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Considerations for home fire safety

The headline “man killed in house fire” is read too often in today’s news. We have heard the comments time and again “he was sleeping and didn’t awake at the smell of smoke” and have seen the nightmare images of someone’s home singed to the ground in just minutes. People don’t tend to personalise these images but we are all at risk of these situations if precautions and necessary steps towards fire safety at home aren’t taken. According to the NSW Fire Brigades, 4226 house fires were attended in 2004 (NSW Fire Brigades, 2005) and still the incidence of house fires seems to have skyrocketed in 2005.

Escaping from a house fire is a difficult feat for anyone, but when coupled with mobility difficulties or sensory impairment, the prospect of fleeing in time can seem hopeless. For example, a person with a disability, living in a residential block of units may not be able to manipulate their front door due to the increased force required to open a mandatory fire door with a door closer device or a person with vision impairment may not be able to find the door in a room surrounded in smoke. Even outside of an emergency situation, households or visitors with disabilities may also find accessing or leaving a unit a difficult task. Residential units present a problem as they *do* have to comply with AS and the BCA and therefore, *do* require a door closer on their front security door which is also a fire door (Australian Building Codes Board, 2005b). Consequently, a person with a disability who is unable to operate a door with a door closer in place may decide to remove the door closer entirely. Door closers create barriers for many people, especially for people with disabilities and when there is no other solution, it’s no wonder people take matters into their own hands. Nevertheless, therapists should not be recommending the removal of door closers when they present a barrier, as removing one door closer can put a whole residential block at risk. Suddenly the therapist is concerned with many lives and not just their client.

Many steps are taken to ensure public buildings can withstand a fire and enable fast and safe egress. These steps are specified in the Australian Standards (AS) and Building Code of Australia (BCA). Some of the requirements of public buildings are: fire rated walls and doors, and door closers to contain fires; smoke alarms, smoke detectors and illuminated exits to alert people; and sprinkler systems along with readily available fire extinguishers to douse fires. Homes on the other hand are not required to comply with the AS and aspects of the BCA, and so are not compelled to have safety equipment installed or at hand, such as smoke alarms. Fortunately, the NSW government has initiated the steps towards prevention of house fires by enforcing that smoke alarms become mandatory for new and existing buildings, including homes (Emergency NSW, 2005). Under the Building Legislation Amendment (Smoke Alarms) Bill (Parliament of New South Wales, 2005) “all dwellings must be fitted with either battery-operated, or hard-wired smoke alarms, by May 1, 2006.” However, even with smoke alarms in place to alert people, other safety equipment that can be used in the event of a fire, such as fire blankets for electrical fires and fire extinguishers, are not compulsory for the home.

Further, home safety is the responsibility of the household but people are not often capable of this responsibility. Disabilities can impact upon someone's ability to have insight into fire safety at home and have the ability to maintain safety equipment. Fortunately, governments, community organisations and technology are beginning to address this issue.

Fire safety products

Conveniently, fire safety products like smoke alarms, fire extinguishers and fire blankets are now commonly available for home use and some are even specialised to address specific needs of certain populations (table 1). In the event of a house fire, the smell of smoke may not necessarily wake sleeping persons, and is more likely to put them into a deeper sleep. Smoke alarms, however provide an early warning sign and enable people to respond quickly. Smoke alarms can be hard wired or battery powered and should be approved by AS 3786:1993. Interconnected, hard wired smoke alarms are activated at the same time and ensure that persons are alerted from any area in the home. For example, if a fire started in the kitchen, the nearest smoke alarm should activate, and then the smoke alarms in other areas of the house should also sound. Hard wired alarms should be installed by a qualified electrician and battery powered alarms need maintenance, however, both models require regular testing. Fire services across Australia suggest changing smoke alarm batteries when changing clocks back at the end of daylight savings (Emergency NSW, 2005). Smoke alarms themselves, have a lifespan of around ten years, so also need replacing (Wormald Australia, 2005).

Smoke alarms should be fitted at least on every level of a home, particularly in the 'at-risk' areas and outside bedrooms to wake sleeping persons. The NSW Fire Brigades (2005) reported that the 'at-risk' areas where most fires occur are the kitchen, bedroom and lounge areas due to the use of cooking and heating appliances. Generally, it is best to contact a qualified tradesperson for installation advice.

