

Office of the Fire Marshal and
Emergency Management

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Staffing Levels in Care
Occupancies, Care and Treatment
Occupancies and Retirement Homes



December 2013

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GUIDELINE

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Abstract

Ontario's Fire Code requires every *care occupancy*, *care and treatment occupancy* and *retirement home* to prepare and implement a fire safety plan that has been approved by the Chief Fire Official. Each of these facilities must appoint, organize and instruct designated supervisory staff to carry out the necessary fire safety duties. There must also be sufficient supervisory staff available to perform these duties. This guideline is intended to assist in determining the number of supervisory staff required to properly implement the fire safety plan, and in particular, to carry out an emergency evacuation.

The guideline identifies a number of factors that should be taken into consideration when establishing staffing levels for purposes of moving occupants to a point of safety during a fire emergency. A methodology is presented to calculate staffing demands based on probable fire scenarios and occupant mix. Guidance is also provided on adjustments that may be made where the time required to move patients or residents to a point of safety exceeds the time available for safe occupancy.

Note: This guideline includes Fire Code amendments introduced by O.Reg. 150/13 that come into effect on January 1, 2014.

Acknowledgments

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1.0 SCOPE

This guideline is intended to assist facility administrators and fire officials in establishing an appropriate level of staffing to effectively implement fire safety plans in *care occupancies*, *care and treatment occupancies* and *retirement homes*. It presents a ‘table top’ methodology for calculating staffing demands based on probable fire scenarios and occupant mix. It is not intended as a substitute for fire drills prescribed by the Fire Code.

Note: The guidance provided in this document is based upon the assumption that the building complies with the Building Code or the Fire Code, and that all building fire safety features are inspected, tested and maintained in accordance with the provisions of the Fire Code.

2.0 CARE OCCUPANCIES, CARE AND TREATMENT OCCUPANCIES AND RETIREMENT HOMES

The Fire Code requires that a building be “classified according to its major occupancy by the Chief Fire Official in conformance with the Building Code” (Article 2.1.2.1., Division B of the Fire Code). For purposes of occupancy classification, the definitions in the Building Code and Fire Code are functionally the same.

Building Code definitions -

Care occupancy means an *occupancy* in which special care is provided by a facility, directly through its staff or indirectly through another provider, to residents of the facility

- (a) who require special care because of cognitive or physical limitations, and
- (b) who, as a result of those limitations, would be incapable of evacuating the *occupancy*, if necessary, without the assistance of another person.

Care and treatment occupancy means an *occupancy* in which persons receive special care and treatment.

Retirement Homes means a retirement home regulated under the **Retirement Homes Act, 2010**, regardless of whether it is a *care occupancy* or a *residential occupancy*.

Examples of *care occupancies* listed in the Appendix to the Building Code include children’s custodial homes, group homes for developmentally disabled residents and residential care facilities (residential care facilities operate under a variety of labels including retirement homes and assisted living centres).

Examples of *care and treatment occupancies* listed in the Appendix to the Building Code include hospitals and long-term care homes.

It is important to note that facilities providing services for psychiatric, emotional and/or behavioural conditions are not classified as *care occupancies* unless the residents also have cognitive or physical limitations, and the other conditions of the *care occupancy* definition are met.

2.1 Assistance in Evacuation

Inherent in receiving special care services in *care occupancies* and special care and treatment services in *care and treatment occupancies* is the residents' or patients' limited capacity for self-preservation and reliance on staff for assistance in evacuation to a point of safety in the event of a fire emergency. As such, evacuation of residents or patients to a point of safety is the responsibility of supervisory staff as outlined in the building fire safety plan. The primary role of fire fighters is to suppress the fire and provide rescue where needed, and therefore should not be relied upon to assist with evacuation.

Patients and residents requiring assistance to evacuate include persons who:

- are incapable of independent mobility;
- require assistance to use or access a mobility aid, e.g. transferring to and from a wheelchair or accessing a walker or cane;
- are incapable of following directions under emergency conditions; or
- are capable of self-evacuation, but not without initial assistance and direction, or within time frames considered necessary for safe evacuation in an emergency situation.

3.0 FIRE SAFETY IN CARE OCCUPANCIES, CARE AND TREATMENT OCCUPANCIES AND RETIREMENT HOMES

The Building Code generally requires that *care occupancies* and *care and treatment occupancies* have a higher standard of construction incorporating a greater degree of containment, egress, early warning and suppression features as compared to residential occupancies. Automatic sprinkler systems are a key mandatory fire protection feature for most of these buildings. These enhanced features anticipate that evacuation under fire emergency conditions may be slowed or delayed due to the inability of some occupants to self-evacuate.

Additional fire safety enhancements for all *retirement homes*, irrespective of occupancy classification, have been incorporated into the 2014 Building Code for similar reasons.

Existing buildings, other than those that comply with the Building Code (in some cases specific editions of the Building Code), are required to meet the retrofit standards in Part 9 of Division B of the Fire Code (see Article 9.1.2.2.).

Despite the presence of built-in fire protection features, significant reliance is placed on the availability of trained staff to facilitate evacuation under fire emergency conditions to a “point of safety”. A “point of safety” is a location that is exterior to and away from the building, or is within the building and meets a high degree of fire endurance as deemed acceptable by the Chief Fire Official. Examples of points of safety include the following:

- a space within an exit stairway that is separated from the remainder of the building by a fire separation having a minimum 30 minute fire resistance rating with adequate capacity to house the evacuated occupants , or
- a space within another portion of the building with adequate capacity to house the evacuated occupants that:
 - is separated from the area of fire involvement by a fire separation having a minimum 30 minute fire resistance rating,
 - has access to an exit that does not necessitate returning to the area of fire involvement, and
 - is usually not located on a floor level above the area of fire involvement.
- A floor below the floor of fire origin.

Indoor points of safety should always be considered as temporary areas of refuge, with a subsequent phase of evacuation always to follow until all occupants are outside the building. The responding fire service has the discretion to call a halt to any phase of evacuation once the fire has been suppressed and the building deemed safe.

4.0 FIRE SAFETY PLANNING AND SUPERVISORY STAFF

Section 2.8 of Division B of the Fire Code requires owners of *care occupancies*, *care and treatment occupancies* and *retirement homes* to prepare and implement a fire safety plan that has been approved by the Chief Fire Official. The typical process in seeking approval of the fire safety plan is as follows:

1. The facility administrator prepares a fire safety plan to address the requirements in Sentence 2.8.2.1.(2);
2. The facility administrator submits the fire safety plan to the Chief Fire Official for review and approval in accordance with Sentence 2.8.2.1.(1);
3. The Chief Fire Official approves the fire safety plan with amendments, if required;
4. The facility administrator implements the fire safety plan as approved;
5. Supervisory staff in *care occupancies* and *care and treatment occupancies* conduct monthly fire drills in accordance with Clause 2.8.3.2.(1)(a);
6. Supervisory staff in *care occupancies*, *care and treatment occupancies* and *retirement homes* conduct annual fire drills of a scenario approved by the Chief Fire Official representing the lowest staffing level complement, to confirm that those reduced staffing levels are sufficient to carry out all duties in the fire safety plan and that specific critical duties can be carried out within pre-determined target times (see Appendix E).

7. The facility administrator notifies the Chief Fire Official prior to each annual fire drill of the scheduled date in accordance with Article 2.8.3.3.;
8. The facility administrator reviews the fire safety plan at least annually to ensure that any significant changes to the building features, staffing levels and resident profile are addressed;
9. The facility administrator consults with the Chief Fire Official to ensure that any changes to the fire safety plan are consistent with the terms of the original approval.

A facility must appoint, organize and instruct designated supervisory staff to carry out the necessary fire safety duties (reference Article 2.8.1.2.). As required by Sentence 2.8.2.1.(6), training records for supervisory staff must be retained for at least two years and be made available to the Chief Fire Official upon request. The term “supervisory staff” is defined in the Fire Code to mean “occupants in the building who have some delegated responsibility for the fire safety of other occupants under the fire safety plan and may include the fire department where the fire department agrees to accept these responsibilities”.

Further information on the development and implementation of a fire safety plan for *care occupancies* and *care and treatment occupancies*, including the appointment of supervisory staff, can be found in technical guidelines TG-00-1997 “Fire Safety Planning Guideline for Residential Care Facilities” and TG-02-1999 “Fire Safety Planning Guideline for Institutional Facilities”, available for reference on the Office of the Fire Marshal and Emergency Management’s (OFMEM) website at www.ontario.ca/firemarshal. These guidelines may be subject to updates and the website should be checked regularly to confirm currency.

