions of dollars) from industry to support various prevention programs. This corporate sponsorship allows the fire service to run larger community safety programs, and fosters partnerships with the private sector and community.

NSW Fire Brigades has a full-time sponsorship coordinator to solicit and liaison with the corporate donors. NSW issues a prospectus outlining the major prevention projects available for sponsorship each year. New Zealand gave its firefighters a guide for dealing with corporate sponsors. It discusses what is permissible and how to deal with sponsors who approach the fire service. These guides foster appropriate sponsorship without compromising the integrity of the fire service in the process.

McDonald's sponsors "Escape Day" activities in the states of NSW and Victoria. Subaru sponsors the program for ethnically diverse communities. A bank foundation sponsors fire education for schools. Other firms sponsor seasonal fire safety calendars, displays at fairs, the "Be Safe Not Sorry" community education campaign, and even the NSW arson dog. Duracell

has sponsored the “Change Your Clock, Change Your Battery” campaign in Victoria since 2001, and nationally since 2006.

Community Fire Safety Presentations – Almost every fire department in the world provides presentations on fire safety to community groups who request them. They usually are coordinated or at least consistent with campaign messages. CFA has a particularly well-organized approach for both residential fires and wildfires. CFA personnel deliver sessions that last 1-2 hours. The residential presentations include:

- Information on how house fires start
- Discussion by participants of their personal fire experience [an effective technique for getting interest]
- Consideration of fire risks in each room in the house
- Demonstrations of how to change a smoke alarm battery (which is both a reminder and a “how to”)
- Demonstrations of the use of a fire blanket
- Demonstrations of the use of a fire extinguisher

Home Visits

The Australia and New Zealand fire services visit many low income households and households with high deprivation indexes. During the visits, they test or install smoke alarms and provide fire safety advice.

High-Risk Focus – The NZFS visits low-income families, especially in the northern region where there is a high deprivation area with a large Maori population. The program focuses on rural villages of 50–200 homes. The fire brigade goes door to door to each home. The program outreach has been high, getting into 60–70 percent of the homes.

During a home visit, the fire service:

- Installs smoke alarms if needed;
- Helps the household develop an escape plan; and
- Provides fire safety advice on safe cooking, smoking, and electricity use.

Firefighters usually visit the households during the daytime, when many of the adults that need to be reached are home because they are unemployed. The fire brigade sometimes hires local unemployed people, mainly Maori, to make the smoke alarm installations under firefighter supervision. This builds further links into the community. Messages are left for people not found at home to contact the fire service.

The western region of New Zealand also has an aggressive home visit program in the smaller communities in its region. They, too, try to visit all homes in the community by going door to door. In larger communities they target homes in blocks that have higher risk based on demographics and fire history. They report that over the course of several years, they have visited most of the high-risk homes in their region. Most career firefighters and some volunteer firefighters in the region are involved in the home visits.

In Australia, NSW increased its home visits from 1,500 in FY 2003–2004 to 10,600 in FY 2005–2006. They did 8,700 in FY 2006–2007. Most visits were to install or check smoke alarms in needy households. Over the same period NSW decreased its commercial building inspections from 1,628 to 1,170, a shift in resources from non-residential to residential risks. In the same period child education presentations doubled, from 1,207 to 2,455, again part of the shift to addressing residential risks. CFA gave 1,000 smoke alarms to households that participated in its home inspection offering last year.

MFB is moving away from direct inspections of homes by firefighters. It is relying more on partnerships with external service providers and education of those who are likely to have direct involvement with high-risk groups in their home, to enable greater penetration of high-risk households. MFB provides assistance in convincing the more reluctant or needy community members rather than using up valuable time on the majority that are readily assisted by their normal in-home service providers.

MFB has formed a strategic alliance with Archicentre, a private professional organization that employs architects and engineers to review properties on a fee for service basis. Archicentre has a contract with Victoria's Department of Housing to provide a free structural and safety inspection service to aged householders no longer in the workforce. MFB has refined Archicentre's survey form regarding home fire safety to include smoke alarms. In return, Archicentre provides MFB with home fire safety statistics from their survey.

Self-Help Focus – Queensland operates a “safe home” program in which at the owner's or tenant's request local firefighters visit homes to conduct a free safety inspection with the resident. This approach helps teach how to recognize risks, instead of always needing the help the fire service. The fire service advertises the availability of home inspections, but visits homes only if requested to do so. Visits can be booked by phone or on-line with fire headquarters, or by calling the local fire station. A “Smart Services Queensland Call Center” has been set up for citizens to get information on any government services, including information on fire service home visits. The home visits are available to tenants as well as homeowners, an unusual wrinkle. Problems found are discussed with the landlord.

Before the home visit, the household fills out a short questionnaire to give the fire service information about the home, such as the main language spoken there, the type of construction, and any disabilities.

The home visits typically last about 45 minutes. The primary task is to check each smoke alarm to see if it is working and properly positioned. The firefighters also discuss evacuation plans, electrical safety, and fire prevention relevant to the circumstances of the household. The occupants are given a checklist to use themselves and fire safety literature.

QFRS makes 3,000–5,000 home visits each year using operations fire crews. They installed 2,000–4,000 smoke alarms per year over the past several years as part of this program and other requests. The households visited were surveyed to evaluate the effectiveness of the visits. The survey found that:

- 70 percent of households had a smoke alarm at the start of the visit, and 97 percent at the end.
- 50 percent had thought about evacuation plans before the visit, 83 percent had a plan after the visit.
- 94 percent said they made at least one change in the household as a result of the visit.
- Virtually all households visited said they found the visit worthwhile.

Consumer Products for Safety

The consumer products used for fire safety, and safety improvements on existing products, are quite similar to those in the United States and Europe, with a few exceptions.

Smoke Alarms – The product that arguably has the largest impact on fire safety is the smoke alarm. Legislation requires them in all homes in Australia and New Zealand, as discussed earlier. More generally, residents are encouraged to purchase safety products that meet Australian standards.

Fire Blankets – Australian and New Zealand fire services promote use of fire blankets for smothering fires, especially cooking fires where use of a lid on a pot or frying pan can be more dangerous than using a fire blanket. A fire blanket can also be used to wrap someone whose clothes are on fire, to smother the flames. Australian fire literature and safety displays recommend mounting a fire blanket and fire extinguisher side-by-side on a kitchen wall. NSW estimated that perhaps 20–25 percent of the households in New South Wales had a fire blanket.

Fire Extinguishers – Australia and New Zealand encourage but do not mandate use of fire extinguishers in the home. Their use is included in fire safety education for children in fifth and sixth grades and higher.

Cigarettes and Upholstered Furniture Regulation – New Zealand is one of the few nations in the western world where the leading cause of fire deaths is not careless smoking. That has been the case for many years, despite there being no fire safe cigarette legislation nor stringent flammability standards for upholstered furniture.

Two factors seem to reduce smoking-related fire deaths. First, many low income people who smoke still roll their own cigarettes. That makes the cigarette essentially self-extinguishing and much less likely to start fires. Legislation requiring manufactured cigarettes with reduced ignition propensity has been drafted in Australia but is awaiting United States results. New Zealand is watching what Australia does. Second, wool is widely used for upholstered furniture coverings in New Zealand because of the huge sheep population and low cost of wool. Wool is extremely difficult to ignite, and so the effect of its wide use was the same as having a regulation on flammability of upholstered materials. The situation may be changing, especially for inexpensive furniture, as wool production gets less profitable, and more hybrid fabrics are imported.

Children's Sleepwear – Australia classifies children's sleepwear in two flammability categories to alert parents to the potential danger of some of the sleepwear.

Electrical Usage in the Home – Voltage in Australia and New Zealand is close to that in Europe, and about double that in the United States. The higher potential for electric shocks has motivated attention to electrical safety. Electrical fires and their associated fatalities have been sharply diminished by stiffened electrical code requirements for ground fault interrupts and circuit breakers on home circuits.

Home Sprinkler Systems – Both Australia and New Zealand would like more of their public to embrace home sprinkler systems, but like the United States, they have had resistance from the insurance companies, home builders, and the public itself.

A New Zealand study found that home sprinkler systems built to New Zealand standards were too expensive and not cost-effective—about \$13.5 million (U.S.) per life saved.⁷ The cost of the system was roughly \$280 (U.S.) per sprinkler head, and a typical house required 10 heads, for a cost of about \$2800.

⁷ O.R. Duncan, *et al.* "Cost-Effective Residential Sprinkler System," Branz, August 2000. [Branz is the building research agency of New Zealand)

In light of this analysis, New Zealand fire engineers designed a lower cost sprinkler system that would extinguish about 90 percent of fatal residential fires. The revised standard gives up sprinklering confined ceiling spaces, bathrooms, and closets, and eliminates the requirement for backflow valves and some other features. The redesigned system was estimated to reduce house fire injuries by 55 percent and fire fatalities by 72 percent, based on a fault-tree analysis. It would operate off the domestic water system, and cost just \$800 for a 3-bedroom house. The life and injury reductions assume that working smoke alarms are present in addition to the sprinkler system.

