Fire Risks Series

Fire Risks for the Blind or Visually Impaired

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FEMA

Fire Risks for the Blind or Visually Impaired

December 1999

U.S. Fire Administration
Mission Statement

As an entity of the Federal Emergency Management Agency, the mission of the United States Fire Administration is to reduce life and economic losses due to fire and related emergencies, through leadership, advocacy, coordination, and support. We serve the Nation independently, in coordination with other Federal agencies, and in partnership with fire protection and emergency service communities. With a commitment to excellence, we provide public education, training, technology, and data initiatives.

On March 1, 2003, FEMA became part of the U.S. Department of Homeland Security. FEMA's continuing mission within the new department is to lead the effort to prepare the Nation for all hazards and effectively manage Federal response and recovery efforts following any national incident. FEMA also initiates proactive mitigation activities, trains first responders, and manages Citizen Corps, the National Flood Insurance Program, and the U.S. Fire Administration.

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OVERVIEW OF THE "FIRE RISKS" SERIES

This report is one in a series of four that discuss the increased fire risks for four groups of the general population:

- older adults;
- the mobility impaired;
- the deaf or hard of hearing; and
- the blind or visually impaired.

Older adults--those over 65 years of age--are a group with one of the highest fire risks in the United States, in large part because they are the fastest growing segment of the U.S. population. Of course, many older adults also may fall into the other three groups, since the elderly suffer some or all of these impairments to a much greater degree than does the general population.

People who are deaf or have hearing impairments, those who are blind or have vision impairments, and those with mobility impairments may face unique challenges in an emergency. Their ability to detect a fire or escape its effects may be hindered by their impairments. As a result, people with these impairments are at a greater risk of death or injury due to fire.

As might be expected, many of the fire safety issues are a concern for all four groups. This commonality is reflected in the reports, particularly in the fire safety tips, most of which apply to all the groups. These safety tips are presented in an appendix at the end of each report, organized in three sections: before the fire, during the fire, and fire prevention. The tips that are common to all four groups are summarized here:

Before the fire:
- identify the nearest fire exit;
- install smoke alarms;
- live near an exit;
- plan and practice escape plans; and
- involve the fire department.

During the fire:
- get out and stay out;
- test doors before opening them;
- stay low and go;
- what to do if you are trapped; and
- stop, drop, and roll.

Fire prevention;
- cooking;
- electrical safety;
- smoking;
- space heaters;
- heating; and
- fireplaces.

EXECUTIVE SUMMARY

Blind or visually impaired people are faced with many challenges, not the least of which is personal safety. Interaction with an environment one cannot see creates potential health and safety hazards. As a result, blind or visually impaired people are at increased risk of injury and death in the event of a fire. Depending on the severity of vision loss, they may be more likely to ignite a fire accidentally through common household activities, while they are less likely to extinguish or escape one. Further, a blind or visually impaired individual is highly vulnerable to sustaining burns by attempting to suppress a small fire.

Practicing fire safety is the most effective means for a blind or visually impaired person to improve his or her chances of surviving a fire. For example, by planning and practicing an escape plan, a blind or visually impaired person can escape to safety, in the event of an actual emergency, with little time lost searching and feeling for an exit. The general fire safety tips that are targeted at the seeing population also address the needs of the blind or visually impaired. Unfortunately, blind or visually impaired people often have been overlooked by public fire education campaigns. Innovative mechanisms by which to disseminate these life-saving messages must be sought in order to raise awareness and foster fire safety practices in the blind and visually impaired community.

The most important findings of this report follow:

- During an emergency, the senses on which visually impaired or blind individuals depend may be overwhelmed.

- High-decibel smoke alarms make it difficult for the blind individual to process audible clues and instructions effectively.

- Many buildings are not equipped with Braille or tactile signage for the visually impaired, hindering the individual's ability to escape because of lack of directions.

- As they may not be able to process visual indicators of fire, individuals with visual impairments are at an increased risk for accidents involving fires and burn injuries.

- Public fire education generally is not formatted for, nor directed to, the blind or visually impaired.

- Practicing fire safety, rather than using improved fire technology, is the most effective means by which blind or visually impaired people can improve their chances of surviving a fire.

People who are blind or visually impaired live in a world without images or, at best, with unclear ones. For people with sight, the sense of vision is the primary means for assessing and interpreting clues in the external environment. As images are transferred to the brain, we react both physically and emotionally to what we see. Without sight, secondary senses evolve into the medium for assessing the external environment. Those who have been blind or visually impaired for several years generally learn to adapt and hone their remaining senses to allow for largely independent living in a society that sees.

The Americans With Disabilities Act (ADA) mandates that employers and owners of public facilities provide reasonable accommodation to people of all disabilities (Reference 1). Federal regulations require that documents and public markings be made available in formats that can be used by people who are blind or visually impaired. Seeing-eye dogs are permitted in all public accommodations, and employers cannot discriminate against blind workers as long as they can perform the necessary duties with "reasonable accommodation" (Reference 1).

