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‘Occupant Interactions with Self-Closing Fire Doors in Private Dwellings’

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Occupant Interactions with Self-Closing Fire Doors in Private Dwellings

Abstract

Prevention measures to reduce deaths and injuries due to domestic fires have included the provision of self-closing fire doors within dwellings. Such an approach however, is reliant on a behavioural response on behalf of the occupier(s). This research examined occupier behaviour in relation to self-closing fire doors. Forty semi-structured interviews were conducted with individuals inhabiting a new home. In all of the properties with self-closing fire doors, the occupants reported interfering with the self-closing mechanism of the doors. A quantitative survey was subsequently undertaken to obtain frequency data. In the majority of dwellings with fire doors occupiers reported propping these open in some way, or removing the self-closing mechanism from the door. The accounts suggest that, for fire doors to be an effective safety measure within dwellings, a greater emphasis needs to be placed on encouraging occupiers to adopt safe practices in relation to fire doors. Alternatively, other measures will need to be found to address the fire risk.

Keywords: Home Safety, Fire Prevention, Fire Doors

1. Introduction

Deaths and injuries arising from dwelling fires are a cause for concern within the UK. Every year, almost 400 people are killed and over 10,000 injured as a result of a domestic fire. Current, yet provisional, data from the Department for Communities and Local Government (DCLG) suggests that in the year ending 30th June 2008, Fire and Rescue Services attended a total of 760,000 fires or false alarms within the UK (DCLG, 2009). Of these, 42,000 were accidental dwelling fires (DCLG, 2009). In the same period, 352 deaths occurred and 10,400 injuries were sustained as a result of a domestic fire (DCLG, 2009). The effects of fire can cause serious disruption to domestic life through the loss of personal belongings and damage to the home. In 2006, the average cost of a domestic fire in the UK was estimated at £24,900, of which approximately £14,600 was considered to be the economic cost of injuries and fatalities and £7,300 was due to property damage (Office of the Deputy Prime Minister [ODPM], 2006).

Reducing the incidence and severity of unintentional injuries sustained within the home is a public health priority (Department of Health, 2003) and various preventative measures targeting unintentional injuries have been introduced. ‘Primary’ interventions are engineering approaches which attempt to eradicate human factors from a situation and rely on structural or environmental modification. A number of primary prevention measures have been incorporated within the UK building regulations, for example the installation of fire doors within dwellings to protect against the effects of fire.

‘Secondary’ prevention strategies attempt to modify an individual’s behaviour, and as such, focus on the beliefs, attitudes and behaviours of individuals. Neither of these approaches however considers the interaction that may arise between behaviour and the environment.

Heimplaetzer and Goossens (1991) argue that many primary solutions aimed at preventing unintentional injury within the home have been chosen on the basis of partial or incomplete modelling of these solutions. For example, in preventing children falling down stairs a closure may be fitted at the top of a flight of stairs, but the consequences of this modification for other occupants is overlooked. In this manner, safety measures introduced to protect occupiers from one element of danger can introduce additional hazards within the home. Indeed, Pickett (2003) highlighted the finger-trapping hazard created by self-closing fire doors within three storey dwellings on a new development in Bristol, whereby the self-closing mechanism on the door applied a continuous force until the door hit the latch. Pickett recorded that over 700 internal self-closing fire doors had been fitted in 64 dwellings on the development. He reported that over 30,000 domestic incidents of finger trapping occur annually and concluded that as more properties were occupied there was further potential for injury.

There is conflicting evidence in relation to the effectiveness of primary interventions as a sole method in reducing the number of injuries sustained within the home. This may be explained by the fact that some environmental modifications, such as the provision of smoke alarms, require a behavioural adaptation to ensure their effectiveness (Carlson-Gielen & Sleet, 2003). A behavioural adaptation is also required for the effective use of self-closing fire doors. The safety protection afforded by fire doors, for example, is negligible if they are wedged open or otherwise unable to close (Meacham, 1999). Following completion of a dwelling and the appropriate approvals necessary to meet the requirements of the building regulations, no further checks are undertaken within privately owned and occupied dwellings. The continued operation or existence of self-closing fire door devices is not monitored or controlled after installation (DCLG,

2007a) and, anecdotally, such monitoring in private dwellings is unlikely to be considered acceptable to the occupants.