5.0 STAFFING LEVELS

Although Article 2.8.2.2. of Division B of the Fire Code stipulates that sufficient supervisory staff must be available in *care occupancies*, *care and treatment occupancies* and *retirement homes* to perform the duties as required in the fire safety plan, specific staffing levels or ratios are not identified as needs are based on factors that vary from one facility to another. As a result, an individual assessment of staffing level requirements is required for every facility and should consider the following factors:

- the degree of assistance required for occupant evacuation;
- the number of occupants that require evacuation;
- building construction and fire protection features to control the growth and spread of fire;
- level of staff training; and
- other actions required of staff under the fire safety plan.

5.1 Factors that Impact on Staffing Levels

(a) *Degree of Assistance Required for Occupant Evacuation*

The degree of staff assistance required for occupant evacuation is directly related to the degree and nature of occupant disabilities. Facilities that house occupants with significant physical and/or cognitive impairment require a greater number of staff to assist occupants with moving to a safe location in the event of an emergency. For example, care facilities with large numbers of residents using mobility aids place a higher demand on staff than do similar facilities with some cognitively impaired but predominantly ambulatory residents.

(b) *The Number of Occupants that Require Evacuation*

The number of occupants in a particular facility may vary from floor to floor, within a floor area, and may also vary by the time of day. For example, the main dining hall may be located on a particular floor of the building within which all the residents are accommodated. Accordingly, demands on staff for evacuation of the residents from the dining hall in the event of a fire emergency will be higher at meal times than at other times of the day.

The number of occupants requiring evacuation will also vary depending upon the circumstances of the fire emergency. The fire safety plan should consider scenarios based on the size and use of the fire compartments that are likely to be involved. As an example, if the room of fire origin is a patient's or resident's room, only one or two patients or residents may require evacuation in the "initial phase" compared to a dining room or a critical care unit, which would involve moving significantly more persons. The "initial phase" usually ends when the door accessing the room of fire origin is closed to contain the fire and smoke.

If the next phase of evacuation involves the floor area containing the room of fire origin, this would require moving significantly more patients or residents. However, a floor area subdivided by a fire-rated zone separation can reduce the number of patients or residents that need to be evacuated in this phase. Each fire scenario will identify the number of occupants requiring evacuation, and therefore establish the number of staff required.

Considerations should also be given to evacuating patients or residents that are located directly above the room of fire origin. Over time, a fire can compromise the ceiling assembly and expose those persons directly above.

(c) *Building Construction and Fire Protection Features to Control the Spread of Fire*

Care facilities and care and treatment facilities that meet current Building Code provisions provide a high degree of protection for their occupants. Although specific features vary based on building size and height, typical features found in such facilities include corridor and resident/patient room fire separations, floors subdivided into fire compartments, self-closing devices on resident/patient room doors, protected exits, sophisticated fire alarm and detection systems, and automatic sprinklered systems. Buildings that do not have such enhanced features may require higher staffing levels to compensate for the lack of built-in protection, as more occupants may be at risk sooner during a fire emergency.

(d) *Level of Staff Training*

Staff training is critical to ensure that proper actions are taken during a fire emergency. Proper actions can prevent the rapid spread of smoke and fire throughout a building. For instance, quick action to properly close and latch the door to the room of fire origin will delay fire and smoke spread into the corridor and adjacent rooms.

Staff training must also incorporate appropriate techniques and procedures for the movement of nonambulatory, bedridden or severely ill patients or residents. Special training may be required to ensure that assistive devices, which facilitate evacuation, are utilized safely and effectively.

Facilities with comprehensive and ongoing staff training procedures will benefit from an improved fire safety record. Well trained staff can also carry out an evacuation more rapidly and efficiently thus minimizing the demand on other in-house and external resources.

(e) *Other Actions Required of Staff under the Fire Safety Plan*

Under the fire safety plan, staff in a particular area of a building may be required to carry out other duties elsewhere in the building. This may delay them or prevent them from assisting with the evacuation of occupants. For instance, certain supervisory staff may be required to respond to the main entrance to receive firefighters. Occupant safety can be seriously jeopardized when only one of two staff members is left to evacuate the floor area. Minimum staffing levels for each shift should therefore be established in consideration of other duties that may be required under the fire safety plan.

6.0 CALCULATION OF STAFFING NEEDS

*Note: The calculation methodology outlined below represents an **optional** method of determining staffing demands based on probable fire scenarios and occupant mix. It is not intended as a substitute for fire drills prescribed by the Fire Code.*

$$\text{Detection Time } (T_{\text{Detection}}) + \text{Time Required to Evacuate } (T_{\text{Required}}) \leq \text{Time Available } (T_{\text{Available}})$$

Assessing staffing needs to evacuate a particular facility requires a systematic and coordinated approach. The assessment should be conducted by a joint management and staff committee that has responsibility for disaster planning. Familiarity and experience with the methods of evacuation are important in arriving at reasonable estimates. The overall objective in the establishment of staffing needs is to ensure that the time taken to detect or discover a fire, and to evacuate patients or residents from a room or floor area (or part of a floor area) to a point of safety, does not exceed the time available to safely evacuate, i.e.

The following steps are typically followed to determine staffing needs*:

1. Identification of Scenarios

A number of probable fire scenarios need to be considered based on occupant use, possible ignition sources and building features. Staffing levels will need to be determined for each individually.

When considering probable fire scenarios for the purpose of determining staffing levels, the most likely fire occurrences and circumstances should be considered, not worst case scenarios.

In evaluating the scenario of a fire in a resident or patient bedroom, consideration should be given to circumstances when residents or patients are sleeping and staffing is at its lowest levels. This is usually during the night-time hours. Fewer staff are available to respond and remove the bedroom occupant(s) to a point of safety, followed by evacuation of other residents or patients to the next point of safety. In the absence of effective zone fire separations on the affected floor, this may involve moving residents or patients down stairs, which can be physically demanding and time consuming for staff.

Other day or evening period probable scenarios should also be considered to determine whether they might challenge staffing levels within the facility. The calculation methodology provided herein will assist owner/operators in determining whether these would also be a challenge for current staffing levels.

Typical considerations in evaluating a scenario include the location and time of fire ignition, the means of fire detection, the number of staff available for evacuation of residents or patients, the various point(s) of safety as residents or patients are evacuated horizontally and perhaps vertically depending on the fire protection features in the building.

Scenario Example -

During the night shift, a fire occurs in a resident bedroom on the highest (2nd) floor that houses both ambulatory and non-ambulatory residents. The fire alarm is activated by a smoke detector in the bedroom. The extent of fire involvement requires the evacuation of one entire wing into an adjacent wing through a zone fire separation. Subsequent evacuation to ground floor will follow the zone evacuation phase. Two staff are on duty to evacuate residents. No sprinklers are provided in the building.

2. Data Collection

Collect data to evaluate the evacuation capability of the facility based on the identified scenarios. Note that the resident profile in a *care occupancy* or *retirement home* will likely change over time and therefore this exercise may need to be undertaken periodically to ensure accuracy of the assessment. Patients in *care and treatment occupancies* and their condition, change so frequently that it is best to assume that all are nonambulatory.

Examples

- a. *Number of ambulatory residents requiring initial assistance and guidance but can be relied on to complete evacuation on their own [Type A].*
- b. *Number of ambulatory residents using mobility aids and requiring movement assistance [Type B].*
- c. *Number of non-ambulatory patients or residents able to assist with transport (e.g. swing carry) [Type C].*
- d. *Number of non-ambulatory patients or resident unable to assist with transport (including other resident Types that are medicated) [Type D].*
- e. *Number of staff in building during each shift that can assist in evacuation (consider other duties under fire safety plan).*
- f. *Number of available staff in adjoining or nearby buildings during each shift that can assist in evacuation (consider other duties under fire safety plan).*

3. Time of Fire Detection ($T_{\text{Detection}}$)

$T_{\text{Detection}}$ = time from fire ignition to when staff are notified of a fire emergency by alarm or other means of discovery

Estimate the time of fire detection based on the probable fire scenarios identified and available fire detection devices. When estimating this time, considerations include the time of day, use of the rooms and likelihood of staff being in the space at that time. For example, staff at care facilities or long-term care homes is likely to be in the dining room during resident meal times. A recovery room in a hospital is another example where staff is constantly in attendance to monitor recovering patients.