The Smoke Alarm Battery Replacement for the Elderly (SABRE) program is a free community service whereby the NSW Fire Brigade and other community groups install and maintain smoke detectors for frail aged people and people with disabilities. The NSW Fire Brigade also educates carers in identifying potential hazards in their clients' homes.

People with hearing impairment may not respond to a standard smoke alarm, but could benefit from some models that have strobe lights and connections for vibrating pads that can be placed under a pillow (table 1).

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) have a register of smoke alarms and other fire protection equipment that complies with AS 3786:1993 which can be viewed via website www.activfire.gov.au/.

Automatic Door Closers and Openers

There seems to be a misunderstanding between the function of door closers compared to door openers. Door closers control the closing of a swing door *after* the door has been opened manually or automatically. They are mandatory on fire doors of public buildings (Standards Australia, 2005a) to ultimately contain a fire. Likewise with individual security doors of units in a residential apartment block, door closers act to contain a fire in a single unit and prevent the fire from spreading to the other units in the building.

The increased force required to open a fire door with a door closer in place can be difficult for many people with disabilities or frail aged people to manipulate. Even if manual door opening is achieved initially, the door users still have to exert force while they are moving through the doorway to prevent the door from closing on them (Steinfeld, Danford, Zingesser, & Baker, 1993). The weight and fast closure of the door can strike a less mobile person on the way through the doorway and in an emergency situation where fast exit is necessary and panic can set in, door closers are even more problematic. AS 1428.2:1992 Clause 23.3c states ‘the problem for access posed by the door closers is the initial resistance at the commencement of the door-opening operation’ (Standards Australia, 1992). The minimum force required to operate a *standard* door with door closer device is specified in AS 1428.1:2001 to initially open the door - 19.5 N, to swing the door - 6 N and to hold the door open between 60° and 90° - 7.5 N (Standards Australia, 2001). However, the minimum force required to open a *fire* door with a door closer in place is not specified. The reasoning behind the exceptions of fire doors in the Australian Standards can be understood by one study reported by Steinfeld, E. & Danford, G.S (Steinfeld & Danford, 1993) which found that “...under emergency conditions people with disabilities can exert relatively high forces to overcome the resistance of door closers, therefore larger opening forces may be possible for doors used only in emergency use...” Unfortunately many people with disabilities living in units have to access these fire doors daily, as it applies to the front door of their unit. Ultimately, therapists should be liaising with fire engineers for alternative or equipment solutions to address the needs of people with disabilities.

Delayed action door closers as specified in AS 1428.2:1992 Clause 23.3 (Standards Australia, 1992), are recommended for people with disabilities who would be unable to move through a standard or fire swing door with closer quick enough. The delayed action mechanism is a magnetic catch which holds the door open for 5-6 seconds. The magnetic hold is activated by the door being opened to a certain degree; sometimes 90° which may require excess force to push the door fully open. Therefore, a delayed action door closer addresses the issue of the door striking someone. Therefore, a delayed action door closer addresses the issue of the door striking someone on the way through the doorway but a high level of force is still required to open the door. The speed of approach must also be considered for people with differing mobility as this will affect the length of time the door needs to remain open (Sawyer, 1995).

Where a person cannot manipulate a standard fire door with closer, suppliers' state that an electronic or pneumatic door opener which has a door closing device can be installed, but these tend to be an expensive option for residential application. Door openers are a mechanism that attach to the door to enable the door to be opened via an electronic switch. Switches can take the form of a push button, push plate, sensor, remote, PIN number, or fingerprint sensor to cater for varying hand function abilities. Door openers can also be activated by the user initiating a push on the door to activate the opening mechanism. They can be programmed to have a delayed swing action whereby the door remains open for a certain amount of seconds enabling safe access and egress for a person. In accordance with AS/NZS 1905:2005.1 Clause 2.1.2 (Standards Australia, 2005a), automatic doors are required to be self-closing on operation of a sensing device. This sensing device will prevent the door from closing when there is an obstruction. There are various types of closing devices on door openers that vary in expense and safety. For example, an electronic motor is cost efficient but in a power failure or fire situation it could remain in an unsafe open position, whereas hydraulic or spring loaded closing devices are better for fire doors. An automatic door opener for a fire door should be connected to the fire alarm and in the presence of a fire should remain closed (Australian Building Codes Board, 2005b). Where automatic door openers which are connected to the fire alarm, are fitted to an exit door other than a fire door, they should automatically unlock and remain open to enable quick egress (Australian Building Codes Board, 2005a). In a power shortage, a door with automatic opener should either remain open or unlocked and some even convert to a manual door with key lock. "Doors can also have a break-out ability where ...swing doors can be pushed in the opposite direction to normal swing, to allow for emergency escape" (Sawyer, 1995). Alternative solutions need to be fire engineered and may include fitting sprinklers on either side of the doorway in place of a fire door with a door closer, which can extinguish the area.

