INTERNATIONAL CONCEPTS IN FIRE PROTECTION

Practices from Japan, Hong Kong, Australia, and New Zealand

by Philip S. Schaeenman and Edward F. Seits

TriData
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ABOUT TRIDATA
TriData specializes in the development and use of management information for government and industry. The company assists organizations in improving their usable data by helping them identify realistic data needs, use practical methods to collect and analyze the data reliably, and apply the results to decisionmaking. Two particular specialties are fire data and its many applications, and performance measurement of government services.

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INTERNATIONAL

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EXECUTIVE SUMMARY

Hong Kong, with over five million people living in the most densely populated place on earth, has fewer fire deaths per million than 57 of the largest 58 cities in the United States. Chicago, half the size of Hong Kong, has triple their number of fire deaths.1

Australia, with wide open spaces that remind many of the U.S. West, has less than half the fire death rate per capita of our western states. New Zealand’s death rate is one third ours.

Los Angeles has over triple the number of fires than Tokyo even though Tokyo is almost four times the size of LA. LA has 10 times more fire calls than Osaka, a city only slightly smaller than L.A.2 New York City has more fire runs in a year than the nation of Japan.3

Engine 5 in Cincinnati goes to twice as many fires in its district in a year as occur in the entire city of Nagasaki (population 450,000).4

New York, Chicago, LA, and Cincinnati do not have unusually bad records. Their fire problems are typical of large cities in the United States. Our status relative to other nations is not new. The United States and Canada have had the highest fire death rates per capita in the world for at least the last 20 years. We also continue to have among the very highest rates of building fires per capita.

This study is the second part of a research program that is looking into why other nations have better records in fire protection than we do. The research is also seeking to find effective programs and approaches we should consider here.

The first study looked at Europe. This study focuses on the Far East and Pacific areas. Four countries are featured: Japan, Hong Kong, Australia, and New Zealand. The chart on page vi shows that the fire death rates of these countries are between one-half and one-third the death rate in the United States. An unusual aspect of fire deaths in Japan is that many of them are self-immolation suicides. The solid bar for Japan on the chart denotes fire deaths without suicides; the dotted line shows the amount with suicides. Also, note that the deaths for Hong Kong includes transportation deaths.

To look at the international comparisons from a second viewpoint, data for 40 major world cities are shown in the first figure on page vi. U.S. and Canadian cities generally have much higher fire death rates than cities in Europe, the Orient, and the Pacific Basin. In this chart, city population is plotted horizontally so that cities of comparable size can be compared. The circular figure indicates where the group of U.S. cities falls. This snapshot of worldwide city comparisons from 1981 is much the same as it was in the late 1970s and continues to be representative of 1984 (based on a more limited sample). The position of individual cities changes from year to year, but the big picture remains the same: We have the higher fire death rates.

The countries studied to date cover as wide a range of economic conditions as is found in the United States. They have diverse housing — woodframe single-family homes, concrete highrises, shacks — just as we do, and diverse traditions affecting behavior and attitudes — some on the positive side of fire safety, some on the negative — just as we do.

Probably the most significant reason for the differences in fire problems is that the United States lags behind other nations in the intensity of our fire prevention efforts. As a result, our citizens are less aware and less concerned about fire problems than they should be, less knowledgeable about how to deal with them, and less motivated to do so.

To be fair to ourselves, we have a more diverse people within one nation and greater freedom to live as we wish than do most other nations, which makes the fire protection job more difficult. But there is always a theme around which public fire safety attitudes can be shaped. The theme may be endangering others, pride of ownership, losing parts of your personal and cultural heritage, economic losses, or fear for your life. The fire service picks the theme that strikes a chord with its public and stresses it over and over. We are a land of many peoples, more than any other nation, and may need to use different themes for different cities, neighborhoods, or ethnic groups.

Here are some of the highlights of what we found in fire prevention and other aspects of fire protection in Japan, Hong Kong, Australia, and New Zealand. There are many more examples in the report that follows.

JAPAN

The emphasis in Japan is on public awareness and individual responsibility for carefulness. A very large share of the effort in Japan is devoted to home fire safety. The fire service also trains and encourages citizens to fight incipient fires. Some specific practices that affect large segments of the population in Japan are as follows:

1. Japanese fire departments devote a much larger amount of their manpower to prevention than is done in the United States. At least 10-15 percent of fire department personnel are assigned fulltime to prevention, and other firefighters spend considerable time on it also. Tokyo has 1,850 firefighters out of 18,000 in the department assigned to
prevention. About two-thirds of the department’s fulltime prevention forces are in district fire stations so that the prevention efforts can be tailored to each neighborhood.

- Schools nationwide routinely include fire prevention as part of science and social studies in the fourth grade and junior high. Nursery schools and kindergartens have fire safety lessons for mothers and children together.
- Radio and TV stations broadcast fire prevention messages in prime time. Spots are 20-30 seconds, once every few days. In addition, the Japan Fire Defense Agency produces a five-minute safety program that is run twice a week in the late morning on TV nationwide. The Osaka Fire Department holds press conferences for TV once every three days. They also broadcast live on two radio stations for five minutes twice daily.
- Excellent media coverage of each structure fire is facilitated by fire department public information teams.
- A public relations car with loudspeakers is sent to the scene of each fire to lecture to the public that gathers. Osaka has 47 PR cars for this purpose. Kyoto has 30.
- Door-to-door distribution of fire literature and voluntary home safety inspections are made or overseen by the fire service. The Kyoto fire department has 190 motorbikes for this purpose; one firefighter from each company spends two hours each day on this effort. Every household is contacted in person at least once every three years.
- Women’s and children’s clubs with 27 million participants help to spread prevention education. Women in one-third of the households in Nagasaki belong; Nagasaki has the best fire record in Japan, an incredibly low 150 fires in 1981 for a city of 450,000 people.
- National fire prevention campaigns are conducted for two weeks in the spring and one week in the fall. In addition, cities add their own special prevention days and weeks. Osaka, for example, designated the seventh of each month as Fire Protection Day.
Each ward in the city targets a particular neighborhood or local fire problem in year-long campaigns.

- Direct mailings of prevention literature to households are made by the fire departments in some cities with the cooperation of the post office, which stuffs the literature into mail boxes.

- The public is taught to extinguish small fires. Two-thirds of all households own fire extinguishers. Extinguishers are installed along streets and roads as well as in public buildings. People receive training in using extinguishers at school, at work, or in community meetings. Other extinguishment techniques also are taught, such as the use of pot lids for extinguishing cooking fires and wet sheets for others.

None of the above activities are token efforts. The vast majority of citizens are reached over and over again, from the time they are children through adulthood, by a variety of media and approaches.

Because of the type of construction used in Japanese houses, fires spread very easily. The public is both very careful in regard to fire and very intolerant of anyone who isn’t. If a person has a fire that spreads beyond his own home, he is ostracized by the community and may even be required to move. Throughout Japan there are legal penalties for fires started by gross negligence as well as for incendiaries.

The built-in safety features in public buildings in Japan are generally similar to those used in the United States. The big difference in public building safety is the thoroughness of plans reviews and, again, prevention education.

Plans reviews are usually done by specially qualified personnel; the Osaka Fire Department has 30 full-time fire protection engineers to undertake reviews. In addition, each public building over a certain occupancy must have a fire protection manager who acts as a private fire marshal for the building and is responsible for seeing that it is safely maintained and in compliance with codes. He is trained by the local fire department. Tokyo has 79,000 private building fire protection managers.

Hotels are awarded “safety marks” to hang in their lobby if they are in compliance with codes. Hotels that are not in compliance are given negative publicity. Government low-interest loans are available for hotels that cannot afford retrofitting safety features on their own. This concept is now being applied to other types of public buildings.

Japan gives its firefighters in all ranks more training than does the United States. This is particularly true with officers, all of whom receive courses after promotion, including prevention training.

Japan, with a population half of that of the United States, has about as many firefighters as we do — 128,000 paid plus 1,000,000 active volunteers. Volunteers provide most of the fire protection in rural areas, but they are also active in major cities. The main role of volunteers in the cities is fire prevention, although they also help with mop-up and overhaul, and standby the regular forces.

HONG KONG

Hong Kong, with 5.3 million population, has averaged a very low 40 fire deaths per year for the last five years. Fire prevention education is stressed but they also rely on built-in safety in highrise buildings, where most of the residents of Hong Kong live.

For public fire education, they tap a different motivating principle than in Japan: that people want to preserve their hard-won stake in life, however small. The citizens are encouraged not only to be very careful themselves but to report any fire hazards they spot to the fire department. Three-quarters of the department’s 140,000 inspections each year are based on complaints.

Hong Kong stresses prevention education for their low-income population. They count on the fact that no matter how poor, everyone has a color TV. Daytime and prime time TV messages are used to alert the public to hazards. They show that dramatic, life-threatening fires can result from a simple action such as leaving cooking unattended. TV also is used to teach the people how to extinguish various types of fires. Media coverage of every large fire raises the public’s awareness of the danger of fire even further.

The development of fire safety posters, TV spots, and literature usually is a cooperative effort between the fire brigade and the Government Information Services Department. The results are highly professional and visually effective.

Perhaps the most impressive achievement in Hong Kong is the shift in housing conditions — and fire safety — for their lowest income group. Over two million people have been shifted from squatters’ shacks and other rundown housing to publicly subsidized highrise apartment buildings. Each household of four or more people gets one “apartment” of 300-400 square feet. The apartment units are entirely concrete. Each unit is vented to the outside at one end and to the hallway at the other. The hallways, also concrete, are clear of obstruction and are ventilated at both ends. Every floor has half-inch hose reels that the residents are encouraged to use. Although 100,000 low-income people can live in a few block area, their fire problem is minimal. Most fires are detected early and confined to the unit of origin.

Hong Kong provides even more training for fire officers than Japan. Officer-candidates must pass the courses before being promoted. They then apprentice for three years on probation.

The plans review unit of the prevention bureau in Hong Kong is a special group in the department. About 14 of the most able officers review building plans. They personally sign for the safety of the buildings they review. Since over three-quarters of fires in Hong Kong are in highrises and most people live in highrises, the built-in protection is critical.

AUSTRALIA

The fire service in Australia is consolidated at the state level, and each state has chosen its own fire protection organization and methods. Most states have a Metropolitan Fire Service that protects cities and a Country Fire Service that provides fire protection for the rural areas.

Enormous brush fires in Australia help raise the public’s awareness of all aspects of fire safety. In 1983, the Ash Wednesday bush and grasslands fire killed 73 people. During the dry season
awareness is increased by fire danger ratings presented with every news report. The media also provide many free spots, especially in the danger season. On “ban days” all outdoor fires are prohibited. Private companies with products or services relating to fire may devote part of their TV commercials to fire safety. These campaigns have a lasting effect on public awareness throughout the year.

The “Household Replacement Policy” requires that insurance be used to replace a burned house as it was on the same spot. This reduces the incentive for arson for profit. Insurance discounts are given in some rural areas for homes built with materials and construction features that retard exposure fires or that have home sprinkler systems.

A major theme in rural fire protection is the reduction of fuel, especially surrounding buildings and farms. Farmers are advised to regularly slash, mow, or burn appropriate areas to reduce fire dangers.

Australia uses a building fire protection manager concept like Japan’s, and encourages citizens to use portable extinguishers and building hose lines to extinguish small fires.

In Queensland buildings with air conditioning systems that serve more than one floor must have automatic venting control for smoke. Buildings over six stories must have openable windows.

In Victoria any building over 25 meters has its safety requirements negotiated, rather than prescribed. This has led to innovative fire safety features.

The Country Fire Brigade in South Australia has found an economical approach to developing fire prevention materials. Rather than starting from scratch, they use a consultant to adapt materials to Australia from among the many outstanding materials that already exist in many nations.

The Sydney fire brigade requires its officers to take a three-year tour in prevention as a prerequisite to promotion. One novel approach of the fire prevention staff is to work with the Australian Standards Association to raise the fire safety awareness of the Association’s members so that they will build fire safety considerations into a wide variety of standards.

Some hotels in Australia have installed an electrical system where the room key must be inserted into a switch near the door to power the electrical circuits in the room. Removing the key when you leave cuts the electricity to the lights and most appliances. This reduces the potential for electrical fires and also saves energy.

NEW ZEALAND
The New Zealand fire service issues fire safety teaching kits to every primary and intermediate school and to all teachers’ colleges. All station officers and higher ranks have access to a guide for teaching fire safety, and have the supporting materials — and many are trained to deliver this package. While not mandatory, school curricula usually incorporate fire safety in some grades.

New Zealand’s population includes Polynesians, some of whom came from the islands of the South Pacific. When traditional fire education approaches did not reach this high-risk group, which is concentrated in the Auckland province, the fire service successfully distributed safety information through the religious leaders of the community, who were trusted by the people and lent their approval to the effort.

Wool, a local resource, has been used in most upholstered furniture in New Zealand. Wool’s natural fire resistance curtails fires due to careless smoking and limits the spread of residential fires. There have been few fatalities involving upholstered furniture.

New Zealand has developed an illustrated version of its code manual containing simple sketches showing what each part of the code requires. This benefits builders, owners, and code enforcers. A totally new code is being considered that replaces prescriptive construction requirements with performance specifications. The new code is heavily illustrated, too.

The Insurance Council of New Zealand has a major influence on the maintenance of fire protection standards within private buildings. If fire protection systems such as sprinklers and automatic alarms are not designed and maintained to insurance standards, the insurance discounts for them are discontinued until they comply. This enforcement of standards has teeth.

New Zealand has demonstrated the value of consolidating fire departments. It is less than a decade since all fire departments were consolidated into a national fire service, but it has appeared to be a large success in all those dimensions one would expect, such as better allocation of resources, efficiency in procurement, and better coordination of firefighting forces. It is a model to consider for regional consolidation in the United States.

FIREFIGHTER SAFETY
Other countries do much better than the United States in firefighter safety as well as civilian fire safety. Perhaps the three biggest factors in the countries studied for this report, apart from having fewer fires, are: physical conditioning, on-duty safety practices, and having all firefighters ride inside truck cabs. In addition, in Japan, all firefighters are protected head to toe with protective clothing.

* * *

There are many other features of fire protection worth noting in these countries. We cannot borrow all of them directly, but they should be considered. Hopefully they will stimulate better practices here.
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HONG KONG

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I. INTRODUCTION

Why do other nations around the world do better than we do in fire protection? Can we learn from them? Are their practices transferable to the United States? These have been the questions addressed by two related international studies we have undertaken within the past five years.

The intent of both studies has been to help improve our fire protection in four ways:

- By identifying some of the reasons for the success of nations that have achieved better fire records than ours.
- By demonstrating the success that is possible when fire prevention is emphasized.
- By finding good ideas for fire programs and stimulating new ones.
- By providing examples from other nations for our fire service organizations to use in gaining support for their own fire programs.

SCOPE

The first international study compared the United States to countries in Europe. The second study, the subject of this report, surveyed fire protection practices of nations in the Far East and Pacific Basin, specifically Japan, Hong Kong, Australia, and New Zealand.

The report addresses many aspects of fire protection, but the emphasis is on fire prevention because that is where the United States appears to be weakest. Statistics on our fire rates show that we continue to have a lot of fires and fire deaths per capita compared to other countries. (The Executive Summary showed some of the new international data we collected.) Although many fire departments here in the United States have had successes with prevention programs, far more attention and dedication of resources to fire prevention is called for. Firefighter safety and training also is emphasized in this report because firefighters in the United States suffer very high casualty rates.

The report focuses on urban problems more than rural or woodland fires. Rural fires are a major problem in the United States and deserve a comparable study in the future. Woodlands fire protection in the United States is very good thanks to the excellent work of the U.S. Forest Service and state fire agencies.

A quantitative evaluation of the effectiveness of the various approaches discussed here was beyond the scope of this study but is highly desirable for future research. The inclusion of ideas here was based on the judgment of the officials visited and the authors.

The report has been written from a U.S. point of view but may be of interest to other nations as well. Because international travel is expensive and often is viewed as a luxury in the United States, there is far less international exchange of fire protection information than there should be. Copies of TriData's first international comparisons report were requested by fire officials from many nations. It was excerpted in British and Japanese publications and referenced in others. In the United States, over 1,000 copies have been distributed by request, and journal articles and speeches have disseminated its information further. It is hoped that this second report will continue this international exchange of ideas.

For this report, an attempt was made to cover the same set of fire protection topics in each country visited and to describe only examples of fire programs actually in practice. As would be expected, the detail and scope of information we could cover varied from topic to topic among countries. When examples are given in the text for some cities or countries but not others on a particular practice, it does not necessarily mean that the others do not follow the practice, but rather that we did not learn of it or did not think additional examples were necessary.

TRANSFERABILITY

Certainly some of the differences in fire protection practices among nations stem from differences in climate, geography, history, customs, political systems, and socioeconomic characteristics. It is difficult simply to lift an idea from Osaka or Adelaide and drop it into Kalamazoo or Austin. But raising objections to the transfer of ideas on the basis of such differences is sometimes just an excuse to avoid change. Uniqueness of circumstances often is raised in discussing transferability of practices between U.S. cities as well as from cities of other nations.

There is good reason to believe that transferability of fire protection ideas is possible, especially with a little imaginative adaptation. Each of the nations covered in this study regularly sends firefighters to visit other nations, including the United States. In Kyoto, Auckland, and Hong Kong there were fire protection practices that originated in the United States. It is high time that we, too, started taking advantage of the world’s pool of ideas.

APPROACH

The information in this report is based largely on firsthand observations and discussions with fire protection officials during a series of visits by the authors during 1984 to Far Eastern and Pacific nations. This was supplemented by a review of relevant fire protection
literature, discussions with U.S. fire officials and others who traveled abroad, and visits by foreign officials to the United States.

The fire protection organizations visited in each nation for this study are listed in Table 1.

CAVEATS
During our visits we used translators where necessary. However, because of differences in languages and terms from country to country, there remain some communications problems in undertaking a study such as this. Also, much information was obtained verbally, and various sources did not always agree. We regret any errors that may have arisen due to such problems.

The coverage of various aspects of fire safety may be somewhat uneven from country to country because time limits precluded delving into everything everywhere. The report is not intended to be all-inclusive for the countries studied. The authors would appreciate being informed of corrections needed and significant ideas we missed for possible use in future editions or other studies.

ORGANIZATION
The sections that follow describe what were judged to be the most important or most innovative practices of the nations visited. The remainder of Chapter I provides background information on the four nations studied and a summary of their fire problems.

Chapter II deals with fire prevention in its broadest sense, including prevention of ignition, facilitating escape, extinguishment by the public of incipient fires, and limiting spread through codes and construction practices.

Chapter III deals with fire suppression management. It gives special attention to firefighter safety and training. It also discusses fire service organization from national to local levels, manning levels, apparatus, and equipment.

Chapter IV briefly discusses fire service practices relating to emergencies other than fires.

NATIONAL CHARACTERISTICS RELATING TO FIRE
The four nations selected for this study had to cover a wide range of conditions but still be perceived as being developed and "Western" enough to have practices that could be transferable to the United States. The nations were:

- **Japan**, pop. 117 million, a modern, highly technological country with reverence for tradition and an orientation to working toward community goals. Most of the population lives in one- or two-story wooden houses grouped closely together to form neighborhoods. Earthquakes and fires are a major concern. The fire service is under local jurisdictions, but the national Fire Defense Agency is influential.

- **Hong Kong**, pop. 5.3 million, 98 percent Chinese, subtropical, British colony, with people ranging from rags
to riches, highly family-oriented, respectuous of parental discipline, entrepreneurial in the extreme, the most densely populated place on earth, with most of the population living in new concrete highrises but some still living as squatters or on junk.  

- **Australia**, pop. 15.5 million, a bustling, frontier spirit nation with temperate climate, a lot of U.S.-style personality and attitudes, British heritage, independent, not keen on regulations. In some states the population lives in houses made of brick or masonry, in others mainly wood. In both, people value their property. The fire service is organized at the state level, and the states are quite independent. Victoria, Queensland, New South Wales, and South Australia are discussed.

- **New Zealand**, pop. 3 million, another British heritage nation, a relatively newly built-up land, a nation of single-family wood frame houses, relatively low density even in cities, very individualistic, highly proud of ownership, a nation that searches the world for the best ideas and rethinks practices for itself. In the last decade the fire service has been nationalized.

**JAPAN**

Oriental people generally have a high awareness of the importance of fire safety. It is passed from parent to child in the home and from society to the individual in both direct and subtle ways as part of the culture.

Nowhere is it more evident than in Japan, where causing a fire carries with it an extreme social stigma: You are lucky if you are not forced to move out of your neighborhood when you are careless and endanger the community, especially if the fire spreads beyond your own house. Your carelessness may be publicized, you are expected to apologize formally to your neighbors individually, and you may be ostracized.

Since Japanese neighborhoods even in large cities are generally closely knit groups, where one's social life depends on being considered a member of the group in good standing, being ostracized may be serious enough to make it necessary to move to another location.

The Japanese thrive on stability and tend to live in the same place for an average of 20 years, so this constitutes significant social pressure against being careless with fire.

These pressures are almost exactly the opposite of what happens in U.S. communities, which tend to pull together in a crisis to help even strangers, and surround people who have fires with outpourings of clothing, food, temporary shelter, money, and moral support.

The Japanese have good reason to be concerned about fire. Of the estimated 48 fires in the history of the world that burned 10,000 or more buildings, Japan had 27. The Japanese are two percent of the world's population and have suffered 50 percent of its major conflagrations. If only the very largest fires are considered (those that destroyed 100,000 or more buildings), six out of eight occurred in Japan.

Most Japanese live in homes of wooden construction with paper windows and interior walls. They are highly vulnerable to fire. Open fires are used for heating, and cooking appliances have open flames. The Japanese make frequent use of fire in worship (e.g., candles for ancestor worship). Many of their national treasures have been destroyed by fire through the centuries. During World War II, entire cities were razed by fire bombings and nuclear weapons. There would be considerable awareness of fire dangers even if the fire service did nothing. But they do a great deal to reinforce this awareness and raise it to the highest levels.

Since World War II, there have been profound changes in the structure and nature of Japanese society and corresponding changes in Japanese attitudes toward life. The life of the individual has become more valued, and the notion of ready sacrifice of life for society diminished. A great deal of effort has gone into prevention of losses from fire, earthquakes, and other types of disasters. Large life loss from hazards is considered intolerable. The Japanese are willing to devote significantly more time and resources to saving lives than even we are.

The prime fire safety appeal in Japan is to safeguard your neighborhood and its wooden houses. It is your obligation to the community. This builds loyalty to the community as well as care in maintaining one's home.

In the city of Kyoto, which houses 20 percent of all of Japan's national treasures, and to a lesser extent elsewhere in Japan, an additional appeal is made to your responsibility for not starting fires that might endanger these treasures. Consciousness of fire safety is said to be higher in Kyoto than the already high level in other large Japanese cities. National treasures, by policy, are to be protected like human life. To do all of this requires cooperation between the owners of buildings, the caretakers of the treasures, the people, and the government.

**HONG KONG**

In Hong Kong, too, there is great social pressure not to start fires, even among the poorest families. The desire of most people in Hong Kong is to build up a financial stake through hard work and entrepreneurship. This extends from rich jewelry merchants to street corner peddlers. There is no welfare. You work or you starve. People are careful with whatever little they accumulate. If you start a fire accidentally, you are endangering the accumulated property of others as well as your own, so you are castigated. If you start a fire intentionally, you may be physically attacked.

Many of the poor in Hong Kong are illegal immigrants who lost whatever property they had in their homeland. They have a double motivation to prevent fires: to avoid losing everything a second time and to avoid any entanglements with the government. This extends to squatters, who may live 20 years in one place illegally. They are highly aware of the dangers of fire. Most have seen major fires that wipe out several hundred families' possessions at a time, and many have had the experience of having had to escape themselves. Squatters' fires are spectacular, with a large column of smoke and bright glare. Many people can see them from far off, and they make a deep impression. "It's not just seeing
Dick Van Dyke,“ said one Hong Kong officer. “It’s the real McCoy.”

Hong Kong also has wealth. About 10-20 percent of the population, mostly the well-to-do and well-educated, live in single-family dwellings. Unlike in the United States, there is not much of a fire problem in one- to two-family dwellings.

Few people in Hong Kong live alone. This improves chances for early fire detection and assistance in escaping from fire. Dwelling units are small, and there is almost no place for children to play undetected with matches. They usually want to get out of their small space and play outside — and there are lots of kids with whom to play. As in Japan, cooking and heating units often have open flames, and the burning of joss sticks and joss paper is used in worship in the home.

The population of Hong Kong increased by 674,000 in the five years from 1976 to 1981. About a half million were legal or illegal Chinese immigrants. In this same period, about 90,000 Vietnamese boat refugees passed through or stayed on. By 1983, 2.5 million of the 5.3 million people in Hong Kong were living in public housing or in subsidized housing. Rentals vary from U.S. $10 per month for about 150 square feet to about $40 for 300-400 square feet. Several hundred thousand people live on boats or in squatters’ shacks.

**AUSTRALIA**

Attitudes toward fire in Australia vary from highly concerned to completely apathetic. Aussies value their property, and this works toward creating an attitude of carefulness. Australia is a dry country, and there are often critical water shortages in some of its states in the summer. Water is rationed at these times, and this serves to remind people of the need to be careful. This awareness is heightened by severe grassland fires in the dry season that cover hundreds of thousands of acres. They also take many lives: The Ash Wednesday fire of 1983 claimed 73 lives. In a sense, such fires serve a similar role as hotel fires have in the United States, bringing media attention to the hazards of fire, even though they are not typical of the majority of fatal fires.

The Australian fire service’s self-assessment is that they are not doing nearly enough to raise public awareness and knowledge of fire safety. It is the typical problem of priorities and money, and they have opted for a lower prevention/suppression ratio of resources than, say, the Japanese.

To further raise the awareness in Melbourne, fire officials are considering taking advantage of the idea that Australians seem to be materialistic and proud of their possessions. A successful police-sponsored neighborhood crime watch program based on this principle is being considered as a model for formulating a new fire prevention program.

How have the Australians succeeded without having strong public awareness of fire safety issues? In the words of some Australian fire officers, “We’ve been lucky!” That may or may not be the case. But their bottom line is that they have had less than half the fire death rate of the United States over many years.

**NEW ZEALAND**

In New Zealand the public attitude toward fire is like that in northern Europe and Australia. There is great “pride of ownership” toward homes. Almost everything seems well-maintained, and there is an interest in preserving personal property, including motor vehicles, from fire. The building fire rate is low, as is the vehicle fire rate. Despite the plentiful amounts of wood and living space and the low cost of homes, despite two thirds of households having no-fault insurance on homes and cars (which reduces the economic incentive to be careful), despite low density, which reduces chances of spread, the New Zealanders are more motivated to be careful than we are. Part of the motivation may lie in their British heritage concept of being a good citizen who is careful of property.

Kwis, as the New Zealanders call themselves, are a do-it-yourself, look-after-yourself, outdoors people. One sixth of the population lives in rural areas of less than 1,000 population; 50 years ago it was one third. A leading New Zealand fire chief suggested that these characteristics infer some measure of a self-survival discipline that heightens the awareness of and concern for fire safety, whether intentionally or unconsciously.

**CURRENT FIRE LOSS PICTURE**

Fire prevention programs can be more effective and efficient when targeted to particular fire problems and particular population groups. The targeting may use data from local and national data systems, citizen surveys, neighborhood contacts, or other sources. The same data can be used to monitor the effectiveness of particular prevention programs over time.