Little is known about the actual number of fire deaths and injuries among people with vision impairments, primarily because of lack of reporting and reporting mechanisms. Neither of the two national sources for fire death data--the National Center for Health Statistics (NCHS) and the National Fire Incident Reporting System (NFIRS)--provides for data collection of ancillary information on the deceased. The U.S. Fire Administration's NFIRS specifically provides a forum for both civilian fire death and fire injury data to be collected, analyzed, and interpreted; however, it does not contain an entry for the presence of physical disabilities. Available fire death and injury data regarding individuals with physical impairments must be viewed with this caveat in mind.

The blind and visually impaired must take extra precautions when it comes to health and safety, and especially fire safety. Few assistive devices will provide better protection to a blind individual than self-initiated life safety practices. This segment of the population always must be prepared to react swiftly in a fire emergency, for precious time may be lost if fire safety steps that compensate for their lack of sight are not taken. Recognition of, and subsequent planning for, the potential fire safety dangers that are unique to

blind and visually impaired individuals can help to preserve a person's life in a fire emergency.

This report is divided into three principal sections. The first section discusses the primary causes of vision loss along with current and projected estimates of the number of Americans who are blind or visually impaired. The demographic characteristics for blind and visually impaired populations are reviewed as well.

The second section of this report focuses on the characteristics of blind and visually impaired individuals that place them at risk for injuries, especially fire-related injuries.

The final section provides tips to fire service professionals for enhancing fire safety for people with disabilities. A reproduction-ready appendix presents fire safety tips. Fire service professionals may photocopy the appendix for use in public education activities.

BLINDNESS OR VISUAL IMPAIRMENT
IN THE UNITED STATES

Causes of Blindness and Visual Impairment

Blindness and visual impairment result from a variety of causes, including traumatic eye injures, pathogenic infections, and complications associated with progressive illness. Many people who have experienced vision loss initially feel anger, then grief, and finally depression (Reference 2). An individual who loses use of any sense permanently usually progresses through the same emotional stages as a person who has suffered the loss of a loved one. Moreover, lengthy depressions are not uncommon (Reference 2).

Many causes of blindness are preventable through routine eye exams and early intervention. Four conditions--macular degeneration, cataracts, diabetic retinopathy, and glaucoma--are responsible for a significant portion of blindness and vision loss in this country (Reference 3). These conditions are often preventable or treatable, if diagnosed in their early stages.

Macular degeneration is a degenerative disease commonly associated with the aging process that affects the macula, a small spot in the central area of the retina located at the back of the eye. The macula is responsible for sight in the center of the field of vision and is the most sensitive part of the retina. Macular degeneration is the leading cause of legal blindness in people over age 50. Visual characteristics of the disease include the inability to see straight lines in the field of vision. Telephone poles, the sides of buildings and streetlight posts appear wavy; type in books, magazines, and newspapers appears blurry; and dark or empty spaces may block the center of the field of vision (Reference 4).

A cataract is a clouding of the eye's lens. The role of the lens is to help focus images onto the retina at the back of the eye, which then transmit the images to the brain. Clouding blocks or changes the passage of light needed for vision. If images cannot be transmitted through an ordinarily transparent lens, images received in the brain may become blurred (Reference 5). Cataracts are a leading cause of blindness among adults in the United States and account for nearly half of all cases of blindness worldwide (Reference 6). Although most prevalent in adults, cataracts can occur in young people and are sometimes even found in a baby's eyes at birth. As medical advances have succeeded in lengthening the human life span, more and more

Americans will be entering the age group associated with the development of cataracts. It has been shown that if we live long enough, most of us will develop a cataract (Reference 7). The symptoms of cataracts include blurred vision, double vision, and ghost images; the impression of a "film" over the eyes; problems with light, such as finding lights not bright enough for reading or near work, or being "dazzled" by intense light; and the need for frequent changes of eyeglass prescriptions, which may not improve vision (References 4 and 8).

Diabetic retinopathy is an eye disease in which the small blood vessels in the retina become weak and break down or become blocked (Reference 5). The longer a person has diabetes, the greater the risk of developing this condition. In fact, diagnosis of diabetic retinopathy is often the first clue that an individual has developed diabetes. More than 40 percent of those who have had diabetes for 15 or more years have some blood vessel damage in the retina (Reference 9). The most serious result of the disease is severe vision loss or blindness. However, the disease is not limited to long-term diabetics; it can appear within the first year or two after the onset of the disease. Early treatment of diabetic retinopathy often improves the potential for saving one's eyesight (Reference 9).

Glaucoma is a condition in which the optic nerve is damaged by increased pressure within the eye. This pressure causes damage that progressively worsens, leading initially to the loss of peripheral vision, then the diminution of central vision, and eventually blindness. An estimated 15 million Americans have glaucoma, a leading cause of blindness--150,000 new cases per year in the United States (Reference 4). The disease may not produce any noticeable symptoms; thus, individuals may not even be aware they have it. African-Americans are four to five times more likely than Caucasians to develop glaucoma; other risk factors include genetics (being related to someone with glaucoma), age (over 50 if Caucasian and over 35 if African-American), nearsightedness, and diabetes (Reference 10). Treatments are available to reduce the risk of glaucoma resulting in blindness (References 5 and 10).