$T_{\text{Detection}}$ can be an important factor when determining how much time is available to evacuate a floor space in a safe manner. Detection time plus evacuation times should not exceed the safe tenability times of a floor space. If $T_{\text{Detection}}$ is excessive then less time is available for evacuation. In fact, if detection in the room of fire origin is significantly delayed, the room of origin may not be tenable for the staff to enter. If detection time is further delayed and room flashover occurs, then the fire confinement time provided by room fire separations and closed doors will be reduced before evacuation even begins. As such, it is very important to keep $T_{\text{Detection}}$ values as short as possible through the use of fire detection devices, so as to maximize the available time to evacuate.

For a fire occurring at night in a patient's or resident's room, $T_{\text{Detection}}$ is the time from fire ignition to activation of the room's detection device. Fires initiating at night in other rooms of the facility could have very different notification times because of differences in size, shape and type of detection, if any. Smoke detectors would activate sooner than a heat detector or a sprinkler system, especially with a smoldering fire. An unoccupied room with no detection could have a lengthy $T_{\text{Detection}}$, depending on where the room is located with respect to the supervisory staff on duty, and whether the door accessing the room is open or closed. On the other hand, $T_{\text{Detection}}$ would effectively be zero for a fire occurring in a dining room of a care facility or a long-term care home during mealtime, since staff and alert residents in attendance would immediately notice a fire. (See Appendix C for examples of detection times)

4. Time Required to Evacuate to a Point of Safety (T_{Required})

Estimate the time required to evacuate the patients or residents to a point of safety based on the identified scenarios. These estimates may be determined through time-based egress analysis (see Appendix D) or other recognized methodology; however, mock evacuations will provide the most realistic estimates. To avoid the risk of injury, it is strongly recommended that proxies for the patients or residents be utilized for this purpose.

The time required to evacuate to a point of safety consists of the following sum:

$$T_{\text{Required}} = T_{\text{Response}} + T_{\text{Move}}$$

T_{Response} = time for staff, once notified of a fire condition, to reach the area of the fire and be in a position to begin moving patients or residents to a point of safety

T_{Response} is based on the normal location of staff in the building during various times of the day, and should be verified by fire drills. Consideration needs to be given to the minimum number of staff required and how long it would take them to respond to a likely fire scenario. It is important however to distinguish between T_{Response} for the room of fire origin and T_{Response} for the zone or floor area outside the room of fire origin.

It should be noted that T_{Response} may be impacted by other procedures outlined in the fire safety plan. For instance, procedures that include calling the fire department, or notifying staff in other parts of the building or in other buildings on the same property, can increase response time to the fire area. Fire drills can be used to determine the impact of these procedures on T_{Response} . In some scenarios, however, the response time may be considered to be “zero”. An example of a zero response time scenario would be a fire originating in a communal space while staff is in attendance, such as in a dining room during mealtime.

Once the room of fire origin has been evacuated, where possible, and the room door closed, the remainder of the floor or zone will need to be evacuated. Additional staff may be needed for this phase of evacuation. T_{Response} for the evacuation of the floor or zone is based on the time it takes the minimum required number of staff to arrive and begin this evacuation phase. The minimum required number of staff for this phase of the evacuation can be determined using tools provided in Appendix D and verified through fire drills.

T_{Move} = the amount of time it takes staff to move patients or residents to a point of safety

T_{Move} is directly affected by the type and capabilities of the residents or patients in the area being evacuated, the physical layout of the building, the points of safety within the building and the number of staff assigned to carry out evacuation. This time can be estimated, from time-based egress data documented in the professional literature as referenced in this guideline, through the use of computer modelling and/or through direct assessment of staff and residents/patients during a fire drill.

Consider the following when calculating T_{Move} :

- a. *Time required to assist Type A residents to safe area. (considerations: time to wake and assist residents to corridor, and then direct residents to next point of safety, close room doors)*
- b. *Time required to assist Type B residents to safe area. (considerations: time to wake and assist residents from their beds, assist residents' move to point of safety, return trip time.)*
- c. *Time required to evacuate Type C patients or residents to safe area. (considerations: number of staff required, time to move patients or residents off beds and the method used, time to move residents to point of safety, place to temporarily park patients or residents, return trip time.)*

- d. *Time required to evacuate Type D patients or residents to safe area. (considerations: number of staff required, time to move patients or residents off beds and the method used, time to move residents to point of safety, place to temporarily park patients or residents, return trip time.)*
- e. *Time required to perform other duties under the fire safety plan (e.g. sounding of fire alarm signal, closing doors to patient or resident rooms, communicating with other staff, responding to main entrance to receive fire fighters.)*
- f. *Response time of additional staff required to assist in evacuation. (from other floors or buildings on same property)*

5. Time Available to Move to a Point of Safety Based on Tenability Levels ($T_{\text{Available}}$)

$T_{\text{Available}}$ represents the maximum time period in which conditions within a space are assumed to be reasonably safe, measured from the time of ignition. It is determined by taking into consideration building construction, room geometry, combustibles loading and fire protection features.

For unsprinklered buildings, this time may vary from between 2 and 3 minutes[†] for a typical patient or resident room, and between 7 and 48 minutes for the floor or zone area located outside the room of origin if a fire is initially contained to the room of origin. The 2 to 3 minute time frame represents the time that a typical patient or resident room in an unsprinklered building is expected to remain tenable, depending on the item being first ignited. The desirable objective is to relocate the patient(s) or resident(s) of the room to a point of safety and close the door before unsafe tenability levels are reached in the room.

Once the door to the room of fire origin is closed additional time is gained for evacuation of the remainder of the floor area or zone. The objective is to relocate the patients or residents in the floor area/zone outside the room of fire origin to the next point of safety before the door to the room of origin is compromised, which would result in unsafe tenability levels in the corridor.

Time frames for a door to withstand fire spread, under typical unsprinklered fire conditions, start when the fire impinges on the door. This usually occurs at room flashover. The fire-resistive effectiveness of various types of doors in a nonsprinklered situation is reflected in Table A.1 in Appendix A.

It should be noted that this time frame anticipates an effective fire separation envelope around the room of fire origin as well as the timely closing of the door to the room. Closing of the door could be achieved through either a self-closing device or responding staff. Even with the presence of a door self-closing device, it is critical that staff be trained to ensure that this door is properly closed and remains closed by removing all potential obstructions such as wheelchairs and walkers from the doorway. The absence of a demonstrable and reliable method to contain the fire to the room of origin would necessitate a significant reduction in the available time. A $T_{\text{Available}}$ of no more than

3 minutes for evacuation of a zone, fire compartment or floor area, as applicable, is advised in this circumstance.

In a **sprinklered** building, where fire originates in a patient's or resident's room, the maximum time period for the room to remain safe will depend on a number of factors. These factors include type of fire, rate of fire growth, proximity of sprinkler heads to point of fire origin and the proximity of the patient or resident to the fire. However, in most cases, the time period before an unsafe tenability level is reached is expected to exceed 5 minutes. Again the desirable objective is to relocate the patient or resident to a point of safety outside the room of origin and close the door to this room.

Once a door to the room of fire origin is closed, the type of door will again play a big part in determining how long it can resist fire spread. As well, the sprinkler system within this room will also greatly impact fire growth as the fire will typically be controlled by the sprinkler system. The effectiveness of the sprinklers in this room is however a function of the available water supply as required by NFPA 13, 13D or 13R compliant sprinkler systems. This water supply duration could be as low as 10 minutes for some systems, if a self-contained water supply is provided, or it could effectively be unlimited if supplied from a municipal water supply system. Table A.1 in Appendix A reflects the duration of various water supplies, and in conjunction with various types of doors, illustrates the safe available time in the floor area or zone once the room of origin door is closed.

Despite the likelihood of an effectively unlimited water supply for sprinkler systems fed from a municipal water supply, the Table puts an upper limit on the duration as an added safety factor. The assigned available time ($T_{\text{Available}}$) to evacuate this zone or floor area to the next point of safety should not exceed the times provided in the Table A.1. However, as stated above, the absence of a demonstrable and reliable method to contain the fire to the room of origin could necessitate a reduction in the available time for evacuation of the zone, fire compartment or floor area. This is particularly important where there are limits on the duration of the sprinkler water supply.