In Japan fire data are virtually 100 percent complete. All fires reported to fire departments are reported to the national Fire Defense Agency via fire agencies at each level of government. Data on all disasters also are reported to the Fire Defense Agency via emergency management channels.

All fires are investigated thoroughly to provide information for prevention in the future. Causes of fires are reported along with data elements similar to those we collect in the United States on each fire. In addition, the Japanese collect some other useful data, such as the number of people displaced by fire, the number of households affected, the area of building space burned (in square meters), and the fraction of each building that was destroyed.

The Japanese national fire data are published in their annual White Book on Fire Service in Japan. This was one of the models that stimulated the Fire in the United States series of the U.S. Fire Administration.

In Tokyo the number of fires, fire deaths and injuries, and fire losses are tallied daily for the year to date. These tallies are displayed on an electronic scoreboard in Tokyo Fire Headquarters, where they are visible to department officers, the press, and the public.

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8 Dick Van Dyke is the star of an excellent series of TV public service announcements developed by the National Fire Protection Association.
There have been 60,000-70,000 fires annually in Japan in the past few years. Almost two thirds (40,000) are building fires. The number of building fires increased by 25 percent from the mid-1960s to early 1970s. Then it decreased until by the mid-1970s it was the same level as in the mid-1960s (five per 10,000 population) as the drive for public fire safety education increased. The building fire rate further dropped to four per 10,000 by the late 1970s. It has fluctuated somewhat since then from year to year. In 1981 it was 3.3 per 10,000 versus 44 for the United States.

There were 1,600-2,000 fire deaths and 8,000-9,000 injuries per year in Japan from 1975-1980. In 1980 there were 1,947 deaths, or 17 per million. Even though this rate was 70 percent higher than in the mid-1960s, it was still only half of ours. Furthermore, 38 percent of their fire deaths are due to self-immolation. If suicides are deducted, their fire death rate is one third ours, and trending downward.9

The leading causes of building fires in Japan in 1981 were cooking (13 percent), careless smoking (10 percent), arson (9 percent), bathtub heater (8 percent), playing with fire (7 percent), stove (heating) (7 percent), open-air fire (3 percent), chimpanzee (3 percent), matches and lighters (2 percent).10 If the bathtub heater, stove, and chimney categories are combined, heating would be the leading cause, as in the United States, with cooking second. Arson is up more than 125 percent since 1970, and cooking fires are up 50 percent. Smoking-related fires and heating fires are down about 20 percent.

In 1983, Tokyo, with 11.2 million population, had 109 deaths and 6,900 fires, of which 4,000 were building fires. The leading causes of fires (building and all other) in Tokyo are arson, careless smoking, children playing with fire, and gas stoves. The leading causes of death — excluding suicides, which comprised 40 percent of the deaths — were careless smoking, arson, and cooking. People over 65 accounted for 53 percent of the nonsuicides; children 5 or under another 7 percent.11 In Kyoto, 28 percent of fires were due to arson, by far the leading cause there, too.

About three quarters of fire deaths in Japan are in residences. Another nine percent of deaths are in buildings that combine a store and a residence. Causes of fires that resulted in fatalities are not published for the nation; rather, great attention is given to the environment and events that led to the deaths.

Half of all building fires in Japan in 1981-1982 were in residences, followed by factories and workshops (12 percent), warehouses (9 percent), restaurants (3 percent), and office buildings (2 percent).12 Fires in highrises are increasing sharply; they quadrupled from 1970 to 1977, and accounted for about 10 percent of all building fires in 1977.

In Hong Kong the fire statistics system face essentially the same problems as in any large city, with the added problem that the reports are in English and many firefighters speak only Chinese. Because data reporting is primarily a responsibility of the officers and they are required to speak English, the problem is manageable. Their data system has close to 100 percent reporting.

The number of fires in Hong Kong trended upward over the years 1978-1983, somewhat faster than the increase in the population. In 1983 there were 9,363 fires, of which 5,170 were building fires. About one quarter of the building fires were at the seventh floor level or higher. About one tenth of the calls were above the sixteenth floor. Of the third alarm fires or higher, almost half (45 percent) were in multistory factories and other industrial buildings, and a third (32 percent) were in squatters' areas.

There were 30-45 fire deaths annually in Hong Kong from 1978-1983, with an average of 40 per year. In 1983, there were exactly 40, or approximately eight per million, less than one third the U.S. rate.

The leading cause of fire deaths in Hong Kong is arson. It is mostly from gang fights, organized crime, and revenge, rather than vandalism or insurance fraud. Unlike Japan, arson is an infrequent cause of fires even though it is a major cause of fire deaths. Suicide fire deaths are rare.

The leading cause of fires in Hong Kong in 1983 was reported as careless handling of candles, cigarettes, matches, hot ash, etc. (54 percent). Other causes included: electrical faults (27 percent); careless handling of joss sticks, joss candles, etc. (2 percent); children playing with matches (2 percent); suspected arson (0.4 percent); miscellaneous (3 percent); and unknown (9 percent).

Surprising to those not familiar with its geography, Hong Kong is seriously concerned about brushfires. One third of the population lives in the New Territories, which comprise 90 percent of the land and include mountains and large amounts of woodlands. The woodlands serve the dual purpose of protecting watersheds and providing recreation space for the ultra dense urban areas. Without them the fresh water supply and possibly the mental health of the people would be endangered. Hong Kong thus directs part of its public fire safety effort to preventing brushfires.

Australia is in the process of developing an automated fire incident reporting system based on the U.S. National Fire Incident Reporting System (NFIRS). The Australian "AFIRS" was tested in Western Australia (Perth) and is being implemented now in other states. Fire statistics have been collected nationally only for a few selected types of data up to now.

For the four years from 1979-1982, the number of fire deaths in Australia (pop. 15 million) ranged from 155-177, or an average of 11 per million. The final total for 1983 will be considerably higher because of the 73 fatalities from the Ash Wednesday fire.

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9 The U.S. death rate for 1981 was 7,600 deaths divided by 229.3 M population, or 33 deaths per million. For 1982, USFA has not published an estimate, but it would be approximately 8,800 divided by 232.1 M, or 29 deaths per million; with transportation excluded, about 26 per million.


Of the 167 fire deaths in 1982, 54 were in transportation, mainly buses and cars. The rate of fire deaths per capita excluding those from transportation fires is only eight per million. The comparable U.S. rate is three times higher.

The state of Victoria, with 3.8 million population, had 45 fire deaths in 1979, or 12 per million.

New South Wales, the only state that has had fire statistics by cause, has six million population, or 35 percent of the nation. Of 3,134 residential fires in 1980, the major causes were cooking (40 percent), matches, careless smoking, or fireworks (16 percent), heating or chimneys (14 percent), home appliances (14 percent), and electrical distribution (15 percent).

Several Australian fire officials commented on the low confidence they had in the determination of the cause of fire. They said the reported cause was often just a guess, and felt they needed to improve cause determination now that a standard fire incident reporting system was being implemented and the data put to more use.

New Zealand has adopted the NFIRS methodology of the United States. They have virtually 100 percent participation. The system is administered by the Fire Service Commission, which provides direction to the national fire service and which reports to the Minister of Internal Affairs. The fire service leaders have given high priority to collecting a base of "good data" so they can use it in managing their prevention programs.

To ensure good cause data for serious fires, a local Fire Safety Officer (a fire investigation and prevention specialist like a fire marshal in the United States) automatically responds to second alarms in New Zealand in jurisdictions with permanent (paid) departments. In cooperation with the fire incident commander, he is responsible for determining cause. In larger cities such as Auckland, the senior officer of the fire safety department responds to third alarms and all fatal fires. He also serves as the regional Fire Safety Officer and responds to third alarms in the areas outside the city. The Fire Safety Officers also are the liaison with police and with the news media.

New Zealand in 1982 had 23,000 fires, of which 9,200 were building fires. There were 36 deaths. From 1980-1982, New Zealand averaged 43 deaths per year including transportation-related fire deaths, and 37 deaths per year without transportation. None of these recent fire deaths have occurred in buildings that comply with New Zealand Standard 1900, their Model Building Bylaw. The most common causes of fire in New Zealand include arson, careless smoking, and cooking.

**CITIZEN SURVEYS**

In addition to fire data systems, other sources of information are used for planning and managing fire programs. Citizen surveys are used both at the national and local levels in Japan to monitor citizen awareness and attitudes toward fire. The surveys also ask citizens for ideas on the information that public education programs should provide and for an evaluation of fire protection programs from the public's point of view.

Results from national fire awareness surveys of the past decade reveal a great deal about Japanese attitudes and fire safety knowledge. The surveys were conducted under the auspices of the Japan Fire Defense Agency in 1974, 1976, and 1982. Typically, 3,000-5,000 people were contacted for each survey with 81-84 percent return rates. These return rates themselves show exceptionally high interest. Some of the key findings are as follows:

- Portable fire extinguishers are installed in 65 percent of Japanese homes (1976). About a quarter (22 percent) of extinguisher owners got them as a result of a neighborhood association's recommendation, six percent from a friend's advice, and 63 percent on their own initiative. About one third of the households that have them said they used them (1974).
- With respect to checking for fire hazards before going to sleep, 81 percent said they always checked, 15 percent nearly always, and three percent sometimes. These trends were observed regardless of sex or type of residence construction (1976). While people may tell interviewers what they think they should be doing rather than what they actually do, they did have the chance to say "nearly always," and yet most said always. This type of carefulness could by itself explain most of the difference between U.S. and Japanese fire death rates.

- When staying at hotels, two thirds of the respondents said they checked for exits or fire extinguishers, and two thirds said they made a fire check before going to sleep (1976).
- Twenty-two percent of the respondents had experienced a fire drill during the past year. Of these, 44 percent were at work, 41 percent in their community, seven percent at schools, and 10 percent elsewhere (1976).
- Fifty-seven percent worried about earthquake hazards, and 33 percent of the respondents' families discussed actions to take if an earthquake occurred (1976).
- Sixty percent of the respondents knew that the most dangerous secondary disaster following an earthquake was fire (1982).
- When asked what they wanted the fire service to do more of, they said: inspections of hazardous places (27 percent), home inspections and drills (23 percent), increased rescue and ambulance service (22 percent), control of hazardous materials (20 percent), recommendations on extinguishers with good performance (13 percent), public information for prevention (13 percent), code enforcement for buildings found in violation (12 percent), more fire stations (10 percent), more volunteers (10 percent), others (two percent), and nothing needed (28 percent). The percentages total more than 100 percent because more than one area could be specified (1976).

- Sixty-five of the respondents knew the meaning of the hotel "fire safety mark" emblem of safety (discussed further below) (1982).
• Where voluntary disaster protection systems (community groups) existed, 26 percent of the responders said they were very active in them and 23 percent attend meetings if asked to do so.

The results of the survey support what many have thought: The level of fire awareness in Japan is very high.

DESIGNATED HOUSEWIFE MONITORS
Civilian housewives in Tokyo are assigned to monitor neighborhood conditions and attitudes related to fire safety. There are also many neighborhood meetings held between fire officials and neighborhood groups or women and children's clubs in Tokyo and other Japanese communities. (See more on these clubs below.) These sources are used to provide up-to-date data on the fire problem in neighborhoods to guide prevention programs.
II. FIRE PREVENTION

As a nation we are far behind others in the scope, intensity, and effectiveness of our fire prevention efforts. Some U.S. communities do an outstanding job in fire prevention. Few ideas in this report cannot be found in practice somewhere in the United States. But by and large we shortchange fire prevention efforts and always have. America Burning said that a decade ago, and unfortunately, it is still true.14

Is this exaggerated? Consider the following:

- Fire departments in Hong Kong and Japan are loaded with magnificent color posters, brochures, and comic book style prevention handouts. They are designed well and distributed widely.
- Osaka has 47 vehicles equipped with public address systems and devoted to public education and fire inspection efforts.
- Kyoto has a fleet of red motorbikes in every station to facilitate public education visits to homes every day by firefighters from each company.
- Japan has three national fire prevention weeks, which are supplemented in many cities by additional days each month and an additional week at the end of the year.
- Japan has more volunteer firefighters and about the same number of paid firefighters as the United States, plus 27 million women and children in fire prevention clubs. Ten to 15 percent of paid firefighters are assigned full time to prevention, and many others have prevention-related duties as part of their work week.

But the situation is not so simple that one can just prescribe throwing resources at prevention. A senior Australian fire chief asked why it is that even though the United States puts “so much emphasis on public education and school programs” (compared to Australia), the United States has a fire death rate more than twice as high as Australia. He felt there was a point of diminishing returns, and that the quality of programs and the specific techniques used were crucial. He felt that public information needed to be succinct and communicated in short bursts. If it is fed continuously, it disappears into the background along with all the other information being constantly disseminated.

We will discuss public fire education first. This is the underpinning of prevention efforts. Next we discuss codes and construction practices: how built-in protection is prescribed and maintained. The chapter then discusses insurance practices and their effect on incentives against arson and carelessness. Standards for furnishings and consumer products are discussed in the fourth section. And the chapter concludes with a description of how fire prevention is organized within fire departments.

PUBLIC FIRE EDUCATION

SCHOOL EDUCATION
National policy in Japan recommends the inclusion of fire protection in the school curriculum. Most school systems choose to follow this policy, though it is voluntary that they do so. The thinking is that not only will the children learn to prevent fires, but they also will pass along the information to their parents and siblings. They may do this by discussion, by giving their parents the fire prevention literature provided, or by nagging or protesting when they see careless behavior, such as smoking in bed or overloading electric outlets. Some of their literature explicitly encourages children to raise a ruckus if they see their parents engaging in unsafe actions—despite the cultural emphasis on obeying parents.

Children may start receiving fire prevention education as early as nursery school or kindergarten in Japan. The Japan Fire Prevention Association (described further in Appendix A) provides curricula and materials to the teachers.

In grades 1-9, most students in Japan receive fire prevention education at least twice as part of their curriculum, once in the fourth grade and again in junior high school. The fourth grade program includes fire extinguishment and the nature of fire as part of science, and basic fire prevention concepts and the role of fire departments as part of social studies. This training raises awareness of fire safety and the importance of leading a safe life as a basic rule of living. It tries to implant this value around the age of 10 when the children are forming a world view they will hold throughout their lives.

In junior high school, fire safety is again included in social studies. The children are taught these lessons by their teachers, who in turn are instructed by the local fire department and through excellent booklets prepared for the teachers. Some fire departments do some direct teaching themselves.

A wealth of handbooks and curriculum guides are available free to the schools. These are well-designed booklets with pictures and cartoons. Cartoons are used frequently to clarify the message and to increase its appeal. The materials are provided by private associations, such as the Japan Fire Protection Association, or by the municipalities.

The children are taught such lessons as:
- Not to play with fire.
- How to prevent common household and woodland fires.

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• How to fight incipient fires with fire extinguishers, buckets, or homemade waterbags.
• The need to report arsonists and to discourage juvenile firesetters. An arsonist is clearly portrayed as a “bad guy” in their cartoon literature.

In Tokyo primary schools have a supplemental reader on fire prevention which teachers use to teach fire awareness and prevention. In addition, the fire department makes a presentation to every class of every school at least once a year, using the prevention staff of the local battalion fire station.

In Kyoto, too, teachers use a text provided by the fire department to teach fire safety. The fourth grade has been chosen as the focus for the main prevention education effort, but that is not the only effort. The fire department conducts an annual evacuation drill in all schools and uses the occasion to teach more prevention on relevant topics to the kids, such as safety with campfires and fireworks. They also hold a competition to draw posters on prevention. Out of a population of 14 million, Kyoto had 652,000 student-days of participation in prevention programs in 1983 at the nursery school, elementary school, and junior high levels, an incredibly high participation level.

One popular handout used in Kyoto is writing tablets for children. They are placemat size and are used by children as a base to write on. They have pictures of the various fire apparatus in Kyoto under a hard plasticized surface. These mats proved to be a hit with the children (and some adults, too).

In Osaka fire safety education starts with classes for mothers and children together in kindergarten. The classes are taught by the fire service and include how to prevent fires and how to administer first aid. The children pretend they are injured and their mothers practice on them, which makes the occasion very memorable for both. Shoulder patches designed by a fire captain to remind young children of fire safety are given away in these classes.

In elementary school in Osaka, fire safety is taught in the fourth grade as part of social studies, as elsewhere. In the first year of junior high school, every 13-year-old receives brochures with details of fire safety practices. They are encouraged to read them and bring them home. In the second year of junior high, the children are encouraged to join fire protection clubs. In 1983 there were 45 clubs in Osaka with a total of 1,500 students. Many of the club members become deeply interested in fire protection, and many career firefighters have come out of this program.

In Hong Kong teaching kits are provided to teachers to learn prevention information themselves. The use of the kit is voluntary; fire safety is not an official part of the already crowded curriculum and it is left to the individual school or teacher to decide how and when to use it.

New Zealand encourages incorporation of fire safety education into the basic school curriculum. Part of the language programs in the junior, middle, and senior levels of their primary school incorporate fire safety.

To aid the teachers in delivering fire safety instruction, a “Fire Safety Games and Picture Pack” was developed in cooperation with the Department of Education. All primary and intermediate schools and teachers' training colleges have been issued the kit. Each kit contains a variety of activities, booklets, games, pamphlets, pictures, cards, tape cassettes, and a teacher’s handbook. This kit was produced and packaged beautifully and has been well accepted by teachers throughout New Zealand.

In addition to explaining how to use the kit, the teacher’s handbook includes information on other fire safety related audiovisual resources available through area lending libraries and their National Film Library. They have many of the National Fire Protection Association (U.S.) films and filmstrips/tapes among these materials.

To aid fire officers in delivering public education, New Zealand has a “Fire Station Guide to Fire Safety Education In Schools.” This gives them a standard, ready-to-go program along with all supporting materials. All Station Officers and higher ranks in New Zealand have access to this program and may be involved in its delivery. In the Auckland region, many are trained to deliver it.

In addition, New Zealand has a full selection of handouts, brochures, posters, and stickers for use by local fire brigades in dealing with schools or the public. Over 150,000 brochures and posters were distributed in 1982. Some, such as brochures on wood-burning stoves, are prepared by the Insurance Council, but most are prepared and provided by the fire service.

New Zealand has three public education trailers available for use in fire safety education during school visits and public events by all fire brigades. The trailers are fully equipped mobile classrooms. They have been somewhat underused due to the lack of fire service personnel trained to use them, but the basic concept has been good.

In South Australia the inclusion of public fire safety lessons in schools is voluntary. When requested, the fire department provides one- to two-hour lectures and demonstrations in the schools. They may reach as many as 1,000 students at a time. The demonstrations include hands-on use of fire extinguishers by students and teachers to put out real fires.

High schools in the mid-north of South Australia have offered a firefighter curriculum as an elective without credit. It has been proposed for regular high school credit.

One staff officer is assigned full-time to fire prevention education in the South Australian Country Fire Brigade. Supplementing this officer is a paid consultant who adapts materials from other countries, primarily the United States, and develops new materials as needed. He also helps deliver public education programs in the field.

The Melbourne Metropolitan Fire Brigade tried to implement the NFPA “Learn Not To Burn” curriculum, but met resistance from the education department. Two lessons emerged: the need to explain to teachers that the materials are designed for them, and the need to adapt materials to one’s own national idiom and images. (They

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15Prorated for population size, that would be over 12,000,000 pieces in the United States.
felt the materials were too Americanized for Australians.)

In Sydney they are developing a 20- to 30-minute school program to address the high rate of arson in schools. Station officers in 82 stations are being trained to deliver the program, which emphasizes the harm that fires can cause.

**PARENT-CHILD EDUCATION**

In Japan an important part of fire prevention education is expected to take place in the home. Japanese parents, like European parents, are expected to stress the importance of fire safety to their children, and they do.

Japanese toddlers used to be taught a nursery rhyme that says that there are four things for children to fear: earthquakes, thunderstorms, fires, and fathers. (Now they say fathers and thunderstorms are not things for children to fear anymore!)

A Japanese neighbor of one of the authors related that when he was a child his father made a big show each night of carefully extinguishing household fires used for heating and cooking and made the extinguishment of each cigarette he smoked a little demonstration on carefulness. His father told him that if he started a fire, he would have to go to the neighbors and bow before each of their houses until the neighbor acknowledged his remorse. Even then, he was told, his family might have to move out of the neighborhood. It left quite an impression on him.

In many cities throughout Japan, the centuries-old custom of a night watch parading through the streets after dinner banging wooden clappers and singing out fire safety slogans still is observed. This “night watch” takes place from about 7 to 9 p.m. by children supervised by a few adults who rotate the duty. (Sometimes it is performed by two adults from 8 to 11 p.m.) It is fun for the kids and a reminder to them as well as to the households who hear them call out “Be careful of fire.” This tradition is maintained even in the largest cities. It was started in the mid-17th century, when Boston as well as Tokyo (then called Edo) used this concept.

In addition to the parent-to-child messages required as part of parental duties and the child-to-parent messages stimulated by schools, enormous efforts are made by Japanese fire protection services to get messages to the home using many different media. These are discussed later in this section, by method of delivery.

In Hong Kong as in Chinese households everywhere, there is great respect for parents and a high degree of acceptance of parental discipline. When parents caution against dangerous play behavior they tend to be listened to. The result is far fewer “children playing” and vandalism fires, even among squatters, than might be expected.

Hong Kong parents teach that “loss is costly,” not that fire brings shame as is done in Japan, in keeping with the cultural emphasis on building a stake for economic survival versus the Japanese emphasis on social cohesion. Both approaches seem to work.

**DIRECT MAIL**

One of the most straightforward methods used in some Japanese cities is direct mailings of prevention literature to the home. This reaches households without school-age children as well as those with. The frequency of the mailings varies from once a year to once every several years, but they attempt to reach every household. The literature sometimes is delivered by the fire service to the post office, which places one piece in each mail box. This circumvents the costs and problems of maintaining address lists, as well as the expense of postage.

**DOOR-TO-DOOR MESSAGES**

In Japan fire prevention messages often are circulated door-to-door. A printed circular is given to one household in each group of houses, which then passes it to the next. Each must “sign” the circular to acknowledge its receipt. The message on the circular may be a notice about a local fire prevention meeting or fire prevention practices for common fire problems.

The circulars often are circulated under the auspices of block associations (chonai-kai). In rural areas there are comparable village associations (buraku-kai). They maintain local public address systems and organize festivals and excursions to keep people close to each other. Every month someone comes around to collect 80 cents or so for the association.

Door-to-door literature also may be delivered by members of the boys’ or women’s fire prevention clubs of Japan. (These clubs are discussed below)

The circulars are formulated carefully despite their casual appearance. The prevention messages are clear from the drawings alone. The drawings also have a touch of humor and the circulars seem fun to read. The characters and drawings in the circular can be found in other prevention literature they use, which saves creative work and provides repetitiveness of images for increased retention.

In Osaka in 1983, 960,000 households, essentially 100 percent in the city, were each given a brochure dealing with fires and disasters. Fire stations distributed packs of the brochures to school fire safety club leaders, who gave them to their members, who distributed them in stacks of 20 to various houses, which circulated them house-to-house in the usual neighborhood distribution system. These brochures are updated once every four years. They have a hole in the corner from which they can be hung for easy reference. It is estimated that about half the households read the brochure.

In Kyoto prevention literature is carried door to door by firefighters. They also offer to conduct a voluntary home prevention inspection. During the inspection visit, the firefighter talks about prevention. He is trained to relate his remarks to the occupation and living style of the household. He inspects the kitchen and bathrooms for appliances that have open flames, such as water heaters, space heaters, and stoves. He will inspect even more on request. All

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16 The “signing” is actually a stamping of an official seal. The stamp is made of ivory, semi-precious stone, or hard wood and is registered with the local government. Each stamp is unique to a household. It carries more authority than a signature in Japan.
firefighters in the city participate. To facilitate these visits, firefighters are provided with red motorbikes. There are about 190 in the Kyoto fire department. Each day during the period 10 a.m.-4 p.m., one firefighter from each unit of five firefighters is dispatched to make such house-to-house visits. He stays in contact by radio. If his company gets a call while he is out, he can respond directly to the scene if need be. They visit every home once every three years. Only a few households reject the visit.

In Tokyo fire prevention units comprised of women wearing distinctive wine-red uniforms make home visits to the elderly and handicapped to provide fire safety instruction and to check on hazards. Visits to ordinary households occasionally are made upon request. In the winter danger season, fire engines in Tokyo ride slowly through neighborhoods clanging their bells to raise fire safety consciousness.

In small towns in Japan, volunteer firefighters often visit homes with fire safety literature.

**RADIO AND TV SPOTS**

Radio and TV stations in Japan provide many more free spots and in better time periods than do most U.S. stations. The spots are typically short (10-20 seconds) but frequent — once every one or two days. Radio spots are used in small towns as well as larger cities.

The Japanese Fire Defense Agency produces a five-minute fire safety program that is run two days a week on daytime TV nationwide. In Tokyo it plays at 9:55 a.m. and 11:25 a.m.

In Hong Kong "Announcements of Public Interest," as public service announcements are called there, are an important part of public fire safety education — perhaps even more so than in Japan. Virtually every household, including squatters shacks, junkies, and low-income highrises, has a color TV with outstanding picture quality. There are only two TV stations, and in many low-income households TV sets tend to be left on all day. Television thus is a major conduit into the households that most need to hear the safety messages. Radio spots also are used.

Typical messages include how to use a kerosene heater safely or how to extinguish a cooking fire.

The messages may feature overloaded circuits, incorrect use of stoves, or propping open fire doors in public buildings. They show the fires that can result from such hazards. Typically messages are 20-30 seconds, and they often run in prime time (7:30-8:30 p.m.) as well as during the day.

The Government Information Services Department works with the fire brigade to produce the fire safety messages in various media, and the results are highly professional. They select just a few messages to focus on in any one year.

In Australia too the media provide many free time spots, particularly in preparation for the dry season. They also provide regular news coverage of the danger levels, as discussed in the next section. During these high fire danger periods, private companies that provide services and products relating to fire safety also give fire prevention messages as part of their paid commercial time. In Melbourne the largest radio station runs frequent fire prevention messages.

**MEDIA RELATIONS**

Major Japanese cities have gone to great lengths to maintain good relations with the media. They make it easy for the media to cover fires and to collect background information. Tokyo has a commitment from the local press to report every working fire. TV coverage of fires also is close to 100 percent. Reporters are encouraged to include the cause and circumstances of the fire and the extent of the damage to raise awareness of the hazard and to give the public a practical lesson in prevention. (In the United States fire officers often tell the press that the cause is "under investigation," and do not like to give damage estimates.)

There is another more subtle purpose in the news coverage: The publicity adds to the embarrassment and loss of face suffered by the careless household, which helps make others more careful to avoid experiencing the same embarrassment.

To encourage media reporting, Tokyo Fire Department Headquarters has a bank of press phones installed in the central dispatch center. Reporters can observe a fire live via fire department helicopter transmission of pictures from the scene of every working fire. They can identify the exact units assigned to a fire, follow its progress, and receive briefings from the watch officer or senior officers. Reporters also can get information at the fireground from public information officers who go with the first due response to all working fires. The videotapes made from the helicopters are loaned to the media and are later used for training by the fire department.