Changes in the tissue of the eye make individuals more susceptible to diseases of the eye as they age. As a result, vision loss is often considered to be normal function of the aging process--a misperception that is reinforced by the prevalence of vision problems in the elderly (Reference 5). Studies have

shown that these problems are not unique to the aged, and usually are treatable (References 11 and 12). Common problems encountered as a result of the aging of eye tissues include (Reference 13)

- requiring more light to see;
- difficulty distinguishing between some colors, particularly shades of blue and green;
- difficulty focusing on things that are near; and
- difficulty adjusting to glare and darkness.

The leading causes of blindness will have a greater impact in the coming years as the Nation's baby boomers reach retirement age. The expected dramatic increase in age-related eye disease threatens to diminish the quality of life for millions. In fact, by the year 2030, twice as many people will be blind as there are today (Reference 13); macular degeneration will continue to be the leading cause of blindness, and there will be a near doubling of the total cases of glaucoma (Reference 13).

Population Estimates

Estimates of the numbers of people who are either visually impaired or legally blind vary greatly. For example, the American Foundation for the Blind estimates that there are between 10 and 12 million persons with visual impairments, while the American Council of the Blind's estimate is 19 million. According to the CDC, there are approximately 8 million Americans with visual impairments (Reference 14).

Legal blindness indicates a degree of loss of visual acuity that prevents an individual from performing work that requires eyesight. In the United States, this is defined as corrected visual acuity of 20/200 or less, or a visual field of 20 degrees or less in the better eye (Reference 4).

Estimating the exact size of the blind and visually impaired population is difficult, and depends on a number of factors. The majority of estimates are derived from the results of the National Center for Health Statistics' National Health Interview Survey. This survey samples American households, and results are dependent on individual interpretation and participation. Since vision impairment statistics usually are collected though surveys, and thus are highly subjective, many agencies are reluctant to accept them fully. The definition of **legally blind** is the only widely accepted definition for blindness; however, most surveys do not rely on this quantitative measure-

ment. Surveys often use a time limit or duration of vision loss that does not reflect transient disturbances in vision. Thus, temporary vision loss as a result of an accident, surgery, or medication may be erroneously recorded as long-term vision loss or not recorded at all. Vision disturbances may go unnoticed and ignored for several years (Reference 15). Many individuals of lower socioeconomic status cannot afford vision care or regular eye examinations that could detect subtle changes in vision (Reference 16).

Demographics

Age, race, and economic standing appear to play significant roles in progressive visual impairments. Age factors prominently in the incidence of blindness and vision loss (Reference 17). Approximately 70 percent of the population over the age of 65 have a severe visual impairment (Reference 17), while only about 4 percent of the people with visual impairments are under the age of 18 (Reference 18). Most cases of juvenile blindness are the result of congenital defects, premature birth, or febrile illnesses (Reference 18). They make up a small portion of the blind and visually impaired population in comparison with older adults who naturally experience deteriorating eyesight (Reference 18).

Race may affect the incidence of visual disturbances indirectly by predisposing an individual to an illness or disorder that commonly leads to vision loss. For example, African-Americans have high incidence rates of hypertension and Type II diabetes (Reference 5). Consequently, the rate of vision impairment related to glaucoma and diabetic retinopathy is also high (Reference 19). However, there is no evidence of a direct link between race and poor vision.

Socioeconomic standing may be the most easily modified risk factor for diseases of the eye and subsequent blindness. Individuals of low income and poor education cannot afford or gain access to the same health and medical benefits that more affluent Americans enjoy. They are less likely to have insurance and even less likely to participate in preventive checkups that help to diagnose debilitating conditions early in their progression--as evidenced by the association of vision loss with systemic chronic conditions often unrecognized in poor populations (Reference 16). Race may appear to be an independent factor in conditions causing blindness; however, studies have shown that the association between minorities and low socioeconomic standing may be more relevant (Reference 15).

The Loss of Sight

Sight is the primary sense for processing information contained in the environment. Loss of this sense may predispose an individual to ignite a fire accidentally or sustain an injury from an already lighted fire. Further, people who are blind or visually impaired may be more susceptible to cooking accidents, or to leaving a heater too close to a flammable object.

To a blind or visually impaired person, the first indication of a fire usually will be the smell of smoke and accompanying sense of heat emanating from the fire. Unable to see exactly where the fire has originated, the visually impaired individual is less likely to be able to extinguish even a small fire. Flames that otherwise would be easily extinguished can quickly become a serious threat.

Also dangerous is the impact that the loss of sight has on the ability to escape a fire. Relying heavily on auditory clues, the blind or visually impaired individual must be able to react and respond to a sounding smoke alarm. If the individual has planned and practiced two escape routes from each room in the home, the chances of surviving a fire are improved. Complications arise, however, when the blind or visually impaired individual is in a foreign environment, such as a hotel, hospital, or new nursing facility. Tactile or high-contrast markings designating exits are not always available. Inability to locate an escape route can waste the few precious minutes before smoke and toxic fumes will overcome an individual.

