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August 2012
OFM Section: Technical Services at (416) 325-3100

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Abstract

Ontario’s Fire Code requires every care occupancy to prepare and implement a fire safety plan that has been approved by the Chief Fire Official. A care facility 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 residents to a point of safety exceeds the time available.
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. 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. It is also not intended as a mandatory undertaking where fire drill records or other documentation is available to validate that sufficient staffing is available to carry out the duties in the fire safety plan, as approved by the Chief Fire Official.

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

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.

The Building Code definition for care occupancy is as follows:

Care occupancy means an occupancy in which persons receive special or supervisory care because of cognitive or physical limitations, but does not include a dwelling unit.

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).

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.

2.1 Special or Supervisory Care

The phrase “special or supervisory care” is not defined; however, the following commentary may be useful in understanding the intent.
Special or supervisory care relates to the care of residents who do not require chronic or convalescent medical or nursing care. Special or supervisory care includes responsibility for the safety of the resident while inside the building. This care might include daily tracking by the operator of the resident’s functioning and whereabouts, making and reminding residents of appointments, the ability and readiness for intervention in the event of the resident experiencing a crisis, supervision in the areas of nutrition and medication, the provision of transient medical care.

2.2 Assistance in Evacuation

Inherent in receiving special or supervisory care services for cognitive or physical limitations are the residents’ 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 that require assistance to move 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 therefore should not be relied upon to assist with evacuation.

Residents requiring assistance to evacuate includes 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 direction or within time frames considered necessary for safe evacuation in an emergency situation.

Additional guidance on assessing evacuation capability, including sample worksheets, is available in the National Fire Protection Association (NFPA) standard *Guide on Alternative Approaches to Life Safety* (NFPA 101A). Although not explicitly adopted through the Fire Code, the NFPA standard is a recognized source document.

3.0 FIRE SAFETY IN CARE OCCUPANCIES

The current Building Code requires that care 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 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.

Existing buildings, other than those that comply with 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.). Appendix A provides a comparison of fire safety features required by the current Building Code and Fire Code.
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. Staff will usually be required to assist in the evacuation of occupants to a point of safety. The outdoors, protected exit stairways and protected adjacent zones or fire compartments are examples of points of safety.

4.0 FIRE SAFETY PLANNING AND SUPERVISORY STAFF

Section 2.8 of Division B of the Fire Code requires owners of care or detention occupancies (which includes care occupancies) 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.(1);
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.(2);
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 conduct monthly fire drills in accordance with Clause 2.8.3.2.(1)(a);
6. 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;
7. 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.). 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. Further information on the development and implementation of a fire safety plan, including the appointment of supervisory staff, can be found in technical guideline TG-00-1997 “Fire Safety Planning Guideline for Residential Care Facilities” available for reference on the Office of the Fire Marshal’s (OFM) website at www.ontario.ca/firemarshal.

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 to perform the duties as required in the fire safety plan, specific staffing levels 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, a care facility with a large number of elderly residents using mobility aids places a higher demand on staff than a similar facility 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, staff demand 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 of the fire compartments that are likely to be involved. As an example, if the room of fire origin is a resident’s room, only one resident may require evacuation in the “initial phase” compared to a dining room, which would involve moving significantly more residents. The “initial phase” usually ends when the the door accessing the room of fire origin is closed to contain the fire and smoke. If the next phase of evacuation includes the entire floor area outside the room of fire origin, this would require moving significantly more residents. However, a floor area subdivided by a fire-rated zone separation can reduce the number of 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.
(c) Building Construction and Fire Protection Features to Control the Spread of Fire

Care 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 bedroom fire separations, self-closing devices on bedroom/resident 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 will be at risk 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 that may 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 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 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 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

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 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.

\[
\text{Detection Time (T}_{\text{Detection}}) + \text{Time Required to Evacuate (T}_{\text{Required}}) \leq \text{Time Available (T}_{\text{Available}})
\]

The following steps are typically followed to determine staffing needs:

1. **Identification of Scenarios**

   Consider a number of probable fire scenarios based on building use and physical conditions. Determine staffing levels for each of these scenarios individually.