Osaka, too, assists the press and media. They have a direct line from their dispatch center to the Osaka press club to make it easy to inform the press about fires. Even more useful, the fire department public information section calls two local radio stations live each day at 11 a.m. and 3 p.m. to pass on the latest fire news. The stations allot three to five minutes for this news. They try not only to report the fires that have occurred but also to give enough details to create a prevention example. They might say that "a woman at such and such a location was frying tempura in oil when she received a phone call and then forgot about her cooking. The damage was . . ." By giving the location they get more attention from people in that area.

Osaka has not been able to get their TV stations to offer free time as do their radio stations, but they get a good deal of TV coverage through another tactic: holding press conferences about once every three days (over 100 per year)! They use them to report purchases of new fire equipment, announce when fire safety classes are being held, and report fire news. Now that the media is used to attending the press conferences, they do so regularly.

Another series of public relations events in Japan takes place early in January every year. Many fire departments hold an annual review of troops and an award ceremony, with demonstrations of new and old firefighting skills. The events are very colorful and are televised nationally. The competition includes ladder climbing, water squirting, and races pulling pumps on hand-drawn carts.
Japan uses the newspapers in another way: to publish lists of hotels and inns that do not meet fire codes. This is the flip side of allowing the safer hotels to display a fire department emblem of safety. (This is discussed further in the code enforcement section below.)

Kyoto has capitalized on an expression coined by a U.S. newspaper and now calls itself the “Fire-free city of Kyoto.” The slogan is used as part of public education efforts to become a self-fulfilling prophesy. They have come close. In 1981 they had the absolutely incredible record of only 216 reported building fires in a city of 1.4 million. A typical U.S. city of the same size would be expected to have 40-50 times more fires!

In Hong Kong almost every fire is given coverage on TV—even fires on junkies. Media coverage of conflagrations among squatters' shacks over the past 30 years is credited with playing a major role in raising public awareness of fire safety, especially among the low-income households that were hit the hardest. On the last day of the authors in Hong Kong there was a front page story and picture of how 700 families were displaced by a large fire in the squatters' section of the city. Few lives are lost in these fires, but the emphasis on losing your home and all your possessions makes a strong impact.

In Auckland, New Zealand, the officers of the Fire Safety (fire prevention) Department who automatically respond to investigate second and higher alarms also have the responsibility of working with the media on reporting the fire. Thus, the media gets the most authoritative version of the cause, and the fire service has its most prevention-oriented officers on the scene to guide the media.

In rural areas and small towns in New Zealand where most people live, a fire is often front page news in the local press—and everyone in the community becomes aware of what happened, to whom, and why. The New Zealand Fire Service encourages calls for public information, so the follow-up action to such small-town stories can be a wave of prevention activity. For example, after a recent residential fire involving a pot-bellied stove, the local fire brigade and national fire headquarters were flooded with calls from concerned citizens asking for advice or help in determining the safety of these devices in their homes.

Australia relies on radio and TV to broadcast fire danger notices daily during the dry season, which lasts from November through April. The messages indicate the fire danger level and whether a “total ban” day has been declared; that is, a day on which all outdoor fires are prohibited, including barbecues. These “ban days” are a function of weather and ground fuel conditions. The daily reminders of fire danger level are thought to increase awareness of all types of fire safety, not just in the bush.

Brush and woodlands fires are well covered by the media because of the public's concern about their spread to inhabited areas and the desire to preserve their limited timber resources.

Reports of the enormous Ash Wednesday wildfires that spread across parts of two Australian states and killed 73 served a consciousness-raising purpose similar to the MGM and Hilton hotel fires in the United States.

In South Australia the Country Fire Services provide an area in the command center of fire brigade headquarters where the media may install private line telephones. The phones are locked until the media chooses to use them, the same approach as used by Tokyo.

CLUBS AND OTHER COMMUNITY MEETINGS

Women's and children's clubs whose sole purpose is to instruct members on fire awareness and fire prevention have been organized in every prefecture in Japan. There are now 2.7 million people — 1.7 million women, 700,000 schoolchildren, and 300,000 kindergarteners participating in 19,000 clubs. The average club size is 100-150 people.

The clubs are organized by the Japan Fire Protection Association (JFPA).

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17 Forty-seven prefectures comprise the nation of Japan.

The clubs train their members in prevention and in fighting incipient fires with fire extinguishers, small hoses, and buckets. They engage in a variety of community activities to spread prevention ideas in their local communities, supplementing the activities of the fire department.

The women's clubs use a variety of social activities as attractions. They have dance groups, choruses, and outings. Some meet weekly, some monthly. The spirit of cooperativeness and social cohesion that is promoted in Japanese society motivates them to join safety clubs and "clean-up" clubs. The women's clubs emphasize fire safety lessons most practical to housewives, such as prevention of fires from cooking, ironing, and other household activities. They also train women in using pot lids to extinguish cooking fires and in the use of extinguishers and home remedies for other fires. Housewives are told they are the safety head of the household and that they are responsible for its fire awareness and precautions.

The city of Nagasaki (450,000 pop.) has one of the most amazing fire records in the world, and much of the success is attributed to the intensive club activity there. In 1980 Nagasaki had 150 reported fires of all types, three per 10,000 population. About 50,000 women, in one out of every three households, belong to the women's clubs. One member summarized the reason for this participation as being that they cannot depend on fire departments to arrive quickly because of the many hills and narrow streets. “It’s our business to protect our property,” she said.

The women in the clubs go house to house giving safety lessons and encouraging women to join the clubs. It is hard to believe, but one “town” (neighborhood) in Nagasaki where women's clubs have been active has not had a reported fire in 10 years, according to the JFPA. People there go so far as to greet
each other with fire safety slogans such as "Have you turned off the gas?"

The women's clubs also conduct fire drills of citizen volunteers. This may take the form of carrying portable pumps or organizing a bucket brigade. Sometimes they use smoke bombs or fireworks to simulate fires and also draw attention to their exercise.

Clubs often meet together to trade lessons and offer each other encouragement. Fire departments lend them further encouragement and give commendations for outstanding prevention activities or for extinguishing a fire. The Director-General of the Fire Defense Agency presents national awards to the best clubs and club leaders annually.

The "boys" clubs in Japan have boys and girls aged 10-15. The clubs study fire prevention, inspect firefighting equipment in schools, engage in poster contests, meet during the summer to hear presentations of study reports by members, and participate in disaster protection parades in the autumn and fire brigade reviews at New Years.

Children's clubs for preschool and kindergarten focus on keeping children from playing with fire. The children are given "happi coats" that say on the front "watch against fires" and on the back "fire defense."

In Tokyo a "junior fire department" (club) is associated with each fire station. The children in the club attend meetings at which they are trained in prevention lessons by firefighters. The children are encouraged to pass on their prevention lessons to their parents and to function as watchdogs (junior fire marshals) in their home.

In Japan and Hong Kong as in most countries, prevention talks by fire personnel are arranged for clubs and other groups on request. The talks are given by paid fire departments, volunteers, or trained club members in Japan, and by the fire brigade in Hong Kong. The appeal in the talks is usually to prevention in the home, where most lives are lost. "Almost all fires are caused by carelessness, neglect, or ignorance," a top Hong Kong official said.

In Kyoto in 1983 there was a staggering total of 10,062 public fire prevention meetings held, apart from school classes. The number of people per meeting varied from five to 100. The attendance at these meetings was an incredible 461,000 out of 1.4 million population. Some people may have attended more than one meeting, but it is still an impressive outreach.

How did they get so many people to show up for fire safety meetings? It started by visits by fire prevention officers to each of the 5,800 "towns" or neighborhoods that comprise Kyoto. Each town has a civic organization or committee with an elected member responsible for fire prevention and possibly other safety issues. These committee members were each given a booklet to educate themselves on the basics of the fire problem and fire prevention. Then special meetings were held to train "caretakers" appointed by the committees. The caretakers served as block wardens and went house to house to inform people that there was a fire safety meeting in the town and that they should attend. The meetings were further advertised on posters.

To encourage prevention in general, Kyoto has special campaigns and, as previously mentioned, uses the slogan the "Fire-free city of Kyoto." It sensitizes its citizens to prevention in many ways, so they are more responsive to their "duty" to attend meetings when they are held. The results of the combined special effort for the meetings on top of the usual background of fire safety slogans and campaigns were spectacular in terms of high attendance, and the bottom line result is their very low rate of fires.

Osaka has had as much success as Kyoto in reaching women with fire safety programs, though it relies less on clubs than on getting women to attend fire safety classes conducted by instructors from the fire stations. The classes or meetings are held in ward halls (meeting places in each ward). They try to attract community women's groups and women's leaders to help draw others. They estimate that they reach two thirds of the adult female population in these meetings.

For children's meetings, Osaka has imaginatively revitalized an institution traditionally used by candy or ice cream vendors to draw a crowd — telling a folktale with a storyboard "theater." They have built a storyboard device which has changeable panels illustrating a fire safety lesson. It is excellent for younger children, quick to set up, and portable.

In Australia the fire service often works with women's clubs, employee groups, and community groups to give presentations on fire safety. They particularly encourage opportunities to train children. As in many countries, they believe "children are the answer" to the long-term reduction of the fire problem.

Melbourne has three public education vans that are used for presentations to clubs and other community groups. They contain display materials on fire extinguishers, projectors and films, and tabletop demonstration equipment. They also have stationary displays that are used at public events, shopping malls, and the like.

Sydney also uses a fire prevention van. At a recent annual Royal Agricultural Show at Easter time, a million people attended over a 10-day period and 80,000 fire prevention kits were distributed.

The South Australian Country Fire Services use a firefighter in a koala bear suit to give public education programs, especially messages dealing with woodland fires during the dry season. The koala bear image is similar to the Smokey the Bear image in the United States.

CHURCHES

Auckland, a region in New Zealand with a population of 900,000, has the world's largest Polynesian population. Many are illegal immigrants from islands of the South Pacific and are afraid of uniformed officials. They often do not call the fire brigade. They are not used to alcohol, which is not available on the small islands they come from, and this exacerbates the fire and alcohol scenarios in Auckland. They also are not used to modern appliances. For instance, it is not uncommon for them to build a wood fire in an electric oven. They are a proud people who do not like to ask questions, to avoid embarrassment. They usually live in the older, more rundown housing areas.

This group is thought to have a higher than average fire problem.
Conventional fire prevention methods, even using materials in their own language, have not worked.

In analyzing their cultural background, the fire service found that much of their society was centered around their religion. The fire service went to the religious leaders and enlisted their assistance in getting fire-safety information to the people through church-related meetings and by legitimizing the need to practice fire safety. They felt that this has worked to lower the fire and fire death rates.

**POSTERS AND DISPLAYS**

The quality of posters, displays, and handouts can make a large difference in whether they are read at all and whether the safety message is understood and remembered. There also has to be good judgment on what to include; i.e., which few problems should be addressed, and from what viewpoint.

In Japan and Hong Kong many outstanding posters raise fire awareness and remind people of fire safety. The posters are usually in full color with high-quality paper and printing. They are visually striking and usually are done with the aid of government or private public information graphics specialists.

Some examples of the ideas in the Japanese posters are shown on the following pages. Some posters use beautiful drawings of national treasures, with a message that attention is needed to preserve them. Another poster (not shown) makes use of a major sports figure—a sumo wrestler's giant hand print with a message that says “awareness is the biggest thing to stop fire!” (We might consider using a basketball or football player.)

The Tokyo Fire Department sponsors drawing competitions in which children are seated in a large circle around a piece of fire apparatus, often in an outdoor setting. The children draw their version of the fire vehicle. The fire department takes advantage of these get-togethers to pass on fire safety information to the children in addition to letting them have the fun of seeing and drawing the apparatus. Such drawing meets often are tied to the competitions to select the poster for fire prevention week. This practice generally is used for younger children.

In Osaka as in Tokyo, children draw posters, often featuring the fire engines that visit their schools as part of the autumn fire prevention campaign. In each school the best poster is selected for citywide competition. Thirty are awarded city-level prizes, and one is selected as the poster to be used in the annual spring campaign. Some examples of recent winners are shown below. Perhaps the most significant aspect of this poster contest is the scale: 15,000-16,000 children participate. Each child is given a little prize by the fire department for participating.

In Hong Kong posters are designed for emotional impact. All must be printed in two languages: Chinese and English. There can be one version for each language or both languages on one. As with other prevention materials, they are a joint product of the fire service and the Government Information Service. The strikingly sharp artistic posters are more likely to be hung. Their message has to be clear as well as attractive. This one is from Kyoto.

The prize-winning prevention poster drawn by an Osaka school child is used to announce the spring fire prevention campaign (Feb. 28-March 13).
quality of the pictures and excellent colors and paperstock used for the posters adds to their impact. Some of the most beautiful posters are directed to preventing woodlands fires. The appeal is to “love your countryside” and preserve the small amount of open space available for recreation and escape from the crowded city life.

Other targets of the Hong Kong posters are locked means of escape, storage of hazardous materials, and careful use of consumer products.

In addition to fire safety posters and displays that are part of campaigns, there are other reminders of fire safety in public buildings in Japan. They often suggest that fire safety is part of the culture and an obligation of a good citizen. For example, in the Sanjuusangendo Temple in Kyoto, a major Japanese national treasure, one of the explanatory signs inside says that the current temple has been intact for 800 years after being rebuilt following a 13th-century fire. “We, the present caretakers of the temple, are trying to keep it in good condition and fireproof...” The text goes on to appeal to the visitor to be careful in the temple and to donate funds to maintain it and its fire protection system. In many landmark places throughout Japan, there are similar reminders of when a temple, building, or castle burned in the past, and the explicit or implicit message to not let it happen again.

In a museum of the city of Tokyo showing what life was like in the early 20th century, the fire history of Tokyo was prominent. The museum was meant to present a view of Tokyo prior to its devastation by fire from bombing in World War II. One of the special collections in the museum is a display dealing with the fire following a 1923 earthquake. Another display features a picture illustrating a story based on a fire disaster.

Posters from New Zealand and Australia generally are similar in style and themes to those in the United States and Great Britain, and are not elaborated here. One notable exception, however, is a poster showing a hazard that accounts for a significant number of fires and deaths in the United States: portable heaters placed too close to furniture (or furniture moved too close to a heater). The emphasis in the poster is what is significant. It says that it is not the furniture that causes the fire, “you do.” It points to the responsibility of the individual to be careful. That theme—responsibility—is found throughout fire prevention messages in the Far East, as well as in Central European countries such as Switzerland and West Germany. We urge people to be careful, but rarely point to their responsibility to society to be careful.

STREET BROADCASTS

Fire departments in Japan have fleets of “public information” vehicles equipped with loudspeaker systems. Osaka alone has 47 of them assigned to fire stations. Kyoto has 30 such vehicles.

The public information vehicles are sent to every working fire. A public
information or education officer may stand on the roof of the vehicle or nearby to inform the crowds that gather of the cause of the fire and ways to prevent it. This takes advantage of the interest and concern of the public at the scene, one of the best times to make an impact. It also adds to the embarrassment of the party who had the fire in a way that makes others want to avoid that kind of notoriety.

The public information vehicles are used in another mode: to ride slowly through neighborhoods warning people to be careful during times when fire hazards are at a peak, such as the dry, windy season, or if a particular hazard arises in a neighborhood. They also are used to ride through neighborhoods that have had arsons, alerting the citizens that an arsonist has been operating there. These cars also are used to transport officers making inspections.

Tokyo, in addition to the public information cars, uses its fire engines to ride slowly through neighborhoods clanging their bells to raise fire safety consciousness in peak fire periods.

In the villages surrounding the core city of Hong Kong, fire engines occasionally park at central points, broadcast fire prevention information over loudspeakers, and distribute posters.

**CAMPAIGNS AND EVENTS**

Fire prevention campaigns in Japan have been fitted into the rhythms of life year-round, which not only increases opportunities for messages, but also allows them to be seasonally appropriate. Two campaigns are supported throughout the nation, and a number of other campaigns and special days are conducted during the year by individual communities. The idea for the first national fire prevention week in Japan (in 1926) came from the United States. They attribute it to commemorating the great Chicago fire of 1871, which was the motivation for fire prevention week in the United States.

On the national level, there are two major annual fire prevention campaigns. The spring campaign lasts for two weeks (February 28-March 13), one week on building fires and one usually on woodlands fires. The fall campaign lasts one week (November 26-December 2), on winter fire problems, such as heating. In addition, the following days or weeks are observed throughout the country:
- "Important Cultural Property Day" — dedicated to safeguarding national treasures, is observed on January 26, the anniversary of the burning in 1949 of the oldest wooden building in the world, the Horyuji.
- "Ambulance Day" and "First Aid Week" — for honoring the ambulance service and instructing the public in its proper use and in first aid, is observed September 9 and the week that follows.

Each national campaign has a theme that is used throughout the country. Examples of past themes are:
- Check fires before going to bed (this includes extinguishing cigarettes and checking fires in hot water heaters, space heaters, and stoves).
- Improve fire protection management in hotels and inns.

*Fire is prominently mentioned or portrayed in Japanese culture, as in this display in a museum on life in Tokyo.*

*Osaka Fire Department public information cars are sent to each fire. Loudspeakers on the roof are used to address the crowds that gather.*
• Prevent fires caused by gas leakage.
• Promote fire protection in the home.
• Every day is fire protection day in my home.
• Be watchful against fires with your mind, with your eyes.
• It is you who starts a fire; it is you who puts out a fire.

The Fire Defense Agency issues a great deal of publicity during the campaign weeks through national magazines, newspapers, and TV. At the municipal level, campaigns may include messages in the local media, vans or public information cars broadcasting messages through neighborhoods, and special shows and meetings put on by prevention clubs. In some cities, drawing contests are held among school children to develop a poster for the theme. The poster of the contest’s winner is used for a year in fire prevention publicity. (Examples of winning posters were shown earlier, in the section on Posters and Displays.)

Some cities in Japan do not feel that the three weeks of national campaigns are enough. They add days or weeks for other campaigns. Kyoto has the additional following campaigns:

• Fire Prevention for National Treasures Week — a week-long special effort by owners of treasures such as shrines and temples, plus the general public and fire service, to safeguard national treasures, is observed January 23-29. This extended week includes the national one-day “Important Cultural Property Day.”

• Prevention of Mountain Fires Week — Kyoto is surrounded by wooded mountains. Preventing woodlands fires is the focus of a week in the period April 15-30.

• End-of-the-Year Safety Week — to avoid starting the New Year with a tragedy, observed the last week in December.

• “Days without Fire” — observed the 5th and 20th of every month. They are similar in concept to our “zero defects” programs in manufacturing plants.

Tokyo designates the following in addition to the national campaigns:

• Citizens’ Fire Protection Day — first of each month.
• Disaster Preparedness Day and Week — for earthquake and other disaster preparation, September 1 and the week that follows.

Tokyo uses one of the national fire prevention weeks to emphasize prevention of transportation fires instead of woodlands fires. It is one of the few cities to have a vehicle fire prevention effort. Such fires account for 20-25 percent of all fires nationally in the United States and many other nations. During the campaigns in Tokyo, each fire station organizes events depending on what they protect in their district. Their plans are reviewed by fire headquarters.

Osaka designates the seventh of each month for special public fire education activities in addition to the national campaigns. Further, there is a year-long fire prevention campaign in each of the 26 wards of the city. Every ward has its own fire safety slogan for a year. The effort in each ward usually is directed at a particular neighborhood or “village” with a high fire rate or special fire problem.

In Hong Kong there is an intensive fire prevention campaign all year round, with no special periods designated.

In Australia the Australian Fire Protection Association and various states’ fire services conduct “Fire Prevention Week” to begin their summer season. They do an all-out blitz of radio, television, posters, school visits, and so forth. It is one massive effort once a year. They use professional media consultants to develop excellent materials for this campaign.

In Sydney a contest is held prior to Fire Prevention Week among boy scouts and girl scouts on fire safety questions. Local winners go to regional contests and then to the finals. Winners receive their awards as part of the kick-off for Fire Prevention Week. The winning scout troops and the winning scouts receive cash awards, and the winning troop gets to hold the national trophy for the year.

LEGAL THREATS

In Japan and Hong Kong people who start fires through carelessness or negligence may be fined or imprisoned, especially if they cause a death. The threat of such punishment is widely known, though it is not frequently invoked. Penalties can be very stiff. For example in Japan you may be sentenced to capital punishment or imprisonment of five years to life for causing a severe fire by “grave negligence.”

The owner of a commercial building or his agents are liable for imprisonment up to three months or a fine of 100,000 Yen (about $300), according to Japanese national law, if they fail to appoint a fire protection manager for the building (described further below), or if they put someone in charge who has not been properly certified. If the owner disregards an order by a fire inspector to correct a hazard, or if he stores too much hazardous material on his property, he can be sentenced to a year or a fine of 300,000 Yen (about $1,000). For interfering with the movement of a fire vehicle or obstructing a member of the fire department engaged in suppression, the penalty is two years’ imprisonment or a fine of 500,000 Yen (about $1,700). For damaging a building, fire alarm or a hydrant, it is five years imprisonment.

The proprietor of a business in Japan is not exempt from criminal penalty under the claim that the offender was not following his directions if someone in his store or office, even a customer, causes a fire. In other words, if it happens in your place, you may go to jail. This is the practice in some European countries as well. The owner and some employees of a Japanese hotel where a fire killed 33 people and injured another 34 in 1982, have been indicted and are being tried.

During dry, high hazard days in Australia when a ban against outdoor fires is in effect, $1,000 fines are given for first violations. Fines or fees also may be charged to the person responsible when a building fire protection system causes a false alarm to the fire department, and it is determined that the alarm reasonably could have been avoided.
PRIVATE FIRE PROTECTION MANAGERS

Every public assembly building, office building, highrise, and multifamily residence above a certain size or occupancy level in Japan must have a person designated as the “fire protection manager” by the management of the building. The criterion used is whether the building is regularly occupied by more than 30 people.

Tokyo has 79,000 building fire protection managers. These individuals are trained by the local fire service and act as private fire marshals in their buildings. The fire protection manager is responsible for overseeing the absence of hazards and the maintenance of escape passages, knowing how to report fires and how to use firefighting equipment to extinguish incipient fires, and for conducting fire drills regularly.

For buildings that have active fire protection systems, such as sprinklers or smoke control systems, a person must be designated as the “fire protection equipment engineer.” These people are trained and licensed by a special unit of the local fire department and are responsible for seeing that the installed equipment is in working order. They are held personally responsible if the system fails in a fire because of lack of maintenance.

A “hazardous materials supervisor” must be appointed for each occupancy where there is more than a specified minimum of hazardous materials. There are two classes of supervisor, A and B, one more expert for the more complicated materials. Types of materials considered hazardous and the quantities for which a supervisor is required are spelled out by code. Again, these individuals are trained by the local fire department.

To assist in the training of building fire protection managers, the Japanese Fire Defense Agency has developed an excellent film demonstrating hazards and fire protection features in public buildings and methods of warning and escape. It shows, for example, the speed of smoke travel relative to walking speed (it can be five to six times faster), the importance of having automatic fire doors and shutters in working condition to block the flow of the smoke, and the need to close doors to contain a fire. For hotels, the film shows how to alert people efficiently and without missing a room (by assigning one person to check rooms on each side of a hallway), and the need to assign staff to guide guests out. It recommends giving elderly and handicapped persons rooms near exits or on lower floors.

Similar to Japan, any industrial establishment in South Australia with 20 or more employees or any commercial enterprise with 40 or more employees must have a designated “Fire Safety Director” or “Public Safety Coordinator.” That person must attend a two-day course taught by the fire prevention bureau under auspices of the State Department of Labor and Industries, and must be recertified every two years at a personal cost of $50.

In Australia a Chief Fire Warden and floor wardens are appointed for each multistory apartment or commercial building. Booklets are provided to them and also others interested in multistory building safety, which describe the basics of escape procedures, reporting fires, and requirements for fire protection systems. Melbourne also showed us a series of fire prevention booklets on the use of fire extinguishers, with special editions tailored to highrise buildings, hospitals, schools, and one for the police.

In Hong Kong “caretakers” usually are employed by owners to take care of each highrise apartment building. There usually are two or three per building. One is on duty at all times. They are responsible for keeping the building safe from crime as well as fire and are trained by the fire service much as the fire protection managers are in Japan. One of their important roles is to fight a fire with the building’s hose reels or extinguishers until the fire service arrives.

FIRE DEPARTMENT PUBLIC INFORMATION SERVICE

The Tokyo Fire Department maintains an information desk at headquarters where people interested in fire safety can stop to get their fire safety questions answered or obtain prevention literature. They also maintain a centralized telephone service people can call for fire safety information. People can inquire about specific consumer products and how to use them safely. They can even get information on the location of hospitals to go to in emergencies, and which hospitals have which types of specialized doctors and facilities. Kyoto, too, maintains a similar telephone consulting service.

In New Zealand the fire service has built an effective public relations program around the open-ended offer “if you have a problem, call the fire brigade.” This applies for questions dealing with general fire safety and not just emergency problems. The fire service makes an overt effort to provide the highest possible level of service, and the people have responded with unquestioned support of the fire service.

CITIZEN TRAINING IN FIREFIGHTING AND ESCAPE

Japanese and Hong Kong citizens are encouraged to extinguish small fires before they grow. To be effective and to prevent injuries, fire departments provide practical training to the citizens in the use of fire extinguishers, water buckets, hoses connected to standpipes in highrise buildings, blankets for smothering fires, lids on cooking pans, and other extinguishment measures.

Approximately two thirds of Japanese households own at least one fire extinguisher. Most have received some training in how to use them. The national survey previously cited found that about one third of the people who own them have used them. Some cities such as Yokohama subsidize the purchase of extinguishers for households. Many cities offer training sessions three times a year on their use.

In Japan public buildings such as hotels have fire extinguishers freestanding on the floor along the corridors. Buildings with large public rooms, such as museums, have fire extinguishers on the floor in each public room. These are intended for use by guards, caretakers, or the general public. Apparently there is no vandalism problem with them. Likewise, fire extinguishers intended for use by the public are installed on streets and roads every few blocks.
All households in Japan are supposed to maintain at least one bucket of water for extinguishing fires. This practice is followed in rural areas as well as in cities. It is considered an especially important precaution for incipient fires that may occur following earthquakes. Special buckets have been designed with a triangular rather than round base to increase stability and preserve the water when the ground shakes. The new-style buckets also have baffles so that the water does not fly out in one swoosh. Buckets of water also are kept in apartment building hallways.

One function of women's clubs is to check that households have the required fire buckets and that they are filled. Some fire officials in Japan believe that the fire bucket's greatest significance is as a symbolic reminder of fire safety.

A private fire research organization in Japan recommends that you hang plastic water bags in each room if you do not have a bucket, or to supplement buckets. There is a way to tie knots in these bags and reshape them so that squeezing the sides produces a jet of water. The water bags and buckets also serve as emergency drinking water supplies.

In Australia, too, citizens are encouraged to obtain fire extinguishers and learn how to use them. The Melbourne Metropolitan Fire Brigade emphasizes fire extinguishers in any prevention education or training programs it conducts for civilians. The South Australian Metropolitan Fire Service has 24 technicians that service extinguishers and other fire equipment for a fee, in competition with private industry. They service about 150,000 pieces of equipment a year.

The Japanese also have pioneered and put into use a number of methods to help citizens help themselves escape from fires in public buildings and homes. They are incorporated into public education and in instructions in buildings. Booklets on these and other even more innovative methods are prepared by a private "Research Institute of Escape Methods" in Japan, which has helped develop some of the ideas.