The same can be true for individuals who have lost their sight only recently. Unaccustomed to relying primarily on their sense of hearing, these individuals have not yet perfected the ability to process auditory clues quickly. Reverting to basic tactile assessment of the environment, an individual could come into contact with a hot door or even an open flame hidden around a corner. Continuous high-decibel smoke alarms may inhibit the blind person's ability to hear and process auditory clues from rescue personnel, neighbors, or others close by.

Visually impaired individuals are at risk from injuries from fires that would not necessarily harm sighted individuals. The most common cause of residential fires is cooking (Reference 20). Many of these fires start when food

cooking on the stove or in the oven ignites. Cooking fires on the stove often are extinguished easily by removing the pan from the heat source or by placing a lid over it. Oven fires often can be extinguished by reducing or eliminating the heat or simply by closing the oven door to restrict the flow of oxygen. Because visually impaired persons may not be able to recognize the early signs of a fire, their responses to the danger may be slowed.

Public Fire Education

Public fire education has made great strides in this country and in nations around the world. Fire is a universal problem that can be reduced and even prevented through concerted educational efforts. Although fire affects all people, certain groups are more vulnerable and subsequently at higher risk of injury and death than others. Young children and older adults are the two groups with the greatest risk of dying in a fire. Accordingly, they are the target of much public fire education and attention. Through widespread educational campaigns, various fire service advocacy groups and public safety agencies disseminate vital fire safety tips to these groups as well as to their caregivers. These efforts have resulted in increased fire safety awareness in these populations.

Although people who are blind or visually impaired have high risk of injury or death from fire, typically they are not targeted by fire education. Generally, the presence or degree of disability of a fire victim is not reported and, consequently, is not recorded in the datasets. Therefore, it is hard to assess the degree to which a person's disability played a role in his or her becoming a casualty. Since these correlations are not readily available, targeted programs may not be delivered when and where they should be.

Public education efforts seeking to modify the behavior of an individual are the best means for the blind and visually impaired to decrease their chances of injury in a fire. In contrast to fire technology and engineering practices that address the needs of other disabilities, such as hearing loss and mobility impairment, relatively few devices currently exist to improve the safety of people who are blind or visually impaired. Awareness of the unique risks posed by the loss of sight and the importance of fire safety practices is the best way to diminish the fire risk posed to the visually impaired population.

Most fire safety technology is based on the assumption that an individual has the ability to hear--a sharpened sense in the blind population. In fact,

smoke alarms were designed on the premise that visual warnings are not the most effective means to alert someone of a fire. Furthermore, heavy smoke emanating from a fire has the potential to reduce or eliminate visibility. Not being able to see should not hinder hearing an audible smoke alarm, crawling low on the floor, and escaping to safety. More important, committing these actions to memory will serve as an instinctual map to safety.

Public education efforts through the mainstream media may not always reach the blind and visually impaired populations. Through market research and discussions with focus groups (Reference 21), it has been found that radio is the most effective medium for disseminating public safety messages to the blind and visually impaired. Consequently, public service announcements (PSA's) should be created for, and disseminated to, those radio stations that are only available to people who are blind or visually impaired and who have special FCC decoders. PSA's also may be included in audiotapes of books and newspapers used by this population (Reference 21).

Blind children do not always have access to the same educational materials that sighted children do. Certain fire safety messages are applicable to all populations, regardless of the presence of a disability. Special editions of children's public education materials (such as Smoky the Bear, Sparky the Dog, and E.D.I.T.H.) should be produced for blind and visually impaired children. Those materials stressing escape drills are especially important to these children.

Newly Blind or Visually Impaired People

Those who have recently lost either all or a significant portion of their sight must undergo a long and arduous process of learning to live with limited (or no) sight. A world that once was familiar is now foreign. These individuals must relearn basic activities of functional life, such as cooking, eating, dressing, and even reading the newspaper (Reference 22). Many therapists and trainers for disability and blindness organizations offer assistance throughout this process. One area often overlooked is fire safety practices. Developing and practicing a fire escape plan is more important to a newly blind or visually impaired individual than to someone who has been blind or visually impaired since birth or for many years.

Residence

The majority of visually impaired persons live in standard private residenc-

es or with their families in the community. Approximately 30 percent of nursing home residents are visually impaired (Reference 23). Board-and-care facilities and nursing homes present significant fire risks, especially to those requiring assistance in an emergency. The majority of these facilities are staffed with medical personnel; it is typical, however, that the residents greatly outnumber the staff (Reference 24).

A fire emergency places residents of nursing facilities at significant risk for a variety of reasons. Any one of these hazards can foster fire growth:

- Nursing and group living homes are often designed with large, open air living spaces that can facilitate the spread of smoke and toxic gases (Reference 25). In a study of fires occurring in nursing home facilities, most of the injuries and deaths were attributed to relatively small fires that produced toxic fumes before the detection or suppression devices were activated (Reference 26).

- Many older nursing homes have been built with limited means for egress, combustible interior finishes, and a lack of automatic sprinkler systems (References 25 and 26).

- Nursing homes typically have other fire hazards such as oxygen, flammable liquids and gases, electrical equipment, and careless smokers.

The residents of nursing homes outnumber the staff, and this ratio may increase at night (fewer staff are used at night) (Reference 21). Many people with visual impairments live in nursing homes because they need assistance with everyday activities. Residents who are bedridden or incapacitated depend solely on the assistance of staff to evacuate them in the event of a fire. Those with less severe disabilities may lack staff assistance that is directed toward those with more pressing needs.