   **Example**
   During the night shift, a fire occurs in a resident bedroom on the highest floor that houses both ambulatory and non-ambulatory residents. The extent of fire involvement requires the evacuation of one entire wing into an adjacent wing through a zone fire separation.

2. **Data Collection**

   Collect data to evaluate the evacuation capability of the facility based on the identified scenarios. Note that the resident profile will likely change over time and therefore this exercise may need to be undertaken periodically to ensure accuracy of the assessment.

   **Examples**
   a. Number of ambulatory occupants requiring guidance but no assistance [Type A residents].
   b. Number of ambulatory occupants using mobility aids and requiring some assistance [Type B residents].
   c. Number of non-ambulatory occupants able to assist with transport (e.g. swing carry) [Type C residents].
   d. Number of non-ambulatory occupants unable to assist with transport [Type D residents].
   e. Number of staff on floor during the night shift that can assist in evacuation (consider other duties under fire safety plan).
   f. Number of other staff in the building that can assist in evacuation (consider other duties under fire safety plan).

3. **Time of Fire Detection (T}_{\text{Detection}}**

   \[T_{\text{Detection}} = \text{time from fire ignition to when staff are notified of a fire emergency by alarm or other means of discovery}\]
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 are likely to be in the dining room during resident meal times.

$T_{\text{Detection}}$ 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 may be partly used up before evacuation even begins. As such, it is very important to try and keep the $T_{\text{Detection}}$ value as short as possible through the use of fire detection devices, to maximize the available time to evacuate.

For a fire occurring at night in a resident’s room, $T_{\text{Detection}}$ is likely the time from fire ignition to activation of the room smoke detection device. Fires initiating at night in other rooms of the facility could have very different notification times. 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 be close to zero for a fire occurring in a dining room 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 ($T_{\text{Required}}$)**

Estimate the time required to evacuate the 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 residents be utilized for this purpose.

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

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

$T_{\text{Response}}$ = time for staff, once notified of a fire condition, to reach the area of the fire and be in a position to begin moving residents to a point of safety.
T_{\text{Response}} \text{ can be estimated based on known locations of staff in the building during various times of the day, and can be verified by fire drills. This response time can be impacted by procedures in the fire safety plan for notifying staff in other parts of the building, or even in other buildings on the same property. For a fire in a resident’s room, } T_{\text{Response}} \text{ depends upon the procedures outlined in the fire safety plan for dispatching staff to the affected area. The time period is close to zero in a dining room during mealtime since staff would be in attendance.}

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

T_{\text{Move}} \text{ can be estimated from time-based egress data documented in the professional literature, through the use of computer modelling and/or through direct assessment of the residents in the facility.}

Consider the following when calculating } T_{\text{Move}}:\text{ }

a. Time required to guide Type A residents to safe area. (considerations: time to wake and direct residents, close resident 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, coordinate staff efforts, return trip time.)
c. Time required to evacuate Type C residents to safe area. (considerations: number of staff required time to move residents off beds and the method used, time to move residents to point of safety, return trip time.)
d. Time required to evacuate Type D residents to safe area. (considerations: number of staff required, time to move residents off beds and the method used, move residents to point of safety, 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 sleeping 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}} \text{ 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, geometry, and fire protection features.}

For unsprinklered buildings, this time may vary from between 2 and 3 minutes for a typical resident room to approximately 15 minutes for a floor area or zone where a fire is initially contained within the room of fire origin.
The 2 to 3 minute time frame represents the time that a typical resident room in an unsprinklered building is expected to remain tenable, depending on the item being first ignited. The objective is to relocate the resident(s) of the room to a point of safety and close the door before unsafe tenability levels are reached in the room of origin.