A project commissioned by the Department for Communities and Local Government (DCLG, 2007a), sought to determine current levels of satisfaction and current practice in relation to self-closing fire door devices within the domestic environment. The DCLG report details the findings of their investigation and suggests that within the majority of those properties where self-closing devices are fitted to internal fire doors, users are likely to disable them to meet family needs (DCLG, 2007a). The findings from the DCLG project however, are based upon limited information; of the 550 questionnaires distributed, only 18 usable responses were returned. One proposed suggestion for this was a fear of reprisal amongst individuals responding to the study. In addition to this, little information was forthcoming from a number of local and national house builders and social landlords. Personal interviews with friends and family of investigators proved to be the most effective and reliable source of data (DCLG, 2007a).

A subsequent study commissioned by the DCLG and undertaken by a market research organisation found that, among those living in the types of property where self-closing fire doors would be expected, only one third reported that they have self-closing devices. This suggests that up to two thirds of occupiers do not realise that they have these items or that they have been removed in the past (Andrew Irving Associates, 2006a; 2006b). These reports provide the only information available on householder interactions with self-closing fire doors; very little academic work has been published in relation to this topic.

Public antipathy towards such safety measures is could be due to the fact that the measures interfere significantly with the day-to-day convenience of occupants. In addition, differing perceptions of risk will continue to be a significant influence. Previous studies have identified that there are barriers to maintaining passive home safety measures (Stone et al., 2007; DiGuseppi et al., 2002) and it is important to establish these barriers in relation to fire door installation and maintenance.

In recognising the potential hazards created by fire doors and the inconvenience faced by occupiers the UK government initiated a consultation process where they were '*minded*' to remove the need for self-closing devices within dwellings (ODPM, 2005). Following this, a revised edition of Approved Document B was published; with the requirements being effective from April 2007. This document states that '*other than doors between a dwelling house and an integral garage, fire doors need not be provided with self-closing devices*' (DCLG, 2007b). The provision of internal fire doors however remains a legal requirement. Furthermore, additional national and local Community Fire Safety programmes are planned to reinforce the fire safety benefits of closing these doors, particularly at night (DCLG, 2007a).

In the UK, the requirement for self-closing devices on fire doors was first initiated in 1972. Regulation E13(2) introduced, for the first time, a requirement to protect stairways in three storey houses with fire resisting construction and fire doors with Regulation E11(5)b permitting the use of rising butt hinges as the self-closing device (HSMO, 1972). The requirement for self-closing devices on fire doors has therefore been a part of building regulations for almost 40 years until the recent amendment of

Approved Document B. A considerable amount of the UK's housing stock would have therefore been subject to such regulations.

The anecdotal evidence suggesting interference with self-closing fire doors in dwellings (e.g. Pickett, 2003; DCLG 2007a) is of particular importance when considering the emphasis now being placed on safety education and fire-protective behaviour within the home. A greater understanding of the ways in which occupiers interact with self-closing fire doors installed within their homes and the drivers for such behaviour would assist the development of safety campaigns aimed at promoting fire safety awareness. This would be of benefit to those occupying new homes where self-closers are not fitted on internal fire doors and also those occupying older dwellings where, for example, the self-closing devices have been removed. The aim of the present investigation therefore was twofold. Firstly to gain information on how occupier behaviour can interact with design features within the home including self-closing fire doors, and secondly, to quantify the extent to which self-closing devices may have been prevented from operating.

2. Methods

This research described in this paper was completed prior to the publication of the revised Approved Document B. The research was subject to and in compliance with the requirements of the Loughborough University Ethical Advisory Committee in relation to research with human participants. There were two phases to the research as follows:

2.1. Phase 1

Phase 1 was a qualitative study involving 40 face-to-face interviews with occupiers of new new-build properties to elicit in-depth information in relation to occupier interactions within the home.

2.2 Sample

Participants from 40 properties were recruited to achieve a structure convenience sample. In total, 774 letters inviting participation were delivered to completed and occupied properties on new build developments within the UK counties of Leicestershire and Nottinghamshire. All known new-build residential developments within a 20 mile radius of Loughborough University were targeted during the course of this research. The primary criterion for inclusion in this study was new build occupancy within the previous 2 years. The final sample included a broad range of property types (detached, semi-detached, terraced, town house and apartment) built by both small and large commercial developers and reflected different types of occupancy status (owner occupier, tenant and shared accommodation).