While most fires can be prevented, people with visual impairments must pay special attention to fire safety. Hazards that might be obvious to a sighted person can have catastrophic consequences for those who are visually impaired. A visually impaired individual living alone must be able to recognize the fire hazards found in his or her immediate surroundings. For this reason, it is recommended that people who are blind or visually impaired reside in homes equipped with automatic fire sprinkler systems or retrofit their residence with such protective devices.

FIRE SAFETY FOR SPECIAL-NEEDS POPULATIONS: TIPS FOR FIRE SERVICE PROFESSIONALS

You have been asked to provide advice on the fire safety needs of a blind or visually impaired individual. Where do you begin? There are the "generic" fire safety tips routinely given out to all who ask, but how do you tailor your recommendations to those with special needs? The first thing to remember is that the generic fire safety tips still apply. Individuals with physical impairments or disabilities are still people and still benefit from the years of conventional wisdom that created existing fire safety programs.

Recommendations for Assisting the Blind and Visually Impaired Population in an Evaluation of Their Fire Safety Needs

Focus groups found that being identified as "special" or "needy" was a concern for individuals with visual impairments (Reference 21). This mirrors the findings of a 1981 fire safety report from the National Center for a Barrier Free Environment. That study concluded that impaired individuals often feel that official concern for fire safety can restrict their freedom of choice--for example, denying an impaired student a bedroom on the upper floor of a college dormitory (Reference 27). These opinions also reflect those expressed at the Solutions 2000 Conference, held by the U.S. Fire Administration and the North American Coalition for Fire and Life Safety Education in April of 1999. In addition, individuals in the focus groups also worried about falling victim to crime if their home was marked for fire department recognition of their needs. The key to dealing with individuals with a visual impairment is to acknowledge their ability to help themselves, while guiding them to recognize their limitations in an emergency situation without drawing undue attention to them as impaired individuals.

The importance of exit drills should be stressed to assist blind or visually impaired individuals in recognizing their physical limitations in crisis settings. If the individual lives on an upper floor or requires other special assistance, it is important for the fire service to be involved in these drills, if at all possible. Blind or visually impaired individuals may have an unrealistic view of the capabilities of the fire department. There may be unforeseen obstacles or barriers to exit or rescue. These should be identified and addressed before a fire occurs.

The use of smoke alarms must be **strongly** advocated. The U.S. Fire Administration considers smoke alarms to be the single most important piece of fire safety technology employed today. The importance of early recognition of a fire cannot be stressed enough in populations where physical limitations may increase the time needed to exit a burning building safely.

If you are called upon to assess the needs of an individual with visual impairment, the Center for Fire Research at the National Institute of Standards and Technology (formerly the National Bureau of Standards) recommends assessment of the following seven risk factors (Reference 28):

1. **The risk that the individual will resist leaving the structure.** For example, is the individual fearful of leaving with a stranger; unwilling to leave pets, belongings, and cherished items; or exhibiting confusion or other symptoms consistent with possible mental impairments?

2. **The individual's response to fire drills.** For example, does the individual's escape plan work during drills?

3. **The individual's response to instructions.** For example, are there language differences or other communication barriers?

4. **The individual's mobility impairments (and the resources necessary to overcome them).** For example, is the individual capable of reasonably safe self-rescue from a burning structure? How much can the person assist his or her rescuers?

5. **The need for extra help.** This may be related to the actual egress or the period immediately following. For example, a ventilator-dependent quadriplegic may require medical resources once outside the structure.

6. **The individual's waking response to alarms.** Will there be a difference between the daytime and nighttime fire safety needs of the individual?

7. **The probability that the individual will lose consciousness in an emergency.** For example, is the individual dependent on specific equipment for life support? Is there adequate backup to provide for emergency situations?

Note the emphasis on performance-based assessment. The risk assessment cannot be based on an individual's impairment, but rather on his or her demonstrated abilities to evacuate a structure in an emergency.

Building Design and Codes

The following recommendations are based on *Design for Accessibility,* a guide for architects on designing barrier-free environments (Reference 29). They should provide some insight into the role of building design in the fire safety needs of the population.

- Provide exit signs set to flash (less than 5 hertz) when a fire alarm sounds. Connect these signs to the emergency power system.

- Provide audible fire alarms that exceed the average ambient sound level by a minimum of 15 decibels (15 phones). These alarms should exceed a noise of 30 seconds or less by a minimum of 5 decibels (5 phones). The maximum audible emergency signal should not exceed 120 decibels (120 phones).

- Provide visual/light alarm signals in all areas occupied by individuals who are deaf or hard of hearing.

- Provide under-pillow vibrating alarm signals in bedrooms for deaf or hard-of-hearing individuals.

- Provide a minimum of two accessible exits or horizontal exits for all accessible areas of all buildings.

- Where there is only one accessible exit, provide a minimum of one fireproof refuge area (fire-rated enclosed elevator lobby preferred, or enlarged landing area in a fire-rated stair enclosure). The fire refuge area should be a minimum of 16 square feet (1.5 square meters) outside of exit circulation paths. Provide an occupancy/call system from refuge areas to fire department enunciator location or entrance vestibules.