The new residential sprinkler system would be cost-effective (about \$600K per life saved), but had not entered into compulsory use as of 2007. However, the NZFS has initiated a program that targets local authorities, plumbers, architects, and developers to sell the benefits of home sprinklers to potential new home owners or those planning major renovation. The program is having some success at voluntary incorporation of home sprinklers. In addition, NZFS has negotiated with the major New Zealand home insurance provider a reduction in insurance premiums for homes fitted with home sprinklers.

In computing the cost-effectiveness of sprinklers, New Zealand researchers reduced the cost of the sprinkler system by the expected reduction in property loss and reduced cost of fire injuries expected from having a sprinkler system. These cost effects are not always thought of when considering cost per life saved, and are important when considering cost-effectiveness.

To help promote use of home sprinkler systems, the western region of New Zealand placed advertisements in the “Homeowners Building Guide”, a commercial publication for architects, builders, plumbers and other home building trades. The longer range plan (or desire) is to get homebuilders to include sprinklers as a non-negotiable part of a new home.

An emerging force that may stimulate more use of home sprinkler systems is the new concept of having twin water systems for a community short on water, one with recycled water and the other for drinking water. With water at a premium in much of Australia (as in the southwest and southeastern United States), the new dual water systems are designed to use less water, but are insufficient to supply current fire engines. Home sprinkler systems, which can work off the domestic water supply, become more attractive in that situation, as opposed to purchasing a fleet of tanker trucks or developing a network of water cisterns for firefighting.

Partnerships

Many of the programs cited in this report use partnerships between the fire service and other government agencies. The partnerships help identify households with problems. The partnerships provide resources for reaching hard-to-reach populations, such as shut-in elderly

and people with disabilities who are visited by care providers. These providers are trained to look for fire safety problems during home visits. Partnerships also are made with private industry to sponsor and disseminate fire safety programs. Burn hospitals have been used to assist in designing prevention materials. Real estate organizations (e.g. the Real Estate Institute of Victoria) have promoted the use of smoke alarms through their agents.

NSW Fire Brigades has a partnership with the NSW Department of Housing. It manages over 130,000 properties, all now using hard-wired smoke alarms to protect their largely low income residents. The fire brigades and housing also jointly developed a fire safety kit for Aboriginal tenants.

MFB formed a partnership with State Government Welfare and VicDeaf (the leading organization for people who are deaf in Victoria) to subsidize and install smoke alarms for the hearing impaired. These battery-powered smoke alarms have strobes, vibrating pads, and a plug-in control unit. The subsidy was necessary due to the high cost of these alarms.

Victoria created the Victorian Burns Prevention Partnership (VBPP). Representatives from the state's fire services and the Alfred Hospital and Royal Children's Hospital burn units meet to share knowledge about burns prevention. They develop joint projects, campaigns, and media releases for prevention of burns and scalds. The committee members have formalized this arrangement with specific objectives, terms of reference, membership, and meeting schedules.

Practices Discontinued

Prevention programs that are not effective should be dropped to free time and money for better programs. We discussed above that some ineffective older school programs were stopped. We were surprised at two other major program deletions that the Australian and New Zealand fire services have made.

Fire Prevention Week – The fire services in Australia and New Zealand have curtailed or abandoned Fire Prevention Week in October. They feel it is not timely relative to the winter and summer fire peaks, and that it may send the wrong message that prevention can be dealt with once a year. They also think it sends the wrong message to the fire service, that if they do something in Fire Prevention Week they can claim to have a prevention program and do little the rest of the year. Australian fire officials said that preparations for Fire Prevention Week took months, and the information went mainly to people who needed it least. Instead they advocate year-round programs targeted to high risk groups. In Victoria, Fire Prevention Week has evolved into Community Safety Month. While fire safety campaigns are run year-round, they are particularly focused in this month and tied to other emergency services.

Inspections – Perhaps even more surprising is the abandonment of a fixed commercial inspection program by the NZFS. There are no national requirements for inspections in their codes or laws. Local governments decide on inspection regulations, or leave inspection planning to the discretion of fire stations, as part of risk management. The local leadership decide as part of annual planning what buildings will be inspected or visited for pre-fire planning. Code violations or major hazards found by the fire service are reported to local authorities, but the fire service is not involved in the legal side of code enforcement. The onus is on building owners to inspect and safe-keep their properties. The fire service may conduct inspections for risk management, but they are not required by code. Reducing the number of required inspections frees firefighter time to visit homes and to focus more on public education and on the behavioral side of prevention rather than the structural side. New Zealand has one of the lowest fire death rates in the western world, so the reduced inspections are not affecting life safety much if at all.

Fire Data

Australia and New Zealand use their fire data both to target and measure effectiveness of their community safety programs. As in the United Kingdom, Australia and New Zealand fire services have detailed socioeconomic maps they can overlay with fire data to help analyze risk. Their prevention strategies are largely based on quantitative risk analysis.

National Data – The Australia Bureau of Statistics is the national source for fire data in Australia. Fire deaths have trended downward over the past decade. There are about 70 fire deaths and 1,500 fire injuries stemming from 10,000 residential fires a year. This is an extraordinarily low residential fire death rate of 3.5 per million, or about one third the rate in the United States. The number of accidental fire deaths has gone down even faster than total fire deaths in Australia. In fact, arson, murder, and suicide fire deaths have been increasing.

Australia is not sure whether residential fire injuries are up or down because of the vagaries of reporting. Many injuries are associated with unreported fires, and as the percent of homes with working smoke alarms increases, early detection and extinguishment of fires by homeowners reduce the number of reported fires and probably reported injuries. Also, some Australian fire services only report injuries to which they attend medically, and not the total number of injuries from the fire. Because this is not done consistently across the nation, it is difficult to combine data from different locations and examine trends. The MFB is trying to merge data from their fire incident files with those of hospitals and other sources to get the fullest data on fire injuries. A draft standard for doing so is awaiting approval.

The leading causes of fires in Australia are cooking, smoking, and electrical faults. As is widely the case among many other Western nations, the highest risk groups are the elderly, young children, and people with disabilities,

New South Wales Data – NSW had their lowest number of fire deaths in recent history in 2006—19 deaths, including suicides and murders. However, fire injuries went up, for which they have no explanation.

Victoria Data – From 1990–1992, the average number of fire deaths per year was 11.7. From 1998–2006 the average dropped to 8.3, but 2007 was up with 19 deaths. However, these are small numbers, consistent with the low national fire death rate per capita. In 2007, the accidental fire death rate for CFA and MFB was 5 and 2-3 per million, respectively.

CFA analyzes its data down to the “mesh block” level, which is on the order of 20 households. They specify a “treatment” (i.e., prevention approach) for each mesh block, depending on its history and land use category (e.g., whether prone to wildfire). They use mesh blocks commensurate with the national census mesh blocks to facilitate detailed demographic analysis. The Australian census is undertaken every 5 years, not 10 years as in the United States, and thus the data are on average more up to date. This is important in a growing population with high immigration.

New Zealand Data – New Zealand has one of the lowest fire death rates per capita in the Western world. It had an extraordinary drop in its accidental fire death rate from the 12–13 deaths per million population circa 1982 to 6 per million by 1998, and then a remarkable further drop to 3.5 deaths per million in 2005–2006. That is a 70 percent drop in 10 years. (These data exclude arson and suicide deaths, but the drop in the accidental fire deaths is still highly admirable.) They achieved this drop with no extra firefighters. The national fire service is the same size as 20 years ago, indicating a large increase in productivity from their revised strategy to emphasize prevention and base prevention programs on research.

The stated national New Zealand goal is to get fire deaths down to below 10 per year. They ranged between 15 and 31 fire deaths per year from 1984–1998. The numbers are so low that the per capita rate can fluctuate considerably from year to year based on a few fires. The number of residential fires average about 4,000–5,000 per year.

The leading cause of fire deaths in New Zealand is cooking, usually associated with use of intoxicants, which leads to the cooking being left unattended. Most fire fatalities are alcohol-related. As mentioned earlier under the discussion of consumer products, smoking is not a major cause of fire deaths in New Zealand.

Fire Investigations – The Australians generally base their fire statistics on fires with verified causes. Less than one percent of fires are classified as “cause undetermined”, which is outstanding. Data on the causes of fire fatalities in the home and elsewhere come from the incident reports in the Australian Incident Reporting System (AIRS) and fire investigations. AIRS was originally based on the U.S. NFIRS system, but has evolved in a slightly different direction.

All fatal fires are investigated by a fire investigator to determine cause and origin. All other fires are first investigated by line fire officers. If they cannot determine the cause, then fire investigators are called. If the fire is of suspicious or incendiary origin, it is immediately turned over to the police to investigate further.