Automatic door opening/closing devices have to be fire rated (Standards Australia, 2005a). The online Underwriters Laboratories (UL) Certifications Directory has a listing of fire tested and approved door closers www.ul.com alternatively look for UL fire approved statements on product specifications.

Even with automatic door openers in place, regular maintenance and servicing is required as with all mechanically controlled equipment. Manufacturers suggest six monthly services are necessary (Australian Automatic Door Industry Forum, 2005) whereas AS 1851:2005b (Standards Australia, 2005b) suggests annual testing.

Evacuation Plan

Smoke can make people confused and disorientated, and can limit vision, so planning for emergency evacuation is a necessity. Residents should have more than one escape plan as house fires can often trap exits. If security doors are kept locked, keys should be readily accessible for a quick exit. Evacuation lock systems like the Exit

Quick Fire Safety Door (table 1) may be a solution as it automatically releases deadlocks and safety chains in an emergency and therefore, allows for faster egress.

Exits should be illuminated and have a clear pathway for egress. Illuminated adhesive strips that can highlight stairs, handrails, door handles and floors may provide direction for someone with vision impairment or limited vision in a smoky room.

The NSW Fire Brigades and other fire protection companies like Wormald (supplier list) produce fire safety checklists and tips for residents to develop evacuation plans to ensure that they and their homes are fit to deal with a fire. These can be downloaded from their websites www.fire.nsw.gov.au or www.wormald.com.au.

Evacuation from residential units can be quite complex as there often isn't more than one accessible exit for people. People with disabilities who would usually access their unit via a lift are warned to refrain from using the lift in a fire situation as the risks are electric shock or short circuit due to the presence of water from sprinklers, exposure to high temperatures or fire and suffocation (Scott, 2003). Water from sprinklers has the potential to damage the safety features of lifts and can even cause the lift to stop unexpectedly. Further, smoke and heat seeping through the ventilation of the lift doors can harm people and disrupt electrical cabling. However, the "idea of using elevators to speed up fire evacuation and to evacuate people with disabilities has gained considerable attention in recent years" (Blote, Levin, & Groner, 1997). One study reported that twenty minutes would allow enough time for people to evacuate from four floors of a building via a lift before the water from sprinklers would threaten lift operations (Scott, 2003), however this study had many unrealistic assumptions and only considered evacuation from the fire floor, two floors above and the floor below the fire floor. Therefore, the safest and only option for people with disabilities is to exit via a stairwell. This may require them to remain on a platform within the fire rated stairwell until the fire brigade rescues them.

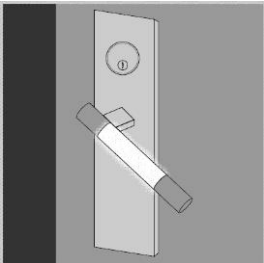
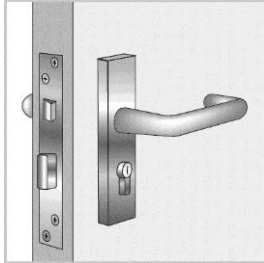
Responsibility of HMM Services and Therapists

The Home Modification and Maintenance Services should update their policies and procedures to reflect the changes in government policy regarding the mandatory existence of smoke alarms. Therapists assessing the home environment should also incorporate a fire safety checklist into home evaluations and encourage their clients to take necessary action towards protecting themselves and their home from fire hazards.

Products for home fire safety

There are a number of products that could be used to address fire safety. **Note:** this is not an exhaustive list.