- Cover open fireplaces with tempered glass doors and guard them by a 9- to 18-inch (23- to 46-cm) raised hearth.

- Provide fire detectors, especially in institutions, in accordance with the recommendations presented in the table below:

Recommended Smoke Alarms

Type of Smoke Alarm				
Area of Residence in Which to Install Alarm	Rate of Temperature Rise	Fixed Temperature, Adjustable	Fixed Temperature, Permanent Setting 175° to 240°F (79° to 116°C)	Smoke/Products of Combustion
Kitchen	Preferred			
Basement	Preferred	Acceptable		
Storage	Preferred	Acceptable		
Trash	Preferred	Acceptable		
Garage		Preferred		
Accessible Attic			Preferred	
Sleeping Area				Preferred
Hallways	Acceptable			Preferred

Source: Based on Robert James Sorensen, *Design for Accessibility* (New York: McGraw-Hill Book Company), 1979.

Instructional Materials

In addition to the reproduction-ready fire safety materials available at the end of this booklet, other materials, such as "Emergency Procedures for Employees With Disabilities in Office Occupancies," is available from the United States Fire Administration Publications Office or on its Web site at www.usfa.fema.gov

CONCLUSIONS

Fire safety is a vital but often overlooked aspect of health and safety for people who are blind or visually impaired. The inability to see creates a greater risk and subsequent challenge in preventing fire injuries; however, the blind or visually impaired individual can overcome this challenge. Just as a blind individual must learn basic skills for living using senses other than sight, he or she can learn and hone fire safety skills through repeated practice.

Public fire education messages address the needs of blind or visually impaired individuals in a contextual manner, but not from the standpoint of delivery. Escape planning and smoke alarm maintenance are equally applicable to both seeing and nonseeing individuals. The general public is inundated with these messages beginning at a very early age in hopes of influencing behavior before, during, and after a fire. Often, people who are blind or visually impaired are not exposed to these messages with the same frequency and thus may be unaware of their content or value. As a rule, educational campaigns neither highlight the potential fire risks specific to blindness and visual impairment nor direct fire safety messages to this population.

Public education efforts that seek to change behavioral practices are the most effective means for people who are blind or visually impaired to increase their chances of surviving a fire. Whereas a specialized smoke alarm may be of great benefit to someone who is deaf or hard of hearing, or a fire-safe elevator may benefit people with mobility impairments, improved fire technology is not necessarily the most appropriate means to combat the fire problem in the visually impaired community. The only thing the visually impaired individual cannot do is see. He or she is capable of hearing an audible smoke alarm and crawling low on the floor to escape to safety. The loss of sight should not be hindrance if the individual is aware of these steps and practices them on a regular basis. In fact, heavy smoke can impair the vision of a seeing individual to the point of simulated blindness. Therefore, sight does not have to be a vital component to escaping from a fire; rather, memory will help the victim of a fire to envision the path to safety. The meaning of traditional fire safety messages increases dramatically for people who are blind or visually impaired. Good fire safety procedures are the most important steps these individuals can take to improve their chances of surviving a fire.

APPENDIX: FIRE SAFETY TIPS FOR BLIND OR VISUALLY IMPAIRED PEOPLE

The following fire safety tips are organized in three sections: before the fire, during the fire, and fire prevention. While these tips represent many fire safety approaches, the use of smoke alarms and exit planning should be considered the most crucial. According to the U.S. Fire Administration, smoke alarms are the single most important piece of fire safety equipment in use today. Exit planning also is extremely important, especially for individuals who may have difficulty exiting a burning building.

These fire safety tips are reproduction-ready. They may be used as educational material by fire service, life safety, or health educators. Permission to reproduce them for that purpose is granted. Proper credit should be given to the United States Fire Administration and the Federal Emergency Management Agency.

Before the Fire

Identify the Nearest Emergency Exit. Whether you are at home or elsewhere, you always should know the location of the nearest exit. This could save your life in an emergency.

Install Smoke Alarms. A working smoke alarm can make a vital difference in the event of a fire; it has the potential to reduce the risk of death in a fatal fire by 60 percent. A properly functioning smoke alarm can alert you to the presence of deadly smoke while there is still time to escape. Place alarms next to each sleeping area and on every floor of your home. Test batteries monthly, and replace them annually. If you cannot do this yourself, ask a family member, neighbor, building manager, or someone from the fire department to assist you. Clean smoke alarms by vacuuming them regularly, or ask someone to do it for you. Install high-decibel smoke alarms to alert you to the presence of a fire. If your smoke alarms are hardwired (connected to the electric circuitry of your residence), make sure they also are equipped with battery backups.

Live Near an Exit. If you live in an apartment building or condominium, try to get a unit on the ground floor. If this is not possible, know where the exit stairwell is located and how to get there. Plan to wait there for help if you also have an impairment that prevents you from taking the stairs.

If you live in a multistory house, try to sleep on the ground floor. Make sure a phone is next to your bed within arm's reach along with emergency telephone numbers.