Among the ideas that are noteworthy:

- **Flashlights** — Hotel rooms have flashlights attached to brackets in a way that simply removing the flashlight from the bracket turns it on and keeps it on. Having a light can be critical in escaping if lighting fails, especially in an unfamiliar building.

- **Plastic Escape Hood** — A fire-resistant clear plastic bag about the size of a pillowcase has been developed to provide an inexpensive emergency three-minute air supply to aid escape. The bag is placed over the head and fastened at the neck. Its special plastic material will not melt in the temperatures that are tolerable to the body. It can permit someone to run through a smoke-filled hallway to a safe staircase or to escape out of a building from lower floors. The bag folds down to the size of a comb.

- **Low Exit Signs** — There is great emphasis on the need to stay low in a smoky corridor and even on how to crawl down a stairway with your nose pressed into the corners for air. To assist, exit lights are placed about 18 inches above the floor or built into the floor in hotel and store hallways or escape paths rather than in the conventional place above the level of doorways where smoke piles up first. One liability is that the low lights may be obscured by people or objects blocking their view in an emergency.

- **Illustrated Escape Booklets** — Emergency instruction booklets in hotels illustrate ways to escape and what to do in an emergency, in pictures as well as words. This helps people overcome language barriers and allows them to quickly grasp the safety information. The illustrations make it more likely that the booklet will be read.

Some additional homemade escape aids they suggest are a sling made from a bedsheet to lower a child from a balcony, an escape shield made from two wet sheets draped over an open umbrella, or just a wet sheet.

**RURAL FUEL REDUCTION PROGRAM**

In rural areas of Australia where bush fires pose a major hazard to homes, farms, and people as well as woodlands, the Country Fire Services' major fire prevention program is fuel reduction. They encourage landowners to regularly slash, mow, or burn: appropriate areas of brush or grass to reduce fire dangers. They encourage mowed lawns around homes, roadside fire breaks, fuel reduction under trees, and wide driveways to assist access by fire apparatus.

The message is carried to landowners by volunteer firefighters. It is considered an important part of their work. Farmers who are prominent members of rural fire brigades are used to ask fellow farmers to carry out prevention work for the safety of the community. Regional Advisory Committees in rural areas meet to plan a coordinated system of fire breaks. Property owners are given literature on what to do and are individually informed if their land constitutes a danger to neighboring properties. If necessary landowners can be ordered to act, but the fire service first tries education and persuasion.

**FIRE GUARDS**

In Japan the fire service often provides a "fire guard" service in extremely dry and windy weather when many fires are anticipated, or in times of typhoons and heavy rains when other emergencies may occur. Firefighters patrol or keep guard in the high hazard areas. They also may stand guard where large numbers of people gather for special events, a common function in U.S. fire departments, too.

In Hong Kong volunteer groups called "Fire Watch Teams" are formed in squatter areas. They assist by heightening awareness of fire safety and advising local residents on how to reduce hazards and prevent fires. They also serve as a deterrent to arson and other crimes. The teams are equipped with some basic firefighting equipment such as extinguishers and can extinguish incipient fires.
CODES AND CONSTRUCTION PRACTICES

This section discusses the influence of codes and building construction practices on fire safety. It starts with the salient or unusual features of codes in the countries visited, and continues with plans reviews, inspections, and enforcement practices. Much of the safety in modern buildings depends on how well codes are realized and enforced.

Customary building features, especially in residences, may have a profound effect on safety, even if not required by code. A particularly important aspect of built-in safety is the presence and condition of active fire protection systems and devices, such as sprinklers, detectors, and smoke control equipment. Although often specified in code, they are treated separately here because of their importance and because some of the more interesting ideas found were not mandated by code.

CODES

The fire and building codes in Japan, Hong Kong, New Zealand, and some areas of Australia give fire authorities considerable discretion as to what fire protection features are required. They generally have more latitude in relaxing requirements or requiring more stringent measures than in the United States. This is characteristic of code practices in some European countries, as well.

In Japan there is a National Fire Service Law that applies everywhere. It regulates certain occupancies and provides general guidelines for others. The national law calls for local governments to provide more detailed ordinances to regulate certain occupancies. The current law dates back to 1948. It has had 33 revisions and is now being rewritten.

The national law requires that wherever a permit or certification is required by a government agency for a certain type of occupancy, the certificate cannot be issued without the consent of the fire chief. To ensure that high occupancy buildings are maintained in a fire safe condition, owners must provide fire protection managers who are trained and certified by the fire department, as noted earlier.

For certain occupancies the law also requires the formation of fire safety plans for each building, execution of fire drills, and installation and maintenance of fire protection systems.

Because modern buildings often have thick, unopenable windows, the Tokyo Fire Department (in accordance with the Building Standard Law) places small red triangles on windows that are openable or are thin enough to break easily, so that their ladder companies can quickly identify the best points at which to set up and attempt entry. Sometimes red lights are used, such as where windows are inset on balconies.

The Hong Kong fire code governs fire protection systems in buildings. Structural aspects of buildings including means of escape are covered by the Building Code. Since three quarters of the population live in medium- or highrise buildings, the codes affect residential safety — and therefore the fire death rate — to a greater degree than in many other countries.

Perhaps the most dramatic codes in Hong Kong are those dealing with the "housing estates" for low-income people. In the past Hong Kong has had an enormous problem with squatters living in shacks. Large influxes of immigrants with little more than the clothes on their back and a very limited welfare system has led to large numbers of people living in extremely poor conditions. An enlightened government has made remarkable progress in improving this situation. About 2.5 million people — almost half of the total population — have been given subsidized inexpensive housing in concrete highrises called "housing estates." They have been designed by code to be highly fire resistant.

There must be at least four household members to qualify for a unit in the housing estates, and there may be as many as 10. The living units are rectangular, with 300-400 square feet. They are arranged symmetrically on either side of a central corridor. In each building there are up to 50 apartments per story, and 20-25 stories. That can mean 4,000-8,000 people per building. A development covering a few square blocks may have 10-20 buildings and a total of 40,000-160,000 people.

Hallways and interior walls are all bare concrete, as is the basic structure of the building. Staircases at the ends of the hallways also are made of concrete and are open to the outside to vent smoke and fumes naturally. The concept was adapted from the U.S. use of external fire escapes on tenements.

The apartment units have a single exit to the central corridor. At the far end of each rectangular unit, away from the door to the corridor, is a small, walled off kitchen area that has a screen leading to a small balcony or that vents directly to the outside, so smoke can escape. The kitchen door to the living area often is self-closing. The walls of the kitchen are usually brick or tile, the floor concrete, sometimes covered by terrazzo. A kitchen fire is unlikely to block escape.

There is a tiny bathroom that has a small outside window, which can vent water heater fumes. The rest of the unit is one main living area, typically containing a few hardwood chairs, beds, a table, a few other simple pieces of furniture, and a television — a low fire load.

The heavy wooden door to the apartment unit often is kept open, with a metal gate drawn across the doorway to bar entry. Smoke from a fire in a dwelling unit may be vented out the kitchen or bathroom windows, or to the hallway. Smoke in the hallway is vented out the ends. The smoke can get into other apartments that have their doors open — but they are vented, too. Almost everyone has only a short distance to go to escape from a unit or to get to fresh air. Fires are detected before they go very far because of the many people present.

Nothing is allowed to be stored or placed in the halls. People who do not abide by this and other rules of occupancy are promptly evicted. Since these buildings represent a major improvement in housing for the squatters and other people with very low incomes, they tend to cooperate fully with the code.

Fixed fire protection systems or portable equipment are provided in
each housing estate building for tackling fires at the earliest stages. In buildings over 12 stories or over 30 m in height, there are standpipes on every floor, with hose reels whose lines can reach every apartment. The hose lines are like half-inch round garden hose, sturdier than folded hose and much easier to use. As previously mentioned, the fire service counts on building caretakers or citizens to use the hose reels or extinguishers to extinguish small fires or at least contain them until the arrival of the fire brigade.

Manual alarms are required on every floor of the housing estates. Pulling the alarm automatically charges the hose lines. The newer estates are providing areas for the elderly on lower floors of the buildings, and these units are fully sprinklered.

In practice, there are rarely extensions of fire from one unit to another, and smoke damage is held at a minimum by the rapid dispersion of the smoke through the natural ventilation.

Hong Kong also has strong codes concerning the storage and use of hazardous materials (called “dangerous goods” there). Since virtually all buildings are multi-occupancy, hazardous materials often are stored in the midst of large numbers of people. This aspect of the codes is taken very seriously and is of great concern to the fire brigade.

Hong Kong also has experimented with requesting (but not yet requiring) building owners to provide one story of refuge for every 15 stories in very tall buildings. Several buildings already have refuge floors. In exchange for these floors, the building owners are allowed to add a corresponding number of stories to the height of their buildings so that the number of occupiable floors remains the same, though the cost of the building is somewhat increased.

The refuge floor provides shelter to people trapped high up in a building. The floor must be devoid of building equipment and must be well ventilated to the outside by being open above parapet level. The floor must be capable of being sealed off from other floors in the building and cannot have its vertical fire barrier integrity broken other than by a fire service elevator. The ventilated openings should be protected by an external sprinkler system. The floor should be suitably insulated from fires below. New buildings with refuge floors meeting these conditions have not yet had a serious fire, so the concept remains to be fully tested.

To further enhance the security of highrises, Hong Kong is considering the concept of “refuge staircases” that would serve as vertical escape tunnels. They would be protected stairwells that would connect refuge floors to each other and then to the street level. They would not be accessible from other floors. (This idea apparently came from the United States.)

Hong Kong requires that highrises over eight stories have at least one elevator that has a highly fire resistant shaft and automatic self-closing fire resistant doors for use by the fire department. This fire service elevator can be used as a cargo elevator on a regular basis.

Both Hong Kong and Australia have strict ordinances dealing with woodland fires. In Hong Kong, outdoor cooking fires can only be made in designated cooking grills that are placed in cleared areas. It is even a crime to “be in a group of people using an illegal fire, whether or not it was lit by a member of the group.” There are clear signs posted in park areas and along trails to warn about fire hazards and the ordinances to be followed.

In New Zealand all fire codes and ordinances now are national. Building codes follow a national guideline, but local governments have great latitude in interpreting them, including their fire safety aspects. In general, New Zealand has followed the codes of its “mother country,” Great Britain. But it also has used codes from other countries as models, and has taken the best of what has been proven by the test of time. They feel they have good construction standards but lag the latest codes by about 10 years.

To help all parties better understand the building codes, but particularly as an aid to their own personnel, New Zealand has produced an illustrated version of their national code, with brief notes to clarify or emphasize certain points. A sample from this
annotated version is shown below. The illustrations are clear, simple hand drawings and are an outstanding aid in clarifying what in many countries is bureaucratically written text presented in fine print.

New Zealand has developed a radically new draft model building code. It goes back to basic principles about fire safety and what has been learned from modern technology. It uses performance specifications rather than prescriptive requirements. The code contains "suggested" features for buildings, but anything that meets the standards for performance would be acceptable, rather than having to use only certain materials in a certain design. This leaves the door open for innovations with new materials or using computer models to improve building design. The entire volume is heavily illustrated with informal drawings like architectural renderings. The document was under review in 1984. It is an innovative, thought-provoking attempt at a one-time total code overhaul. However, the New Zealand Fire Service does not support this radical departure from the existing, prescriptive code because of their concern with enforcement. They believe it would require too much reliance on self-enforcement because of the difficulty in measuring how well buildings meet performance specifications.

Because New Zealand is in a very active earthquake zone, rigid construction standards were adopted in 1931 that carried with them some extra fire protection as well. As is the case in many countries, there is great pressure to dilute existing codes for economic reasons. To counter this possibility, the New Zealand Fire Service believes there is a need for a concerted public relations effort to defend the virtues of built-in protection.

One major area of contention in current codes is wood shingle roofs. Most homes in New Zealand have corrugated iron or metal tile roofs. Wood shingle roofs were totally prohibited until recently, when they became allowable under certain circumstances. The New Zealand Fire Service is vigorously

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it is serving as a force for standardization nationally. As in New Zealand, codes are under attack for requiring buildings to be overbuilt and unnecessarily expensive. The political pressures to reduce code requirements are high.

Government buildings including schools are exempt from state and local regulations, but the Commonwealth and State governments generally require their construction departments to comply with these regulations unless there is good reason not to do so.

In the state of Victoria there are no highrise regulations. Instead, anything over 25 meters must be brought to a referee for a variation from existing regulations, and then requirements are negotiated. Large area commercial processing and manufacturing buildings also have requirements negotiated. This approach has resulted in some unusual and original ideas, such as overhead evacuation tunnels.

In the state of Queensland, all highrise buildings over 42 meters are sprinklered. They want to lower that to 25 meters, the new standard set by the Australian Uniform Model Building Code.

A potentially important strategy taken by the Australian fire brigades (particularly those of New South Wales and Victoria) is to have its fire prevention staff work with the Australian Standards Association to raise the fire safety awareness of its members and thereby encourage them to build fire safety considerations into a wide variety of standards. They thus can leverage a modest effort into a far-ranging impact.

In Sydney residential buildings are constructed with solid walls to provide compartmentation of fires. They generally employ much higher fire resistance ratings than in the United States, which may be significant in explaining comparisons.

In South Australia wood shingle roofs are not prohibited, but the fire service discourages their use and they are not among the recommended building materials. The experience of the great Ash Wednesday fire, in which many homes burned, made it obvious why wood shingle roofs or siding were dangerous there, they said.

**Vehicle Fire Safety** — An aspect of codes that often gets relatively little attention from the fire service is vehicle maintenance ordinances. In New Zealand inspection of gas-fueled vehicles is required every six months to obtain a “Warrant of Fitness,” which is necessary for licensing and insurance. Vehicle fires in New Zealand occur at about a quarter of the rate per capita as in the United States and account for about 10 percent of their fires versus 16 percent in the United States. Vehicles are very expensive in New Zealand which provides incentive to maintain them, but this also is part of the reason for their high rate of vehicle arson. Without the arson counted, their rate of accidental vehicle fires is even more favorable compared to ours.

Australia, too, seemed to have more cars in “new”-looking condition, with few junkers. Cars assembled in Australia are fairly affordable. The affect of this on car fires is speculative, but it may be a reason for the proportionately few car fires there.

The **Hong Kong** fire brigade believes it has a significant car fire problem. The territory is small in land area, taxis are plentiful and cheap, and you therefore do not get in too much difficulty if your car breaks down. Many cars are driven with maintenance deferred. Nevertheless, their vehicle fire rate per capita is far less than in the United States. Six to nine percent of the fires in Hong Kong are in vehicles, compared to 16 percent in the United States. But if you consider fires per 1,000 miles driven, they probably have a higher rate than we do.

**CODE ENFORCEMENT**

Codes are not effective unless they are enforced. The fire service abroad often has more training in enforcement, more resources, and greater support for strict enforcement than we do. The courts in Japan and Hong Kong seem to be highly sympathetic to the fire departments. Department personnel feel they rarely will lose a case.

The greatest emphasis in the code enforcement process in the Far East, as in Europe, is in the plans review stage.

It goes with the emphasis on prevention. If the building is situated and designed well, much of the safety will be built in.

**Plans Review** — In Hong Kong the plans review section of 14 officers is one of the specialized groups in the fire brigade. Some of the brightest, best motivated, most mature officers with successful field experience are selected as candidates. They must have good aptitude and interest in this area and take specialized training.

Each new building plan in Hong Kong is assigned to one of these officers, regardless of the size of the building. The plan must be reviewed within 30 days or it passes by default. (The same time limit is used in Queensland, Australia.) The reviewing officer literally signs off on each page of the building plan personally. The officers take pride in buildings that subsequently enjoy a safe record. They feel personally associated with “their” buildings and the people who use them. If anything goes wrong because of building design or fire protection features, the reviewing officer is held accountable.

The heart of the plans review process in Hong Kong is the dialogue between engineers, architects, and the reviewing officer. The officers are under intellectual pressure because they have to justify their decisions technically. The arguments on both sides often take into account worldwide practices, since many of the companies involved are international. “This is not required in Texas or Britain,” the builders might say. Yet despite the city’s interest in catering to commercial interests, the fire department has succeeded in getting building owners to comply with the code, and then some.

Fire protection features of buildings in Hong Kong are inspected when the buildings are complete to ensure that they are built to the approved plans and that all fire protection systems are working. The Director of Fire Services has discretion over what constitutes adequate testing of them. Special attention is given to ensuring that fire stopping from floor to floor is intact. If satisfactory, the building receives an occupancy permit from the Building Authority. Once built, inspections are
The Insurance Council is responsible for plan approval, contractor approval, installation overview, initial testing, and annual inspections. The level of enforcement has decreased in recent years due to a lack of resources, but is being revived with the aid of a computer-assisted inspection monitoring program and random audits of installations.

The New Zealand insurance industry has an effective method of encouraging proper design, construction, and maintenance of fire protection systems to code: If they are not installed properly or not regularly tested and serviced, the insurance discounts for them are discontinued until the problem is remedied.

Inspections and Compliance —
The vast majority of buildings in Hong Kong are highrises, and the fire brigade cannot inspect them all each year. They survey the highest hazards and a random sample of the others and rely heavily on complaints.

There are many old multi-story industrial buildings that have different factories on each floor and that predate much of the modern codes. Some floors are subdivided into cubicles, each with a different trade. Hazardous materials and poor housekeeping are common. These high hazard buildings receive special attention from the inspectors. Of particular concern are the improper or excessive storage of hazardous materials and obstruction of means of escape. Hong Kong businesses are very concerned about being shut down. The fire inspectors make random, surprise visits. Many factories cut corners in safety, especially with overcrowding, and the inspectors can almost always find infractions. To keep major hazards under control establishments are threatened with closure on the basis of their other legal infractions, such as overcrowding, if the fire service’s recommendations are not followed immediately, regardless of whether or not they are covered by code.

Many people notice hazards that are a public menace or directly threaten their own property. Unlike Japan, neighbors tend not to form cohesive groups and usually are willing to report the person down the hall. The fire service encourages people to complain and tells them to look for problems such as exit obstructions, damage to fire protection equipment in common areas, or storage of hazardous materials in apartment buildings. All complaints are followed up. Inspections in response to complaints amounted to about 68 percent of the 140,000 Fire Protection Bureau inspections in 1982.

The Hong Kong code gives broad power to the Director of Fire Services in determining what is a hazard. After spelling out specific problems, the code empowers the inspector to raise “...any other matter or circumstance” that he finds hazardous. The fire officers (inspectors) have the right to enter all nondomestic premises within reasonable hours for inspection for fire hazards or infringement of hazardous materials regulations. This makes for a situation in which the inspectors get a great deal of respect and their findings are complied with. The courts usually back their judgments.

Inspectors from the Fire Protection Bureau do most of the inspections for special purposes such as a change in occupancy use, an expansion of a facility, or response to a complaint. The line firefighters do spot checks, some of which are random and some ordered to be done. The multistory factories sometimes are checked by the local fire brigade crews for their own safety or to update or review prefire plans.

NCOs (sergeants) from the Fire Protection Bureau who are “program verifiers” do the follow-up inspections to check for compliance with ordered corrections. Notices issued by line firefighters or inspectors from the Bureau must be responded to or the building owner may be summoned to court. There are heavy fines for failure to comply: Initial fines are up to U.S. $4,000, plus another $400 a day until compliance is achieved. They were not always this high. In 1982, over 2,000 prosecutions were brought for failure to
comply, but fines averaged under $100, which was considered much too low, and penalties were raised tenfold. In addition to fines, improperly stored hazardous goods or excessive amounts of hazardous goods may be seized.

When inspectors spot fire hazards they may slap a sticker saying "This is a fire hazard. Remove it now!" onto the hazard. The sticker not only marks the specific hazard to be removed, so that there is no confusion, but also serves as an embarrassingly visible indication that a problem exists, for workers and customers to see.

In New Zealand there is a schedule for inspections that spells out how often each occupancy class should be inspected. For most it is annually; for some, such as schools, semiannually. The schedule also specifies the regulatory authority and which agency is responsible for conducting the inspection. This is another example of how they are clarifying the information needed for administering code enforcement.

Sprinkler systems in New Zealand must be tested weekly or monthly depending on the age (modernity) of the fire brigade's signal receiving equipment to which the system is connected. The tests are conducted by contractors approved by the Insurance Council.

In Australia local building authorities in most states are responsible for enforcing the fire protection aspects of building codes and issuing certificates of occupancy. The "building surveyors" inspect new buildings for compliance with the report generated by the fire brigade in the original plans review. Buildings are reinspected every three years by the surveyors. For existing buildings, alterations or extensions are also usually subject to certification, along with portions of the old building that connect with remodeled sections. There is less building control in country (rural) areas than in urban areas.

In the state of Queensland "Fire Safety Officers," who are the prevention and code enforcement specialists, are empowered to enforce the Fire Safety Act as opposed to the other states where this task is performed by building surveyors. The enforcement officers are "certified" by the state. As elsewhere, all new certified buildings are reinspected once every three years. The fire service in Queensland inspects places that are licensed by other state agencies, such as liquor stores or nursing homes. The licensing agency holds the license until corrections are made, so enforcement is through the licensing agency rather than through the fire brigade.

The fire service in South Australia tries to inspect certain "sensitive" occupancies such as private schools and health care facilities at least once every three years. They do not inspect public schools at all, because these are Crown (state) properties, which are exempt from control of the fire department. Even though they do little of what we consider important in school inspection, they do not have a problem with these facilities.

Fire protection equipment in buildings must be inspected twice a year in Australia. Sprinkler systems are inspected as often as monthly. The fire brigade used to do this, but now private contractors are allowed to inspect the systems and certify compliance. The fire service provides this service for a fee, too, using civilian employees.

Modern fire inspection in Japan started with practices instituted by the American General Headquarters during the U.S. occupation after World War II. Routine inspections are conducted by line firefighters in the smaller fire stations or by the fire prevention bureaus of larger stations. In most communities all large multifamily dwellings, commercial buildings, and places of public assembly are inspected. In 1982 the fire service inspected 1,100,000 buildings. 21

In Kyoto all businesses and homes are inspected, regardless of size. Building furnishings and fire protection features are checked, along with the building structure and the use to which it is put. Prefire planning often is done simultaneously with the inspection. Inspections are made about twice a year. The rate varies with the occupancy type.

21 There are no nationwide statistics on U.S. code enforcement with which to compare this.

When a problem is found on an inspection in Japan, a first warning is issued with recommendations on how to improve the condition. This usually suffices and compliance is achieved. If the recommendations are neglected, an order is issued in the name of the fire chief to make the changes or to prohibit the use of the building. In 1982, only 330 orders had to be issued nationally. If the problem is still not fixed, then legal punishment may be brought, which can range from fines to prison sentences. Some fire departments use a point system to decide which action—recommendation, order, or indictment—they should select if a building has many hazards. It is possible, for example, to issue an official order to make changes immediately after an inspection if there are many flagrant hazards, rather than first starting with unofficial recommendations.

In the last few years, Japan has started to publicly indicate which hotels are considered safe. Hotels that comply with 24 fire safety requirements are given a special plaque called a "safety mark" to hang in their lobbies. It has the emblem of the fire department on it and is highly visible. The signs are intended to affect the business of the hotels, and they work. Many tour group and convention arrangers, all school trip organizers, and all government travel agents prefer hotels with the safety mark. The local fire brigade provides the names of noncomplying hotels to the press. Since the occurrence of several high life loss fires in hotels in Japan and the United States in recent years, the mass media have helped inform the public on the meaning of the safety marks. If a hotel cannot afford fire protection improvements that are needed to meet code, the federal government may give them a low-interest loan through the Japan Development Bank.

By mid-1982, 12,500 hotels had been rated and 74 percent received the mark. Several hotels that did not receive the mark have gone bankrupt. The display of safety marks has proven so popular that the Japanese are extending the concept to other public assembly buildings, such as theaters, nightclubs, and department stores.
OTHER CONSTRUCTION PRACTICES

Some common construction practices not regulated by code help fire protection and some hinder it. Also, building owners sometimes go well beyond code to install fire safety features, often at the suggestion of the fire department.

In Japan the biggest contribution to the fire problem from construction practices is probably the continued demand for traditional-style paper and wood houses, and the closeness of the houses. Even in Tokyo, most people live in such one- to two-family dwellings. The traditional Japanese house does offer some advantages. They are well ventilated to the outside, which allows smoke to escape. Most people live at ground level or one story up; and there are many sliding doors and flimsy wall structures, which all make it easier to escape. The close proximity of houses allows neighbors to detect fires in early stages if the occupants do not. The smaller size of the houses (they are about one third the size of U.S. houses) makes the distance to escape smaller, too, but also means that there is proportionately more furniture in a small space, with more potential for spread from piece to piece. But despite the advantages, flammability of the homes leads to widespread damage when fire occurs.

At the other extreme of construction, some new highrise buildings in Japan have advanced smoke control systems and refuge areas in addition to the required sprinklers and detectors. Some highrises are being built with interfloor connections restricted to groups of no more than five floors, to prevent spread of fire throughout a highrise via floor-to-floor connections of utilities, piping, and so forth.

In New Zealand homes typically are made with timber frame and wood siding, and with metal roofs, as discussed earlier. New Zealand is known as the "country of wooden houses," though some homes have brick veneer exteriors. Most people own their own homes since they are quite affordable, with wood plentiful and inexpensive. Unlike in Japan, the houses are well-separated, even within cities.

An important fire safety feature of homes in New Zealand is that most are single story and have openable windows. Hence it is relatively easy to escape in the event of a fire.

Interior walls in New Zealand typically are of half-hour flame resistance, and floor plans are similar to houses in the United States. The most notable difference is the relatively infrequent use of central heating systems, in favor of portable or fixed room heaters, because of the mild climate most of the year. This use of portable heaters does not cause the same degree of fire problem as it does in the U.S. Southeast, where it is the leading cause of fire deaths.

Most public assembly buildings were constructed within the last 50 years. There are no concentrations of old buildings in the cities. Thus, most public buildings were built to modern fire protection standards—a situation not unlike the U.S. Southwest. There are no tenement ghettos. Few people live in highrises.

In Hong Kong hundreds of thousands of people still live in shacks, many as squatters. There are even squatters shacks on the roofs of some downtown highrise buildings, since the fire ordinances were written in a way that defines "premises" as the insides of buildings and does not prohibit use of the roof! Fires among squatters often leave several hundred people homeless because of the ease with which they spread. Because it is easy to get out of their makeshift shacks, the squatters fires do not often cause many deaths and even among the squatters there is a sense of family and respect by children for their parents, which tends to hold down the fire rate.

Space is so cramped in Hong Kong that people in private buildings often extend their tenement units into the airspace outside. They do this using cubicles made of grillwork or iron bars. The appearance of many buildings is one of having metal cages mounted outside. These can cause serious difficulties for rescue work.

Interior doors are often heavily locked, sometimes with metal gates. The police stress the importance of maximum security against burglary. The fire codes permit the use of interior and exterior security devices and cages so long as they do not affect the means of escape of buildings, but there are many windows blocked by such devices.

“Single person quarters” in Hong Kong are even more spartan than the housing estates previously described. They are small, single-room cells off a central corridor, with common bathrooms and common kitchens or no kitchens. But again, a group of the low-income people who often have disproportionately high fire rates in other countries are provided in Hong Kong with living units that tend to contain any damage.