III. JAPAN

Japan has a population of about 130 million. Its population density is one of the highest in the world at 343 people per square kilometer, four times higher than in the United States. Their population has been essentially level for the past decade.

The proportion of elderly in Japan is larger than in most industrial nations, and growing. That is a significant factor in their slow but steady increase in fire deaths per capita, because the elderly have higher fire death rates than other age group.

Grandparents now often live apart from their families. This enables them to maintain a more traditional lifestyle, but also is a result of economics and changing attitudes. Living with other elderly is a positive factor for fire safety when they live in group homes built and maintained under modern fire codes. Living alone is a negative factor if they live in traditional old wooden two-story apartment houses, as many do.

There have been other changes in socioeconomic and living conditions in the past 20 years that affect fire safety. The younger generation has become more westernized. More of them live apart from their family. Because of the scarcity and cost of land, Tokyo and other cities have been building vertically, with more multi-story structures and multi-use structures than 20 years ago. More people now live and work in structures regulated by codes, but the structures are harder to escape from than the traditional paper and wood, one or two story houses of the last century. Modern residences also are more compartmented and airtight, which means they contain smoke better, and it can take longer for occupants to detect a fire.

Other relevant lifestyle changes include less smoking and less cooking at home (more eating out), both of which tend to reduce the number of residential fires.

Despite modernization, many people still live in conventional detached homes built extremely close together, often with only one meter of separation from the neighboring house (see Figure 14, an example from Nagasaki). The clusters of homes are highly vulnerable to fire spread. That is a major motivation for people not to cause fires, and to disdain people who are careless. Having a fire is considered shameful. On the other hand, the closeness of houses within neighborhoods fosters mutual cooperation, with people coming to help their neighbors (and indirectly themselves) when fire occurs.

Figure 14: Typical Japanese Neighborhood With Homes Very Close Together



Japan has had some of the worst earthquakes in history, most recently the great Hanshin (Kobe) earthquake of 1995. Because many fires break out after earthquakes, disaster safety education includes fire safety, especially how to prevent and fight small fires. Citizens are expected to help themselves, then others, in a disaster.

The net result of the above factors is strong support for extensive fire safety education, much more than in most Western nations. This leads to an incredible array of fire safety programs that reach much of the population repeatedly, as will be discussed later.

Overview of the Japanese Fire Service

The fire service in Japan is organized at the local level. Even the smallest village has a fire department, often supported by one or more larger communities nearby. The fire service provides emergency medical services and the full range of other services found in a U.S. fire department. Firefighters are expected to participate in delivery of prevention programs in the normal course of their job.

The federal Fire and Disaster Management Agency (FDMA) develops national laws and standards, collects fire incident data, and develops national fire safety campaigns and associated materials, among other functions. They choose the themes and set the calendar for the fire safety

campaigns. They also help identify and share the best prevention programs. They do not carry out prevention programs directly; that is done entirely at the local level.

Tokyo Fire Department – Tokyo has a population of 8.5 million in the prefecture area and 12.6 million in greater Tokyo, which includes the city and some of the surrounding area. The Tokyo Fire Department is responsible for protecting greater Tokyo. It is the largest fire department in the world, with 18,000 personnel. It has 80 major fire stations and 206 “fire branch stations.”

To supplement its career firefighters, Tokyo has a volunteer fire corps of 16,000 people trained to deal with disasters, such as earthquakes, and to extinguish small fires. Their training carries over to their own home fire safety as well. They also train community residents in fire prevention and initial firefighting.

Approximately 1,900 career personnel are assigned full-time to prevention, over 10 percent of the department. Proportionally this is 50–100 percent more than in a typical U.S. major city department.

The HQ Fire Prevention Division is responsible for fire prevention inspections, fire investigation, and hazardous materials. The Public Relations Section, in a different division, is responsible for community fire safety, public education and training, public relations, public consultation, and international relations. The Public Education Section in the Disaster Division plays a major role in planning public safety education.

Each of the 80 major fire stations has its own prevention section that uses firefighters to locally coordinate and carry out the HQ-directed prevention programs. All firefighters are involved in residential fire prevention one way or another, through campaigns, home visits, school visits, etc.

Recruits receive 20 hours of training in prevention, including public education, inspections, and hazardous materials incident prevention. New firefighters assigned to a prevention bureau receive additional technical training in prevention. Prevention is also part of fire officer training.

Osaka Municipal Fire Department – Osaka is the second largest city in Japan at 2.64 million population. It has residential neighborhoods more crowded than even Tokyo, with many old wooden houses near each other.

The Osaka Fire Department has 3,500 personnel, 25 main fire stations, and 64 sub-stations. Fire Prevention is one of the three major divisions of the Fire Department. There are 300 firefighters assigned full time to prevention at HQ or in the stations, 8 percent of the

department. As in Tokyo, the HQ prevention staff manages the prevention program, implements the publicity aspects of the national campaigns, and plans promotions. The local station prevention staff and firefighters do most of the implementation in schools, neighborhood associations, etc. Osaka also makes use of retired firefighters to form a “Disaster Cooperation” unit, which allows them to share their prevention skills.

There is no special prevention training for recruits. When assigned to a public education team, junior members are expected to learn on the job by observing the team leaders.

Nagasaki Fire Department – Nagasaki is a bowl-shaped, medium-size port city of 450,000 population in the southwest of Japan. The residential areas are extremely hilly, like San Francisco, but with many narrow streets (see Figure 15). Access is difficult for the fire department. Response times are longer than in other cities because of the terrain. According to the fire department, knowing that it will take the fire department time to reach their house is a major factor in the citizens having high fire safety awareness.

Figure 15: Congested Hillside Residential Areas in Nagasaki Have Difficult Access



Nagasaki has 3 major fire stations, 16 branch stations, and 5 sub-stations. It has 493 employees, of whom 39 (5 percent) are assigned full time to prevention. In addition, 269 of the firefighters have prevention duties. Each major fire station or branch station has its own fire prevention section.

In addition to the career fire service, Nagasaki has 2,875 citizen volunteers in a Volunteer Fire Corps. They are used in disasters such as earthquakes and typhoons, when the regular fire service cannot reach an area or needs more support. They also assist with prevention campaigns, and play an everyday role in firefighting by using portable, wheeled hand pumps or fire extinguishers that are distributed throughout the city.

When there is a fire or medical emergency, a neighbor is often notified (“dispatched”) in parallel with the fire units. The neighbor checks the situation and helps with first aid or fire extinguishers, if possible. Before the fire department arrives, they may fight the fire or help lead people to safety. After help arrives, they may give directions to the fire.

Japan Fire Alarm Manufacturers Association (JFAMA) – This private sector association comprises 15 fire alarm manufacturers and 60 sales and maintenance companies. They are involved in the development of smoke alarm policy, the testing of smoke alarms to meet standards, and smoke alarm campaigns. They have various committees for technical standards and promotion. One committee focuses on dwelling fire prevention—such issues as what the standards should be for number of rooms with alarms, their placement, and sensitivity.

Reaching School Children

Almost all school children in Japan receive extensive fire and disaster safety instruction in school through a variety of programs. Varied approaches keep interest high.

In-Class Instruction – In Osaka, all students in the fourth grade receive a fire safety brochure. Teachers or firefighters explain the contents. When given by firefighters, the session often includes instruction on the use of extinguishers. About 65 percent of schools are visited by firefighters in a given year. By 2011 the fire department plans to give annual fire safety lessons to all elementary and junior high schools. Materials are developed for each age group in grades 1–3 (7–9 years old); grades 4–6 (10–12 years old); and junior high school (13–15 years old). They receive one session appropriate to their age in each year.

Class training may be given in four places: schools, fire stations, life safety learning centers, or the firefighter training ground.

Junior Fire Clubs- Children in elementary and junior high schools may elect to join a club that gives them fire and life safety training, and also information to bring to their parents. The expectation is that they will grow into adults with fire safety awareness. The clubs meet at fire stations or fire camps. Children attend them after school or on holidays. The fire service gives information to the club leaders to disseminate.

In Nagasaki, there are 36 junior fire clubs with 1,500 members in a city of 450,000 population.

Outside Drills – In Osaka, each school is expected to conduct an evacuation drill three times a year. Once outside, the time is not wasted—the children are given fire safety information, and practice fire safety behavior such as using extinguishers or crawling low in smoke. Nagasaki uses a similar approach. Firefighters conduct these drills. The idea is to get the children’s attention with the drill, which is useful itself for school safety, and then use it as a teachable moment. This approach fosters fire safety both at school with the evacuation drill and at home with the additional activities.

Poster Contests – For decades a novel version of a poster contest is used to increase elementary and high school students’ attention to fire safety. The children make posters with pictures of firefighters or fire trucks drawn from life, during visits to the schools. The posters include a fire safety message. A new wrinkle is to provide a “ sketch course” to increase the students’ interest in the contest. Posters are judged at the school, regional, and national levels. The national fire safety campaigns use the best posters each year, which is a huge incentive to participate. The contest and judging take place in May.