6. Compare Sum of Detection Time ($T_{\text{Detection}}$) and Time Required (T_{Required}) to Time Available ($T_{\text{Available}}$)

$$\text{Detection Time } (T_{\text{Detection}}) + \text{Time Required to Evacuate } (T_{\text{Required}}) \leq \text{Time Available } (T_{\text{Available}})$$

For any given scenario, if the time to detect a fire ($T_{\text{Detection}}$) plus the time required to evacuate (T_{Required}) is less than the time available for safe evacuation ($T_{\text{Available}}$), the staffing levels are deemed adequate. On the other hand if the detection time ($T_{\text{Detection}}$) plus the evacuation time (T_{Required}) exceeds the time available for safe evacuation ($T_{\text{Available}}$), then adjustments will be necessary.

Some adjustments that might be considered –

- increasing the number of supervisory staff on duty;
- enhancing supervisory staff training;
- incorporating more or different types of assistive devices;
- redistributing the placement of the occupants who require the greatest assistance in evacuation;
- reducing the overall number of patients or residents in the building or zone;
- reducing the flammability of furnishing within patient or resident bedrooms to reduce likelihood of ignition and limit fire growth;
- use of zone separations (fire compartments) to add additional points of safety on the floor area, which can reduce the occupant load in each zone, reduce the travel time to a point of safety and provide additional time for subsequent evacuation stages;
- enhancing early detection in various areas of the facility to enable faster supervisory staff response to a fire; and
- installing fire protection systems such as sprinklers, which can effectively control a fire, thereby increasing the time available.

Adjustments are often based on an evaluation of both limitations identified and resources available. For instance if $T_{\text{Detection}}$ is excessive, leaving little time for staff response or safe evacuation, then improvements in early detection should be considered. On the other hand, if $T_{\text{Available}}$ is impacted by open room doors permitting early contamination of the corridor, then room detection devices and door self-closers in combination with hold-open devices should be considered to keep the corridor tenable as long as possible during floor or zone evacuation.

Appendix D contains tools to evaluate evacuation times and minimum staffing level needs.

7.0 FIRE DRILLS

In accordance with Article 2.8.3.2. of Division B of the Fire Code, *care occupancies* (including *retirement homes* classified as *care occupancies*) and *care and treatment occupancies* are required to conduct monthly fire drills for staff with delegated fire safety responsibilities. *Retirement homes* that are not considered a *care occupancy* only require fire drills annually, unless located in a high-rise building, in which case a fire drill is required every 3 months. Fire drills are an effective way to validate the fire safety plan and the staff resources allocated to implementation of the plan during a fire emergency. They also provide a basis by which to fine tune the emergency procedures and determine the need for additional staff training. Fire drills also provide an opportunity for staff and fire department personnel to discuss how best to coordinate evacuation procedures with emergency response procedures.

Sentence 2.8.3.2.(2) also requires that once every 12 months, fire drills in *care occupancies*, *care and treatment occupancies* and *retirement homes* need to be carried out using a scenario approved by the Chief Fire Official, representing the lowest staffing levels that might be encountered in the facility. The purpose of this drill is to demonstrate that those reduced staffing levels are sufficient to carry out all duties in the fire safety plan and that specific critical duties can be carried out within pre-determined times. Critical duties include closing the door to the room of fire origin and evacuating patients and or residents within the zone of fire origin to a point of safety.

Appendix E provides a worksheet to assist both with the development of a fire drill scenario and with the determination of times available to carry out these critical duties. A completed worksheet may be submitted to the Chief Fire Official to facilitate approval of the proposed scenario, including times available to carry out critical duties that can subsequently be validated during the fire drill.

In undertaking fire drills, the degree of patient and resident participation must be carefully considered such that disruptions are minimized and injuries are avoided. Further information on the planning, coordination and conducting of fire drills can be found in technical guideline TG-01-2004 “Fire Drills” available for reference on the Office of the Fire Marshal and Emergency Management’s (OFMEM) website at www.ontario.ca/firemarshal.

8.0 RESPONSIBILITY

For purposes of Fire Code compliance, the facility administrator is deemed the ‘owner’ of the building. As such, facility administrators are responsible for ensuring that adequate resources are available to implement the fire safety plan. The fire safety plan approval process allows the Chief Fire Official an opportunity to assess the rationale used by the owner in setting staffing levels for emergency evacuation. It may also be appropriate for fire department personnel to witness or be involved with a mock evacuation to verify the suitability of the plan.

Although Article 1.2.1.1. of Division A of the Fire Code states that “unless otherwise specified, the owner is responsible for carrying out the provisions of this Code”, the Chief Fire Official is responsible for approving a fire safety plan and accordingly ensuring that the approved plan is acceptable. In order to support the decision to approve the fire safety plan, it is prudent for the Chief Fire Official to document the reasons that they believe the plan is sufficient. Conversely, if the Chief Fire Official believes that the fire safety plan is inadequate, or that there is insufficient supervisory staff to carry out the duties prescribed in the plan, these concerns must be communicated to the owner as soon as possible and the plan or portions of the plan should not be approved.

A periodic reassessment of staffing levels should be carried out to account for occupancy and staff changes. Significant alterations or renovations to a building that may either increase or reduce bed capacity will also warrant a reassessment of staffing levels.

Failure to implement an approved fire safety plan and to adequately account for changes in the use and characteristics of the building may subject the facility administrator to enforcement action by the local fire department.

9.0 ADDITIONAL INFORMATION

For additional information on this guideline, please contact your local fire department or the Office of the Fire Marshal and Emergency Management at (416) 325-3100.

* Table Top Evaluation for Evacuation Capability in Hospitals and Long Term Care Facilities - Graf Jorg W.: Bolton Publishing, Sharbot Lake (ON); 1997

† Based on NIST TN 1658 fire tests in sleeping rooms in dormitories.

Appendix A

Table A.1 – Additional Time Provided by Door Ratings and Sprinkler Water Supply Duration in Floor Area Outside Room of Fire Origin

Door and Frame Details/Fire-Rating (or equivalent)	Unsprinklered Building	Sprinklered Buildings (minutes) (water supply duration based on water supply design)		
		NFPA 13 or 13R compliant sprinklers with minimum required water supply (30 min.)	NFPA 13D compliant sprinklers with minimum required water supply (10 min.) [§]	NFPA 13, 13D or 13R compliant sprinklers fed from municipal water supply (assumed 60 min.) [†]
Wood panel or hollow core wood door (5 minutes)	5	35	15	65
45 mm (1¾ in) thick solid core door (15 minutes)	15	45	25	75
Hollow metal door (30 minutes)	30	60	40	90
20 minute labelled door in 20 minute labelled frame (20 minutes)	20	50	30	80
45 minute labelled door in 45 minute labelled frame (45 minutes)	45	75	55	105

* Additional time provided in corridor is sum of door rating (or equivalent) plus sprinkler effectiveness period based on water supply duration (where sprinklers provided)

[§] Minimum water supply duration for NFPA 13D system as required in OFC 9.7 is 20 minutes

[†] For purposes of this staffing level guideline the municipal water supply is being credited for 60 minutes

Appendix B - Illustrations

The following illustrations compare tenability times ($T_{Available}$) in the room of fire origin and the corridor serving the floor area to detection time ($T_{Detection}$) plus evacuation time ($T_{Required}$). Illustrations #1 and #2 both show that patients or residents are safely evacuated from their respective areas before the tenability limits are reached.