Australia has a wide range of building conditions from state to state, and urban to rural areas, as does the United States. In South Australia residential construction is mainly low-density, single-family houses. Unlike in New Zealand, they are not built with timber. There are almost no wooden buildings, no old tenement buildings, and relatively few multifamily dwellings. Most construction is new; at least this century, and mostly post-World War II. There are few dilapidated buildings and no slums. Vietnamese immigrants in large numbers have moved into the older structures, but they have been "good neighbors" and there has not been any special fire problem resulting from their immigration.

There has been a recent trend toward remodeling homes in Australia as economy measures rather than moving up to more expensive homes. While detached rooms (separated from the house) are controlled through codes and the local building councils, there is little control when homeowners just move the walls out. The fire safety concern is for the extra heating devices, such as wood stoves and extended electrical wiring, that may be included in the addition.

In Melbourne, Victoria, a 200-year-old city, the construction is mostly brick or masonry because it has been cheaper than wood frame construction. There are no flammable roofs, even on single-family dwellings. The roofs either are tile, slate, steel, aluminum, or asbestos cement (though the last is no longer used). Commercial
buildings often have reinforced concrete roofs. Even the earliest buildings in the city were made of bluestone, the relatively nondestructible material used to house the convicts that helped settle Australia. Even in the outlying areas of Victoria, there are no wood shingle roofs, but the newer generation homes are now timber frame, much as in the United States.

In the state of Queensland, wood frame/wood clad houses dry out like tinder, particularly in the lower income areas where people cannot afford to paint regularly. Many of the older houses were built off the ground, which allowed circulation underneath for cooling in the days before air conditioning. (It makes for an interesting firefighting problem to have to fight fire around, on top of, and underneath a building.) If the fire department does not arrive within about three minutes, the whole building is usually lost.

Many Australian fire officials, including some who have visited the United States, believe that our heavy use of wood construction and flammable roofs are major contributors to the fire and fire death rate differentials between these two countries. Yet in some Australian states and in New Zealand wood houses are as common as in the United States. Flammability of structure makes a difference in the spread of fires (e.g., house-to-house or grass-to-house) and can affect whether a fire gets large enough to be reportable to the fire service. But many fire death victims are thought to succumb from smoke before the structure ignites. While it is clear that flammability of structure does make some difference in life safety, it is not clear how much difference it makes.

**DETECTORS, SPRINKLERS, AND OTHER ACTIVE FIRE PROTECTION FEATURES**

One of the most important aspects of modern fire protection is the use of automatic detection and suppression, including smoke detectors, sprinklers, and smoke venting. As elsewhere in this report, this section provides some of the less routine ideas rather than a comprehensive description of the situation in each nation.

**Home Smoke Detectors**

Countries in both the Far East and Europe have not been as enamored of smoke detectors in private residences as has been the case in the United States. More than two thirds of U.S. households now have smoke detectors, while only a few percent in other countries have them. Most fire departments abroad do not actively encourage detector use as ours do. They do not trust the reliability of detectors and prefer to spend public education time on how to prevent ignitions and extinguish small fires.

One reason mentioned in Hong Kong for the lack of enthusiasm about detectors was that the crowdedness and openness of highrise living conditions made early detection likely without detectors. There is almost always someone awake because of the diversity and long hours of jobs and the sharing of living space. Most fires are detected at an early stage and often are reported by neighbors. Once detected, the resulting shouting and commotion wake up and alert the tenants. The promotion of smoke detectors is considered less important than advertising safe practices.

In Japan, with its paper and wood housing, fires tend to spread rapidly and become noticeable quickly. They prefer to stress carefulness to prevent ignitions and then early extinguishment, rather than relying on "devices." The Tokyo fire department does not encourage the use of detectors. There is even some concern that detectors would make people less careful.

One possible application of detectors under discussion in Japan for the elderly or handicapped is to mount the signal unit from the smoke detector outside the house, so that neighbors can be alerted if there is a fire.

In New Zealand smoke detectors are encouraged for household use but are not mandated. The fire service feels that people are more likely to maintain equipment they are persuaded to buy and install voluntarily rather than equipment that they are forced to buy, but there is no data to confirm this theory. The fire service is very concerned about the problem of maintaining detectors. They also question the validity of the claim that smoke detectors can save many lives. The New Zealand Fire Service pamphlet on detectors is quite negative and is in a format that challenges "fallacies" about detectors and encourages people to rely on prevention by eliminating hazards.

A leading New Zealand fire official said that these pamphlets will be revised, in the light of new information made available on results in the United States. Also, the New Zealand Fire Service has initiated moves to produce national standards for residential detectors and sprinklers.

Smoke detectors are neither encouraged nor discouraged for home use in Australia, though they are used frequently for special applications. Smoke detectors are considered unreliable. Early on, there were charlatans in the business who sold unreliable units that were cast-offs from the United States for as little as U.S. $2.50. Some of these units were ones that had not met UL standards and were unloaded in other countries such as Australia. The Australian fire service now recommends that consumers demand a guarantee that detectors from the United States are validly listed by UL.

The Australian fire service thinks there should be a nationwide standard for detector performance and marketing controls that would provide penalties for the sale of unlisted units. In the meantime, they are ambivalent about recommending detectors in general.

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22One brochure from New Zealand cites the United States as having installed 50 million detectors in a two-year period with no effect on fire death rates. In fact, U.S. fire deaths dropped from 8,500 in 1975 to under 7000 in 1982, the period during which there was an increase in households with detectors from less than five percent to over 67 percent. The Fire in the United States series produced by the U.S. Fire Administration documents the trend. A great deal of data indicates that detectors have saved many thousands of lives in the United States and that our fire death rate would be higher without them. The evidence includes deaths per fire in homes with and without detectors, the low presence of detectors in fires with deaths, and hundreds of anecdotes of situations where deaths probably were prevented by detectors.
They are not widely used. The fire service also is concerned that detectors would not be maintained by the general populace.24

**Systems Connected Directly to Fire Departments** — In New Zealand heat and smoke detection systems required by code for commercial and institutional properties must be connected directly to the fire brigade. In most of Australia, too, the detectors and automatic sprinkler systems required by code must be connected directly to the fire brigade. With direct connection, the fire brigade can get to the scene sooner, while fires are in earlier stages of development than with telephone alarms. The New Zealand fire service argues that direct connection systems also reduce stress on firefighters because the fires they fight are smaller, though in the United States the concern is over the increased stress that comes from going to more false alarms as a result of these systems.

Over 2,000 buildings of various types now are connected to the Adelaide fire brigade. About 7000 are connected to the Melbourne fire brigade. Unfortunately, the fire brigades are experiencing a very high rate of false alarms — 25,000 in Melbourne alone, versus 8,000 in New Zealand. About 80 percent of the false alarms are from malfunctions in the signaling devices of fire protection systems. One of the reasons for the high false alarm rate stems from sprinkler system servicing or tests. When the pressure in the system has to be pumped back up by hand the serviceman sometimes does not take it up all the way. Then when the pressure in the main rises at night, it creates an equalization offset and causes an alarm.

The Australian fire alarm industry is looking to certification of those who install and maintain alarm systems as a way to improve quality control. All fire protection systems, including alarms, must be issued a certificate of compliance when installed, but the individual installers and the maintenance of the systems are not certified.

In Hong Kong automatic smoke detection systems are required for certain occupancies, and they must be connected by direct line to the fire brigade. For example, portions of some of the highrise housing estates are designated for use as homes for the elderly or as hostels, and they have detection systems connected directly to the brigade.

**Sprinklers** — In Japan national law requires sprinklers retrofitted in all public assembly buildings, such as hotels and theaters, as well as in new highrises and public buildings. Many shrines and temples have wooden roofs and wooden exteriors. Some now have sprinkler systems on the roof to preserve the exterior, such as the famous Kiyomizu Temple in Kyoto. Costs for installing fire protection systems in buildings considered to be national treasures are shared between the owners and the government.

To retrofit fire protection systems to other types of buildings whose owners cannot afford them, low-interest loans are available from the Japan Development Bank, as previously noted for hotels.

In Hong Kong all new commercial buildings must be fully sprinklered inside. Because the floors of modern highrises are concrete and outside walls are usually fire resistant, windows can be the main mode of extension of fires from floor to floor or building to building. To reduce this exposure risk, some highrises in Hong Kong have external sprinkler systems to provide an outside curtain of water over windows.

In Japan and Hong Kong, the contractors who install and maintain fire protection systems must be registered and certificated by the local or prefectural government.

**Australian and New Zealand** use of sprinkler systems was discussed previously.

The Australian insurance industry requires two independent water supplies to commercial building fire protection systems, when possible. Most sprinkler systems are wet pipe, because of the moderate climate. They are thus simpler and less expensive to construct.

Sprinkler systems almost always provide full coverage of a building.

**Control Panels** — For commercial building fire protection systems in Australia and New Zealand, control panels usually are easily accessible in cabinets that can be opened by the public. Public respect for the fire service and fire safety are reflected in a total lack of vandalism of these systems.

The fire service in New Zealand would like all major public buildings to have a single-point control panel for annunciation of detectors, sprinklers, voice communications, elevator controls, etc., so that the responding crew can go to one place and have information to size up the situation and control subsequent operations. The position of the panel is normally determined by agreement between the local chief, the owner, the Insurance Council Technical Department, and the contractor. Recently, panels have been placed right outside the front door in some cities. Architects and building designers have opposed this idea, but the fire service, supported by the Insurance Council, has won the fight for some buildings. There are now a number of examples of how the architects can tastefully incorporate these “command centers” into the facades of new buildings.

Testing requirements for control panels vary with the type of communications receiving equipment the local brigade has. In brigades with older systems, the panels are tested weekly. In brigades with newer systems they are tested monthly. The tests are conducted by companies approved by the Insurance Council.

New Zealand also requires the locations of interior firefighting equipment such as hose reels and fire extinguishers to have very conspicuous markings. They have overcome interior designers’ attempts to have them blend into the woodwork. The conspicuous fire safety features outside and inside buildings also may carry a subliminal fire safety awareness message with them.

**Automatic Venting** — The state of Queensland has special code provisions for venting of smoke. For buildings with air conditioning systems that serve more than one floor, there must...
be automatic venting control. Certain categories of highrise buildings must have openable windows.

**Architect and Engineer Education** — To further the use of state-of-the-art fire protection techniques in buildings, **Hong Kong** fire officers give a three-hour course to architects and engineers in conjunction with their Institute of Architects.23

**CHIMNEY SWEEPS**

Unlike in the colder countries in Europe, chimney sweeps do not play a significant role in Japan and **Hong Kong** because there are few fireplaces, woodburning stoves, and conventional chimneys. Heating there is primarily done with portable space heaters or fixed room heaters. The chimney sweeps are not needed.

In **New Zealand**, where there are many chimneys and an increasing number of woodburning stoves, the fire service recommends at least annual chimney cleaning. There are few chimney fires in the warmer north, but they do occur in the cooler south, because of the increased use of wood-burning stoves over the last 10 years. However, the use of chimney sweeps is not required in New Zealand (or Australia) as it is in Europe.

**INSURANCE AND ARSON**

This section discusses insurance practices and their influence on fire problems, especially arson. It also discusses arson-related programs.

Arson has become a major problem in Japan, where it is one of the leading causes of fires and fire deaths. Little of the arson is for profit. Much of it is in residences rather than in businesses, and is thought to be a demonstration of dissatisfaction with society or a way to get revenge.

The lack of arson for fraud in Japan is due to several reasons. One is that a much smaller percentage of homes and businesses have fire insurance than in the United States. Second, even if you do have insurance, you are unlikely to receive 100 percent of value from the insurance company if you have a fire. If half of a house burns, only half the insurance is paid, even if the owner has to knock it all down to rebuild. (Owners sometimes ask the fire department to let a building keep burning so they can get the full insurance.)

A third reason there is little arson for fraud is that Japanese workers tend to be employed in their place of business for life and are unlikely to want to destroy it. Last but not least, Japan is a disciplined, law-abiding society.

The large percentage (about 50 percent) of homes without insurance in Japan is a powerful added incentive to be careful. Many people would suffer significant financial loss if they had a fire. If a fire spreads from your home to your neighbor’s, they might well not be covered by insurance, which adds to the social pressures against those who start fires.

Because fire is a shame and embarrassment for a family, some elect not to report them to the insurance company, although they are required by law to report fires to the fire service.

Insurance companies in Japan are concerned about the possibility of fire disasters. If a particular company insures one house, they usually do not insure any of the neighboring houses. Home fire insurance has not been aggressively pushed in the past, though that seems to be changing, and more homes are being insured.

The insurance companies donate many pieces of fire apparatus and ambulances to the nation’s fire departments each year. In 1982, the Fire and Marine Insurance Association of Japan bought 65 fire engines and various other equipment for fire departments. They also published a variety of periodicals and manuals, made a film on industrial fire protection, distributed 620,000 posters, held safety presentations in 17 cities, offered TV spots on safety, and gave honorary degrees of “Disaster Protection Doctor” to housewives with outstanding voluntary contributions to fire protection in their communities. Still, local fire departments feel that the insurance industry does not play a major role in prevention of residential fires other than by not promoting household insurance.

For industry in Japan, the insurance companies do play a significant role. They have excellent information services and provide free consultation on better construction and fire protection systems. Insurance companies try to inspect the buildings they insure once a year.

Arson is the one aspect of the fire problem that greatly puzzles and disturbs the Japanese fire service, and unfortunately the problem is growing. They include in the prevention education of children the message that arsonists or juvenile firesetters are bad guys and their actions are reprehensible. But apart from that, the authors found no novel anti-arson ideas.

In **Hong Kong**, too, there is only limited use of home insurance, mainly because people do not want to spend money for it. Even commercial buildings do not all have insurance.

There is little arson for profit or for any other reason. There is a small amount of arson for welfare fraud. Squatters whose homes burn are placed in a temporary shelter and then get priority for low-income housing units as they open up. People with no job and no property — usually the more recent illegal immigrants — sometimes set fire to their shack to better their prospects for getting into subsidized housing. Not everyone living in squatters shacks wants to be rehoused, however. It may mean having to find another job, since they often walk to work to save carfare. Also, the “temporary housing” that fire victims are given consists of little more than a shelter comprised of a concrete slab, four upright posts, and a roof. The occupants can build walls and partitions with their own labor while awaiting more permanent housing.

A major disincentive for arson in Hong Kong is that your neighbors may physically attack you if they see it. Even the poor will be very upset at anyone who intentionally threatens what little they have. The result is an incredibly low arson rate — less than one percent of all fires.

The **Hong Kong** fire brigade has three fulltime photographers. Their
main purpose is investigation of suspicious fires. But with little arson, they routinely attend all large fires and document them for training purposes.

In New Zealand, the Insurance Council has 47 members representing all carriers and underwriters of insurance, with one exception: the government. The government insurance agency competes directly with the private sector. It has 21 percent of the business, but works closely with the Insurance Council.

The New Zealand insurance community is perhaps the least regulated in the world. There is no government insurance commissioner. That is the industry's good news. The bad news is that the insurance industry must pay three quarters of the national fire protection budget, and the Fire Service Commission (which reports to the Ministry of the Interior) sets the budget! This has led the Insurance Council to be the principal motivating force behind the buildup of a very good system of built-in fire protection in large buildings. If fire losses increase, the insurance industry pays double in a sense — the insured losses plus three quarters of the bill for the buildup in firefighting forces that would ensue.

There are no premium discounts for residential fire protection such as smoke detectors or home sprinkler systems because the market has been too competitive and there is not enough margin with which to work.

The Insurance Council recently started sponsoring arson investigation seminars for public and private personnel, including those from the insurance industry itself, often using experts from the United States to run the seminars.

Prior to 1976 when the fire service was nationalized, local fire boards controlled fire and building regulations. Because the officials on these boards had neither the resources nor much desire to regulate fire protection (many were strictly amateurs in fire protection), an informal coalition evolved between the fire service and the insurance industry to fill the gap. For example, sprinkler and fire alarm standards were originally established and policed by the Insurance Council, and it worked. Formal and informal networks formed among knowledgeable parties while the country and fire protection systems went through a post-war building boom. The result is a very sound set of buildings in existence today. Ironically, now that more formal control has been established nationally, there is a challenge by business to reduce standards that cannot be proven worthwhile on a cost-benefit basis.

As previously noted in the section on School Education, the Insurance Council produces some fire safety brochures used in schools. Its former role in providing fire prevention programs for primary schools was abandoned when the fire service developed a new, elaborate curriculum package.

Arson in Australia is increasing, and accounts for 20-30 percent of their fires, about the same proportion of the problem as in the United States (but at much less than the U.S. rate per capita). Much of the arson is felt to be in the fringe areas around cities and to be related to juvenile unemployment and the resulting frustrations. Young people are lighting fires in the bush thinking they will stir things up without doing much damage.

The "Household Replacement Policy" in Australia requires that a burned home be rebuilt as it was on the same spot. Insurance usually covers the whole cost. New building materials are allowed. There is less incentive for arson for fraud because you cannot take the money and run, though arson to acquire new possessions or for remodeling is possible.

Some concessions are made to the Household Replacement Policy for homes built in high fire hazard areas. Homeowners are allowed to rebuild in a new location when their homes are destroyed by woodlands fires and they do not want to remain in the same high risk area.

There are few instances of insurance incentives for putting fire protection systems into homes in Australia. The main reason is that only 10 percent of household premiums are for fires, and as in New Zealand the market is highly competitive and there is no margin for a significant discount. Another reason given is their lack of standards for residential sprinkler systems. The insurance industry feels that the lack of insurance incentives is not inhibiting fire safety improvements because people who want them are not making the decision based on savings in insurance costs.

One interesting exception to the lack of insurance discounts is that a 20 percent reduction in premiums is offered for houses in a rural area outside of Adelaide that score better than 80 out of 100 on a self-administered rating of the fire safety of the home. The emphasis is on safety from exposure to woodlands fires. Considerations include the geometry and material of the roof, screening of eaves, presence of gutters, construction under floors, screening of windows and doors, material of external walls, attached wood structures, and surrounding shrubbery. A significant point bonus toward the score of 80 is given if a home sprinkler system that meets standards is installed.

In Melbourne, an Arson Investigation Task Force Team of police and fire officials has been formed. The fire component is responsible for fire cause determination only. If the cause is arson, the case is given to the police who handle all further investigation and apprehension. A similar split of responsibilities between fire officials and police exists in other states, as well.

**HOUSEHOLD FURNISHINGS AND CONSUMER PRODUCTS**

The people of Japan and Hong Kong have an enormous range of consumer products from which to choose, especially electronic products. Relatively few of these products are involved in fires where it is product design rather than carelessness that causes the fire.

For cooking, kerosene appliances are dying out in Hong Kong and are being replaced by LP gas, "town gas," and electric appliances. The incidence of fires that start by kerosene spilling on a hot surface or open flame has diminished. Apartment dwellers now tend to use a small propane-fueled stove. A single large housing estate highrise may
have over a thousand such stoves, yet they have not caused untoward difficulties.\textsuperscript{26}

The use of propane stoves in the squatters shacks is another story. The shacks tend to become fully involved in fires, and the propane tanks often explode, dramatically spreading the fire. Firefighters try to move the tanks away from the fire — extremely hazardous duty. Few people are killed in these fires because escape from the shacks is easy.

Heating appliances are not a significant fire problem in Hong Kong. There is little need for heating because the climate is warm most of the year, never getting below 35-40°F. Many low-income families have no heat in their apartments, even space heaters. Most of the well-to-do and some middle and lower class families have some form of heater for occasional cool days.

Many Chinese are concerned about dry skin. It is customary to place a bowl of water or some other container in front of the heater to act as a humidifier. This serves the side purpose of providing some space between the heater and anything else. It also provides a handy source of water for extinguishing if a fire starts from any source! The heaters preferred by those who can afford them are oil-recirculating heaters, which work by convection rather than radiation and are considered less damaging to the skin. They also are somewhat safer than other portable heaters as they are more resistant to careless or ignorant actions, such as getting flammables too close to the heater.

The highrise housing estates of Hong Kong do not have central heating or air conditioning. People who want heating or cooling must provide it themselves, usually in the form of portable kerosene or propane heaters or small window air conditioners. Electricity is available and people may have electric heating or air conditioning if they wish, but most tenants tend to be conservative in their use of any source of energy. The portable heating units could be a high hazard if it were not for a combination of public education programs, the desire to preserve one's possessions, and the high fire resistance of the apartment units and hallways.

Hong Kong makes the use of LP gas heaters difficult though they are not outlawed. Code allows no more than two cylinders of LP gas in a dwelling unit, and the fire brigade recommends having only one. Because of the severe living space shortage, most people do not want to have two anyway. Usually, LP gas is preferred for cooking, and that accounts for the one cylinder recommended. These cylinders get dirty from cooking grease and fumes, and people do not want to roll the cylinder used for cooking into the sitting room for heating. By relying on a keen knowledge of their people, the Hong Kong government thus does not have to altogether prohibit LP gas heat but cleverly and effectively limits its use.

Hong Kong has a Consumers Council and an associated Consumer Products Testing Bureau that publishes information on the safety of individual brands of consumer products, such as electric cooking pots and air-conditioning units, two of the most common appliances. It is a semigovernmental body funded in part by the government, something like a subsidized version of the Consumer Union in the United States. It is advisory only, not regulatory, and depends on publicity for its effectiveness. It publishes a "Consumer Reports" type of periodical monthly.

For many products, the Bureau relies on foreign testing by organizations like Underwriters Laboratories and the Consumer Union in the United States, and reports the findings of these organizations. Electrical products usually display a rating by DIN, which is like that of our Underwriters Laboratory (UL).

Despite the love of fireworks by the Chinese, they are totally banned in Hong Kong for use by anyone except the government, which conducts special displays. In Japan, on the other hand, fireworks are still widely used by the public, even for simulating fires in citizen fire drills. The Japanese depend on having children properly instructed in how to use the fireworks.

Few people are killed in smoking-related fires in Hong Kong. In most countries such fires are tied to intoxication, but drinking at home is not common in Hong Kong. It is more often done in the company of others in bars or places of entertainment. The Chinese tend not to drink except to celebrate an occasion or holiday. They are self-disciplined and are unlikely to get drunk or to drink alone. One chief-level fire officer said he only saw one case of someone dying from a fire caused by smoking in bed in the last 15 years.

Opium use has almost disappeared. New drugs, used mainly by kids and the lower classes, are not involved in many fire deaths.

Households in Hong Kong tend to be much more sparsely furnished than in the West. There are few curtains or rugs, and chairs tend not to be heavily upholstered. The fire load in a dwelling unit is lower than in most other countries.

In Japan, as in Hong Kong, consumer products are seen as a problem because of misuse and not because of "being dangerous" or "failing." The Japanese go after the person misusing the product rather than the manufacturer of the product unless the product is dangerous in normal, proper use.

The Ministry of International Trade and Industry (MITI) in Japan controls electric products. Standards are made and revised by its Agency of Industrial Science and Technology. It issues certificates on the safety of various products. The approved products bear a marking "JIS," which stands for Japan Industrial Standards. Among those tested and certified are TVs, electric blankets, electric heaters, and cookers. If safety problems are found with a product, "strong messages" are sent to the manufacturer to fix them.

Although the standards are not mandatory for whole products, there are mandatory Japan Industrial Standards for many electrical components that are used in products. When such component standards exist, they must be followed.

The government cannot regulate products, but it can proscribe the use

\textsuperscript{26} Fire officers in the United States who have heard this have been either incredulous or horrified, but it is another example where a known danger causes people to be particularly careful, with a net lower problem than from our vastly safer appliances.
of certain products. That is, the manufacturers can make them legally, but you cannot use them legally. The burden is put on the consumer. One example of such a product is oil heaters. The government has asked manufacturers to make oil heaters that go out when tipped over. The concern is that they are widely used and can start many fires in an earthquake, as happened in 1968. Consumers are prohibited from using such heaters, but there is no penalty if they do.

Mattresses, upholstered furniture, and televisions are not important fire problems compared with heating and cooking equipment in Japan. For example, in 1981 there were only 83 fires involving TV sets, phonographs, or radios nationwide.

Most Japanese sleep on mats with a hard headrest. Western-style bedding is easier to ignite. Also, the Japanese bed is not spread out until someone wants to go to sleep. This cuts down opportunities for smoking in bed. But the Japanese tend not to smoke in bed anyway, even in Western-style beds. The last large hotel fire involving cigarette ignition of a bed was caused by a foreigner. The Japanese believe that the public is well aware of not smoking in bed. Cigarettes falling off ashtrays and smokers carelessly discarding cigarettes are thought to be a bigger problem.

Hotels generally have several ashtrays in even the smallest guest room. The Tokyo Subway Public Corporation distributes ashtrays that hold water in their bottom. The Japan Tobacco and Salt Corporation distributes free portable ashtrays as part of their "smoking clean" campaign. These ashtrays look like small coin purses with an aluminum coating inside. They are a handy way for smokers to dispose of butts. The Kyoto fire department jointly with the Lions Club International distributes them free printed with a slogan that says, "Keep Kyoto beautiful and clean."

The government manufactures all domestically made cigarettes. Two or three centuries ago smoking was forbidden in several towns. They no longer feel that extreme is necessary for fire safety. The semigovernmental organization that runs the tobacco industry has participated in fire prevention week campaigns and helped promote slogans such as "be careful with fire" and "put cigarettes in ashtrays." As with the vast majority of fires involving other consumer products, the Japanese hold the consumer responsible for his or her actions.

There are fewer cooking fires per capita in Japan than in the United States. Greater carelessness is probably the largest factor. The largest single reason for our cooking fires is "unattended cooking." The Japanese cook most foods for much shorter times than we do and eat many foods uncooked. Many of their common cooked dishes require constant attention for a short time. Also, the "cooker" is often a simpler device than our stoves. The one exception for the Japanese is the deep frying of tempura-style foods, which is one of their more common types of fires.

Because of the lack of central heating and the temperate climate, most New Zealand households have some form of portable or fixed space heaters. Most of the portable heaters are electric because the copious supply of hydroelectric power is inexpensive. New Zealand also is experiencing an increasing use of LP gas portable heaters. Their design complies with standards and they are considered safe devices. While the fire service has some concern, no major problem has developed. (In the southeastern United States, the leading cause of fire deaths has been such portable and fixed room heaters.)

The majority of homes in New Zealand have fireplaces, usually for aesthetic reasons rather than heating. Woodburning stoves, often potbellied stoves with metal flues, are increasingly common. These units often are improperly installed, especially by do-it-yourselfers, as in the United States, although theoretically a building permit is needed before installation. After a rash of such fires, the fire service brought the six manufacturers of the stoves together, did some testing, developed some voluntary standards, and provided for improved instructions to be included with each stove sold. The instructions describe the necessary clearances, surrounding protection, and proper cleaning. None of these heating devices has yet caused as dramatic a problem as has arisen in the United States in recent years, where there has been a huge increase in fires related to solid-fuel stoves and fireplaces. People in New Zealand have learned how to use open flame devices, and these devices have not been a major regulatory concern.

In upholstered furniture and carpeting, New Zealand and Australia use a great deal of pure wool or blends with high wool content (80 percent) since wool is one of their major products. Because wool is naturally fire resistant, its widespread use is probably a key factor in their low number of fires started by cigarettes carelessly dropped on upholstered furniture.

New Zealand does have the alcohol-related smoking in bed scenario, one of their major causes of fire deaths. The New Zealand Fire Service feels the approach to reduce this problem is through fire public education.