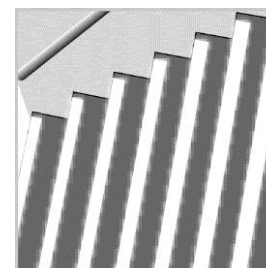
Table 1. Products for home fire safety

	Advantages & Disadvantages	Image
Illuminated Door Handles (concept)	<ul style="list-style-type: none"> - A design concept which is not yet available for retail ✓ Guides people to emergency exits in a smoky room ✓ Also acts as a night light ✗ Not yet available for retail 	
Emergency escape lock	<ul style="list-style-type: none"> ✓ Special deadlock unlocks with turn handle in an emergency ✓ Can be retrofitted into an existing doorway. 	

Note: Table key for advantages and disadvantages column ✓ Advantages ✗ Disadvantages

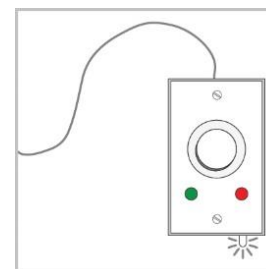
Glow-In-The-Dark Strip

- ✓ Designed to be visible for more than 100 hours after the lights go out.
- ✓ Suitable as stair strips, floor strips, handrail strips and door handle strips.
- ✓ Guides people to safety and exists in fire emergencies and smoky rooms.
- ✓ Suitable for indoors
- ✗ May confuse people with a cognitive
- ✗ Impairment or who are disorientated in a fire situation.
- ✗ May become a trip hazard if adhesive wears.



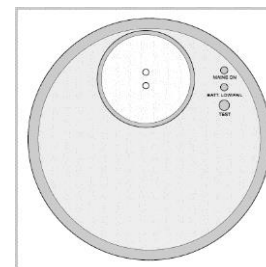
Electric And Gas Stove Isolation System

- Automatically cuts off electric or gas stove after 20 minutes.
- ✓ Reduces risk of a house fire as a result of leaving stove/oven on.
- ✗ - May interrupt cooking time.
- ✗ - Needs to be installed by a qualified electrician.
- ✗ - Expensive.



Visual fire Warning Device

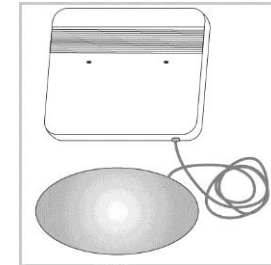
- Strobe battery unit
- ✓ Intense strobe light
- ✓ Can alert people with hearing impairment of a fire.
- ✓ Mains powered with battery back-up so can be interconnected to other smoke alarms.
- ✗ Needs to be maintained; battery back-up check and replacement is essential



Note: Table key for advantages and disadvantages column ✓ Advantages ✗ Disadvantages

Smoke Detector

- Intense strobe light and vibrating pad to be placed under pillow of sleeping person with hearing impairment.
- Can alert people with hearing impairment.
- Extra vibrating pads or strobe lights can be attached to the unit for other areas of the home.- Mains powered with battery back-up so
- ✓ Can alert people with hearing impairment.
- ✓ Extra vibrating pads or strobe lights can be attached to the unit for other areas of the home.
- ✓ Mains powered with battery back-up so can be interconnected to other smoke alarms
- ✗ Needs to be maintained, battery back-up check and replacement is essential



Note: Table key for advantages and disadvantages column ✓ Advantages ✗ Disadvantages

Fire Safety Checklist

- Does the client have Australian Standards approved smoke alarms installed and have they been tested? If not, they should contact their local fire protection company for advice and recommendations and have the alarms tested.
- Is the client capable of maintaining the smoke alarm? If not, regular check-ups should be organised such as through the SABRE program.
- Has the client organised a fire evacuation plan? Has the client got a fire extinguisher or fire blanket close to the kitchen to address possible electrical fires?
- If the client in a wheelchair lives in a residential unit block, are they aware of lift restrictions in the event of a fire? If not, they should be informed of an alternative evacuation plan.
- If the client lives in a residential unit block, do they have an adequate fire door? If not, this will increase the risk of a fire in their unit spreading throughout the building.
- Can the client operate their front door of their unit since it is a fire door? If not, an automatic door opener should be considered or a fire engineer should be consulted for alternative or equipment solutions.

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Appendix 1: Australian Standards and the BCA

AS 3786: 1993

(Amdt 1-4). Smoke alarms. (1993)

AS/NZS 1905.1: 2005.

Components for the protection of openings in fire-resistant walls. Part 1: Fire-resistant doorsets. (2005)

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BCA – Volume 1: Class 2 to Class 9 Buildings

BCA – Volume 2: Class 1 and Class 10 Buildings