Illustration #1 - Evacuation of Room of Fire Origin

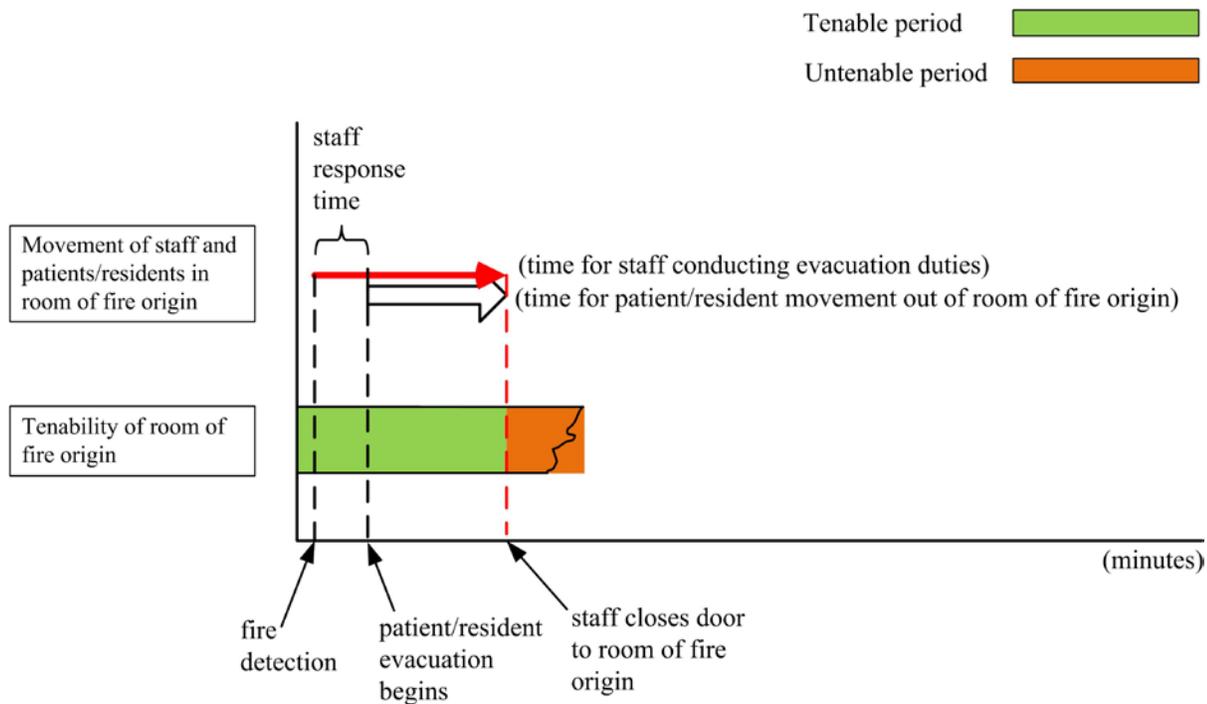
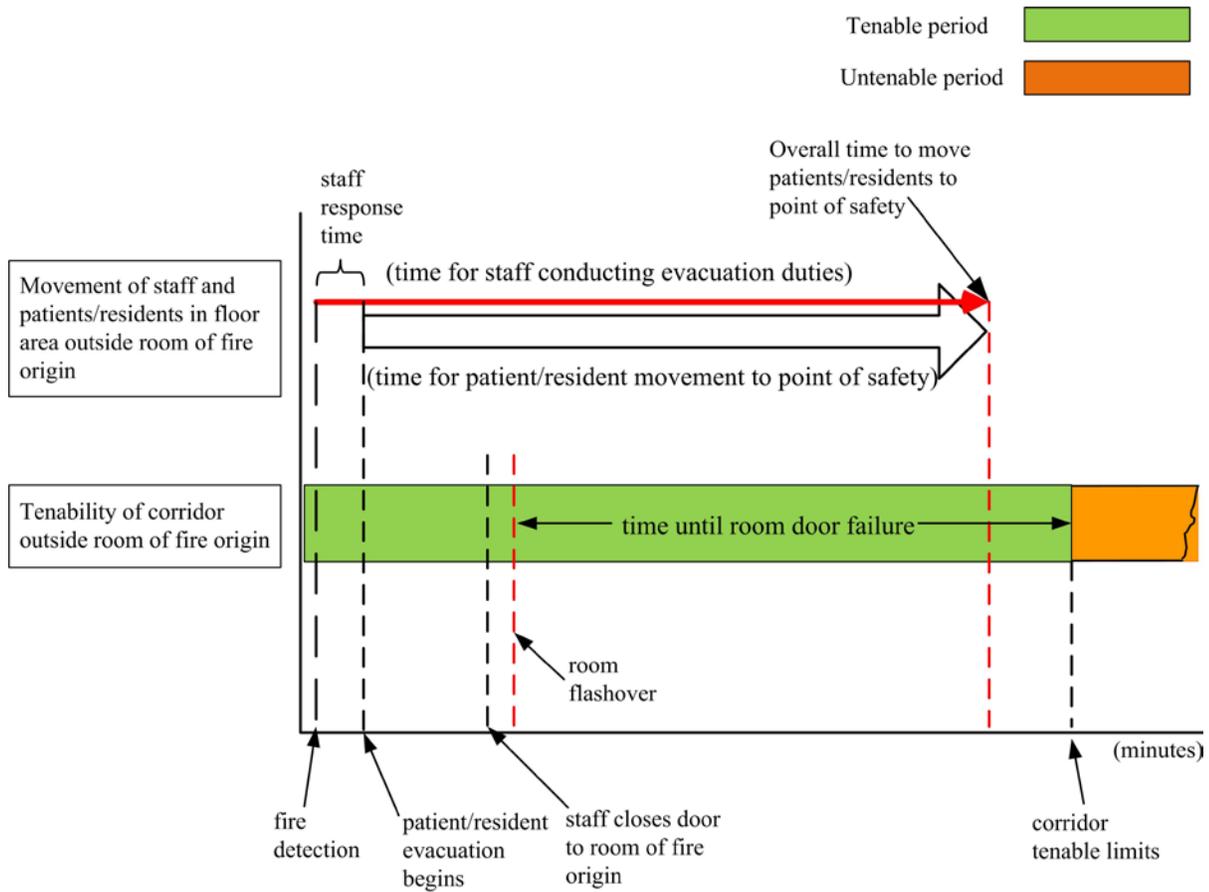


Illustration #2 - Evacuation of Floor Area Outside the Room of Fire Origin



Appendix C – Detection Times

Detection time for fires in a *care occupancy, care and treatment occupancy or retirement home*, whether by detection device or discovery by persons, can vary depending on factors such as fire growth and confinement. For purposes of this guideline, certain assumptions should be made for a typical fire in one of these facilities. One assumption is that the fire will have a “medium” t²-fire growth curve, and another is that once a fire is started, it will have enough fuel to continue to room flashover. The use of accelerants in a fire is not assumed.

Smoke detectors, heat detectors and sprinkler heads are typically installed to the maximum spacing* permitted by recognized standards (NFPA, ULC, etc.), except when installed in small to medium-sized rooms, where one device per room is usually sufficient. The number of sprinkler heads required is also impacted by the configuration of a room where additional heads are sometimes needed to adequately cover the room for fire control purposes.

The lack of a detector in the room of fire origin can result in a significant delay in fire detection, and as such, tenability levels in the room of origin may be exceeded before supervisory staff can respond to the location. If the room of fire origin has an open door to the corridor and the corridor has heat or smoke detectors, these detectors may activate early enough to permit responding staff to close the door to the room of fire origin. Closing the door will gain staff additional evacuation time, which may be long enough to permit safe evacuation of the floor area or zone. If, however, the door to the room of origin is closed, thereby delaying detection by corridor detectors, the time remaining before door failure will be reduced, thereby reducing the available time for safe evacuation.

Based on this analysis, the importance of early fire detection times is clear. The following Table provides examples of realistic fire detection times based on a waste basket or bedding fire in a typical bedroom of a *care occupancy, care and treatment occupancy or retirement home*. These fire detection times are approximations and can be adjusted based on additional information or conditions provided at the site.

The “time to detect” in Table C.1 represents when staff in the building are notified of a fire condition. As such, single-station smoke alarms are only effective if they can be heard by staff at their normal workstations or if they are part of an interconnected smoke alarm system.

Table C.1 – Fire Detection Times

Detection Method*	Time to Detect (sec[†])
smoke alarm/detector in small bedroom (12 x12 ft) of fire origin	15 to 30 [‡]
smoke alarm/detector in medium to large room (15 x 20 to 25 x 25 ft) of fire origin	15 to 45 [‡]
smoke detector in corridor, with fire initiating in adjacent bedroom with open door	30 to 90
smoke detector in corridor, with fire initiating in adjacent small bedroom with closed solid-core wood door	160 to 300
135°F heat detector in small bedroom (12 x12 ft) of fire origin	40 to 90
135°F heat detector in medium to large room (15 x 20 to 25 x 25 ft) of fire origin	40 to 150
135°F heat detector in corridor outside adjacent small bedroom of fire origin with open door	120 to 200
135°F heat detector in corridor outside adjacent small bedroom of fire origin with closed solid-core wood door	900 to 1080
135°-165°F residential type sprinkler system in a bedroom of fire origin	90 to 150 [‡]
supervisory staff at work station smelling smoke from fire in room with door open to corridor	120 to 360
supervisory staff at work station smelling smoke from fire in room with solid-core wood door closed to corridor	240 to 500

*Smoke detector spacing - 30 x 30 ft; Heat detector spacing - 25 x 25 ft; Residential sprinkler head spacing - 15 x 15 ft

[‡] Some values based on NIST TN 1658 fire tests in sleeping rooms in dormitories.