Kerosene heaters are common in Australia, especially in camper vehicles and camping facilities. However, they have not noticed any particular problem other than occasional fires when the heaters have been used to dry clothes. There has been a large increase in the use of potbellied woodburning stoves, but again no major problem yet. Supplemental heating commonly is provided with electrical strip units.

There is no control over upholstered furniture or other home furnishings in Australia. The interior design of their homes seems similar to that in the United States. There has been a rapid changeover from what they consider "low hazard" furniture to synthetic materials, which may affect the picture in the future. When asked what is the main cause of fires in Australia, given that they often start in furnishings, one of their senior officers said "stupid behavior."

Officials of one Australian state believe that although contents of buildings affect the nature of fires, and there

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37 One fire official in Japan disagreed with the majority opinion of those we met with and thought that there was considerable smoking in bed.
has been increasing use of substances for furnishings and fittings that are not only highly combustible but also generate toxic gases, there does not appear to be any satisfactory way to specify standards and enforce controls for toxicity at present. They intend to continue to monitor other countries’ efforts. Australia is devoting some effort toward flame spread and smoke development standards. They are developing furniture flammability standards.

In Melbourne fire officials feel that their relatively low rate of heating fires results from the fact that natural gas central heating systems are almost universal, and there is little use of solid fuel heating appliances. Fireplaces are not common and are more for decorative than heating purposes. Potbellied stoves are increasing but not causing a problem because of the requirements the state imposes for installation and venting.

Natural gas is plentiful and cheap in Victoria and there is no need for alternative methods for primary heating in the cooler areas. In New South Wales electricity is the principal heating source.

A way to reduce the potential for electrical appliance fires is being introduced in some hotels in Australia. A plastic tag on the room key activates the electric circuit in the room when the key is placed in a special switch just inside the door. When the key is removed, all electricity is cut except to the TV and refrigerator. Since it is common to have an electric coffee/tea pot in each room, this eliminates the problem of someone leaving the room with the unit plugged in. The room key-operated switch also is an energy conservation measure, since it also turns out the lights when the room is unoccupied.

In Australia the Standards Association awards an “Australian Standards Mark” that provides independent assurance that a manufacturer is producing articles which comply with established Australian standards under a quality assurance program. Both the performance and quality control are vouched for by this mark. In addition to giving consumers assurance, the standards mark is intended to increase productivity by reducing the need for commercial purchasers of equipment to test the products on their own. Detection, suppression, and extinguishing equipment for buildings are among the items rated under the standards.

**FIRE PREVENTION BUREAU ORGANIZATION**

Fire departments in Japan have much more manpower devoted to prevention activities than in comparably sized U.S. cities. The manpower is both fulltime employees devoted to prevention bureaus and part of the time of employees assigned to other duties in the fire department.

There usually is a prevention bureau attached to each “Fire Station” (comparable to a battalion level in the United States) as well as to fire department headquarters. Out of 18,000 firefighters in Tokyo, 1,850 (slightly over 10 percent) are assigned fulltime to the headquarters or fire station prevention bureaus. In addition, another 5-10 percent of all other manhours are assigned to prevention work, for a total of 15-20 percent of on-duty time of all personnel.

Prevention is the focus of two major headquarters divisions in Tokyo. The Fire Prevention Division is responsible for plans review, inspections, fire investigations, and hazardous materials management. The Public Relations and Education Division is responsible for public education, public information, media relations, fire prevention literature, training citizens in firefighting, and training and certifying civilian fire protection managers and fire protection system engineers.

The prevention unit at the station level is expected to tailor the prevention policy and guidelines set by fire department headquarters to the particular needs of the community served by the station. It also investigates all fires in its district. Some firefighters are assigned fulltime to the prevention unit at the station, and some are assigned to prevention when not responding to fire calls.

Firefighters in Japan, including those who respond to calls, usually have desks. This changes their image to one

![Fire Station Organization Diagram](image)

*Tokyo's Marunouchi Fire Station Organization, 1984. The number of personnel in each unit is in parentheses. The total is 166.*
of being white collar workers at least part of the time. Watching TV typically is allowed only from 12-1 p.m. and after 6 p.m., so that firefighters can pursue their prevention assignments or other duties during the workday.

A typical downtown fire station in Tokyo is organized into three sections: administration, fire suppression, and prevention, as shown in the diagram of the Marunouchi Station at the left. Of the 115 staff assigned to this Fire Station (apart from those in branch stations that report to it), 36 are in the Fire Prevention Section. They all report to the station chief, not the Headquarters Prevention Division.

Of the 36 assigned to prevention, 15 are in the guidance and investigations branch, which investigates each fire for cause and which provides public education and training relating to fires and disasters. Since there are about 7,000 fires annually in Tokyo and 75 fire stations, there is an average of only one fire every three or four days to investigate per station. This leaves the vast majority of the time of the 15 member staff for public education work.

The inspections branch of 10 inspectors buildings, recommends corrections when needed, and tracks compliance. The “prevention” branch of seven does plans reviews for new buildings and additions, reviews reports of the installation of fire protection equipment in new and old buildings, and inspects construction sites. The hazardous materials branch of four approves the handling and storage of hazardous materials and visits occupancies such as service stations to explain handling of their special problems.

All of the prevention section professionals are trained as firefighters and can assist in suppression if necessary. The fire station has one pumper, one ladder, an ambulance, and a rarely used wall drill truck. Thus the 115 personnel in the fire station (excluding branch stations) have lots of time for prevention.

The fire station organization in Osaka is similar to that of Tokyo. In Osaka, out of the 3,296 uniformed men in the department, 12 percent (391 employees) work fulltime on prevention.

Of these, 104 are in headquarters and 287 are in the stations. An impressive 30 of the headquarters prevention staff are engineering graduates with B.S. or M.S. degrees. Line firefighters do not work in prevention in Osaka, unlike Tokyo.

In cities where there are volunteer and paid forces, both are likely to be involved in prevention. In Kyoto the paid fire department indoctrinates the volunteers. It does some prevention activities directly itself and some jointly with the volunteers. The volunteers do much of the public education work at community meetings and also teach use of extinguishers.

Each fire station in Kyoto has its own prevention unit, and as in Tokyo, it reports to the station head, not the central fire prevention bureau. They look to fire department headquarters for prevention policy and report to it on their progress. All inspections are conducted from fire stations rather than the headquarters prevention bureau. At one fire station with 133 men, 27 were assigned to the prevention unit. Eighteen of the 27 are building inspectors, two of whom are also public relations specialists. Another eight specialize in plans review, instruct fire protection managers, and issue other fire protection certifications.

In the Hong Kong fire department, which had 6,391 fulltime employees in 1984, the fire prevention bureau attached to fire headquarters is called the “Fire Protection Division” and has 272 employees. This includes 123 officers, 72 firefighters, and 77 civilian clerical staff. In addition, there are small fire prevention offices associated with each of the three regional commands. Policy is set at headquarters and adapted to local conditions by the commands. Some of the time of the line fire companies in each command is spent on neighborhood inspections and other prevention work as well. During the next few years it is planned to increase decentralization of prevention work one step further, down to the fire divisions reporting to the three regional commands. They will be responsible for most inspections, including places of public assembly, and also implementation of policies for storage of hazardous materials.

In Australia fire prevention forces are much smaller than in Japan or Hong Kong. South Australia’s Metropolitan Fire Brigade, which is a state agency that serves the metropolitan areas of the state’s 1.2 million population, has 880 fulltime personnel. Its Fire Prevention Bureau has 18 personnel, including 14 officers, two “general hands,” and two civilian administrative staff. Five of the officers have qualified as Fire Engineers through examinations by the (British) Institute of Fire Engineers.

In Victoria (pop. 3.8 million) urban fire prevention responsibilities are split between the Melbourne Metropolitan Fire Brigade’s training division, which handles public education and training of hospital and other institution personnel, and the fire protection branch, which handles codes and code enforcement.

The fire prevention department in the training division has nine people: the director, deputy director, and administrative assistant; and three teams of two, each with an officer, a senior firefighter, and a van. The department provides talks if requested to do so by community groups or local fire services. There is little proactive program.

The fire protection branch of the Melbourne Fire Brigade has 24 professional employees. Their inspection capability is supplemented by the 51 municipal building surveyors who do the follow-up inspections for the fire brigade as well as their own inspections. Thus there is a total of 33 fire prevention specialists plus the building inspectors.

For the rural areas of Victoria, the Fire Prevention Bureau of the Country Fire Authority is very small — seven personnel, including four officers. They focus on industrial and commercial structures, where they give special attention to inspecting hose reels, fire extinguishers, and similar equipment used to extinguish incipient fires.

In the state of Queensland, fire safety officers are largely decentralized; 15 (of 81) brigades have them. The state uses regional fire safety officers to cover areas between brigades. Each gets an initial four-week fire prevention course, which only 50 percent pass. Those who are successful receive an additional
four weeks of training on fire safety
codes. They then are certified for three
years, after which they are reevaluated.

In Sydney a tour in prevention is
now a requirement for promotion. The
fire prevention staff consists of 23 offi-
cers and clerical staff. They are
trained on the job and encouraged
with pay incentives to obtain advanced
learning. Their normal tour is 2½ to 3
years.

In New Zealand the “Fire Safety Di-
rectorate” (fire prevention bureau) has
93 employees for this nation of 3 mil-
lion. Of the 93 employees, 81 are fire of-
icers and 12 are civilians. Six of the
officers are assigned to National Fire
Headquarters. The rest are distributed
in 19 command areas throughout the
nation. Nineteen of the officers hold
the coveted diploma in Fire Engineer-
ing from Great Britain’s Institute of
Fire Engineers.
III. FIREFIGHTING AND FIREFIGHTER SAFETY

The firefighting capability of the United States is among the best in the world. Our departments generally have first-rate apparatus, good response times, and an excellent record in suppression of fires. But there are several areas for improvement. Our record is poor relative to other nations in firefighter safety. We have among the highest rates of firefighter deaths and injuries in the world. We provide less training to firefighters, especially officers, than do most nations. Our various levels of local, state, and federal government fire efforts are not as well coordinated as in some other nations. And our manning levels have been dropping.

This section discusses how other nations approach training, safety, and fire service organization. It also discusses some of the more interesting fire apparatus and equipment in the nations visited.

TRAINING

The most striking difference between training in other countries and in the United States is in officer training. The U.S. National Fire Academy and some cities and states have taken large strides toward improving officer training, but on the whole the amount of mandatory training that has been given to each officer, especially to lieutenants when they are first promoted, is far less here than in most other countries. In many places in the United States there is no officer training at all.

There are also international differences in training for basic recruits and in specialties. Much more instruction in prevention is provided in other countries to both firefighters and officers than in the United States. In several nations, officers must take special training in prevention as well as do a tour of duty in prevention in order to advance.

RECRUITS

Recruit training in Japan is conducted by either the firefighter training schools of large city departments or by prefecture training schools, not unlike in the United States. In large cities such as Tokyo, the curriculum for recruits who have a high school diploma is six months long. For college graduates, a somewhat different five-month curriculum is used. It assumes knowledge of some basic liberal arts and sciences that is included in the six-month curriculum. Appendix B shows the full curricula for firefighters with and without college. The curriculum is intended to develop motivation and instill culture and tradition, as well as to provide vocational training, per se.

Prevention is a major subject in the recruits' curriculum. They get two to three weeks of it. For college graduates 12 hours are devoted to inspections and 68 to other aspects of prevention. For high school graduates the hours are 16 and 98.

Some firefighter training schools in Japan have a shorter training period than does Tokyo, typically ranging from two to three months. They depend on additional daily training in the fire station. This is common for volunteers as well as the paid fire service in small communities. Volunteers in Japan are trained in the same local or prefecture fire schools as are paid firefighters.

In Hong Kong as in Tokyo, the curriculum for recruits is six months, to allow those with as little as six years of formal schooling to catch up. The more schooling with which you enter, the higher your salary is, but the course duration is the same. The curriculum is shown in Appendix B.

OFFICERS

There are basically one of three approaches taken to train fire officers in most countries: an officer-candidate course taken prior to becoming an officer, an officer's course taken immediately upon promotion to officer, or a voluntary selection of courses and on-the-job training after promotion.

In Hong Kong officer-candidates receive six months of fulltime training. The course consists of three months on the basics of firefighting (which covers the material in the six-month recruit course) and three months on command and control, rescue, and advanced firefighting. Some basics of prevention are included.

If they pass the course, they continue on probation as station officers for three years. Six months before the three years are up, they return to school to take a two-week training and evaluation course, during which they must demonstrate their ability to command. Graduation is not automatic, even at this point. After a successful probation, they become full-fledged station officers.

The Hong Kong fire brigade feels that their training program has proven very effective in making good judgments about officer-candidates. The candidates enter the program either up from the ranks, or via lateral entry if they have a high school or university degree. Lateral entry is by far the more common entry because of the high academic standards of the fire service. Officers must be fluent in written and oral English and must pass a difficult science curriculum. The officer curriculum is taught entirely in English to further language training since English is the official language in Hong Kong.

The senior officers continually look for potential officer-candidates among the ranks. Those selected attend an intensive two-week assessment course that acts as a tough screening to see if
they have what it takes, especially intellectually. All senior firefighters (below officer level) also are scheduled to take courses at the training academy to improve their technical knowledge and supervisory ability.

The Hong Kong probationary officer just out of officer-candidate school is usually very young — 18-30 years old, some of them just out of high school, and with no firefighting experience. He usually is given one piece of apparatus to command (what we would call a company) and is not in charge of even a one-alarm run. Over his three-year probation he is supposed to gain firefighting field experience and maturity, as well as leadership experience. The result of this process is a very young, dynamic officer corps.

After promotion to station officer, there are various courses for specialties at the training school or, for a select few, overseas.

Almost all officers go through prevention training. It is an additional eight-week course that includes laws, regulations, and inspection training. A one- to two-month apprenticeship attached to a fire prevention officer follows the formal training. If successful, the officers then are posted to the Fire Protection Bureau for about three years. Usually they have six to seven years of experience as a firefighter before they go into the bureau, because the position requires maturity and confidence in dealing with the business community.

Senior officers all have to attend a three-week "Senior Fire Protection Course" to prepare them to deal with fire prevention matters at a higher level.

In New Zealand officers are offered the opportunity to take a series of courses after promotion to the officer ranks, but they are not mandatory. As in Hong Kong, the policy is that station officers serve a tour as a Fire Safety Officer in the prevention division (for two years versus three in Hong Kong). Although not a formal requirement, this experience is critical for promotion.

The New Zealand system ensures that virtually all officers have an awareness of fire protection concepts in buildings and how they translate to the safety of the firefighter in combat operations. The senior corps of officers appreciates the role of prevention, and that attitude filters down through the ranks.

Potential Fire Safety Officers must take three two-week courses in code interpretation and application, public fire safety education, and fire investigation. In fire investigation they are cross-trained with police. Fire safety officers must be operationally fit; these are not considered light-duty assignments.

In Tokyo there are required training curricula for every level of officer after promotion. Lieutenants receive eight weeks of training. Captains and battalion chiefs receive four weeks. Courses for chiefs are only a few days. Examples of the curricula are given in Appendix B. Promotion in Tokyo (and Osaka) is up from the ranks. There is no lateral entry. All officer coursework is geared to experienced firefighters.

There is a wide range of specialty courses that can be taken by firefighters and officers. Examples of the subjects are as follows:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rescue</td>
<td>187</td>
</tr>
<tr>
<td>Water rescue</td>
<td>76</td>
</tr>
<tr>
<td>Radio operator</td>
<td>50</td>
</tr>
<tr>
<td>Physical education</td>
<td>44</td>
</tr>
<tr>
<td>Inspection</td>
<td>123</td>
</tr>
<tr>
<td>Hazardous materials</td>
<td>55</td>
</tr>
<tr>
<td>Fire prevention (building systems)</td>
<td>29</td>
</tr>
<tr>
<td>Fire investigation</td>
<td>81</td>
</tr>
<tr>
<td>Disaster preparedness</td>
<td>48</td>
</tr>
</tbody>
</table>

Volunteer officers, like volunteer firefighters, are trained by local or prefecture schools, and chiefs by the National Fire Defense College.

Training in Australia is done primarily by the Metropolitan and Country Fire Brigades of the states, which have their own training staff and facilities. A senior officer course (similar to the Executive Development courses of the U.S. National Fire Academy) brings together senior officer personnel annually from all states. It provides an interchange of information and a chance to establish personal contacts for future cooperation.

PUBLIC EDUCATORS
In Tokyo a special group of public educators consists of college educated women. They receive five months of training generally like that received by male firefighter recruits with college degrees, but with more emphasis on how to deal with the public and less on firefighting skills. The women's public educator curriculum is shown in Appendix B. It may be the most intensive course in the world devoted to public fire education. There are male public educators, too, but they receive the standard firefighter curriculum.

HIGHER EDUCATION
The Tokyo Fire Department provides a few selected officers with scholarships to attend university fulltime. It feels that the broader background makes for better managers, particularly in higher ranks, and so it provides the opportunity to the most promising young officers who have not attended university before.

In South Australia and New Zealand, many of the senior officers are members of the Institute of Fire Engineers, a British fire protection engineering association. They work on their own to achieve the technical knowledge level required to pass demanding standards for certification.

INTERNATIONAL VISITS
Japan sends about 100 of its fire officers abroad each year. The intent is to:

- Identify and exchange new ideas, especially in new technology.
- Broaden the experience of the individuals.
- Measure themselves against others.

About one half are sent to the United States and one third to Europe. Our hosts in Japan were familiar in detail with U.S. fire protection practices and equipment as a result of such travel.

Hong Kong, too, with a budget much smaller than comparably sized U.S. cities, sends officers abroad to attend courses, broaden their professional knowledge and skills, and keep them abreast of modern fire technology. The overseas program features the British
Fire Service College but includes travel to other countries, including the United States.

Plaques showing attendance at the U.S. National Fire Academy courses and various U.S. fire conferences can be seen on display in fire departments in the Far East.

**FILMS AND PICTURES OF FIRES**

In Hong Kong, as noted under arson investigation, an excellent photographic record is made of each large working fire. The photos are mounted in books in chronological order to provide a visual record of what happened at the fire. The photo books are maintained by the senior information officer of the fire brigade. They are consulted as a reference for training purposes, both as a critique for those who participated and as a realistic example for others. The film record also provides some excellent visual backup for equipment evaluation and budget requests and serves as a history of the department.

In Tokyo videotapes taken from department helicopters of large fires are used for similar purposes as the photo record in Hong Kong.

Melbourne has a video studio and some highly sophisticated production equipment for developing specialized video presentations on firefighting techniques. They are putting video cassette recorders in all fire stations and plan to circulate training cassettes among them. They also have used the video equipment to film and critique instructor training programs. (A number of U.S. departments have started using similar methods.)

Tokyo has had only one firefighter killed at a fire in the past three years. Before that, there was one in 1974 and 19 in an explosion in 1964. That is all for 20 years. Kyoto (1.4 million pop.) had one firefighter death in the last 10 years and that was from a vehicle accident. Osaka had one firefighter death five years ago. The next earliest one was 20 years ago.

There have been 9,666 firefighters injured in the past five years in Japan, or 1,933 per year. New York City, with less than one tenth the number of paid firefighters as Japan, has far more firefighter injuries per year than does all of Japan.

Better safety records are not restricted to Japan: A senior chief in Sydney could recall only one firefighter killed in combat in his department in the last 25 years. Hong Kong also has very low casualty rates compared to the United States.

Probably the biggest reason for the lower firefighter death and injury rates in these other nations is simply that the firefighters go to fewer fires and have less exposure to possible injury. But there is also a greater emphasis on firefighter safety in these countries. Some of the most noteworthy features of their safety programs are described below.

**PHYSICAL FITNESS TRAINING**

In Hong Kong all active firefighters take a physical fitness test once a year. Firefighters through the rank of senior station officer (approximately our battalion chief) are included. The test is conducted by the department's two Physical Education Officers who are specialists in this field. The test has six "events" that test cardiovascular conditioning, strength, and agility. They include a three-mile run, push-ups, squat jumps, arm dips, trunk curls, and arm heaves.

Points are given for the achievement level reached on each event. The test criteria are set by age group rather than rank. In addition to having to exceed a specified total score, the firefighter has to achieve at least two thirds of the recommended score on each test component individually. If the test is failed, the firefighter has three months to get back into condition. If he does not pass he is sent to a remedial conditioning program for a week and then retested. The cycle continues until he passes. He is barred from promotion until he does.

The author's observation was that the Hong Kong firefighters were in magnificent condition. There apparently was a lot of grumbling when the test was first introduced 10 years ago, but it is now accepted and has helped promote fitness.

There is a fully equipped gym with modern exercise equipment in almost every fire station. About 40 minutes each day is devoted to physical exercise. Training is done at each of 10 types of exercise equipment. Once or twice a week the training sessions are run by physical training instructors who rotate around stations and report to the Physical Education Officers in headquarters. The rest of the time the training is led by an NCO — twice each 24-hour shift.

One of the reasons for their great attention to physical conditioning is that statistics, especially from the United States, show that the majority of firefighter deaths are caused by heart attacks and that a large percentage of injuries are caused by strains, sprains, and other problems that can be prevented to some extent by physical conditioning. Another reason is that Hong Kong firefighters face a warm subtropical climate with high humidity, and the majority of their working fires are in highrise buildings. The combination is extremely stressful and can be eased somewhat by conditioning.

The Japanese also require firefighters to keep physically fit. They are required to undertake physical conditioning each day. As one small example, during the author's visit to a headquarters section of the Tokyo Fire Department all officers seated at desks were asked to stand up and go through a series of calisthenics led by one of their officers.

Osaka encourages firefighters to join athletic clubs associated with each fire station, and most do. Osaka administers a physical fitness test once a year, similar to Hong Kong's. Strength,
agility, speed, and cardiovascular conditioning are checked under supervision of a fire department physical education specialist. If you do not pass, you are referred to a doctor and may be given a remedial fitness program. In addition, medical exams are given twice a year by a doctor from the city public health center. Every battalion-level fire station has a nurse for day-to-day ailments.

Kyoto provides full gyms in the fire stations. A two- to three-hour per week workout is compulsory for everyone, including officers. Annual physical fitness tests are administered.

In New Zealand also there is widespread recognition of the importance of good physical conditioning. A personal commitment is made by most firefighters to keep in shape. Time is set aside for voluntary exercising each day while on duty, but there is no mandatory program. There was an attempt in the past to establish a mandatory fitness program but the union wanted early retirement concessions for those who could not pass, and that was considered too expensive to implement. To encourage voluntary exercise, multipurpose gym equipment is installed in many of the fire stations. The recommended training program follows that developed by England and used by the NATO military forces. There is a mandatory medical exam at age 45 and every three years thereafter.

In South Australia (Adelaide), a decision has been made to elevate the priority of physical fitness. A physical fitness director will work with the Adelaide Sports Science Clinic to develop not only a physical fitness program and fitness tests, but also programs for rehabilitating injured firefighters. They plan individualized assessments and individually tailored fitness programs. The people involved in managing the program have backgrounds in training Australia’s Olympic teams. The brigade also has invested in an elaborate physical fitness facility in their new headquarters.

In the state of Queensland there are no physical fitness standards once past the recruit program. However, senior officer appointments require a medical exam.

All stations in Sydney have gym equipment. Its use is voluntary, but most fire personnel do use it.

**Breathing Apparatus**

All firefighters in Japan and Hong Kong use breathing apparatus for interior fire attack. The most common version has a single tank, like ours. Most of their new breathing apparatus is positive pressure. As a side note, the weight of the breathing apparatus relative to the average body weight of an oriental firefighter is another reason that they need to be in top physical condition.

The use of the breathing apparatus in building fires is mandatory. As is the case in American cities that follow this practice, they have comparatively few smoke inhalation injuries.

Many countries have wrestled with the problem of long-duration breathing apparatus. In New Zealand the fire service has a cadre of specially trained firefighters who can man a highly mobile task force equipped with long-duration breathing apparatus when they are needed. They use Draeger BG-174s, as does Australia.

In general, long-duration breathing apparatus are not held in high esteem in New Zealand because the associated training and maintenance is too costly; they have few large building complexes where they are likely to be needed, and they are concerned about effectiveness and safety when they are worn for long periods. Instead, New Zealand uses more firefighters equipped with standard breathing apparatus. They have mining rescue teams and equipment that are available for special situations.

The Hong Kong fire brigade has used Draeger-type masks and now is starting to use Swedish Aga positive pressure breathing apparatus. The fire brigade had a specially trained mobile strike team to deal with fires in their underground rail transit system. More recently the brigade has trained transit authority personnel in the use of breathing apparatus and in the basics of firefighting to get an earlier attack on such fires, and the mobile strike force has been discontinued.

In South Australia a senior fire officer thought the increased use of breathing apparatus was contributing to the improved health of firefighters, and that firefighters were living longer and enjoying their retirement in better health, with fewer heart and lung problems.

In Melbourne the fire service is in the process of converting from Draeger PA-80 negative pressure masks to positive pressure masks for routine use. They also have 20 Draeger BG-174, four-hour capacity masks, which are maintained on a special van that transports them to the scene when needed. Part of the brigade, about 170 firefighters, are trained in the use of the long-duration masks for multiple alarm fires.

In Queensland breathing apparatus is required to be worn at all structure fires. They use Proto Mark-4 two-hour duration units in addition to the standard units.

Sydney uses CABA apparatus with an air tight gas suit. They use a buddy system where two firefighters must be together at all times when breathing apparatus is used. Further, when two go in, there must be two standing by outside with breathing gear as backup. Sydney also uses the Draeger BG-174 four-hour unit. They have a van that responds with the CABAs and Draegers. Almost half of the firefighters in Sydney have been trained on the long-duration units. Because the air gets hot and dry through recirculation, they prefer that firefighters wear them for no more than two hours and not the four they were designed for in mining use.

**Protective Clothing**

In Japan every firefighter in the cities visited had a complete protective outfit that was in first rate condition (perhaps in part because of the few fires they attend!). The protective outfits are prescribed in national standards and are uniform throughout most of the nation.

The latest turnout coat and pants are constructed of Nomex or Conex (made in Japan) covered with rubber mixed with aluminum powder. The boots also are aluminum powder on a rubber base. They reflect heat and are close to waterproof. The pants legs are attached to the top of the short rubber
boots. The coat has a cotton lining. The helmet is made of fiberglass and has an attached aluminized hood that gives complete neck protection. The helmet also has an interior visor. All photos and drawings of firefighters distributed to the public show a silhouette of a firefighter that includes the hood, so it is part of their "image" to wear it. They also wear gloves.

In Hong Kong the fire service takes a radically different view of protective clothing. Their turnout gear is lightweight cotton that is neither fire resistant nor waterproof. "Getting soaked" is how they obtain some fire resistance. The complete outfit consists of cotton turnout coat and pants, cork helmet, rubber boots, leather gloves, a flashlight, and small length of line. The outfit is perhaps the most lightweight, least protective firefighter outfit in the world, and it is also the least stressful to wear. It reduces the pounds they have to carry when running upstairs in a high-rise — where the majority of their fires are — and it is much cooler than any other kind of outfit for the climate they are in. This gives the firefighter greater mobility and work efficiency, but puts a premium on firefighters being careful in positioning themselves with respect to the fires. They therefore must be taught to strictly obey an elaborate set of safety rules. The system works. Their casualties are very low.