Pre-School Education Clubs – Many fires are caused by young children playing with matches, lighters or other heat sources. Some cities such as Nagasaki have organized pre-school clubs for mothers and children. Club directors provide instruction on the basics of fire safety in kindergarten and child care centers. There are 99 clubs in Nagasaki, with a total of 8,700 members.

Tokyo has organized pre-school “fire prevention circles”. They provide fire prevention education to children in nursery schools and kindergartens. The directors of those facilities play a leadership role in delivering the information. Tokyo has almost 1,300 circles with 166,000 children.

In The Home – In addition to the fire safety education and training given in schools, Japanese parents teach their children about fire safety and the need to think about the consequences of their actions on their neighborhood. Parents teach fire safety both to reduce risk and to save face, which would be lost if their children started a fire, whether accidental or not. Children also are taught fire safety as part of the larger concept of respecting ones neighbors, and not inconveniencing or jeopardizing them. Children are told they will have to apologize to each neighbor if they start a fire.

Reaching Elderly and People with Disabilities

Two-thirds of all Japanese accidental fire fatalities are among people who have special needs—mobility impaired, hearing impaired, feeble, on drugs, intoxicated, etc. Those under age 50, including young children have relatively low fire death risk. (Young children often sleep in their parents rooms and are rescued by them in a fire.)

Changing Elderly Risk – Professor Ai Sekizawa of Tokyo University has undertaken analysis of the elderly fire problem. His surprising new finding is that the fire death rate per capita for people over 65 has dropped sharply, by 40 percent over the 25 year period 1979–2004. This was a larger drop than for any other age group. The drop is thought to be the result of a combination of factors. People over 65 are healthier today than 25 years ago. Many are still fit, alert, capable of detecting and escaping from fires, and physically better able to survive injuries from fires. Additionally, as previously mentioned, many now live in group homes or apartment buildings with modern fire protection features, instead of the wooden two story fire traps, though many still live in the latter.

Despite progress, the risk to the elderly still is much higher than for the younger ages. Fire fatalities per million population for those between the ages of 66-70, 71-65, 76-80, and over 80 are 1.12, 1.53, 3.21, and 5.26, respectively. The new high risk age group has been redefined to be people over 75 years old, not 65. The older group account for most of the growth in fire deaths in Japan. The risk sharply increases for people over 75, indicating that this group should be a prime focus for fire safety programs.⁸

Home Visits – A key strategy to reduce fire risk for the elderly is for the fire service to visit elderly at home to advise on home safety, especially the use of smoke alarms. Osaka and Nagasaki focus home visits on elderly living alone (and households of people with disabilities.) The city's wards (ku's) usually have information on where elderly people are living alone. Households with elderly also are identified in the course of the general household visit program.

The information given to the elderly during home visits is similar to that given others, but with additional focus on issues relating to physical disability, such as escape planning and getting assistance in an emergency. Firefighters making the home visit also may go to the nearby neighbors to arrange for them to assist their elderly neighbor in an emergency. The fire department also visits group homes for the elderly to give safety guidance.

⁸ Data courtesy of Professor Ai Sekizawa, slide presentation, April, 2008.

In Nagasaki, home visits to the elderly and people with disabilities are conducted by teams of three: a firefighter, welfare officer, and member of the welfare committee of the region. They use a checklist of hazards for conducting a visit.

Elderly Campaign – Each September Osaka has a week devoted to fire prevention for the elderly, in addition to the two other national fire prevention weeks for the whole population. They raise awareness of the fire safety issues of the elderly and do intensive outreach to them during this week.

Specialized Alarm Systems – The fire service wants to make sure that all elderly have some version of a working smoke alarm. A related strategy is to promote smoke alarm systems with special features for the elderly. The goal is both to detect fires to warn household residents to escape, and to automatically report fires and health emergencies more rapidly to the fire service. The elderly are a special target of media campaigns and other outreach methods, including the above-mentioned home visits by the fire service, and home visits by social and health service providers who are trained about smoke alarms and other fire safety basics.

Pendant Alarms: There are several relatively new technologies whose capabilities go beyond the basic smoke alarm. One is the pendant radio alarm. It is worn around the neck. An elderly person can simply push a button on the pendant to report a fire or health emergency. They do not even have to get to a phone. The pendant contains a radio transmitter that sends a signal to a box in the home that forwards it directly to the fire department. Tokyo and Osaka actively promote pendant alarms for the elderly and for people with disabilities. Upon request, the fire department may provide these devices at no charge to needy elderly.

Exterior Alarms: Another novel smoke alarm enhancement for elderly people who live alone and need assistance in an emergency is a bell placed outside their residence that is triggered by the smoke alarm or pendant radio alarm. The bell alerts neighbors to an emergency, and they can come to help before the fire service arrives. This is essentially an appeal for anyone nearby to assist, as opposed to the selective call to a neighbor described above.

Automatic Reporting Alarm: Some elderly in Tokyo are given an automatic fire reporting system that is a dedicated radio link to the smoke alarm. If the smoke alarm detects a fire, a radio message is sent automatically to fire department dispatch. This is similar to commercial automatic alarm systems. This system is used sparingly, mainly for elderly or other people with severe disabilities.

Smoke Alarms for Hard of Hearing: An estimated 18 million people in Japan are hard of hearing, and 315,000 are deaf. Many of them are elderly. The Smoke Alarm Manufacturers

Association promotes special smoke alarms for these populations as part of the national campaign to increase use of smoke alarms.

Neighbor Dispatch – An even more novel approach, used for selected elderly and people with disabilities, is to identify a neighbor who is willing and able to assist in an emergency. The neighbor is dubbed a “community assistant” and enrolled in a program for volunteers to assist in a variety of disasters and day to day emergencies. The fire department dispatch system contains their names and contact information, and they are dispatched in parallel with a fire unit or ambulance. Prior to professional assistance arriving, the neighbor may help the elderly or disabled person to escape, or may start fire fighting or provide first aid. The neighbor also may provide additional information to the fire department on the nature of the emergency, and direct the first responders to the scene.

Other Safety Equipment – Nagasaki has a “Project to Pay for Daily Life” sponsored by the city. Elderly and low income households must apply to the city for this assistance. If deemed needy, they may be given fire alarms, safer food cookers, and even an automatic suppression system over the stove.

Reaching Immigrants and Visitors

Japan still is largely a homogenous society, but there are increasing numbers of immigrants from Korea, the Philippines, and elsewhere. There also is a growing foreign resident population.

Tokyo has 370,000 registered foreign residents, about 2.9 percent of the population. The Tokyo Fire Department gives them disaster training, how to make a 1-1-9 emergency call (their version of 9-1-1), how to use fire extinguishers, and basic first aid. English-speaking personnel are assigned to areas with many foreigners.

The Tokyo Fire Prevention Bureau has a special section to deal with fire safety issues of non-Japanese, many of whom have less cultural conditioning to be fire safe and are considered high risk. This includes Americans. Tokyo published a fire safety brochure in five languages

National and Local Campaigns

Japan has fire safety campaigns going on throughout the calendar year. It is probably the most extensive system of national fire safety campaigns in the world. The Fire and Disaster Management Agency develops the national campaign themes and fire safety campaign materials. They are used by most cities. The majority of the campaigns have been going on for decades. Local governments often add their own campaigns on top of the national schedule. For instance,

Nagasaki characterized their campaign themes and materials as about 80 percent originated by the national level, and 20 percent locally.

Spring and Fall Campaigns – Week-long fire prevention campaigns run in the spring (March 1-7) as well as the fall (November 9–15). The national spring and fall campaigns have featured use of smoke alarms since 2004. The outreach is extensive. For example, 2.06 million people in Tokyo participated in events associated with these campaigns in 2006. Fire prevention talks and fire fighting and escape drills are given at fire stations and a variety of public venues. Media report on the campaigns.

Tokyo emphasizes two key themes in its recent local campaigns:

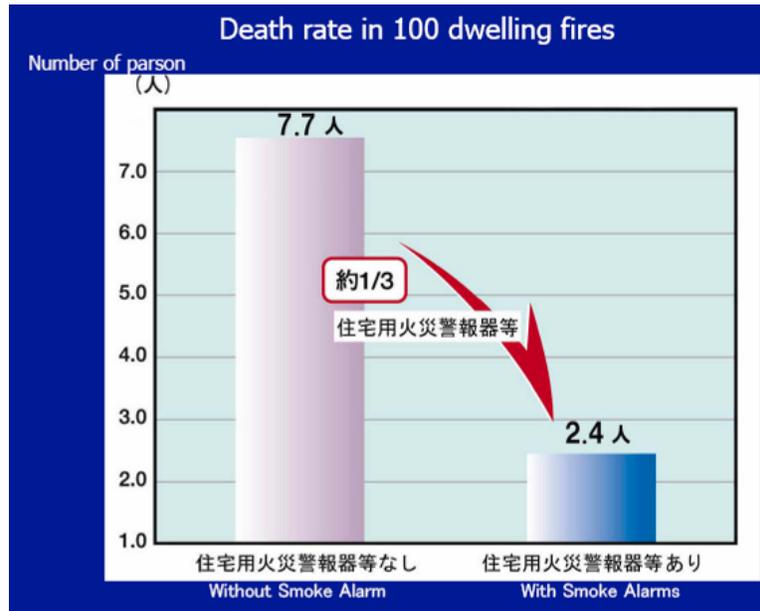
- Use of smoke alarms.
- Fire and disaster preparation.