2.3 Research Design

A semi-structured interview schedule was prepared which contained questions in relation to individual experience of occupying a brand new home. One section of the interview schedule contained questions in relation to internal self-closing fire doors (Table 1). The interview schedule was piloted with 2 households before producing the final version.

[Table 1 here]

Of the 40 semi-structured interviews undertaken, 27 were conducted with a single participant; either the sole occupier of the property or the sole occupier willing to be interviewed and 13 were conducted with partners present. In total, 26 males and 28 females participated. The interviews were conducted by the same researcher, trained in interview techniques and were recorded with the knowledge and consent of all participants. Each interview lasted approximately one and a half hours.

2.4 Analysis

The recorded interviews were fully transcribed. Computer assisted qualitative data analysis was undertaken using the software tool NVivo, Version 2. The analysis followed three steps: data reduction, data display, verification and conclusion drawing (Miles & Huberman, 1994). Data reduction was achieved by coding the interview data and the subsequent pattern coding of initial codes. Validation of the coding was achieved by independent review of a sample of the data and subsequent interpretation by another experienced researcher, independent of the study.

2.5 Phase 2

Following analysis of the data obtained in phase 1, a quantitative study was undertaken to obtain frequency data from participants within a wider geographical area. This allowed quantification of the issues from a larger sample of participants.

2.6 Research Design

A questionnaire was developed which consisted of 4 sections. Section 1 requested personal data from respondents such as age, gender and details of the household composition. Section 2 requested information about the property and the length of occupation. Section 3 contained questions relating to the design of the property with a set of questions relating to internal self-closing fire doors. At the end of each set of questions within section 3, respondents were given the opportunity to add any comment or to provide further information. The research tool was piloted prior to the research and the feedback informed the subsequent development of the tool.

Explanatory notes were attached to the questionnaire which detailed the reasons for the study and provided the contact details for the researcher. Participants were informed that any responses given would remain confidential and that all information would be used solely for research purposes and reported anonymously.

A housing developer from the Midlands area of the UK agreed to assist with this research. In total, 794 questionnaires were distributed by post to all properties completed by this developer and occupied in the previous 12 months. A self-addressed freepost envelope was included to facilitate the return of the questionnaires. Participants responded to the questionnaire anonymously and therefore reminders were not sent to non-responding households. A total of 142 completed questionnaires were returned to the researcher.

2.7 Analysis

The data from the completed and returned questionnaires were analysed using the software SPSS (Version 14) to produce frequency calculations.

3. Results

3.1 Phase 1

The mean length of occupation of the properties in this study was 12.5 months (S.D. = 8.6). The age of participants ranged from 20 to 65 years (mean = 37.5 years, S.D. = 12.9). Within the sample, 137 (96.5%) of the properties were owned by the occupant(s) and 2 (1.4%). (Missing data 2.1%). No other occupancy status was reported. The range of property types are shown in Table 2.

[Table 2 here]

3.2 Fire Doors

Of the 40 properties, 26 were fitted with internal self-closing fire doors in line with UK building regulations which were current at the time of construction. These consisted of all of the town houses (n=20) and 6 apartments. The remaining 14 properties were exempt from the requirements for internal fire doors. In 25 of the 26 properties the self-closing devices fitted to the doors were concealed chains (see figure 2), and in the remaining property the fire doors were fitted with self-closing arms. All the fire doors were for habitable rooms in line with legislative requirements. In addition, within some properties, self-closing fire doors were installed to some bathrooms and airing cupboards; the provision of these going beyond the legal requirement.

In every one of the 26 properties with internal self-closing fire doors, the occupants had interfered with the self-closing mechanism of the doors in some way. In 25 of the properties a number of the fire doors were wedged open in some way preventing them from closing. Nine of the participants reported interfering with the self-closing mechanism itself. Examples are shown in Figures 1 to 3.

[Figures 1, 2 and 3 here]

Preventing a fire door from closing within a private dwelling is not illegal in any way. Whilst these actions were reversible interference, in that the wedges could have been removed, or the self-closing devices replaced, the act of disabling the doors resulted in reduced fire protection for all occupants within each dwelling. Of the 26 properties where fire doors were disabled in some way, 22 were occupied by the owners, 2 were rented flats and the remaining 2 properties, both town houses were multi-occupancy dwellings whereby each bedroom was rented to a separate individual.