[‡] The time for staff to be notified of a fire through the activation of a single station smoke alarm will depend on the audibility level of the device and if it can be heard by staff

[†] This value includes the delay between sprinkler head activation and the alarm sounding, and is dependant on system design. This should be confirmed at site.

Appendix D – Guidance for Determining Time Required for Evacuation of Floor or Zone

Evacuation strategies need to be evaluated in order to ensure safe evacuation of patients/residents and ensure the best use of limited staff resources. To do this, realistic scenarios need to be established, with each scenario evaluating the number and type of patients/residents that need evacuating, the available staffing at that time of day, and the fire safety duties that need to be carried out. Whereas the initial evacuation of the room of fire origin requires the quickest response times by staff, the secondary evacuation phase which includes the entire floor or a zone (if the floor area is subdivided by a fire-rated zone separation) usually requires the most number of staff.

The guidance in this Appendix is intended for evaluating adequacy of staffing levels using various fire scenarios for the evacuation of a zone, floor area or building once the room of fire origin is evacuated.

Each patient/resident type requires different numbers of staff to assist with evacuation, as identified in Table D.1. Based on staffing levels available, teams of two staff will often be needed to evacuate Type C and D patients/residents, while single staff members are usually enough to assist Type A and B residents. Type A residents should only need assistance to ensure that they get from their bed to the corridor in a timely manner and then subsequent direction for their continued self-evacuation. The estimated time that staff needs to spend with each Type A resident may be as little as 20 to 30 seconds, as they are presumed to have the capability to evacuate with minimum assistance.

Transportation aids for moving Type C and D patients/residents can also impact evacuation times and need to be evaluated in each scenario. For instance, if a wheelchair is required by a patient/resident then two staff will usually be needed to move the patient/resident from the bed to the wheel chair. This time is illustrated in Table D.2 as pre-horizontal movement time. A single staff person can then wheel the patient/resident to a zone separation or exit. However, if stairs are encountered, then two staff will again be needed to move the patient/resident vertically, using whatever carry aids are provided. Again some time is needed to transfer the patient/resident from the wheelchair to the carry aid prior to the movement down the stairs. This time is illustrated in Table D.2 as pre-vertical movement time. Type A and B residents both need some pre-horizontal movement time where staff assistance is provided to ensure speedy movement from the bed to the corridor, but neither needs any pre-vertical movement time.

For evacuation scenarios that include the vertical movement of patients and residents down stairs, there is one final step that needs to be considered. That is the transfer of patients and residents from carry aids and their appropriate temporary placement. This is more critical for Type C and D patients/residents than it is for Type B and A's, although Type B residents may also need some seating accommodations. Decisions on appropriate post-move placement of patients and residents will need to be pre-planned.

Table D.1 - Assigned Staffing Levels for Evacuation of Patients/Residents

Patient/Resident Type	Capability of Patient/Resident to Evacuate	Type of Movement Aids	Staffing Resources Required to Move Each Patient/Resident to a Point of Safety
A	ambulatory, requiring no assistance but needs guidance	Some walkers or canes possible	1 staff to assist resident from bed to corridor, and direct resident to zone separation or exit
B	ambulatory, requiring assistance	Some walkers or canes possible	1 staff to assist resident out of bed and walk resident to safe location (horizontal and vertical movement and post-move placement as required)
C	non-ambulatory, able to assist	Wheel chairs, gurneys, and carry aids at stairs (if needed)	2 staff to lift patient/resident out of bed 1 staff to move patient/resident horizontally using wheel chairs 2 staff to move patient/resident vertically and for post-move placement (if required)
D	non-ambulatory, unable to assist	Wheel chairs, gurneys, and carry aids at stairs (if needed)	2 staff to lift patient/resident out of bed 1 staff to move patient/resident horizontally 2 staff to move patient/resident vertically and for post-move placement (if required)

Table D.2 – Time for Pre-Horizontal and Pre-Vertical Movement

Patient/Resident Type	Type of Movement Aids	Time for Pre-Horizontal Movement (sec)	Time for Pre-Vertical Movement (sec)	Time for Post-Move Placement (sec)
A	Some walkers or canes possible	30 ¹	0	0
B	Walkers	30 ²	0	20 ⁴
C	Wheel chairs, gurneys	30 ²	30 ³	30 ⁴
D	Wheel chairs, gurneys	30 ²	30 ³	30 ⁴

Note 1: Staff time to wake and assist Type A resident to corridor, then give resident direction and close room door.

Note 2: Time needed for staff to assist Type B, C or D patients/residents from bed to their walker/wheel chair to corridor, and close door. May not be necessary where gurneys used in *care and treatment occupancies*

Note 3: Time needed for staff to transfer Type C and D patients/residents to carrying aids at stairs

Note 4: Time needed for staff to shift patients/residents from carry aids and/or find temporary placement

For each scenario, speed of movement for each patient/resident also needs to be taken into consideration, whether with staff help or unassisted. Horizontal movement can range from slow, for those patients/residents that use walkers and canes, to faster for those being moved by wheelchair or gurneys. Rate of horizontal travel speed* can be assigned based on Table D.3. Vertical movement of patients/residents down exit stairs is a more time consuming exercise, and a big draw on staff resources. This vertical travel speed* is also provided in Table D.3.

* Reference – Fire Protection Handbook, Nineteenth Edition, Section 4

In any evacuation time evaluation, consideration must also be made of staff member's time between each patient/resident move. As such, the movement speeds of staff members returning for the next patient/resident are also provided in Table D.3, which indicates unhindered horizontal movement and climbing back up stairs.

It should also be recognized that fatigue will play a factor with staff members that are operating at a very high level of exertion. When calculating final staffing resource times for each evacuation scenario, an increase of at least 20% needs to be included due to staff fatigue, depending on duties.

Table D.3 – Rates of Speed of Evacuation Movement

Patient/Resident Type or Staff	Type of Movement Aids	Rate of Horizontal Movement (m/sec)	Rate of Vertical Movement at Stairs (m/sec)
A	Some walkers or canes possible	0.5	0.3
B	Walkers	0.3	0.1 ¹
C	Wheel chairs, gurneys, lift chairs, stretchers	1.3	0.1 ²
D	Wheel chairs, gurneys, lift chairs, stretchers	1.3	0.1 ²
Supervisory Staff	-	1.5 ³	0.6 ³

Note 1: Movement speed of Type B residents being assisted down stairs by staff

Note 2: Movement speed of Type C and D patients/residents being carried down stairs by staff using carrying aids

Note 3: Movement speed of supervisory staff returning after each patient/resident is evacuated