Osaka emphasizes three points in its fire messages: report fires quickly, call out loudly to alert other people, and close the door of your room when evacuating. They also advise that people should rush to an exit away from direction of the flow of smoke, which may not be the closest exit. Closing the door and going away from the flow of smoke are not commonly taught in the United States.

Nagasaki promotes the theme “Learn to Protect Your Own Neighborhood”. Because of the difficult response of the fire service to the hilly areas of the city, they want the citizens to prevent fires from occurring and to cooperate with their neighbors in fighting fires that do occur.

All of the Japanese cities we visited show citizens statistics on the magnitude of the fire problem and the effectiveness of smoke alarms. Deaths per fire are decreased by two-thirds when a working smoke alarm is present (see Figure 16).

**Figure 16: Japanese Drop
in Fire Deaths per Fire When Smoke Alarms Are Present**



Messages regarding what to do when a smoke alarm sounds include the following:

1. Check to see if it is a real fire.
2. Call out “fire” to alert others.
3. Try to fight the fire at first (if it is not large). Ask people around you to report the fire to the fire department and alert the neighbors.
4. If you cannot handle the fire, leave.

As we found in other countries, these instructions are quite different from what the fire service in the United States promotes, which is to get out quickly if the alarm sounds, and then call the fire service.

Other Campaigns – Besides the spring and fall fire prevention weeks, several other weeks or days publicize different aspects of safety. One week in January is for volunteers to practice disaster mitigation. Hazardous materials safety week is in June. A week in September is for practicing first aid, promoting injury prevention, and explaining proper use of emergency medical services. Another week in September is disaster preparedness week.

One day each year highlights the need to preserve national heritage sites such as temples and museums from fire. Every September 1st is National Disaster Preparedness Day, in memory of the great Kanto earthquake in 1923. Disaster drills that include fire extinguisher practice are undertaken this day. November 9th is 1-1-9 day, when guidance is given on how to make an emergency call on conventional telephones and cell phones, and what to say when calling.

Media – Local fire HQ prevention units coordinate use of the media to carry out campaigns. Fire departments use the national campaign materials and concepts in media spots, but often develop or adapt their own as well. Fire departments pay for local TV and radio spots, as in the UK and Australia.

Nagasaki runs fire safety spots on cable network TV twice a week in the spring and fall campaigns. They also routinely get TV coverage of fire drills run at hotels and malls, which further adds to awareness. Osaka sponsors a one minute prevention spot every day, Monday to Friday on the radio. The safety topics vary.

The real novelty of Japanese public fire safety education, besides its sheer volume, is the range of unique organizations and techniques used to implement campaigns. They include neighborhood associations, women’s clubs, private fire brigades, volunteer fire corps, junior fire clubs, and pre-school clubs. We discuss the first three of these below, and the rest in other sections of this report.

Neighborhood Associations – Most neighborhoods in Japan have a neighborhood association with 10–20 households. They also are called community associations. Apartment houses have condominium or apartment associations.

The associations meet regularly, typically once a month, to discuss safety and other local issues. The tradition of neighborhood associations is very old in Japan, stemming from cooperative actions needed for rice harvesting. Because of the increasingly mobile society and reduced familiarity with neighbors, these associations have somewhat fewer people participating in them than in past years, but they still are a major delivery mechanism for fire and disaster safety education and firefighting training. For example, in Tokyo, 1,072,000 people participated in 13,400 disaster drills in 2006, and neighborhood associations conducted half of these drills.

When there is an important information flyer to disseminate, the home association gives it to one household to start the chain. Each household must read it, sign it, and then pass it to the next home. The flyers may contain information on national or local safety campaign themes, information on when hands-on drills will be held with extinguishers and portable pumps, and other safety information. Figure 17 shows an example. The boxes at the bottom of the form are for the households “seals”, or signatures. The lower right corner of the poster shows a “sick” smoke alarm, and a message on maintaining them. In the lower center is a plea not to clutter potential escape paths.

Figure 17: Example of Safety Circular Distributed From House to House by Neighborhood Association



Osaka prepared a “textbook” on fire and disaster safety for the leaders of their neighborhood associations.

Women’s Clubs – Another unique resource for fire safety education in Japan is the network of women’s fire clubs. Even today, women are viewed as the cornerstone of fire safety in the home. They undertake many of the activities involving heat sources, especially cooking, and influence family members. Women in the clubs meet regularly to discuss home fire safety. They also train on how to suppress a home fire using fire extinguishers, pot lids, or towels to cover stove fires, or other means (see Figure 18). Recently, they are instructed to make sure their home complies with national and local standards.

Figure 18: Women’s club members training with extinguishers



In Nagasaki, the number of women’s clubs has grown to 335 clubs with 48,000 members since the first was started in 1963. About a quarter of Nagasaki’s households have a member. This level of participation is extraordinary. A club president, shown in Figure 19, coordinates the city fire clubs’ activities. The city provides firefighting buckets to the women in the fire clubs. Citizens encourage each other to have these buckets, to extinguish minor fires, including ones that break out after earthquakes.

In Osaka, 73,000 women belong to fire clubs. During the spring and autumn prevention weeks, they help conduct or participate in prevention programs at their local fire stations and public spaces. Osaka Fire Department prepared a “textbook” for the women in clubs, with much detail on improving home fire safety.

Figure 19: President of the Women’s Fire Clubs of Nagasaki, at meeting with Fire Chief



Japan Fire Alarm Manufacturers Association Promotions – To increase usage of smoke alarms and get the fire service and public to understand more about the national requirements, JFAMA conducts a wide array of promotional efforts. They support 12 symposiums a year nationwide. The symposiums are run by the (national) Fire and Disaster Management Agency for the fire service, women’s clubs, and community leaders. They will cover all 47 prefectures in the nation over a 5-year period. JFAMA also provides lecturers for neighborhood associations across the nation, and sponsors TV and radio advertising on smoke alarms. Radio ads are run every Sunday at 6:00 PM.

In addition to Japanese, JFAMA developed pamphlets on smoke alarms in Chinese, Portuguese, Korean and English, and they provide brochures on smoke alarms to managers of public housing.

Workplace Visits and Private Brigades – In Nagasaki, the fire department visits every workplace to encourage employees to install fire and smoke detectors in their homes. Also, many businesses have private fire brigades to ensure rapid response to emergencies. The private brigades’ slogan is “let’s protect our workplace with our own hands.” The brigades work to increase fire safety awareness among the workers, conduct firefighting drills, and maintain their firefighting equipment. This knowledge carries over to workers’ homes. Nagasaki Fire Department made over 900 workplace visits in the past year.

Street Broadcasts – In Nagasaki, the fire service drives through neighborhoods making fire safety announcement from loudspeakers mounted on engines. They report 2,900 broadcasts were made in the past year. They announce the spring and autumn campaigns, tell the neighborhood of any local arsonist activity, and announce “weather” days when the dry conditions merit extra precaution with outside fires. Women’s club members make some of these broadcasts, as shown in Figure 20.

Figure 20: Street Broadcast by Women’s Club Members



Fire Watch – Incredible as it may seem to westerners, the Japanese have preserved the tradition of night watchmen that dates back to the 1600’s, when they were used in England and the American colonies. Firefighters patrol neighborhoods at night, making sounds with clackboards, and calling out “be careful with fire” This is done not just in small towns, but cities too. We are not sure of the scope nationally, but this practice is still undertaken in Tokyo.

Fire Department and Fire Station Websites – Citizens are encouraged to contact their local fire department for specific advice on fire safety and disaster preparedness. To facilitate this, the Tokyo Fire Department and others maintain extensive websites with fire safety tips and information on disaster preparedness. The Tokyo website provides information in Japanese, English, Chinese, Korean, Thai, and Tagalog (Filipino). In addition, and more innovative, every fire station in Tokyo has its own website to provide information to residents in its area of coverage. In 2006, there were an astounding 24,300,000 visits to the two levels of websites. Tokyo also encourages citizens to email or call the fire department for safety consultations.