Some participants explained why they had disabled the fire doors within their homes. These explanations included inadequate internal lighting when the doors were shut; noise due to the doors slamming and to prevent finger-trapping injuries. A full breakdown is shown in Figure 4. Where the reason is unspecified, the participants did not provide an explanation for interfering with the fire doors.

[Figure 4 here]

Despite interfering with the fire doors, participants reported that they did appreciate the safety reasons for the installation of the doors. A 25-year-old male living in shared accommodation said:

“I think obviously they are a good idea [but] I’m sure there’s another way of doing it”

A 35-year-old married female commented:

“I understand the health and safety behind it but it drives me [mad]. It worries me, they really go [close] with a bang!”

A 51-year-old home owner said:

“I understand why they are there, they are there for safety but they are a blimming nuisance”

3.3 Phase 2

A total of 142 completed questionnaires were returned to the researcher, a response rate of 17.8%. Of those who responded to the survey, 40% were male and 59% were female (missing data 0.7%). A range of property types were also represented, terraced (12%), semi-detached (59%, detached (26%) and other (3%). Of those responding, 23% lived alone, 6% were single parents living with children, 27% lived with their spouse/partner with children and 44.% lived with a spouse/partner with no children.

3.4 Fire Doors

Self-closing internal fire doors were reported as being fitted in 36% (n = 51) of the homes. In 3.5% (n = 5) of the homes, the occupants did not know if the internal doors were fire doors (missing data 1.4%). Where fire doors were reported as being present in the property, information regarding this safety feature had been given to just 33.9% (n = 19) of the sample.

In 70.6% of properties with fire doors, occupiers reported propping these open in some way, preventing the self-closing mechanism (a concealed chain – see Figure 1) from working. These concealed chains were the same self-closing mechanism as reported in phase 1. In 19.6%, occupiers reported having removed the self-closing mechanism from the fire door. In 23.5% of properties where fire doors were installed, participants reported that some member of the household had experienced a finger-trapping injury due to the fire doors.

One participant with a small child described why the fire doors were propped open within the home:

“Because we have a child under 2 years old and need to be able to see and him at all times. With one small child we find them very dangerous”

Another participant described a similar situation:

“Frightened that children visiting the property will trap fingers, also very noisy when slamming shut. Very unsafe where children are concerned”

In addition to the associated safety concerns, some participants also described the inconvenience caused as a result of having fire doors within their home:

“The closers slam the door shut and make moving around difficult. For convenience we prop them open”

“Having doors closed all the time does not create a nice atmosphere in the home and limits light. Also creates greater difficulty moving between rooms”

4. Discussion

This research has provided evidence of how occupiers interact with internal self-closing fire doors fitted within dwellings. During this research, two types of self-closing mechanism were identified, the concealed chain (see Figures 1 and 2) and the self-closing arm (see Figure 3). These are the most common self-closing mechanisms found within dwellings.

Self-closing fire doors were described by participants as an inconvenience in that they inhibited free movement between rooms within the home and were difficult to negotiate when carrying articles. When closed, the fire doors obstructed natural light and the self-closing mechanism resulted in the doors slamming thereby creating additional noise and a risk of injury. In response to this, occupiers described obstructing the self-closing mechanism on some of the doors and in some instances occupiers reported removing the self-closing mechanism altogether. The interference with self-closing fire doors by occupiers has been a consistent finding throughout this work and is in line with previous

published work (Pickett, 2003; Andrew Irving Associates, 2006a; 2006b; DCLG, 2007a).

Barnes (2002) claims that public antipathy towards self-closing fire doors may be due to a lack of trust in the formal bodies responsible for regulating safety, yet the findings reported here indicate that usability is a greater concern for occupiers. The way in which occupiers interact with the doors by propping them open and removing the self-closing mechanism offers support for the claim that for virtually all primary modifications, a behavioural adaptation is also required (Carlson Gielen & Sleet, 2003). If the results of this study are indicative of behaviours practised in other homes, as suggested by previous studies (Pickett, 2003; DCLG, 2007a), the provision of internal self-closing fire doors within dwellings may be largely ineffective as a sole safety measure. The fact that some participants recognised the benefits of having fire doors and understood the health and safety reasons behind their installation, yet still interfered with their doors indicates the significant practical problems users found with this safety measure. It also highlights the importance of addressing the interaction between behaviour and the environment in implementing engineering solutions to health and safety problems.