Plan and Practice Escape Plans. Knowing your escape plan is one of the most important steps you can take to save your life in a fire. Plan your escape around your capabilities. Know at least two exits from every room. Make sure you can unlock all your doors and windows. Be sure you know how to open your windows. If security devices such as bars are installed across the windows, ensure that they release from the inside.

Exit Indicators. The confusion and disorientation of a fire in the home can be difficult to overcome. You may be forced to crawl along the floor to avoid smoke. As it can be very disorienting to crawl where you are used to walking (especially if you count steps to locate doors and hallways), it is recommended that you place tactile markers along the baseboard of exit routes inside your home. These will help to identify where to go in case of a fire.

Involve the Fire Department. Ask the fire department to help you plan an escape route, and inform them of your special needs. Ask the fire department to help identify fire hazards in your home and explain how to correct them. Any areas you plan to use as a rescue area must be identified and agreed upon by you and officials from the fire department. Learn the fire department's limitations, and make fire officials aware of yours.

During the Fire

Get Out and Stay Out. Leave your home as soon as possible. Do not try to gather personal possessions or attempt to extinguish the fire. Do not use the elevator. Once out, **do not go back inside.**

Test the Doors Before Opening Them. Using the back of your hand, reach up high and touch the door, the doorknob, and the space between the door and the frame. If anything feels hot, keep the door shut and use your second exit. If everything feels cool, open the door slowly and crawl out low to the ground if smoke is present.

Stay Low and Go. Crawl low and keep under the smoke if you can. If not, try to cover your mouth and nose to avoid breathing toxic fumes and make your way to safety as quickly as possible.

What To Do If You Are Trapped. Close all the doors between you and the fire. Stuff cracks in doors and cover all vents with a damp cloth to the best of your ability to keep smoke out. If possible, call the fire department and tell them where you are located. Signal rescuers from a window with a light-colored cloth that you keep in a predesignated place for this purpose.

Stop, Drop, and Roll. If any part of you catches fire, do not run and do not try to extinguish the flames with your hands. Cover your face with your hands. Drop to the ground, rolling over and over. If you have another disability preventing these actions, try to keep a flame-resistant blanket or rug nearby to smother any flames.

Fire Prevention

Cooking. Never leave the stove unattended while cooking. If you need to step away from the stove, turn it off. Wear tight-fitting clothing when cooking over an open flame, and keep towels and potholders away from the flame. If food or grease catches fire, smother the flames by sliding a lid over the pan and turning off the heat. Do not try to use water to extinguish a grease fire. When deep-frying, never fill the pan more than one-third full of oil or fat. Never put foil or other metals in the microwave. Make sure the stove is kept clean and free of grease buildup. Turn pot handles away from the front of the stove so they cannot be knocked off or pulled down.

Electrical Safety. Electric blankets should conform to the appropriate standards and have overheating protection. Do not wash blankets repeatedly as this can damage their electrical circuitry. If an appliance begins to smell suspicious or emit smoke, unplug it immediately. Replace all frayed or broken electrical cords. Never use an appliance with exposed wires. Never overload extension cords, and keep them out of traffic areas. Use only lighting evaluated by a nationally recognized laboratory such as Underwriters Laboratories (UL).

Smoking. Never smoke in bed. Make sure that you are alert when you smoke. If a gas stove or oxygen source is nearby, do not smoke. Place signs stating that oxygen is in use and warning visitors to refrain from smoking. Do not smoke while under the influence of alcohol or if you are taking prescription drugs that can cause drowsiness or confusion. Never leave smoking materials unattended, and collect them in large, deep ashtrays. Check around furniture, especially upholstered furniture, for any discarded or smoldering smoking materials. Before discarding them, soak the materials in the ashtray.

Space Heaters. Give space heaters space. Keep heaters at least 3 feet from any combustible material, including people. Follow the manufacturers' directions regarding operation, fueling, and maintenance of your space heater. Do not use heaters or other heating devices to dry clothing.

Heating. Have your heating systems and chimneys checked and cleaned annually by a professional. Never store fuel for heating equipment in the home. Keep fuel outside or in a detached storage area or shed.

Fireplaces. Open fireplaces can be hazardous; they should be covered with tempered glass doors and guarded by a raised hearth 9 to 18 inches high.

For more information, contact:

The United States Fire Administration
Office of Fire Management Programs
16825 South Seton Avenue
Emmitsburg, MD 21727

Or visit the USFA Web site: www.usfa.fema.gov

REFERENCES

1. Department of Justice, *Final Rule on Title III of the Americans With Disabilities Act of 1990* (42 U.S.C. 12181).

2. A. G. Dodds, H. Flannigan, and L. Ng, "The Nottingham Adjustment Scale: A Validation Study," *International Journal of Rehabilitation Research*, Vol. 16, No. 3, September 1993.

3. B. Rahmani, J. M. Tielsch, J. Katz, J. Gottsch, H. Quigley, J. Javitt, and A. Sommer, "The Cause-Specific Prevalence of Visual Impairment in an Urban Population: The Baltimore Eye Survey," *Ophthalmology*, Vol. 103, No. 11, November 1996.