Community Disaster Teams – Japanese cities offer training on the aftermath of disasters- how to cope in the first hours. Osaka predicts a major earthquake within the next 30 years, so they train citizens a few wards each year. There are 24 wards in total. After the great 1995 Hanshin earthquake, community disaster assistance leaders were appointed across all neighborhoods. There is one disaster assistance leader for each of the 331 school districts, which were adopted as the organizational unit. They are trained to lead the immediate response and recovery actions by citizens cut off from government services. Each community district has 5 teams: fire suppression, medical rescue team, information, guiding team (to lead people to safety), and logistics (food and water). A total of 8,300 people have been trained to be “leaders”.

Publicity Events – Besides press conferences on fire issues or specific newsworthy incidents, an innovative publicity event is to appoint a public figure as Honorary Fire Station Chief for a day, and use that event to draw media attention to fire safety. Public figures like to be associated with the fire service, and this is an inexpensive way to get good publicity for both parties.

Campaign Evaluations – Since 1989, the Tokyo Fire Department has systematically polled citizens over 20 years old in an annual survey. It measures the public’s awareness of fire safety, emergency systems, and disaster preparedness in light of the public safety education programs. It also solicits opinions on what is needed to further improve awareness and safety.

Another questionnaire, called the New Year’s Fire Review, is given to Japanese and foreign visitors to Tokyo. It guides the implementation of annual events aimed at these audiences.

Life Safety Learning Centers

Several Japanese cities are making extensive use of fire and disaster training centers to educate the public on the hazards of earthquakes and the fires that may follow them. Most of the fire safety lessons apply equally well to everyday fire safety in residences. They go well beyond the experiences offered by fire safety houses/trailers and most fire safety training centers in Western nations. The key difference is providing more hands-on experience, more realistic settings, and better videos about disasters. In two cities we saw excellent 3-D movies showing what it was like to be in an earthquake, including fires following the earthquake.

The scale of the training at these centers and their size and equipment are extraordinary. Tokyo gave fire and disaster training to 2,000,000 people in the last several years at its three Life Safety Centers. Just in the past year 270,000 people visited a training center. Visitors can practice putting out a simulated kitchen fire with a real water extinguisher, and crawl low

through a maze of hallways under simulated smoke. As shown in Figure 21, they can experience the shaking of an earthquake, and then practice shutting off appliances and use of fire extinguishers and portable hand-drawn fire pumps in its aftermath. The centers also teach citizens CPR and the basics of splints and bandages using materials at hand in a household.

Figure 21: Citizens can practice taking cover while “shake table” simulates earthquake



The training center in Osaka gives visitors a report card on how they did on each activity. They also show the visitor a videotape of themselves going through the activities they failed. For example, if they do not crawl low enough in the smoke maze, they set off photoelectric sensors tied to a camera. The video hammers the lesson home. The report card and video are an innovative approach for personalized reinforcements of the safety messages and training.

The Honjo Life Safety Center in Tokyo, the largest of their three training centers, cost 16.6 billion yen, or about \$160 million, to construct and equip, which indicates the level of commitment and importance attached to it. The operating cost (including maintenance and training staff) works out to \$16 per visitor, but they are offered free of charge.

Home Visits

Home visits conducted by Japanese fire departments are an important mode for increasing fire safety awareness and delivering safety information directly to households. The

approach is generally similar across cities, but with some significant policy and implementation variations.

Tokyo – The fire department tries to make home visits to the elderly and disabled at least once every 3 years. Priority for visits are elderly living alone and bedridden; people 75 and older; and people with disabilities, especially mobility impairments.

Tokyo's goal is to visit all households at least every 5 years. While in practice they are only reaching a quarter of them, the number of annual visits is still large, about 300,000 out of their 6 million households.

The fire station prevention section decides which areas to visit in a given year. Firefighters make the visits, sometimes in combination with leaders of the neighborhood association or people from public welfare services. Gas or electric utility personnel also make some visits.

Usually the fire department notifies the neighborhood association or condominium association that they are planning to visit their households. The department asks the association to spread the word about the upcoming visits.

The visits usually stop at the door, without entering the home. The household is given information verbally and in writing. If requested, the firefighters will test smoke alarms, and with this opportunity the firefighters can also look for hazards such as combustibles near heat sources.

Osaka – In 2006, the Osaka Fire Department made 290,000 home visits. In 2007, this increased to 420,000 visits, out of about 1,270,000 households in the city. The visits are made by firefighters, as in the other cities. The surge in home visits is to promote new smoke alarm regulations.

As in Tokyo, the Osaka fire service tells the homeowners association in advance of the planned visits to a particular neighborhood. Most visits are made in the daytime and stop at the door. They explain smoke alarm requirements and advise the household about fire extinguishers.

Nagasaki – The Nagasaki Fire Department, too, visits homes on a regular basis, though only a few percent of households each year. Last year they visited about 3,000 households, of which 560 were homes of the elderly. As part of the visits they distribute a questionnaire that asks about local risks and personal risks (e.g., are there smokers in the household?).

Codes and Laws for Home Safety

Codes and standards are another important prevention approach that can greatly influence the home environment and to a lesser degree individual's behaviors. The most noteworthy new

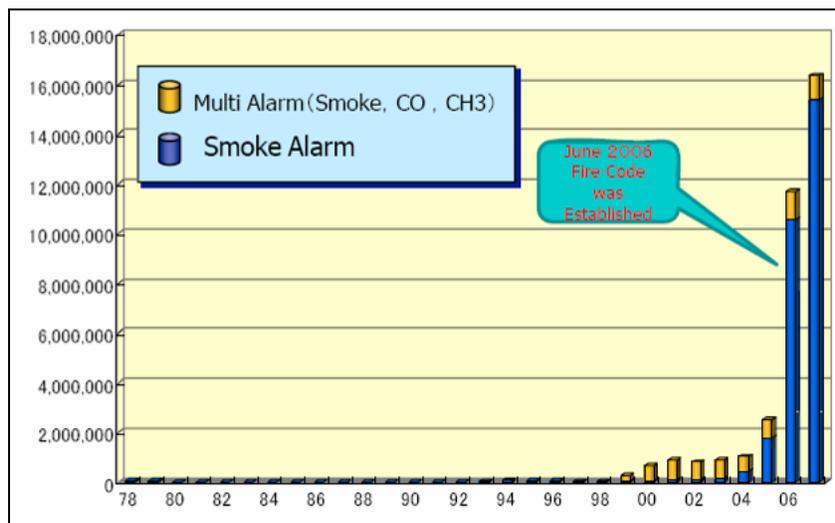
changes in codes and standards that affect home safety related to smoke alarms and cooking appliances.

Smoke Alarms – Arguably the most important change in fire prevention in Japan in the past five years is the new code requirements for home smoke alarms. In the past, Japan relied more on safe behaviors than technology to achieve fire safety, but their fire death rate plateaued for a number of years, and recently has been trending upward as the population ages. Smoke alarms are seen now as a potential tool for reversing the trend, especially among the elderly.

JFAMA estimates that only about 15–20 percent of households in Japan currently have a smoke alarm. Tokyo estimates that 20–25 percent of their households have them. Nagasaki found that 24 percent of households had them in the one area of the city that was surveyed. The city of Nagoya has one of the highest usage rates, 50 percent of households.

Figure 22 shows the huge increase in smoke alarm sales in the last few years, with 16 million in 2007. For interpreting the statistics, it is useful to know that there are 48.5 million households in Japan, and that a typical household would require about 4-5 detectors.

Figure 22: Number of Smoke Alarms Shipped Per Year (courtesy JFAMA)



The National Fire Defense Law of June 2006 requires smoke alarms in all new residences in Japan. They must be installed in each regularly-used bedroom. If there are second-floor bedrooms, a smoke alarm is required on the wall or ceiling of the stairway leading to them. (This is a much more extensive requirement than in the United States.) Many local governments have set dates for similar requirements to go into effect for existing homes. Starting in 2010, all homes in Japan, new and old, will have to meet the national and local standards.

Details regarding the number of rooms and the placement of alarms are left to localities to prescribe. Generally, Tokyo and the larger cities require a smoke alarm in every “living

room”, which includes bedrooms, living rooms and the kitchen. Japanese homes typically have less floor space than American homes, and rooms are multipurpose (e.g. living room during the day, bedroom at night). The kitchen may have a heat detector instead of a smoke alarm, to reduce false alarms. Figure 23 shows the typical requirements for alarm placement. They can be on walls or ceilings, following prescribed placement considerations for each.

Figure 23: Diagram of Smoke Alarm Placement Standards for Residences



The Japanese are using only photoelectric detectors. They do not want ionization detectors both because they think they cause too many false alarms, and because they have radioactive sources to create the ionization. Japanese do a lot of fish frying, and their rooms are relatively small. There is also high humidity in many places. These factors exacerbate the false alarm problem. However, photoelectric alarms (while less sensitive to flaming fires) are also more expensive than ionization alarms. They cost \$50–\$100 apiece in Japan. A typical home has 4-5 “living” rooms, so the cost per home is on the order of \$200–\$500 to meet the new standard

of a smoke alarm in every “living” room. Some people are installing multi-purpose detectors that detect fires, carbon monoxide (CO), methane, and heat. These multipurpose detectors are of course more expensive than the basic smoke alarms.