New Zealand is converting to aluminized turnout coats similar to those being used in Japan. They also are monitoring the research on new fabrics in the United States, including the U.S. Fire Administration’s Project FIRE. Firefighter safety is a high profile issue in New Zealand because of strong union influence on the subject. Their policy on protective clothing is to perform their own field tests on an experimental basis and make sure the unions and other major players are satisfied before buying in.

In Australia some firefighter protective outfits are wool, as in Britain. Wool is naturally flame-resistant, protects against radiant heat, and some even think it is relatively comfortable in extreme heat. Also, Australia is a wool-producing nation. Some departments use American-style bunker coats.
VEHICLE SAFETY
In Hong Kong and Japan all firefighters ride inside the cabs of their vehicles. This has eliminated falls from vehicles en route and provides safety in traffic accidents. Hong Kong also has a special driving school for training fire apparatus drivers, which stresses safe driving in their congested streets. Not every firefighter is qualified to drive their apparatus.

In New Zealand, too, all crew members ride inside the cab. No one is allowed to ride the back step, including volunteers. A new cab design is being developed that is said to be the safest in the world. It has been prompted by some serious traffic accidents involving crew in cabs. The new cab would fit many types of apparatus. Computer design studies have been used to produce an optimal structure that can absorb considerable impact rather than having it transmitted to the crew. Initial tests of a prototype have proved successful. If all goes well, it is expected to be introduced in the next year.

SAFETY TRAINING
The Japanese firefighter was once the ultimate in machismo. The bravest firefighter in each fire company was chosen to be the standard-bearer. At the scene of a fire, the standard-bearer climbed to the roof with the unit's flag and stayed there until the fire was extinguished. If it wasn't, he could have died. Now the Japanese use remote control snorkels with TV cameras to avoid having to go up on roofs at all for some common fires and pay a great deal of attention to safe practices.

Modern Japanese and Hong Kong firefighters are taught to follow all rules strictly, including safety rules. Disciplinary action is taken for rule violations such as not wearing all items of protective clothing.

Every firefighter in Kyoto is issued a 140-page safety manual that has lots of pictures showing safe or unsafe ways to do various jobs. To make sure that it is clear whether a picture illustrates the right or wrong way, an "X" is put above each picture showing the wrong way and a "O" over the pictures showing the right way. A page from the manual is shown in the figure below.

In Sydney, firefighters are taught standard safe working practices. All personnel learn "to do it one way and one way only..." so when they work together, they know what everyone else is going to do. They have low firefighter injury and fatality rates.

STRESS MANAGEMENT, WELFARE, AND RETIREMENT
Both Japan and Hong Kong are concerned about the mental stress levels faced by firefighters and have taken some modern approaches toward remedying the problem. Starting with recruit class they are taught what to expect from a psychological point of view with the emergencies they face. The situation has changed somewhat from the days when Japanese firefighters slept with their heads on a shared log and were awakened to respond to a fire by the chief striking the end of the log with a mallet.

There are a wide variety of sports and cultural activities available to the Japanese firefighter in the form of clubs, especially in the larger cities. Tokyo's clubs include sports like volleyball, soccer, baseball, martial arts like Kendo dueling and archery, and cultural activities, such as flower arrangement, art appreciation, and nature appreciation. The fire service encourages peaceful and contemplative activities as well as physical activities to work off tensions.

Firefighters in Hong Kong can retire at 45 or stay until 55. Officers cannot retire until 50 and can work until 55. The officers can work past 55 if they have excellent performance ratings and are in good physical condition.

Firefighters in Hong Kong are not supposed to have a second job. Living quarters are provided for married personnel. Currently there are 1,950 quarters and an additional 2,000 planned, or a total of 3,950 for the 5,600 firefighters. Older fire stations have staff quarters on the upper floors of the station.

Hong Kong also has a Service Welfare Officer of divisional (battalion chief) rank who is responsible for counseling on personal and domestic problems and general welfare both for active and retired firefighters. He is also responsible for checking on all hospitalized members.

Great importance is given to participation in sports and recreational activities in Hong Kong. All uniformed staff are automatically members of the Sports and Welfare Club, which sponsors a variety of sporting events and competitions, picnics, and cruises.

Firefighters in Australia are given a chance to recuperate and refreshen with a sabbatical or "long service leave" once every 10 years. At that time they get 13 weeks of paid leave plus a 175 percent salary bonus to spend on the leave during that period. They can save up these long service leaves and take them at retirement or use them in at least four-week increments. Their retirement system is not a pension, but

Kyoto's firefighter safety manual illustrates the safe and unsafe ways to carry out a task.
rather a lump sum payment. Retirement is mandatory at age 65. You also can retire at 60 and take a reduced retirement sum.

In Sydney they believe that strict observance of safety practices reduces stress. The officers all come up from the ranks and it is believed that the confidence they have in each other also reduces stress.

In New Zealand the fire service may acquire housing for personnel, which it traditionally has done for senior officials and, in some locations, for volunteer personnel. On-duty firefighters are provided with individual quarters rather than dormitory-style bunks.

One side effect has been that there has been no problem with station accommodations for female firefighters, of which there are two in Auckland (both drivers, well accepted, and meeting the same standards as male firefighters).

REducing Hazardous Building Conditions

In Hong Kong among the most dangerous fires for firefighters are those among the squatters shacks. They are often on hillsides with no road access and remote from water supplies. It is physically difficult to get water on the fire and to undertake rescue, and there are hundreds of frightened, panicky people running around carrying whatever possessions they can rescue. The fire service has helped get to the root of the problem by supporting schemes to get the squatters into subsidized, fire resistant buildings.

In Australia a fire chief pointed out the significance to firefighter safety of their insistance on nonflammable roofs and solid walls, which provides compartmentation in private dwellings. Australian firefighters have less need to climb or roofs to vent, which is often a dangerous job and a source of injuries.

In Tokyo and most of Japan, buildings are either made of concrete and steel or are made of wood and paper. They do not have buildings that tend to collapse or have a wall fall as in the U.S. type of construction with brick veneers and wooden joists. This reduces the incidence of catastrophic losses of groups of firefighters.

FIRE SUPPRESSION ORGANIZATION

ORGANIZATIONAL APPROACHES

Most fire services in the western world are organized around the concept of a municipal fire department. There are few centralized, national fire services. On the surface fire departments seem similar from city to city around the world, but there are major differences in organizational approaches. Engine and ladder companies are the fundamental units in almost every country, but some differences in the details are significant.

Japan had a national fire service prior to World War II. After the war, as part of decentralization, fire departments were made part of local governments. All large cities and many medium and small towns now have their own fire departments. Communities near large cities may have their fire protection provided by the large city under a contract arrangement. Some other communities “entrust” their fire protection to a neighboring community that has a professional fire service. The Ministry of Home Affairs in the national government and the prefecture fire agencies assist in organizing these arrangements, which allow more people to be protected by full-time professionals and provide economy of scale by promoting a smaller number of larger departments. Of the municipalities with permanent departments, 79 percent provide fire service to others.

Another major feature of Japanese organization for fire protection is in the use of volunteers. The main role of volunteers in Japan is fire prevention! They also play an important role in suppression. In rural areas they may be the only suppression force. But everywhere they are expected to engage in prevention activities.

Some of the large cities in Japan, such as Tokyo and Kyoto, have very large volunteer firefighting forces that supplement the paid forces. On the other hand, some large cities, such as Osaka, have no volunteers.

Tokyo has 25,000 volunteers, of which 16,000 serve the city. The rest cover the other part of the metropolitan area that the fire department serves. The city volunteers have no apparatus of their own but supplement the paid manpower in fighting fires or giving first aid, if necessary. They also have 872 portable pumps distributed in 626 equipment depots apart from regular fire stations for use in disasters. The volunteers outside the city in the Tokyo Metropolitan District have 250 pumpers, 279 portable pumps, and — not the least — 14 public relations cars for prevention work.

The suppression role of the Japanese volunteer firefighter varies from city to city. In Kyoto, which has 4,000 volunteers, they routinely respond to every fire from their homes or from their fire station. Some volunteers get the apparatus while others go directly to the scene. All wear uniforms provided by the city. At the scene, the volunteers do the “mop up” or final extinguishment of fires, allowing the paid forces to return to quarters sooner.

Some small Japanese municipalities have mixed paid/volunteer departments, with fulltime engine drivers or fulltime standing squads that are supplemented by volunteers, most of whom are part-timers with regular jobs.

Japan overall has 1,060,000 active volunteer firefighters and 128,000 fulltime paid firefighters. (This is in the range of 1.5 million often given as the estimated number of active firefighters in the United States.) Their number of paid firefighters almost doubled from 1971-1981, increasing from 70,000 to 125,000. In the same period, the number of volunteers decreased by 126,000. As in the United States, the attitude among youth toward volunteerism is weakening somewhat, and the population is getting older.

Backing up the paid and volunteer firefighter corps in Japan is a less well trained and less formally organized civilian fire corps that is intended for use primarily in major disasters, such as earthquakes. They are equipped either with portable pumps carried in a litter arrangement by two to four people or with pumps mounted on carts drawn by two to six people. Both types of pumps can be used when fire vehicles
cannot gain access to an area. Storage sites for these pumps are dispersed throughout the country.

The civilian fire corps, called "volunteer fire and disaster preparedness organizations," are organized at the town or village level. The chief of the organization is often a local merchant who also heads other community groups. It is therefore an established, socially acceptable role and even civic duty to belong.

In both the first and last line of defense are ordinary citizens with fire extinguishers, buckets, and plastic waterbags who are ready to fight incipient fires day to day and small fires that might break out following a disaster.

At the local level, the paid fire department has "Fire Stations" that correspond to battalion-level organizations but with much larger staffs and more authority than a U.S. battalion headquarters. Each fire station is semi-autonomous and has branch stations reporting to it. A general rule of thumb is that every 10,000 people are to be covered by a "fire station."²⁹

A "fire station" in Tokyo typically has a fire station chief, three battalion chiefs, several fire captains, and 100-300 men. Normally two pumpers, a chemical pumper, a ladder, a public relations car, a radio car, a chief's car, and an ambulance are at the main station, and one to two pumpers are at each branch station, though some have...
ladders or special apparatus, too. The organization chart for the Tokyo Fire Department is shown on the preceding page. The two divisions devoted to prevention were discussed in the previous chapter. The Fire Science Laboratory studies various fire protection problems, such as improving the safety of household appliances that have open flames, improving firefighting equipment, and developing ways to escape from fires. There are four laboratory divisions, each specializing in a different aspect of fire science.

At the national level, the Japan Fire Defense Agency develops model national codes and sets standards for firefighting equipment, manning levels, response times, station location, and fire department practices. These are treated as guidelines rather than mandated requirements. To develop the guidelines the Agency has divisions for firefighting, hazardous materials regulation, fire prevention, and other areas as shown in the organization chart at the right. The Agency also gives subsidies to local fire departments to fund equipment purchases in part; that is, the national government provides a small part of local department budgets.

The Fire Defense Agency provides national-level training for middle and upper ranks through its Fire Defense College. In addition to providing training on-site and in the field, it sets standards for training and designs the curricula used by firefighter schools at the prefecture level.

The Fire Research Institute is another part of the Fire Defense Agency. It shares the fire research role with parts of the Building Research Institute at Tsukuba. The Fire Defense Council investigates major fire problems and recommends courses of action.

Situated between the federal government and municipalities are prefectural governments, roughly like our states. The prefectures have fire and emergency service agencies that provide advice to their municipal fire services. The guidance may be in fire defense planning, mutual aid, ambulance service, or other areas. The prefectures also provide training for the paid fire service and volunteers, those who do not attend big city fire academies. The prefectures assist in exchange of fire officers among their municipalities and they help evaluate facilities, equipment, and material. They act as liaisons between national and municipal levels of government and help to coordinate intercity agreements for contracted fire service.

There are no firefighter unions in Japan. Police and firefighters are prohibited by national law from forming unions.

There is a series of administrative reforms underway in Japan that are affecting fire protection. The trend is for further decentralization and for shifting some of the responsibility from the public sector to private industry. For example, a private organization is being given responsibility for certifying designers and installers of fire protection equipment and hazardous materials. Previously this was done by the prefectural government (in Tokyo, the Tokyo Fire Department). Certification standards are being made uniform throughout the nation. Examination fees will be charged.

In Hong Kong the territorial fire brigade functions like the fire brigade of a large city. It has 6,200 personnel, of which 2,000 are ambulance attendants. There are 48 fire stations and 13 ambulance depots. The newer fire stations have four to five bays. All fire units are part of the one centralized fire brigade, including those that serve the more rural areas. There are three major commands, Kowloon, Hong Kong Island, and New Territories. Each is semi-autonomous and is headed by a Chief Fire Officer. Hong Kong does not use volunteers.

The Hong Kong fire service is especially well-organized and prepared for fighting fires in the harbor, at sea, and on the outlying islands. Their Marine and Off-Shore Islands Division has 230 firefighters and eight fireboats, one
of which is an airport rescue launch. (Hong Kong airport extends into Hong Kong Harbor on filled land.)

All of the fire boats have crews adequate to operate all of their equipment without use of land crews. On the larger boats, there is one officer and 16 crew. On the others, the crew is 15, 11, or seven plus the officer.

Standard response for a shipboard fire is one boat dispatched directly with whatever crew is on board, plus a second that picks up a land crew and delivers them to the ship for firefighting on board. For a passenger ship a third boat is included in the initial response. (Standard response for land fires is discussed in the section on Manning and Response.)

Hong Kong has had extensive experience in fighting marine fires, including the burning and sinking of the Queen Elizabeth in the harbor in 1971 — a disaster caused by multiple arson fires; the Jumbo floating restaurant fire the same year, which was started by a welder's torch and killed 34; and many “household” fires aboard the wooden junks on which several hundred thousand people live. Also, there are continual ship collisions in the waters in and around Hong Kong to which the fire brigade responds.

Hong Kong, unlike Japan, permits trade unions in the fire service — and they have six.

New Zealand recently has chosen a different course from most Western nations in organizing its fire service. In 1976 the fire service changed from being a wholly decentralized service under local jurisdictions to a totally centralized, national fire service, one of the few in the developed world. Countries such as Japan, Great Britain, Germany, France, Sweden, and Switzerland are all decentralized, though the national government in several of these countries plays a much stronger role in fire protection than in the United States. It is important to keep in mind that New Zealand has a population of only three million, and its organization is not unlike the state-level organizations in Australia, where the states average about the same population as New Zealand.

The New Zealand Fire Service is under the direct control of the New Zealand Fire Service Commission. The Commission controls all the fire service property, buildings, and equipment formerly owned by individual jurisdictions. The Commission consists of three members appointed by the Governor-General. The Chairman of the Commission must have a special knowledge of administration and is not from the fire service. The Deputy Chairman and the third member must have been chief-level fire officers.

The Commission members have five-year appointments and are thus not directly tied to changes in the incumbent government. They are therefore somewhat freer from political pressure than would otherwise be the case. These terms also provide an element of consistency over time, and tend to negate the interruptions and drastic change inherent in transition of national governments from one party to another.

The New Zealand Fire Service, volunteers and paid, is under the operational command of the Deputy Chairman of the Commission. Command is the appropriate term, because the Commission controls every facet of fire service organization and operations, property (fire stations, training facilities), equipment (specifications and purchasing), and personnel, including the appointment of all officers.

The strong control by the Commission is balanced by an Appeals Board that settles disputes, generally those arising from personnel matters such as assignments, discipline, and retirement benefits. Another balancing force is the unions. There are three major unions (service organizations) in the NZFS, and they have a high level of input directly to the Commission. All ranks are represented in the unions, including senior officers. In effect, their management personnel are unionized.

The NZFS is divided into six regions. Each region is divided into several areas (there are 20 areas nationwide). Each area has districts and the districts have brigades. There are 270 brigades nationwide, 250 volunteers and 20 paid volunteers in support to varying degrees.

The nationalization of the NZFS seems to be generally recognized now as a “good thing.” It has brought about the following advantages:

- Better personnel utilization, training, and professional development. For example, position vacancies, especially for senior officers, are advertised nationwide. Anyone meeting the qualifications for a position can apply on a competitive basis. Lower level appointments generally are delegated to region, area, or brigade level.
- Equipment standardization, with accompanying economies of common design, purchasing, support, and maintenance. Equipment also has improved since the standard chosen was “first-class.”
- Standard command and tactics practices. This facilitates the mobility of officers among brigades and increases fireground efficiency when units from different jurisdictions operate together.
- Uniform administration and enforcement of codes and ordinances, including in rural areas.
- Centrally administered information systems, such as fire incident reporting and building inspection records.
- Common national communication linkages for routine and national emergency operations.

![Command and Control Organization of the New Zealand Fire Service.](image-url)
Leveraging limited program resources for maximum benefit, such as in public fire education.

Centrally focused research and development efforts, eliminating duplication and increasing the probability of meaningful results from adequately funded efforts.

Improved standards of training in many areas.

Fewer jurisdictional problems.

Not all of these benefits have been realized as quickly as had been projected initially, and some observers feel it will take another 10 years to realize all of the potential benefits. There have been some unexpected problems, such as localities letting water supply systems deteriorate by deferring spending on maintenance, in the absence of a local fire service to keep insisting on it. And, as could be predicted, there are some personnel with long service and some segments of the volunteers who resent the control from Wellington (the capital). But there is plenty of evidence to provide encouragement for continuing in the present direction.

The NZFS Commission pointed out that it took a special set of circumstances to make their approach practical and "the three most important factors are size, size, and size." Their approach may apply in the United States to consolidation of fire departments within counties or multicounty jurisdictions, where many of the same benefits could be expected.

The funding of the NZFS is rather unusual. National law requires that insurance-related sources provide 72.5 percent of the NZFS budget averaged over time. (The period of averaging is not specified in the law!) The government contributes 27.5 percent. The insurance-related contribution is comprised of a 22 percent tax on fire premiums levied on the insurance industry plus a tax of 24 per $100 of insurance coverage levied on the owner obtaining the insurance.

In 1983 this formula raised revenues that totaled 105 percent of the fire service budget, "a quite extraordinary state of affairs" according to a representative of the Insurance Council. Since one third of households are uninsured or underinsured, inequities are built into the system. Some people are getting a free ride. Also, the government contribution is intended to pay for protection of government buildings and installations, plus the nonfire-related activities of the fire service. As proportionately more time is spent by the fire service on nonfire activities and emergencies—about 25 percent of all calls—the government contribution becomes inadequate. The system also discriminates against rural dwellers who pay high insurance rates that carry a high tax, but do not receive as effective fire protection as others. There are other equitableness issues, too, and it is likely that adjustments to the system will be made soon.

The resources of the NZFS, serving close to 3 million people, are as follows:

- 841 fire apparatus
  (pumpers, ladders)
- 420 fire stations
- 2,545 employees, of whom
  202 are civilians
- 7,309 volunteer brigade members
- 588 volunteer fire police
- 10,442 personnel

New Zealand volunteers have some special features worth noting. The busiest all-volunteer stations often have a permanent employee, called the "stationkeeper" He is responsible for maintaining the station and its apparatus and equipment to help free the volunteers to fight fires and cut down the amount of spare time the volunteers need to spend.

In mixed brigades comprised of volunteers and paid personnel in urban areas, the volunteer's role is to back up the paid forces at larger fires and also to stand by to handle other calls while the main force is out.

A special type of volunteer is the "volunteer fire police." They assist the permanent staff at fires with crowd control, salvage, fireground security, and similar duties. They operate under control of the chief fire officer of the fire brigade.

The NZFS purchases equipment for the volunteer brigades, which removes a large burden from them.

The New Zealand Fire Service initiated an extensive capital equipment replacement program when the service was nationalized in 1976. The inventory is gradually being converted to American-made pumpers and will be more uniform than it is at present. Other nations, such as Japan, Britain, Germany, and France, also specify standards at the national level, though their individual departments can exercise discretion.

In Australia the fire service has a totally different organization from the Far Eastern countries or the United States. The national constitution of Australia gives most powers of government to the five states, and thus the fire service is organized at the state level.

In most Australian states, there is a Metropolitan Fire Brigade for the main cities and urban areas, and a Country Fire Brigade that handles fire protection in the small towns and rural areas. The National Forest Service has responsibility for national forests, parks, and other federal lands.

There may be some changes to this organization in the future. Under consideration is a possible revision to the national Fire Brigade Act that would pass code enforcement to local building authorities. Also being considered is the establishment of auxiliary (volunteer) firefighters in metropolitan brigades, as exist in some Japanese cities and New Zealand.

More fundamentally, Australia has considered consolidation of the metropolitan and rural fire services at the state level. One concern holding back further consolidation is that volunteers might drop out, thereby raising the cost of the fire service. The volunteers are concerned that they would be left out by the paid service. Neither happened in New Zealand.

In most of the Australian states the fire service is run by a board of civilians. However, the South Australian Metropolitan Fire Service, headquartered in Adelaide, is directed by a corporation of the state government, run
by fire officers. This agency is responsible for the area around the city of Adelaide plus 20 outlying “county centers” that are towns of 20,000-40,000 people located throughout the state. The agency reports to the Minister of Emergency Services, as does the police department. This has improved the cohesion and cooperation between the two services.

Funding for the fire service in most states in Australia, as in New Zealand, is primarily based on insurance (75 percent) with the rest split between the state (12.5 percent) and federal government (12.5 percent). Budgets are set by the boards that run the fire services in each state, and the necessary sum is levied against all insurance companies doing business in the state.

There is pressure from the insurance industry to get out of this direct funding, and alternative approaches are being considered. For example, volunteer fire service equipment costs are shared 50-50 between the local municipality and the Country Fire Service in South Australia.

Queensland has been the first state to break the pattern of insurance funding. The tax for fire services there is levied directly on homeowners. All commercial properties are taxed directly rather than through insurance premiums.

Ancillary sources of revenue in Australian departments include fees for plans reviews, fees for servicing fire equipment, sales to industry of fire service patented inventions such as valve monitoring devices, and sales of fire safety training services for the private sector.

In the state of New South Wales, a “turnkey” fire brigade is provided to any outlying community whose population reaches 900. The state establishes a volunteer fire brigade, recruits personnel, and gives them a fire station and all necessary equipment.

A mechanism for problem-solving of common issues among the Australian states is the “Assembly of Fire Authorities,” which has representation from all state-level boards and commissions. Its coordinating steering committee is comprised of the chief fire officers of these organizations. This is a small, key group of seven to eight principal fire service managers that brainstorm together and represent key elements of the Australian fire service. They meet one or two times a year to discuss mutual problems, plan for the future, and coordinate common interests.

Within the last decade a series of Building Fire Safety Committees have been established throughout South Australia. They are comprised of local authorities and the fire service. They look for possible life safety hazards in existing buildings. The committees have the power to enforce recommendations, whereas the fire service does not. Consequently, the committee is used by the fire service as a vehicle for implementing change. A Salvation Army boarding home fire in the 1970s triggered the creation of this committee structure.

The mix of personnel and equipment varies from state to state in Australia. There are no national standards. In South Australia the Country Fire Service, which serves 96 percent of the vast state area, has 460 fire stations with over 800 pieces of apparatus (one to two per station). There are 15,000 registered volunteers, but hundreds of others “just show up” at fires to help. To lead and support the volunteers, there are 38 paid firefighters including 16 officers.

In Victoria the Country Fire Brigade has 106,000 volunteers and 626 paid. Half of the paid staff are in operations; the others are shop and maintenance people who build the apparatus and communications systems. Country brigade professionals must previously have been volunteers. Two thirds of their budget comes from the insurance industry, one third from the state government.

The Melbourne Metropolitan Fire Brigade, which serves the metro areas of the state of Victoria, in 1983 had 1,770 firefighters plus 280 civilian personnel, or 2,050 in total. They man 47 fire stations and 170 pieces of apparatus, with an average of about four per station.

At the federal level in Canberra, Australia is the Commonwealth Fire Board, which is a fire safety advisory board for the Commonwealth (i.e., federal) Government departments and authorities. The Board is comprised of a fulltime chairman and five part-time members representing various departments, a major fire research organization, and the capital city of Canberra’s Fire Service, which is independent of the brigades in its surrounding state.

MANNING AND RESPONSE

In general, fire departments in Japan send more men and more equipment to a first alarm response than in the United States, but the response takes somewhat longer to get there. Levels of manning and apparatus in Japan are still affected by the decision to follow the American National Board of Fire Underwriters guidelines set in 1949, such as one station with three engines per 10,000 population, five men per engine, 14 fire prevention officers per 100,000 population. Actual values today are about 80 percent of those old standards — without counting the one million volunteers!

The Tokyo Fire Department has 18,000 paid personnel serving 11,350,000 citizens, or 16 per 10,000, plus the 25,000 volunteers. The department staff was increased by 75 percent in the late 1970s for three main reasons: to reduce hours worked and change from two shifts to three, to keep up with the expansion of the city, and to provide a large increase in fire prevention manpower resources for purposes such as detailed fire inspections and public education. The shifts now are 24 hours on, 24 hours off, eight hours on. At least part of the eight-hour shift is usually spent on prevention. Out of the 18,000 personnel, 1,850 are assigned to prevention fulltime, and 1,300 are ambulance attendants. There are 286 fire stations and branch stations.

Tokyo has a particular manning problem because of an old, low-pressure water supply in some parts of the city. As a result, they typically send seven to eight pumpers on a first due response, with pairs of engines acting in tandem to get the pressure high enough. (Thus they have the water throwing capacity of four or fewer U.S. companies.)

In addition to the seven or eight pumpers, the first due response

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Firefighting and Firefighter Safety
includes one to two ladders, an ambu-
lance, a chief's car, and a public
relations car. A mobile command cen-
ter might also be sent. The response
time in Tokyo is five to seven minutes
for the first units plus another three
minutes to get water flowing. Only 23
percent of the pumps carry water.
The rest are small so they can manu-
ver in the narrow streets.
Response times in the rest of Japan
are similar to Tokyo's. Fifty percent of
fires nationally are responded to in less
than five minutes. In 90 percent of
fires, water is flowing in less than 10
minutes.

In Kyoto (pop. 1,480,000) the older
shift format of 24 on, 24 off is still
used. Sixteen hours on duty and eight
sleeping comprise the 24 hour shift.
Part of the shift may be spent on pre-
vention duties. Firefighters are not
allowed to hold second jobs.

Kyoto has 11 fire stations and 35 sub-
estations, or a total of 46. There are
1,738 paid personnel or 12 per 10,000,
plus the 4,000 volunteers. One typical
downtown fire station has 133 men as-
signed to it. Its standard response to a
first alarm is five to six pieces of appa-
ratus, a rescue car, a chief's car, and an
ambulance. There are four to five men
per apparatus. The mix of units sent
varies depending on the type of area.
Sometimes it is two ladders and three
pumpers, sometimes five pumpers. Its
water supply is good though the pipes
are old. Average response time is six
minutes. They try to keep it under
eight.