This study has also demonstrated how self-closing fire doors within dwellings can introduce the risk of finger-trapping injuries. Participants from phase 1 and phase 2 of this research reported that they were concerned that the self-closing fire doors in their home were a hazard. This is an example of partial or incomplete modelling of a primary injury prevention solution (Heimplaetzer & Goossens, 1991) whereby self-closing fire doors have been incorporated into modern dwelling designs as a safety

measure without consideration of the context in which they are used. Because of this, those responsible for the implementation of such measures have not foreseen the additional consequential hazards.

The amendment to Approved Document B (DCLG, 2005), effective from April 2007, removed the legal requirement for most internal fire doors within dwellings to be fitted with self-closing devices. The provision of internal fire doors which do not necessarily incorporate self-closing devices remains a legal requirement. The effectiveness of these doors as a safety measure will therefore rely on a behavioural adaptation on behalf of occupiers to ensure that they are closed, particularly at night. Previous injury prevention approaches have focused on environmental modification or behaviour change in isolation and have not considered the complex interactions that arise between occupiers and dwelling design features such as internal fire doors. This research has demonstrated how occupier behaviour can interact with some safety measures to reduce the level of protection afforded within the home. The proposed approach to maintaining fire safety within dwellings incorporates environmental (i.e. doors) and behavioural (i.e. educational) initiatives simultaneously (ODPM, 2005), and therefore must also consider and address the interactions that may arise between occupant behaviour and fire door design.

Notwithstanding this recent change in building regulations, much of the UK's current dwelling stock consists of homes of more than 2 stories built with self-closing devices fitted on all internal fire doors. The findings from this study suggest that within the majority of homes where fire doors are fitted these may be ineffective against the spread of smoke or fire. Fire safety measures aimed at encouraging safe practices within

dwellings should therefore not be restricted to those occupying new properties but should also address the potential for injury which is apparent in current stock.

In phase 2 of this research, a number of participants reported that they were unaware whether the internal doors within their properties were fire doors. This suggests that there remains scope to improve the level of information provided to new home owners. This is particularly relevant for those occupying new homes which are built without self-closing devices on the fire doors where occupant behaviour will be essential to ensure the effective operation of fire doors.

This research has therefore demonstrated shortcomings in relation to a safety measure which forms part of building regulations, with the current provision for fire doors in some new homes. The interactions which arise between an individual and the home environment involve a combination of behavioural factors and environmental factors; future fire safety strategies will therefore need to address both behavioural and environmental influences simultaneously in order to be effective. Such strategies may benefit from a review of the design of current measures, in particular the self-closing mechanisms fitted to internal fire doors.

Future work in this area will also need to consider both behaviour and environmental factors and the interactions that arise between them. Attitudes and knowledge about fire risk and fire safety may have an affect on the correct use of fire doors as a safety measure. Furthermore, with the recent change in building regulations (DCLG, 2007b), it would be useful to evaluate the impact of this change on the effectiveness of fire doors as a safety measure within dwellings. In addition, it would also be appropriate to

assess whether the planned Community Fire Safety education programmes to reinforce the safety benefits of closing fire doors at night (DCLG, 2007a) have had an effect on occupier behaviour.

Critiquing the study methodology, the retrospective nature of the data gathered in phase 1 relied heavily on participants' recollections of their experiences at a busy and sometimes stressful period and as such it is possible that information may have been missed. The response rate obtained during the second phase of this research was low (17.8%), however the house types represented amongst the returned questionnaires reflect current trends amongst dwelling stock within England as a whole (DCLG, 2007c). It is possible that some participants in this study failed to accurately report their behaviours in relation to the self-closing fire doors for fear of reprisal, as experienced in previous studies (DCLG, 2007a). The extent to which this may be true cannot be determined. Even if unsafe behaviour has been under-reported, the combined results from phase 1 and phase 2 provide a clear and comprehensive view of householder interactions with self-closing fire doors. It may also be argued that the data set is biased towards occupiers who had experienced a particular problem with their dwelling and who may have used the study as an opportunity to express their frustration. However, in utilising any self-selecting sample within research, this issue of response bias cannot be completely removed.

The results from this work however are illustrative and informative and will be of particular interest to those responsible for the development of national and local community fire safety programmes.

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