The alarms can be battery-powered or hardwired, and do not have to be interconnected. If battery-powered, they can be either tamper-proof 10-year battery detectors which are to be discarded at the end of that period, or detectors with 5-year batteries that can be replaced.

The alarm sensitivity is less than in the United States, again to reduce false alarms. The units will not alarm from transient smoke. They require an accumulation of smoke continuously for 10 seconds with 15 percent obscuration per meter before alarming. Because they will be in every room, they do not have to sense thin smoke from several rooms away.

To help reduce the cost of buying alarms, and to make sure people get them, neighborhood associations often purchase the alarms in bulk and resell them to their members. Even better, the city of Kyoto bought 14,400 smoke alarms for 170 of its community associations, and reduced the price from \$60 per alarm to \$30. They also subsidize the purchases for some elderly and low income households.

The new smoke alarms are self-testing, and do not require monthly checking. There are some models that give verbal alarms as well as a sound alert. They announce the type of emergency if the device can detect multiple hazards. Some alarms allow a mother or someone else’s voice to be recorded and make the alarm announcement, which is an especially useful feature for a child’s room. Research has shown that a mother’s voice is more effective for waking up a child.

Stove Heat Sensors – Starting in April 2008, new kitchen stoves must have a heat sensor in each burner. This is a change from the previous requirement of a heat sensor in at least one burner. The intent is to reduce the number of unintended cooking fires, which is the leading cause of residential fires in Japan, as in the United States.

Annunciator Systems – In new apartment buildings, each unit must have an annunciation system that can be used to relay information in a fire or other emergency. The novelty here is requiring them in the units, not just in public areas.

Sprinklering – The National Building Safety Law requires sprinklering of buildings over 1,100 feet tall (11 stories), including apartment houses. Only the units and areas on the eleventh floor and above must be sprinklered. (That is considered the maximum reach of fire department ladder trucks.) In Tokyo, sprinklers are also required in buildings with basements, certain types of floors, and some other conditions. Condominiums over 11 stories may have fire doors to

compartment off any area over 100 square meters instead of sprinklers. (In the United States codes, high rises must be sprinklered on all floors, which is a safer though more expensive practice.)

Private Fire Brigades – Multi-use buildings over 107,000 square feet or holding 2000 people must have their own fire brigade. They usually are equipped with large, wheeled extinguishers, small hand extinguishers and personal protective equipment. They also can use building standpipes. In some complexes the fire brigade actively monitors the status of the building’s smoke and heat alarms and sprinkler systems.

Consumer Products for Safety

Some consumer products help detect and fight fires, others help prevent them. Besides smoke alarms, pendant alarms and cook stove, discussed above, the following products are being promoted by one or more Japanese fire departments.

Throw-type Fire Suppressant – Besides conventional fire extinguishers, another type available commercially comes in a plastic container the size of a coffee mug. It is filled with a fire-extinguishing fluid, to be thrown into a fire. The throw-type extinguishers can be used by elderly and children and require no training. They can be wall-mounted in plastic brackets.

Similar devices once were filled with carbon tetra-fluoride in the United States, but have been unavailable for some time. Twenty to 30 years ago the U.S. fire service advocated home-made “throw-type” extinguisher filled with baking soda for extinguishing oven and stove fires, but they are rarely promoted today.

Fire Retardant Sprays – Liquid spray fire retardants are commercially available to households. They are intended to treat such things as flammable doors, room screens, curtains, carpets and furnishings.

Fire Tested Products – Upholstered furniture, bedding, and many other products are not regulated but are tested for fire safety by the Japan Fire Retardant Association, a private organization. Products they approve carry a label saying “fire retardant product” (similar to the U.S. UL label).

Cigarettes – Japan is still considering whether to enact a fire safe cigarette legislation. They are looking for the early U.S. results to help inform this decision.

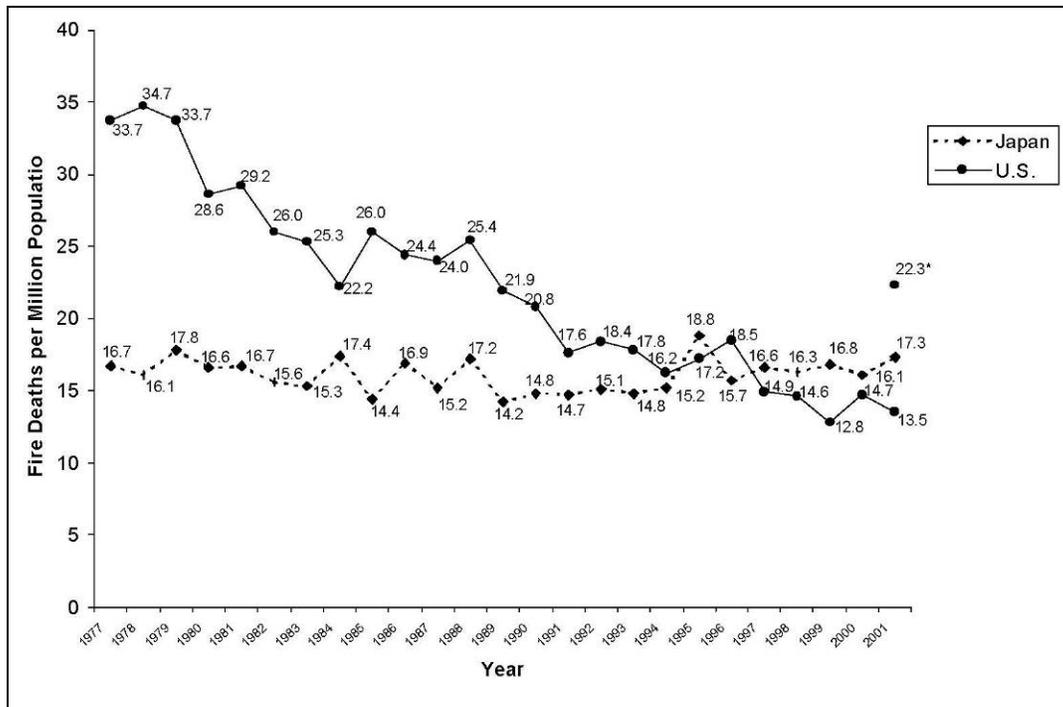
Fire Data

Fires have been decreasing in Japan over the past decade, but the fire death rate per capita has been increasing. The vast majority of fire deaths are in residences, as in the United States.

As shown in Figure 24, the rate of fire deaths per capita in Japan had been relatively level for three decades, ranging from 14 to 18 deaths per million population. It perhaps is more accurately described as a slight decrease for the early years and then a shallow climb back up again.

Japan used to have a much lower fire death rate per capita than the United States. In 1977 the U.S. rate was 34 per million vs. 17 in Japan. By 1995 the trends crossed. Subsequently the U.S. trend continued downward while the Japanese trend increased. The high and growing proportion of elderly make it difficult for the fire death rate to be reduced by traditional means in Japan. As discussed earlier, the Japanese are hoping that new mandatory use of smoke alarms will help level if not reduce the fire death trend, as it has in the United States.

Figure 24: Trends in Total Civilian Fire Death Rates, U.S. and Japan

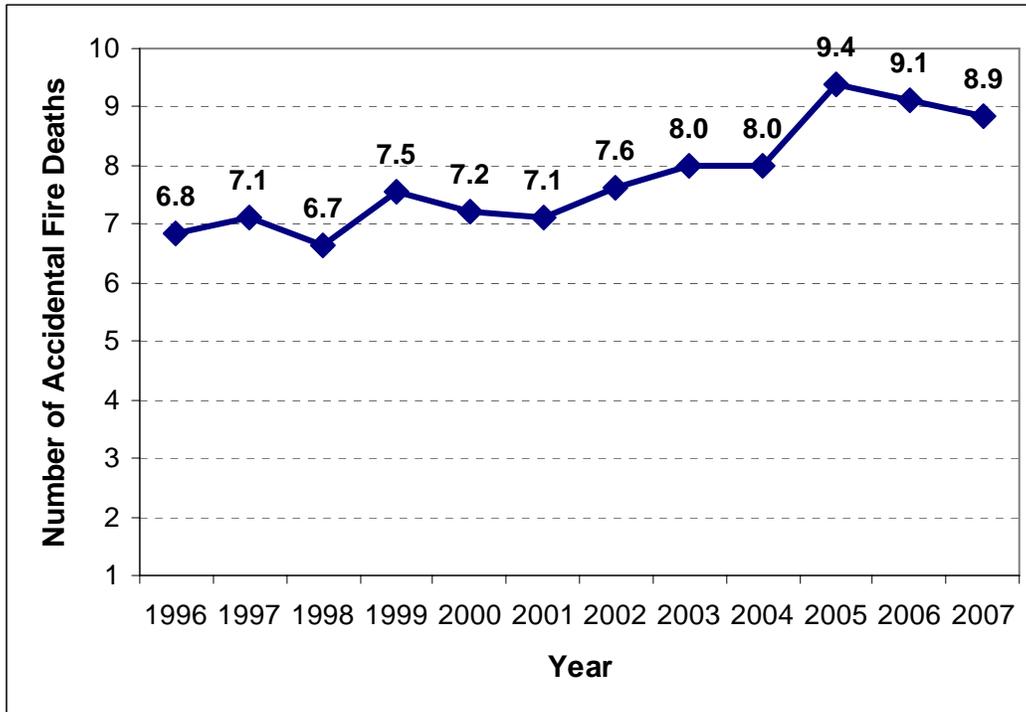


Source: *Fire in the U.S. and Japan*, NFPA, August 2003 (NFPA survey, U.S. Census Bureau, Japan's *White Book*, Dr. Aki Sekizawa)
 * U.S. with events of September 11, 2001