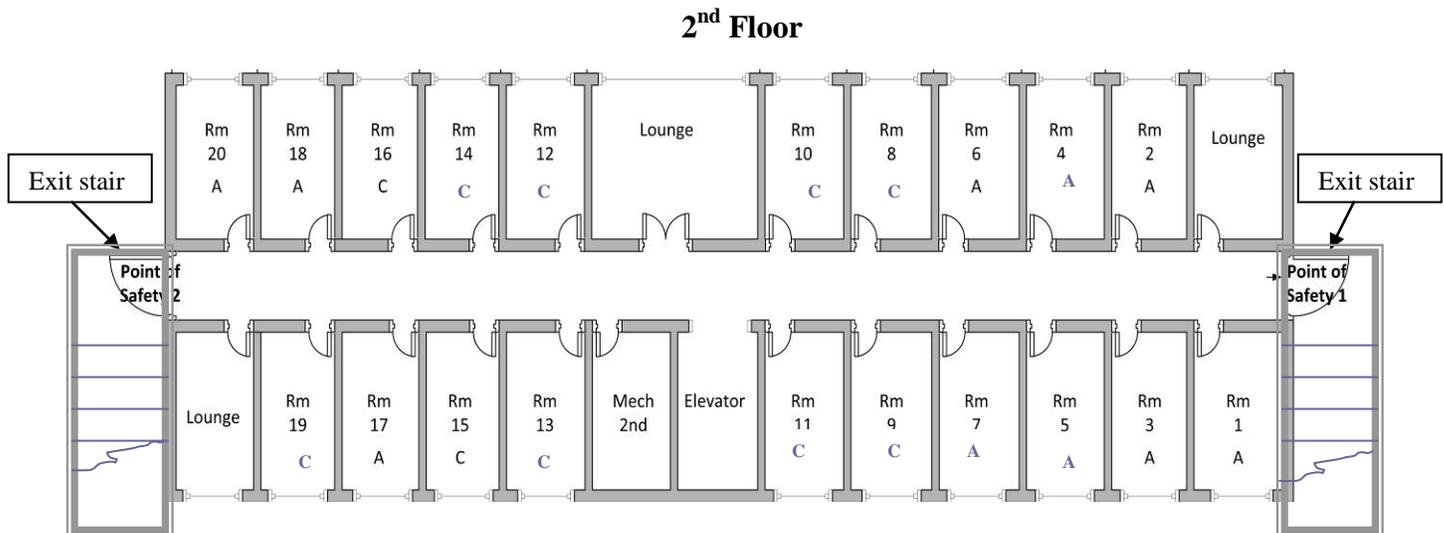
If the secondary phase of the evacuation plans only requires patients/residents to be moved to another zone on the same floor area, there will be significant time savings and reductions in staffing resources when compared to evacuation plans that require patients/residents to be evacuated down stairs to a lower floor. These zone separations reduce the total distance traveled by staff and patients/residents to a point of safety, and allow more time to carry out any vertical evacuation. They also provide additional time for subsequent evacuation of the floor area because of their fire-resistance rating.

The tabulated information above provides estimates for use in a table-top evaluation. The information is based on NFPA studies and other reasonable assumptions, and should be taken as average values only. However, every facility and situation is different, and as such it is encouraged that partial evacuation drills be carried out to obtain more accurate values for each patient/resident. Keep in mind that times used in the table-top evaluations generally assume a well-trained and capable staff. Evacuation drill times will be negatively impacted by staff with insufficient training or physical limitations.

See the following example of how to use the above tools in a table top evaluation to determine time needed by staff for safe evacuation of patients/residents in *care occupancies*, *care and treatment occupancies* or *retirement homes*, and subsequently the staffing levels needed to do this in the time available.

Examples on Use of Tools to Determine Staffing Needs –

The table top calculation process is illustrated in the following two examples; one being the evacuation of ten Type A residents in a care facility from the 2nd floor bedrooms to the relative safety of the 1st floor, and the other being the evacuation of ten Type C residents in an unsprinklered care facility from bedrooms on the 2nd floor to the 1st floor. The following floor layout can be used to illustrate both examples. The Type A residents example calculates the maximum time needed by the residents and minimum staffing resource needs. The Type C residents example calculates minimum staffing needs to carry out the evacuation.



Scenario #1: Determine required staffing levels to evacuate 10 Type A residents from beds in rooms on 2nd floor down to 1st floor. Exit stair is 16 m travel distance from the furthest Type A resident’s room. Exit stair vertical travel distance from 2nd floor to 1st floor is 5 m measured diagonally along stair run. Assume the safe available time to evacuate the unsprinklered floor area is 17 minutes based on a solid core wood door at each room entry.

Considerations –

- Type A residents can walk without staff assistance
- Minimum Number of Staff for Each Task: 1 staff to assist each resident from bed to corridor
- Estimated Pre-horizontal movement time needed for staff to assist each resident to get from bed to corridor, provide direction for evacuation, and close bedroom door: 30 sec.

Time to perform required tasks needed for most remote Type A resident:

1. pre-horizontal movement (from Table D.2)
2. horizontal movement by most remote resident [travel distance to exit stair ÷ movement speed (from Table D.3)]
3. vertical movement by resident [travel distance down exit stairs ÷ movement speed (from Table D.3)]

Calculation of Time Needed for Most Remote Type A Resident to Move to First Floor

Task Performed by Type A Resident	Time (seconds)
Pre-horizontal movement	30.0 [†]
horizontal movement by most remote resident	32.0 (16 m [‡] ÷ 0.5 m/sec*)
vertical movement	16.7 (5 m of stairs ÷ 0.3 m/sec*)
Total of Time to Move Most Remote Type A Resident to the First Floor (seconds) -	79

[†] See Appendix D - Table D.2

* See Appendix D - Table D.3

[‡] 16 m from most remote Type A room to exit stair

Keep in mind that this calculation is to determine required staffing levels, and staff resources are only necessary for the 30 seconds of pre-horizontal movement for each Type A resident's evacuation. As such, the total staff resource-time required to evacuate 10 Type A residents to first floor is $10 \times 30 = 300$ staff-seconds. The fatigue factor should not be too significant for this task by itself so will not be added here.

Note that staff-seconds units indicate amount of staff resource-time, and not time. This can be converted to time by dividing by the number of staff to do the work. As a result, the above resource-time of 300 staff-seconds can be carried out in a time period (T_{Move}) based on staffing levels provided in the following table:

Evacuation Time of Floor Area Outside of Room of Origin to First Floor Based on Staffing Levels

Minimum Staff Conducting Evacuation	Time Needed to Evacuate Floor Area (T_{Move}) (Total Staff Resource-Time Required ÷ No. of Staff)
1	$300 \div 1 = 300$ sec (5 min)
2	$300 \div 2 = 150$ sec (2.5min)
3	$300 \div 3 = 100$ sec (1.7 min)

Remember that the most remote Type A resident still needs 79 seconds to safely get to the first floor once assisted and directed to evacuate. Both the time that staff requires in assisting these residents and the time required by the most remote Type A resident to reach the first floor needs to be considered when being compared to the safe available time (17 minutes) in the corridor. In this scenario, one staff could accomplish the pre-horizontal movement of all 10 of the Type A residents

in 300 seconds. Depending on whether the most remote Type A resident is assisted first or last, it will be either 79 seconds or $(300 + 79) = 379$ seconds (6.3 minutes) before the resident reaches the first floor, which is well within the 17 minutes safe available time.

Considering the formula $T_{\text{Detection}} + T_{\text{Response}} + T_{\text{Move}} \leq T_{\text{Available}}$, the 300 second of time required by the one staff to move the residents (T_{Move}) still leaves time to account for fire detection time ($T_{\text{Detection}}$), staff response time (T_{Response}) and time to carry out other assigned duties under the Fire Safety Plan, including make phone calls and meet the fire department upon their arrival.

Scenario #2: Determine required staffing levels to evacuate 10 Type C residents from beds on 2nd floor down to the 1st floor. Exit stair is on average 20 m from Type C residents' rooms. Exit stair vertical travel distance from 2nd floor to 1st floor is 5 m measured diagonally along stair run. Assume the available time to evacuate the unsprinklered floor area is 17 minutes based on a solid core wood door at each room entry.

Consideration –

- Minimum Number of Staff Required to Assist Resident for Each Task:
 - 2 staff needed for transferral from bed to wheelchair
 - 1 staff for horizontal movement
 - 2 staff needed for transferral from wheelchair to carry device at stairs
 - 2 staff needed for vertical movement down stairs

Time to perform required tasks needed for average Type C resident:

1. pre-horizontal movement (from Table D.2)
2. horizontal movement by average resident [average travel distance to exit stair ÷ movement speed (from Table D.3)]
3. return trip by staff member [average travel distance to exit stair ÷ movement speed (from Table D.3)]
4. pre-vertical movement (from Table D.2)
5. vertical movement by resident [travel distance down exit stairs ÷ movement speed (from Table D.3)]
6. return trip by staff member up stairs [travel distance up exit stairs ÷ movement speed (from Table D.3)]

Total Staff Resource-Time Required to Move Average Type C Resident to 1st Floor

Task Performed by Staff	Time to Perform Task (sec)	Staff Required[§]	Staff Resource-Time (staff-sec.) (task time x no. of staff)
Pre-horizontal movement	30 [†]	2	60
resident horizontal movement stage (average distance)	15.4 (20 m [‡] ÷ 1.3 m/sec*)	1	15.4
return trip for staff member (average distance)	13.3 (20 m [‡] ÷ 1.5 m/sec*)	1	13.3
Pre-vertical movement at stairs	30 [†]	2	60
resident vertical movement down stairs	50 (5 m ÷ 0.1 m/sec*)	2	100
Post-move placement	30 [†]	2	60
return trip up stairs for staff members	8.3 (5 m ÷ 0.6 m/sec*)	2	16.6
Total Staff Resource-Time to Evacuate Average Type C Resident to 1st Floor -			325 (staff-sec)
Total Staff Resource-Time to Evacuate 10 Type C Residents to 1st Floor -			3250 (staff-sec)

[§] See Appendix D - Table D.1

[†] See Appendix D - Table D.2

* See Appendix D - Table D.3

[‡] Exit stair on average 20 m from Type C rooms

Although it would require a total staff resource-time of 3250 staff-seconds to evacuate 10 Type C residents to the first floor, the last few residents entering the exit stairway on 2nd floor would be protected from effects of fire for an additional time (based on the door rating) once the stairway door is closed behind them, as they are now in a point of safety. This effectively reduces the above total staff resource-time by 474 staff-seconds by excluding a pre-vertical move, a vertical move and a post-move placement for 2 Type C residents and a return trip by 2 staff. This results in a total staff resource-time of 2776 staff-seconds, but increases by a 20% fatigue factor to 3331 staff-seconds.