Once the door is closed, the 15 minute time frame represents the time that a solid-core wood door or 20 minute rated door is expected to remain in place under typical fire conditions in an unsprinklered room, while allowing for installation and manufacturing variations. It should be noted that this time frame anticipates effective fire separations around the room of fire origin as well as the timely closing and latching of a 20 minute rated or solid-core wood door to the room, by either a self-closing device or responding staff. The absence of such features would necessitate a significant reduction in the available time. A $T_{Available}$ of no more than 3 minutes for evacuation of a zone, fire compartment or floor area, as applicable, is advised in this circumstance.

The objective is to relocate the residents in rooms and areas outside the room of fire origin, to a point of safety, before the door is compromised and unsafe tenability levels are reached in the corridor.

In a sprinklered building, where fire originates in a resident’s room, the maximum time period for the room to remain safe may exceed the 2 to 3 minute limitation. The period of safety depends upon a number of factors including type of fire, rate of fire growth, proximity of sprinkler heads to point of fire origin and the proximity of the resident to the fire.

Once the door to the room of fire origin is closed, the period of time for evacuation of the remainder of the zone or floor area is significantly increased as the fire within the room would usually be controlled by the sprinkler system. This time period is a function of the available water supply to the sprinkler system and as such may vary from 60 minutes for an on site water supply to significantly greater than 60 minutes for a sprinkler system supplied by a municipal water supply. However, for the purposes of determining a $T_{Available}$ for evacuating the remainder of the zone or floor area, it is recommended that a time frame of no more than 45 minutes be used as a benchmark.

6. **Compare Total of Detection Time ($T_{Detection}$) and Time Required ($T_{Required}$) to Time Available ($T_{Available}$)**

$$T_{Detection} + T_{Required} \leq T_{Available}$$

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

- increasing the number of supervisory staff on duty;
- enhancing supervisory staff training;
- incorporating assistive devices;
- installing equipment that would reduce the number of activities to be undertaken by staff e.g. installation of self-closing devices on resident bedroom doors;
- redistributing the placement of the occupants who require the greatest assistance in evacuation;
- reducing the overall number of residents in the building or zone;
- reducing the flammability of furnishing within resident bedrooms to reduce likelihood of ignition and limit fire growth;
- introducing or adding zone separations (fire compartments) to reduce the occupant load in each zone and travel time to a point of safety;
- enhancing early detection in various areas of the facility such as in resident bedrooms to enable faster supervisory staff response; and,
- increasing the time available through enhancement of building fire protection systems, such as sprinklers, which can effectively control a fire.

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 are required to conduct monthly fire drills for staff with delegated fire safety responsibilities. Fire drills are an effective way in which 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. In undertaking fire drills, the degree of resident participation must be carefully considered such that disruptions and injuries are avoided. Further information on the planning, coordination and conducting of fire drills can be found in technical guideline TG-00-1997 “Fire Drills” available for reference on the Office of the Fire Marshal’s (OFM) website at [www.ontario.ca/firemarshal](http://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, 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 at (416) 325-3100.

For information on fire safety planning related seminars and workshops for employees of care occupancies and care and treatment occupancies, please contact the Ontario Fire College at (705) 687-4611.

* 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

The Table below summarizes the principal fire safety features that would be expected in a building containing a care occupancy based on the date of construction\(^1\). The summary is based on a building up to three storeys in building height with more than 10 residents\(^2\). Represented in the table are features for buildings that predate the introduction of the Ontario Building Code (OBC) in 1975 and which would therefore be subject to compliance with the minimum standard in Section 9.5 of Division B of the Ontario Fire Code (OFC) as well features for buildings that are in compliance with the minimum standard required by the current 2006 Ontario Building Code.