Accidental Fire Deaths – Unlike total fire deaths, the **accidental** fire death rate (with incendiary and arson deaths excluded) still is lower than in the United States, though increasing. Figure 25 shows the trend in accidental fire deaths. About a third of fire deaths in Japan are from intentionally set fires, vs. only 14 percent in the U.S. In Japan, most of the intentionally set fires leading to fatalities are thought to be suicides. (It is often clear that the fire was intentionally set but not the motivation for doing so, if no suicide note is left.) Half of all fire deaths in the 21–60 age group in Japan are thought to be suicides. Because of the high proportion of incendiary fire

deaths in Japan, one must be careful in comparing Japanese death statistics to those of other nations—it matters whether the accidental fire death rate or overall fire death rate is being considered.

Figure 25: Japanese Trend in Accidental Fire Deaths per Million Population



(Source: Tokyo University and Fire and Disaster Management Agency)

The most recent comparative fire death data as of this writing is shown in Table 2. The United States accidental fire death rate of approximately 9.7 per million is about 10 percent higher than the Japanese rate of 8.9 per million for the same period. These numbers fluctuate somewhat year to year.

Table 2: Recent Japan and US Fire Death Rates

	Japan (2007)		United States (2006)	
	Total	Per Capita	Total	Per Capita
Total Fire Deaths	1357	10.4	3245	10.9
Accidental Fire Deaths (w/o Suicide/Arson)	1152	8.9	2872 (est.)	9.7 (est.)

The number of accidental fire deaths in Japan has been proportional to the number of fires for several decades. Thus, the deaths per fire have been essentially constant, while this ratio have been trending upwards in the United States. The leading known causes of accidental fire deaths in Japan are smoking, heating, cooking, and candles.

Definition of Fires – The definition of fire in Japan differs significantly from that used in most western nations. The Japanese fire service only counts an incident as a “fire” if it is not trivial and requires fire suppression technology such as hoselines or fire extinguishers to extinguish. If the fire can be extinguished with a glass of water, or by turning off a stove or electric power, it is not considered a fire in their reports and statistics.

Another problem in counting fires in Japan is that households may not report a fire if they can keep its occurrence from being known. This is to avoid the shame and embarrassment that comes from having an accidental fire. So if they detect a fire and can extinguish it with a home fire extinguisher, they may well not report it.

The Japanese truly have low fire incidence but it appears even lower because of these definitional and reporting issues. Their definition makes the number of fire deaths per fire seem extraordinarily high when comparing this statistic to other countries that use more encompassing definitions for fire incidents.

Reporting Completeness – Japanese fire departments report fire incidents to the Fire and Disaster Management Agency once a month. Every fire must be investigated for cause and reported to the national agency. The federal agency reports that they receive close to 100 percent of fire reports, even from the smallest fire departments. Their “White Book” summarizes national fire statistics in Japan, and was one of the inspirations for our national report, *Fire in the United States*.

Injuries – In past decades, 40 percent of Japanese injuries associated with reported fires were injuries to firefighters. For comparison, firefighter injuries comprised 84 percent of injuries from reported fires in the United States in 2006. Japanese civilian fire injuries are increasing, but firefighter injuries are not, the opposite of what is occurring in the United States. The number of civilian injuries per fire also is increasing in Japan. The success in getting people to fight incipient fires may be one reason for their increase; about half of the reported fire injuries come from citizens trying to put the fire out. However, the number of fire injuries per capita continues to be much lower in Japan than in the United States. Having civilians fighting fires adds some casualties but may reduce others.

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Below are data provided by the Japanese cities visited. It was difficult to obtain the same format of data for each city because of translation difficulties and the lack of certain data that were readily available. The data nevertheless show the relative magnitude and trends in the fire problem across cities.

Tokyo – the annual number of fire deaths varied between 116 and 157 in the years 2002–2006, as shown in Table 3. The total fire death rate varied from 9 to 12 per million population.

Table 3: Tokyo Fire Deaths (including Suicides)

Year	Total Fire Deaths	Deaths Per Million Population
2002	128	10
2003	151	12
2004	122	10
2005	137	11
2006	116	9

Similar to the national data, about 30 percent of Tokyo fire deaths are suicides. In 2006, the accidental fire deaths numbered 86, for an accidental fire death rate of 7 per million, lower than most large U.S. cities. Of the 86 deaths, 52 involved elderly people. Eighty percent of fire deaths in Tokyo happen in the home.

In 2006, there were 1,234 civilian injuries in Tokyo, and 5,912 fire incidents, of which 3,727 were in structures. Of the structure fires, 60 percent were in residences.

Arson is by far the largest single cause of fires in Tokyo, accounting for 1,968 fires, about one third of all fires. Smoking (810), cooking (608), and playing with matches and lighters (152) are the main accidental causes.

Osaka – Total fire deaths in Osaka have fluctuated in the range 35–50 per year since 2001, as shown in Table 4. However, accidental fire deaths (without fire and suicide) are considerably lower, in the range of 9–16. In 2007, they had 28 accidental fire deaths (without arson and suicides) of which 14 were in residences. Their accidental fire death rate was 10.6 accidental per million in 2007, and the accidental death rate in residences was 5 per million population.

Table 4: Osaka Fire Deaths

Year	Total Fire Deaths	Accidental Fire Deaths*	Accidental Rate Per Million
2001	50	38	14
2002	35	24	9
2003	47	41	16
2004	47	43	16
2005	41	39	15
2006	49	42	16
2007	37	28 (14 residential)	11 (5)

* Excluding arson/suicide

The number of fires in Osaka has been trending downward. In recent years 36 percent of the fires in Osaka were arson, about 500 out of 1,400. The arson problem is not large, but appears high because the accidental rate is so low.

Nagasaki – In 2007, Nagasaki had 5 fire fatalities (excluding suicides) and 30 injured in fires. Its accidental fire death rate was 11.1 per million.

IV. CONCLUDING REMARKS

When asked which of the many community safety programs had the most impact on reducing residential fire deaths, none of the Australian and New Zealand fire services could say for sure because of their many programs operating in parallel, and many exogenous factors affecting fire safety. One top leader of the Australian fire service thought the most important factors were:

- Data from research used to target programs and design messages
- Legislation requiring working smoke alarms in every home
- Public housing having hard-wired smoke alarms
- Partnerships with non-fire agencies, especially social service and health agencies that work with high-risk groups to whom they deliver fire safety messages and undertake inspections while delivering services in the home
- Mild winters, which reduce heating fires
- Social safety net that provides safer housing for low income people (e.g., electricity and heat are never disconnected for lack of payment, which reduces fires from misuse of candles, stoves, ovens, and portable heaters)

In New Zealand, when asked the same question, a senior fire service leader attributed their success in achieving a low fire death rate to:

- Research on prevention
- Monitoring prevention programs
- Delivering prevention programs

In our judgment, these reasons all make sense, but there are two other factors for success that largely go without saying in Australia, New Zealand, and Japan, but need to be made explicit:

- Their fire safety programs reach large percentages of the population, especially the high-risk populations such as school children, elderly, and minorities. In the United States, we have many examples of good programs but rarely with comparable outreach.
- To achieve the outreach, they use more firefighter time to deliver programs and spend much more money buying prime time media. They evaluate what works and what does not, and have the statistical and management tools to monitor prevention program delivery down to the station level.

We can borrow some of these ideas to use in the United States. Our culture is not that different from Australia and New Zealand. While Japanese culture is quite distinct from that in the United States, their many successful prevention practices also should be considered for adoption or adaptation in the United States. We should be open-minded, and consider good ideas wherever found.

We need to emphasize the proverbial ounce of prevention to avoid paying the pound of cure. The best practices discussed in this report and the others in this series hopefully provide specific ideas on how to accomplish this goal.