Note that staff-seconds units indicate staff resource-time, and not time. This unit can be converted to time by dividing by the number of staff needed to do the task. As a result, the above resource-time of 3331 staff-seconds can be carried out in a time period (T_{Move}) based on staffing levels provided in the following table:

Evacuation Time of Floor Area Outside of Room of Origin to First Floor Based on Staffing Levels

Minimum Staff Conducting Evacuation	Time Needed to Evacuate Floor Area (T_{Move}) (Total Staff Resource-Time Required ÷ No. of Staff)
2	$3331 \div 2 = 1666 \text{ sec (27.8 min)}$
3	$3331 \div 3 = 1110 \text{ sec (18.5 min)}$
4	$3331 \div 4 = 833 \text{ sec (13.9 min)}$

Increasing the number of staff continues to reduce evacuation times assuming no bottlenecks in the path of egress travel. So, depending on how much time is available on the floor for safe evacuation, the facility would have to either adjust staffing levels or enhance its fire protection features (i.e. sprinklers, zone separations, etc).

Since this facility provides an available time for safe evacuation ($T_{\text{Available}}$) from the floor of 17 minutes from fire ignition, it would appear that a minimum 4 staff would be needed to evacuate 10 Type C residents off the 2nd floor. The 13.9 minutes (T_{Move}) required by 4 staff to complete this phase of the evacuation leaves 3.1 minutes for detection time, staff response time (see formula $T_{\text{Detection}} + T_{\text{Response}} + T_{\text{Move}} \leq T_{\text{Available}}$) and other tasks. These other tasks include other assigned duties under the Fire Safety Plan, including make phone calls and meet the fire department upon their arrival.

Appendix E – Fire Drill Scenario Development*

Purpose:

The purpose of this document is to assist owners/operators of *care occupancies, care and treatment occupancies* and *retirement homes*, with the development of a proposed scenario for submission to the Chief Fire Official for review and approval as referred to in Sentence 2.8.3.2.(2.1) of Division B of the Fire Code.

Background:

Sentence 2.8.3.2.(2.1) of Div. B of the Fire Code requires that once every 12 months, a fire drill in *care occupancies, care and treatment occupancies* and *retirement homes* be carried out using a scenario representing the lowest staffing levels that might be encountered in the facility. This scenario must be approved by the Chief Fire Official in advance of the fire drill.

The annual fire drill required by Sentence 2.8.3.2.(2.1) should be based on a probable fire scenario that would provide the greatest evacuation challenge for staff. Ontario fire loss statistics reveal that fires starting in resident/patient rooms tend to be the most serious in that they account for the largest number of fire deaths in vulnerable occupancies. Typically, nighttime hours represent the time during which staffing levels are at the lowest levels. As a result, a scenario based on a fire originating in a patient/resident room during nighttime hours would constitute an effective annual fire drill exercise. It should be noted that the fire drill is a simulation of a fire occurrence and although the number of staff and their location in the facility should replicate night time conditions, the drill itself can be undertaken on any day, at any time. Furthermore, owner/operators may consider use of proxies in lieu of actual residents/patients for participation in the drill.

In keeping with the objective of developing a probable fire scenario that poses evacuation challenges, the zone or floor area chosen to demonstrate the fire drill should be one that includes either the largest number of residents/patients or a large number of residents/patients that require the greatest assistance with evacuation. In facilities with a variety of sleeping arrangements, the sleeping room chosen to be the room of fire origin within this zone or floor area should be one occupied by non-ambulatory resident(s)/patient(s) with more than one occupant, where applicable.

The fire drill should demonstrate staff responding to the resident/patient room of fire origin, the removal or assistance of the occupant from the room, and the closing of the door to the room before the fire spreads to the corridor. Similarly, evacuation of residents/patients in the zone/floor area outside the room of origin to the nearest point of safety should also be undertaken as part of the drill. This portion of the drill should demonstrate that evacuation can be accomplished while conditions within the corridor remain safe. The times available to safely carry out these critical duties are determined in advance of the fire drill and constitute a critical part of the scenario. The ability for staff to carry out these duties within these times needs to be verified during the drill so as to establish that the provisions of Sentence 2.8.3.2.(2.1) are satisfied.

*As required by Ontario Fire Code, Sentence 2.8.3.2.(2.1) of Division B

Instructions for Developing a Fire Drill Scenario:

<p>Step 1: Develop a Scenario Representing Lowest Staffing Level Complement</p>	<p>Proposal</p>	<p>Chief Fire Official Approval</p>
<p>A. Select a zone/floor area of fire origin involving residents/patients in resident/patient rooms that poses the greatest evacuation challenge for staff.</p>	<p>Floor #: Zone:</p> <p>Total number of residents/patients in the fire compartment that will require evacuation to a point of safety:</p>	
<p>B. Identify the point of safety to which residents/patients in the zone/floor area of fire origin will be evacuated.</p>		
<p>C. Select a resident/patient room within this zone/floor area that would represent the room of fire origin.</p>	<p>Room #:</p> <p>Total number of residents/patients in the room:</p>	
<p>D. Simulate the time of day representing the lowest staffing level complement available to respond to the room of fire origin.</p>	<p>Time of day:</p> <p>Number of staff available to respond:</p>	

<p>Step 2: Determine Time Available for Closing the Door to the Room of Fire Origin</p>	<p>Proposal</p>	<p>Chief Fire Official Approval</p>
<p>A. Estimate the time required for detecting a fire in the room of fire origin. Use Table C.1 in Appendix C of TG-01-2013.</p>		
<p>B. Estimate the time period during which the suite or bedroom of fire origin is safe to enter.</p> <p>Choose 2.5 minutes for an unsprinklered room or 5 minutes for a sprinklered room.</p>		
<p>C. Calculate the time available for staff to :</p> <ul style="list-style-type: none"> • respond to the room of fire origin • remove/assist occupants from the room, and • close the room door. <p>Time available = Time estimated in “B” – Time estimated in “A”</p>		

Actual time taken during the fire drill to carry out the tasks described in “C”: _____.

(Compare to “time available” in “C”).

<p>Step 3: Determine Time Available to Evacuate Occupants in the Zone/Floor Area of Fire Origin to a Point of Safety Following Closing of the Door to the Room of Fire Origin</p>	<p>Proposal</p>	<p>Chief Fire Official Approval</p>
<p>A. Identify the type of door to the room of fire origin.</p>	<p>Hollow-core wood <input type="checkbox"/> 45 mm solid-core wood <input type="checkbox"/> 20-min. rated <input type="checkbox"/> Steel <input type="checkbox"/> Door rating (if provided) - _____ (min.)</p>	
<p>B. Identify whether or not the building is sprinklered. If sprinklered, identify the water supply source.</p>	<p>Not Spinklered <input type="checkbox"/> Spinklered <input type="checkbox"/> Water supply: Municipal water <input type="checkbox"/> On-site water <input type="checkbox"/> Duration of on-site Water supply (min.) : _____</p>	
<p>C. Use Table A.1 in Appendix A of TG-01-2013 to determine the time available for residents/patients in the zone/floor area of fire origin to be evacuated to the point of safety. (This is time available after the door to the room of fire origin is closed.)</p>		

Actual time taken during the fire drill to evacuate the zone/floor area: _____.

(Compare to “time available” in “C”).