4. C. L. Thomas (Ed.) *Taber's Cyclopedic Medical Dictionary*, 18th Ed. (Philadelphia: F. A. Davis Co.), 1997.

5. K. L. McCance and S. B. Huether, *Pathophysiology: The Biologic Basis for Disease in Adults and Children* (St. Louis: Mosby), 1994.

6. P. M. Livingston, C. A. Carson, and H. R. Taylor, "The Epidemiology of Cataracts: A Review of the Literature," *Ophthalmic Epidemiology*, Vol. 2, No. 3, December 1995.

7. L. D. Pizzarello, "The Dimensions of the Problem of Eye Disease Among the Elderly," *Ophthalmology*, Vol. 94, No. 9, September 1987.

8. K. N. Anderson, L. B. Anderson, and W. D. Glanze (Eds.), *Mosby's Medical, Nursing and Allied Health Dictionary*, 4th Ed. (St. Louis: Mosby), 1994.

9. L. P. Aiello, J. Cavallerano, and S. E. Bursell, "Diabetic Eye Disease," *Endocrinology and Metabolism Clinics of North America*, Vol. 25, No. 2, June 1996.

10. T. J. Liesegang, "Glaucoma: Changing Concepts and Future Directions," *Mayo Clinic Proceedings*, Vol. 71, No. 7, July 1996.

11. T. A. Wingert, N. Tumosa, and W. H. McAlister, "Epidemiological Evidence That Access to Routine Optometric Care Benefits Nursing Home Residents," *Optometry and Vision Science*, Vol. 69, No. 11, November 1992.

12. L. Hyman, "Epidemiology of Eye Disease in the Elderly," *Eye*, Vol. 1, Pt. 2, 1987.

13. P. Braus, "Vision in an Aging America," *American Demographics and Consumer Trends,* Vol. 17, No. 6, June 1995.

14. Department of Health and Human Services, Centers for Disease Control and Prevention, *Vital and Health Statistics,* Series 10, No. 199.

15. P. Orr, Y. Barron, O. D. Schein, G. S. Rubin, and S. K. West, "Eye Care Utilization by Older Americans: The SEE Project (Salisbury Eye Evaluation)," *Ophthalmology,* Vol. 106, No. 5, May 1999.

16. R. W. Weitz, *The Sociology of Health, Illness, and Health Care* (New York: Wadsworth Publishing Co.), 1996.

17. G. S. Rubin, S. K. West, B. Munoz, K. Bandeen-Roche, S. Zeger, O. Schein, and L. P. Fried, "A Comprehensive Assessment of Visual Impairment in a Population of Older Americans: The SEE Project (Salisbury Eye Evaluation)," *Investigative Ophthalmology and Visual Science,* Vol. 38, No. 3, March 1997.

18. P. G. Steinkuller, L. Du, C. Gilbert, A. Foster, M. L. Collins, and D. K. Coats, "Childhood Blindness," *Journal of AAOPS: American Association for Pediatric Ophthalmology and Strabismus,* Vol. 3, No. 1, February 1999.

19. S. K. West, B. Munoz, G. S. Rubin, O. D. Schein, K. Bandeen-Roche, S. Zeger, S. German, and L. P. Fried, "Function and Visual Impairment in a Population-Based Study of Older Adults: The SEE Project (Salisbury Eye Evaluation)," *Investigative Ophthalmology and Visual Science,* Vol. 38, No. 1, January 1997.

20. National Fire Data Center, United States Fire Administration, Federal Emergency Management Agency, *Fire in the United States, 1986-1995.*

21. United States Fire Administration, Federal Emergency Management Agency, Fire Stops With You--Special Population Campaign: *Fire Risks for the Visually Impaired, Deaf and Hard of Hearing, and Older Adults, 1999.*

22. J. E. Keeffe, D. Lam, A. Cheung, T. Dinh, and C. A. McCarty, "Impact of Vision Impairment on Functioning," *Australian and New Zealand Journal of Ophthalmology,* Vol. 26, Suppl. 1, May 1998.

23. J. M. Tielsch, J. C. Javitt, A. Coleman, J. Katz, and A. Sommer, "The Prevalence of Blindness and Visual Impairment Among Nursing Home Residents in Baltimore," *New England Journal of Medicine,* Vol. 332, No. 18, May 1995.

24. R. L. Cherry, "Agents of Nursing Home Quality of Care: Ombudsmen and Staff Ratios Revisited," *Gerontologist,* Vol. 31, No. 3, June 1991.

25. P. Blye and J. P. Yess, "Fire-Safety in Elderly Housing," *NFPA Journal,* November/December 1987.

26. J. S. Petraglia, "Fire and the Aging of America," *NFPA Journal,* March/April 1991.

27. B. Levin, R. Paulsen, and J. Klote, "Fire Safety," *Access Information Bulletin,* National Center for a Barrier Free Environment, 1981.

28. J. Kuns, "Public Education," *Proceedings of the 1980 Conference on Life Safety and the Handicapped,* National Bureau of Standards, NBS-GCR Series (Washington DC: GPO), 1981.

29. Robert James Sorensen, *Design for Accessibility* (New York: McGraw-Hill Book Company), 1979.