In Osaka (pop. 2,700,000) there are
3,491 personnel in the fire department
(13 per 10,000), of which 3,296 are uni-
formed. About 25 percent are officers.
Nonuniformed personnel include
clerks and technicians. There are no
volunteers. The fire department oper-
ates 25 fire stations and 64 branch fire
stations, or a total of 89.
The large Japanese departments are
enhancing their computer-assisted dis-
patch systems with automated libraries
of building plans. In Osaka and Tokyo
facsimiles of building plans can be
transmitted to units at the scene of a
fire. At present Osaka holds plans for
10,000 buildings in its dispatch center
database. Each building has an average
of four sheets of plans. When there is a
fatality, the location can be marked on
the plan by the fire unit on the scene
and transmitted back to headquarters
for public information purposes.
In Hong Kong four pieces of appara-
ratus respond to first alarms for any fire,
including a pumper, aerial (ladder),
snorkel, and light rescue or other appa-
ratus. If there are known casualties, an
ambulance also responds. The pumper
crew is eight men — an officer, a driver,
and six crew. The aerial and snorkel
each have six men — an officer, a driver
and four crew. The ambulance has a
crew of two. Typically 22-29 men in
total arrive at the scene. The response
time goal is six minutes in town.
The high manpower levels are justified
partly on the basis of reducing fatigue
and partly on the need for a large crew
at highrise fires. The crew for the
pumper is used as follows: Two men
connect the hydrant to the vehicles.
Two advance the line into the building.
One man and an officer go to survey
the scene. The driver stays with the
vehicle. One man stays with the hydrant
and protects the water supply. The
valve for the hydrant may be in the
roadway, and he needs to watch for ve-
hicles passing through the street, which
may not be blocked off because of the
resulting congestion. He also acts as a
spare crew member.
A second alarm is sent automatically
for any fire in a squatter area or for
special risks, such as hospitals and un-
derground malls or stations. This aids
escape and rescue activities.
There are two water systems in Hong
Kong — a fresh water supply (red
hydrants) and a salt water supply
(yellow). Fresh water is sometimes in
short supply.
In Auckland, New Zealand, the of-
ciner on duty in the dispatch center has
the authority to call out whatever re-
sources he feels are needed on an al-
arm. He makes the decision, and thus
responses to first due alarms are varied.
Typically, the first alarm response to a
building fire is three pumpers, with
one to four men per unit. For lower
risks, one or two pumpers may be sent.
Response time goals vary with cate-
gory of risk. For the highest risks, such
as highly concentrated commercial and
business areas, the goal is five minutes.
For business areas in medium size
towns, it is 10 minutes. For small towns
and rural areas, it is 25 minutes.
The Sydney fire brigade has a stand-
ard response to a building fire of two
companies, each with an officer, a
driver, and five firefighters. Outside the
city, they use one officer and three fire-
fighters per company.
The Melbourne Metro Fire Brigade's
response time goal is five minutes in
urban areas.

SPECIAL FIRE APPARATUS
AND EQUIPMENT

Some of the countries visited for this
study had some unusual fire apparatus
or used some familiar vehicles in dif-
ferent ways.
Prevention Vehicles — The most
startling apparatus in Japan are the
fleets of motorbikes and public infor-
mation cars used by firefighters as-
signed to prevention duties. These have
been discussed in previous sections. In
addition to their practical value, they
are a visible sign to the firefighter that
prevention is taken seriously.
Helicopters — The large cities in
Japan are using helicopters for an in-
creasing number of purposes. In Tokyo
and Osaka live TV pictures are broad-
cast to fire headquarters from large
working fires. The pictures are re-
corded on videotape and are used to
give senior personnel a more accurate
idea of what is happening and to
provide material for doing postmor-
tems. The films also are used to brief
press and visitors and to convince legis-
lators of fire department needs. To fa-
cilitate broadcasts, the helicopters
lower an antenna that allows very high
quality pictures to be received despite
the many highrise buildings.
Helicopters are used to transport
water and spray it on a fire from the air,
especially for woodlands fires. A foam
unit suspended from a helicopter on a
long line is used for petroleum fires.
Helicopters are used for aerial in-
spections, photos, and fire guard func-
tions. Helicopters in Osaka and Kyoto
are used to patrol for fires, especially in
buildings or to reach remote or poor access areas. Fire departments practice dropping troops by lines onto the roofs of buildings.

With this increasing range of uses, the helicopters are growing in importance. Tokyo now has a fleet of five helicopters, and several other large cities are expanding their fleets. The helicopters range from four- to 20-seaters.

**Remote Control Squirt with TV** — The Kyoto Fire Department has developed a remote control squirt that has a TV camera mounted just above the water nozzle. This allows them to run the arm over the top of a roof or to an area where it is difficult or hazardous to put a ladder, and to see if any fire is present. The TV camera is in a box with a glass front plate that has a windshield wiper on the outside so that the camera may be operated while water is flowing. Spotlights are attached at each side of the camera. A TV monitor is attached to the vehicle by a cable. It provides a closed circuit picture of the view from the camera. The apparatus is pictured at the left.

**Smoke Rescue Vehicle** — The Osaka Fire Department designed a clever vehicle for rescuing people from underground shopping centers where smoke is present. The vehicle is about the size of a jeep, has six wheels, and is articulated in the middle so that it can ride up and down stairs leading to underground shopping malls or subways. It has two simple “obstruction sensors” (antennas) that look like insect feelers and that project a weak beam for several meters in front of the vehicle. These show an image on an oscilloscope on the dashboard to indicate if there are obstructions. The vehicle can be operated by two firefighters wearing breathing apparatus. There are an additional two seats to carry out victims, each seat with breathing apparatus attached. Two such vehicles can be transported to the scene of a fire by a special flatbed transport truck.

Apparently this vehicle has never been used in practice. The citizenry has been well trained to escape from smoke and usually are gone by the time the fire department arrives with this vehicle. Also, there is a hazard of running into people as you drive this vehicle through smoke, not to mention the hazard of operating the vehicle in poor visibility conditions. Nevertheless, there may be some situations where visibility is adequate to drive and not everyone has been able to escape. It demonstrates some of the imagination and experimentation going into special apparatus for fire protection.

**Wall Driller** — Another fire vehicle created by the Japanese is a massive drill mounted on a truck bed that can make a hole in the side of building for injecting water when other access points are blocked. This might occur, for example, when the walls are windowless or windows have been bricked or boarded up. The vehicle has not had occasion to be used in practice.

**Heavy Pumper** — Hong Kong has a specially designed compact super pumper with a large Rolls Royce engine that is intended to throw large quantities of water on a disaster, such as an air crash within the city. A number of extra-large hydrants (about five feet high) designed to be used with the super pumper are placed strategically throughout the downtown area. The pumper has 10 outlets that each can deliver 200 gallons per minute, or 2,000 gallons per minute in total.

**Light Pumpers** — Hong Kong has 18 Ford Transit light pumping vehicles for fast response to remote areas and hard-to-reach places. They are essentially a van with a hose reel and pump under the van hatch and a ladder on the roof. For speed and mobility in fighting grass and shrub fires, Melbourne uses a four-wheel drive pumper. (A variety of such vehicles are commonly used in the United States, especially in the West and Southwest.)

**Aerial Trucks with Elevators** — The taller Hong Kong aerials — with ladders up to 50 meters — have elevators that can lift three men over 10 stories. Kyoto’s aerials have two-man elevators. These cut firefighter exertion and are considered safer for firefighters and civilians compared to climbing.

**Escape Towers and Chutes** — In addition to the usual types of aerial ladders, Japan continues to make extensive use of escape towers in which a cage is raised on a telescopic arm up to
the level of a window where victims can be taken out or fire crew admitted. The Japanese also use a device that raises an escape chute (a sock-like sleeve) to a highrise window. Victims climb into the chute and descend automatically to the ground. Aerial ladders in some cities (e.g., Kyoto) also are equipped with escape chutes.

Another escape device is a nylon sling with which a victim can descend to the ground. The speed of descent is automatically regulated. The device to which the sling is attached is erected by an aerial truck.

**Robot Vehicles** — The Japanese have experimented with robot fire vehicles that have caterpillar treads and carry a foam gun. They can get closer to a fire than a firefighter and can be used in hazardous situations, such as in refinery fires or when an explosion is threatened. The vehicles are controlled by radio or by a fiber optics connection. They are transported to the scene in fire vehicles designed with a storage space instead of a water tank. Such vehicles are in operational service.30

**Customizing Vehicles** — The Melbourne fire brigade customizes its own fire apparatus, using its shop personnel. In the same state of Victoria as Melbourne, the Country Fire Brigade designs and builds its own apparatus. In 1976 they began using fiberglass for bodies.

**Standardizing Vehicles** — New Zealand is moving toward nationwide standardization of fire apparatus. All are purchased now at the national level. The state of Queensland, Australia, is doing the same at the state level.

**Low Profile, Computerized Stability Ladder** — Melbourne uses a ladder truck with a low height of 2.85 meters (9’4”) versus their previous conventional 3.46 meters. It gives greater maneuverability under low bridges and arches. The ladder also has adjustable width extension jacks that allow a range of extension from 2.35 to 4.5

---

30Some American departments such as Scottsdale, Arizona, also have experimented with similar but smaller remote control vehicles that look like miniature tanks. Others are under development.
meters. An onboard computer automatically resets safety devices on the
display panel to correspond to permissible projections of the ladder rela-
tive to the stabilization width to which the jacks are set.

**Fireboats** — In both Japan and Hong Kong more fireboats are used
than in comparable size U.S. cities today. Tokyo has nine, Hong Kong eight.
Crews are much larger than in the United States.

The newest and largest fireboat in Hong Kong has a telescopic snorkel
that can reach up 75 feet to the deck level of large ships. The fireboats are
intended to be used for rescue operations when a boat or a ship accident oc-
curs, but commercial or private boats in the crowded harbor often get to the
scene first.

**Fog Gun Nozzle** — The city of Osaka has developed a new “fog gun”
nozzle for use in small fires in me-
dium- and highrise buildings. Such
fires often result in more water damage
to lower floors than the original fire
damage. The fog spray has proven
effective in extinguishing fires in com-
partmented spaces with a relatively
small volume of water. The fog gun is
now in widespread use in Osaka.
IV. OTHER EMERGENCY SERVICES: EMS AND DISASTERS

The fire services in most countries see themselves as first responders for a wide range of emergencies and disasters, not only fires. In Japan there is much attention to preparations for earthquakes and the fires that follow them, which usually cause most of the “earthquake” damage. In Hong Kong there has been attention to preparing for air crashes and water accidents. New Zealand and Australia similarly prepare for a wide range of disasters and nonfire emergencies.

Although these subjects were beyond the scope of this report, some interesting information on EMS and disaster preparation was collected incidental to the main research and is summarized briefly here.

EMERGENCY MEDICAL SERVICES

In Japan emergency ambulance service is provided by specially trained firefighters. They are not permitted to administer medicines, give injections, or employ many other practices common to EMS in the United States because of their national law restricting such care to doctors. Their role is mainly first aid and transport.

One of the notable aspects of EMS in Japan is the information available in fire department dispatch centers on hospitals that have emergency facilities. In addition to displaying the status of every fire company as to whether it is in service or returning from a fire or in quarters, there is another set of status reports dealing with hospitals. For each hospital, information on its emergency resources, such as the number of beds and the presence of specialists, is stored in the dispatch computer. For example, the computer stores and can display the status of intensive care units, cardiac care units, the number of plastic surgeons, brain surgeons, hand surgeons, children's surgeons, and burn specialists and the corresponding number of beds available at various hospitals. The hospitals relay their status to the fire department computer via input units that transmit over phone lines. Smaller hospitals that do not have an input unit call the local fire station, which in turn inputs their status to the headquarters computer.

Tokyo and Osaka both have such emergency care data systems as part of their dispatch centers.

The fire service uses the information on hospitals to direct EMS units to deliver patients with particular types of injuries to the most appropriate nearby facility. If someone has a mangled hand, for example, you would like to send him to a hospital that has a hand specialist rather than one with only general surgeons.

One problem of EMS service in Japan that is shared with the United States is the large number of calls for nonemergency medical treatment or types of medical service not intended to be provided by the EMS units. To reduce these unnecessary runs, information about when to call the EMS service is provided as part of fire prevention education activities.

In Hong Kong the fire service provides the full range of emergency services, including rescue and EMS. In 1982 there were 276,000 ambulance calls, or over 30 per hour, compared to 14,500 fire calls. Other than EMS and fires, the leading type of “special services” call was for people trapped in elevators.

The New Zealand Fire Service is recognized as their nation's only disciplined force “ready to go” in any type of emergency. The Police Force never has been structured, equipped, or trained to provide emergency services, such as automobile accident extraction, hazardous chemical incidents, etc. The NZFS does not provide emergency medical service; that is provided by ambulance brigades, which are organized with fulltime professional staff in larger cities and community volunteers in many others. Where ambulance brigades are not available, hospitals often provide the ambulance service. In spite of the fire service not handling EMS, their ratio of fire-to-nonfire calls is now about 50:50. It used to be overwhelmingly fires (14:1) in 1970.

In Australia the fire service does little EMS work. The firefighters usually have CPR training but not much beyond that. The ambulance service is separate from the fire service and is responsible for EMS. It has a state charter, receives a subsidy, but operates like a private company.

EARTHQUAKES

As mentioned above, Japan has made extensive preparations for earthquakes and the subsequent fires in all areas near earthquake prone zones, which includes almost all of the country. One line of defense is the widespread instruction on how to fight incipient fires and how to prevent fires after an earthquake by measures such as shutting off utilities.

Another education approach makes use of a portable “shakebox” on a trailer in which citizens can experience what being in an earthquake is like. They also are instructed on what to do and can practice safe actions. (Similar trailers are used in California at the present time.)

Earthquake preparation literature is distributed along with fire prevention literature at various times of the year, especially on days designated as “disaster preparation days” in several cities. The literature often has the symbol of the catfish on it. The catfish serves much the same purpose for earthquake safety education in Japan as Smokey the Bear does for forest fires in the
United States. The catfish was chosen as a symbol because, according to Japanese legend, a huge catfish moved the earth. Also, many people think that catfish sense earthquakes ahead of time, and that observing their behavior can provide some lead time in preparing for an earthquake. Scientists apparently find some truth to this, since the bottom-lying Japanese catfish are able to sense earth tremors.

Another major aspect of earthquake preparation is the construction of many large cisterns (e.g., 100 m³) that hold emergency water supplies, and the distribution of small pumps that can be used by volunteer firefighters and citizen fire brigades.

In Osaka the city maintains a “City Protection Center” for earthquakes. It has displays on what to do in case of an earthquake and demonstrates what happens using a “shaking room.” About 35,000 visitors annually attend the Center. As mentioned earlier, every household is given a brochure on how to deal with various types of disasters, including earthquakes, floods, and typhoons.

In Tokyo taxis all are equipped with fire extinguishers to help fight fires following an earthquake.

FLOODS AND OTHER DISASTERS

About 120 large and small rivers run through Tokyo, and some areas are below sea level. The city has 164 areas designated as vulnerable to flooding. When a flood is expected, off-duty firefighters are recalled, and the large volunteer corps is summoned. The fire department drills for flood protection and rapid erection of sandbag barriers.

In Melbourne an exceptional facility for disaster training is built into the understructure of the new fire headquarters building. It is a realistic simulated disaster area.

In the state of Queensland the fire service is in charge of hazardous materials incidents, and disasters when fire is present. The police are in charge of all other disasters.

EMERGENCY TELEPHONE NUMBERS

Tokyo has been allocated 54 radio frequencies to use for its range of emergency services.

In Japan the number for reporting a fire or calling an ambulance is 119. In New Zealand it is 111 and in Australia it is 000; these may be easier for children and the elderly to remember.

In Japan calls to 119 directly reach the command and control center of the local fire department (versus in the United States and Europe, where “911” calls may be first received by a dispatcher or operator in a central communications center and then connected to the fire department if a fire is involved).
Appendix A
PRIVATE FIRE PROTECTION ASSOCIATIONS IN JAPAN AND ASIA

In addition to the fire service, there are a number of private and semigovernmental organizations that act as conduits of ideas, training, research, or funds for fire protection. Several that play important roles in Japan and Asia are described briefly below. Some of their activities have been noted throughout the body of the report, too.

FIRE CHIEFS ASSOCIATION OF JAPAN
The Fire Chiefs Association of Japan functions much as does the International Association of Fire Chiefs in the United States. All the members of the FCAJ are members of the International Fire Chiefs Association of Asia. Both of these organizations are highly active and have regular meetings for the exchange of ideas.

The FCAJ was established in 1949 with the purpose of maintaining harmony and coordination among fire chiefs, exchanging ideas and information, studying fire service systems and techniques, and cooperating with each other to solve common problems so as to contribute to the development of the Japanese fire service. The FCAJ now has a membership of all of the 915 fire chiefs in Japan.

The Association is charged with carrying out the following works:
• Exchange of fire service information and ideas.
• Improving the fire service system and related laws and resolutions.
• Securing financial resources to improve fire service strength and fire protection equipment.
• Betterment of firemen’s working conditions.
• Study of fire equipment and technology.

• Improvement of fire prevention administration and firefighting techniques.
• Studies concerning control of hazardous materials.
• Establishment of measures against special disasters.
• Public relations and promulgation of fire prevention consciousness.
• Improvement of the ambulance service and emergency medical system.
• Review of problems regarding fire protection districts.
• Counseling and answering inquiries from member fire departments.
• Making requests and appeals to the National Assembly, government, and concerned agencies.
• Communication and cooperation with the national government and concerned agencies.
• Organization of study meetings and seminars.
• Publishing the Association’s monthly magazine.
• Commendation of firemen with meritorious deeds and citizens who cooperated with the fire department, and conducting memorial services for the deceased.

To carry out this charter, the Association holds a general conference and area meetings every year. It has 10 committees on fire service laws and regulations, finance, personnel and training, techniques, fire prevention, fire suppression, public relations, ambulance service, fire protection districts, and hazardous materials. The committees study the respective problems and submit suggestions and recommendations on how to improve the Japanese fire service.

JAPAN FIRE PROTECTION ASSOCIATION
The Japan Fire Protection Association (JFPA) is quite different from the National Fire Protection Association in the United States. While its main purpose is to raise fire safety awareness and knowledge, the JFPA has little responsibility for codes, research, or data.

The primary activity of the JFPA is the establishment and coordination of fire prevention clubs for women and children, as discussed in Chapter II. They also develop and distribute fire protection literature, films, and the like. They sponsor and financially support courses for fire protection managers and private fire protection organizations.

Most of their funding comes from donations from private sources such as lotteries and the motor racing associations. They also gain revenues from the sale of publications but give many of their publications away.

JAPAN FIREMAN’S ASSOCIATION AND FEDERATION OF WORLD VOLUNTEER FIREFIGHTERS ASSOCIATIONS
The Japan Fireman’s Association previously was called the Japan Volunteer Fireman’s Association. It should not be confused with the similar sounding (in English) Fireman’s Association of Japan, described below. The Japan Fireman’s Association has 1,052,000 volunteer firefighter members and 58,000 paid firefighter members (or half of the 128,000 paid firefighters in Japan). The members technically belong to 47 prefectural fireman’s associations (one for each prefecture in Japan). The prefectural associations are the members of the national.

The Association:
• Awards “excellent unit” citations to volunteer departments.
• Awards individual volunteers for meritorious deeds, good performance over an extended period, and long service.
• Makes welfare payments for death and disablement.
• Holds firefighting contests.
• Subsidizes the purchase of fire apparatus.
• Gives uniforms to outstanding women's civilian brigades.
• Sponsors firefighter overseas visits (95 in 1982).
• Distributes fire prevention posters (550,000 in 1982).

The Association receives 86 percent of its annual budget of $6.5 million from the Japan Shipbuilding Industry Foundation.

Recently the JFA helped to establish the Federation of World Volunteer Firefighters Associations to create a forum for exchange of information among volunteers internationally. In 1983, it was recognized and registered as a Non-Governmental Organization of the United Nations.

FIREMEN’S ASSOCIATION OF JAPAN

With the return to locally run municipal fire services in Japan in March 1948, the Firemen’s Association of Japan was established for the purposes of undertaking research and studies on the control of fires and other disasters, promoting fire protection consciousness among civilians, training firemen, and strengthening municipal fire service systems.

The Association is comprised of the 128,000 paid firemen in Japan and considers itself the professional career firefighters’ association.

The Association carries out the following works:
• Promulgation of disaster preparedness among people.
• Publishing of fire service training manuals, disaster preparedness books, and other publications.
• Organization of seminars, lecture meetings, and other meetings.
• Organization of technical classes and guidance on fire protection management, ambulance and first-aid techniques, and fire equipment.
• Life and other insurance services for members.
• Promotion of welfare of members.
• Training and education of members.
• Coordination and cooperation with concerned government agencies and fire service organizations.

INTERNATIONAL FIRE CHIEFS ASSOCIATION OF ASIA

The International Fire Chiefs Association of Asia (IFCAA) was established in May 1960. It facilitates the exchange of information and development of fire service techniques in Asian countries. Meetings are held once every two years; in 1984 it was in Manila.

It was at the 10th General Conference of the Fire Chiefs Association of Japan that the idea for this organization originated. Fire service leaders from several Asian countries made a joint proposal that an international organization be established for the development of the fire service in Asia. In response to their request the FCAJ set up an organizing office and arranged the first meeting in 1960.

The Association now has about 1,200 members from 15 countries, including Bahrain, Bangladesh, Hong Kong, India, Indonesia, Israel, Japan, Korea, Malaysia, New Zealand, Papua New Guinea, Philippines, Singapore, Thailand, and Taiwan. It also has more than 150 honorary members from 19 other countries.

The IFCAA is now one of the three largest international fire service associations, together with the International Association of Fire Chiefs and the International Technical Committee on Fire Prevention and Extinction (in Europe).

JAPAN FIRE RESEARCH INSTITUTE

This organization is part of the Fire Defense Agency and generally plays a role similar to that of the Center for Fire Research of the U.S. National Bureau of Standards. The research areas vary from year to year and include both applied and theoretical studies.
## Appendix B
### FIRE SERVICE TRAINING CURRICULA FROM TOKYO AND HONG KONG

#### CURRICULUM — TOKYO

1. **Recruit Course**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Period</th>
<th>Firemen (College)</th>
<th>Firemen (High School)</th>
<th>Firewomen (College)</th>
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<tbody>
<tr>
<td>Director's talk</td>
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<td>Chief's talk</td>
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</tr>
<tr>
<td>Ethics</td>
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<td>3</td>
</tr>
<tr>
<td>Guide to discharge of duty</td>
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<tr>
<td>Outline of organization</td>
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<tr>
<td>Outline of laws</td>
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<td>Fire service laws and regulations</td>
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<td>Hiking</td>
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<tr>
<td>Flower arrangement and tea ceremony</td>
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<td></td>
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<td>Extracurricular lessons</td>
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<tr>
<td>Execution of duties</td>
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<td>25</td>
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<td>Preparation of documents</td>
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<td>Lecture on hygiene</td>
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<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Tour of fire stations</td>
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<td>15</td>
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<tr>
<td>Buildings and fire protection</td>
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</tr>
<tr>
<td>Fire protection systems</td>
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<td>Fire service and electricity</td>
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<td>Hazardous materials</td>
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<td>Education of citizens</td>
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<td>Fire prevention management</td>
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<tr>
<td>Handling of fire prevention puppets</td>
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<td>Handling of 16 mm projector</td>
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<td>Fire inspection</td>
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<td>Fire suppression</td>
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<td>Safety management</td>
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<td>Combustion &amp; extinguishment</td>
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<tr>
<td>Disaster preparedness</td>
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<td>15</td>
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<tr>
<td>Fire equipment</td>
<td></td>
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<tr>
<td>Ambulance service</td>
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<td>Manners &amp; drill</td>
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<td>Fire fighting</td>
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<td>Breathing apparatus</td>
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<tr>
<td>Rope knots</td>
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<tr>
<td>Rescue</td>
<td></td>
<td>14</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Handling of fire equipment</td>
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<td>13</td>
<td>17</td>
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</tr>
<tr>
<td>Standpipe practice</td>
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<td>25</td>
</tr>
<tr>
<td>Gymnastics</td>
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<td>25</td>
<td>29</td>
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<tr>
<td>Kendo fencing</td>
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<tr>
<td>Graduation inspection</td>
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<td>2</td>
</tr>
<tr>
<td>Orientation</td>
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<tr>
<td>Others</td>
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<td><strong>Total</strong></td>
<td></td>
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<td>650</td>
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Note: 1 period is 70 minutes
## CURRICULUM

### 1. Recruit Course (continued)

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<thead>
<tr>
<th>Subject</th>
<th>Hours</th>
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<tbody>
<tr>
<td></td>
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<tr>
<td>Basic actions</td>
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<tr>
<td>Regular inspection</td>
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<td>Other manners</td>
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<td>Pump practice</td>
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<tr>
<td>Combined firefighting drill</td>
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<td>Rope knots</td>
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<tr>
<td>Ladder practice</td>
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<tr>
<td>Handling techniques</td>
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<td>In-smoke drill</td>
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<tr>
<td>Hydraulic rescue equipment and gasoline driven saw</td>
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<tr>
<td>Lighting equipment</td>
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<tr>
<td>Escape equipment</td>
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<tr>
<td>(incl. combined drill)</td>
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<tr>
<td>Operation of various equipment</td>
<td>6</td>
</tr>
<tr>
<td>Rope bridge, sling down with and without victim on back</td>
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</tr>
<tr>
<td>Emergency rescue and descending lifeline</td>
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</tr>
<tr>
<td>Standpipe practice</td>
<td>3</td>
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<tr>
<td>Combined drill</td>
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<td>Graduation inspection</td>
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<tr>
<td>Gymnastics</td>
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<tr>
<td>(A)</td>
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<tr>
<td>Kendo fencing</td>
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<tr>
<td>*a 214 HRS</td>
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<tr>
<td>*b 186 HRS</td>
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<tr>
<td>21%</td>
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<tr>
<td>Individual activities</td>
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<td>*c 185 HRS</td>
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<tr>
<td>21%</td>
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<tr>
<td>Orientation</td>
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<tr>
<td>Others</td>
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</table>

| Total                                                                  | 1,046 | 870 | 870  |

- Appendix B
### 2. Officer Courses

(A) Fire Lieutenant Course

<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours</th>
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<tbody>
<tr>
<td>Chief's Talk</td>
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## (A) Fire Lieutenant Course (continued)

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## (B) Fire Captain Course

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<td>Company deployment and command and control</td>
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## CURRICULUM — HONG KONG

### 1. Recruit Course

Note: 1 period is 60 minutes

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All recruits to be examined in the following:


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Appendix B
## 2. Station Officer Course

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<td>3</td>
<td>Breathing apparatus course — compressed air</td>
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<td>4</td>
<td>Bridger line gun</td>
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<td>5</td>
<td>Building construction, air conditioning and natural ventilation</td>
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<td>6</td>
<td>Conduct and discipline</td>
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<td>4</td>
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<td>7</td>
<td>Dangerous goods</td>
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<td>8</td>
<td>Electricity</td>
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<td>Fire extinguishers</td>
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<td>Fire Services Organisations, Ordinances, Orders and Administration</td>
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### 809

| Reception | 7 |
| Opening Address by C.T.S. | 1 |
| Quiz or Test — Weekly | 37 |

### 43

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<th>Contingency</th>
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<td>Talk on Supervisory Accountability by Officer of ICAC</td>
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<td>Visits — In Service — (MC) and other F.S. units</td>
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<td>Visits — Non Service — F.S.I., Lift Motor &amp; Fireman’s Lift</td>
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<td>Visits — Non Service — Special Risks</td>
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<td>Visits — Non Service — Others</td>
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<td>Revision, Passing-out Drill, Final Examination</td>
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### 1014

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