### Principal Fire Safety Features

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<tr>
<th>No.</th>
<th>Feature</th>
<th>OFC 9.5 Compliant</th>
<th>2006 OBC Compliant</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Automatic sprinklers</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>Floor Assemblies</td>
<td>30 minute rated fire separations</td>
<td>60 minute rated fire separations (3.2.2.39.)</td>
</tr>
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<td>Sleeping Rooms</td>
<td>30 minute rated fire separations</td>
<td>60 minute rated fire separations</td>
</tr>
<tr>
<td>4</td>
<td>Corridors serving sleeping rooms</td>
<td>30 minute rated fire separations</td>
<td>60 minute rated fire separations</td>
</tr>
<tr>
<td>5</td>
<td>Zoned Floor Areas</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>6</td>
<td>Exit stairway enclosures</td>
<td>30 minute rated fire separations</td>
<td>60 minute rated fire separations</td>
</tr>
<tr>
<td>7</td>
<td>Doors</td>
<td>45 mm thick solid wood doors in solid wood frames for doors in fire separations under items 3, 4 and 6</td>
<td>20 minute rated doors in fire separations under items 3, 4 and 6</td>
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<tr>
<td>8</td>
<td>Self-closing devices</td>
<td>Doors in exit stairway fire separations</td>
<td>All fire doors</td>
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<tr>
<td>9</td>
<td>Fire Alarm system</td>
<td>Single stage, not monitored</td>
<td>Single or two stage, monitored</td>
</tr>
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<td>10</td>
<td>Fire detectors in sleeping rooms</td>
<td>No</td>
<td>Yes – smoke detectors</td>
</tr>
<tr>
<td>11</td>
<td>Fire detectors in corridors serving sleeping rooms</td>
<td>No</td>
<td>Yes – smoke detectors</td>
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<td>12</td>
<td>Fire alarm zones</td>
<td>Each floor area and the elevator shaft</td>
<td>Each floor area, the elevator shaft and the exit stairwells</td>
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<td>13</td>
<td>Smoke alarms in each sleeping room</td>
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</table>

Note 1 - The above summary is intended for guidance only and should not be relied upon as a comprehensive and accurate representation of the applicable regulations.

Note 2 - The requirements for buildings containing fewer than 10 residents or which are over three storeys in building height may vary significantly from those summarized above.
Appendix B - Illustrations

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

**Illustration #1 - Evacuation of Room of Fire Origin**

[Diagram showing staff response time, tenable and untenable periods, movement of staff and residents, fire detection, resident evacuation begins, and staff closes door to room of fire origin.]

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

- Staff response time
- (time for staff conducting evacuation duties)
- (time for resident movement from floor area)
- Time until room door failure
- Tenable period
- Untenable period
- Movement of staff and residents in floor area outside room of fire origin
- Tenability of corridor outside room of fire origin
- Fire detection
- Resident evacuation begins
- Staff closes door to room of fire origin
- Corridor tenable limits
- Time to get residents off floor
- Staff closes door to room of fire origin
- Tenable period
- Untenable period
- (minutes)
Appendix C – Detection Times

Detection time for fires in a care facility, 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 a care facility. One assumption is that the fire will have a “medium” $t^2$-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 fire discovery. 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 may gain staff an additional 15 minutes of evacuation time, which may be long enough to permit safe evacuation of the floor or zone. If, however, the door to the room of origin is closed, thereby delaying the activation of the corridor detectors, the time for fire detection increases and 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 are examples of realistic fire detection/activation times based on a waste basket or bedding fire in a typical care facility bedroom. These fire detection/activation times are approximations and can be adjusted based on additional information or conditions provided at the site:

- Smoke alarm/detector in small bedroom (12 x 12 ft) of fire origin – 15 to 30 sec
- Smoke alarm/detector in medium to large room (15 x 20 to 25 x 25 ft) of fire origin – 15 to 45 sec
- Smoke detector in corridor, with fire initiating in adjacent bedroom with open door – 30 to 90 sec
- Smoke detector in corridor, with fire initiating in adjacent small bedroom with closed solid-core wood door – 160 to 300 sec
- 135°F heat detector in small bedroom (12 x 12 ft) of fire origin – 40 to 90 sec
- 135°F heat detector in medium to large room (15 x 20 to 25 x 25 ft) of fire origin – 40 to 150 sec
- 135°F heat detector in corridor outside adjacent small bedroom of fire origin with open door – 120 to 200 sec
- 135°F heat detector in corridor outside adjacent small bedroom of fire origin with closed solid-core wood door – 900 to 1080 sec
- 165°F residential type sprinkler system in a bedroom of fire origin – 60 to 120 sec
- Supervisory staff at work station smelling smoke from fire in room with door open to corridor – 120 to 360 sec
• supervisory staff at work station smelling smoke from fire in room with solid-core wood door closed to corridor – 240 to 300 sec

*Smoke detector spacing - 30 x 30 ft; Heat detector spacing - 25 x 25 ft; Residential sprinkler head spacing - 15 x15 ft

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

Tools to Assist with Determining Time Required for Evacuation

Evacuation strategies need to be evaluated in order to ensure safe evacuation of residents and ensure the best use of limited staff resources. To do this, realistic scenarios need to be established, with each evaluating the number and type of 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 in subdivided by a fire-rated zone separation) usually requires the most number of staff.

Each resident type will require different numbers of staff to assist with evacuation, as illustrated in Table 1. Based on staffing levels available, teams of two staff will often be needed to assist Type C and D residents, while single staff members are usually enough to assist Type B residents. Type A residents should only need a single staff person to check on them and provide direction for evacuation. The estimated time that staff need to spend with each Type A resident may be as little as 5 to 10 seconds, as they can evacuate with minimum assistance.

Table 1 - Assigned Staffing Levels for Evacuation of Residents

<table>
<thead>
<tr>
<th>Resident Type</th>
<th>Capability of Resident to Evacuate</th>
<th>Type of Movement Aids</th>
<th>Staffing Resources Required to Move Each Resident to a Safe Area</th>
</tr>
</thead>
</table>
| Type A        | ambulatory, requiring no assistance but needs guidance | Some walkers or canes possible | Number of staff – 1 (only needs some direction)  
Level of Assistance - direct resident to exit stairs, check resident room and close room door (5 to 10 seconds each) |
| Type B        | ambulatory, requiring assistance | Walkers and carry aids at stairs (if needed) | Number of staff - 1  
Level of Assistance - assist resident out of bed and walk resident to safe location (zone separation door, exterior door or exit stairs) and return |
| Type C        | non-ambulatory, able to assist | Wheel chairs, and carry aids at stairs (if needed) | Number of staff - 2  
Level of Assistance - lift resident out of bed and move to safe location (other zone, exterior door or lower floor) and return |
| Type D        | non-ambulatory, unable to assist | Wheel chairs, and carry aids at stairs (if needed) | Number of staff - 2  
Level of Assistance - lift resident out of bed and move to safe location (other zone, exterior door or lower floor) and return |
Transportation aids for moving Type C and D residents can also impact evacuation times and need to be evaluated in each scenario. For instance, if a wheel chair is required by a resident then two staff will usually be needed to move the resident from the bed to the wheel chair. This time is illustrated in Table 2 as pre-horizontal movement time. A single staff person can then wheel the resident to a zone separation or exit. However, if stairs are encountered, then two staff will again be needed to move the resident vertically, using whatever carry aids are provided. Again some time is needed to transfer the resident from the wheelchair to the carry aid prior to the movement down the stairs. This time is illustrated in Table 2 as pre-vertical movement time. For Type A residents that don’t require assistance in use of movement aids, a certain amount of time is necessary for them to awaken, orient themselves or receive instructions, and initiate horizontal evacuation.

Table 2 – Time to Initiate Pre-Horizontal or Pre-Vertical Movement

<table>
<thead>
<tr>
<th>Type of Resident</th>
<th>Type of Movement Aids</th>
<th>Time to Initiate Pre-Horizontal Movement (sec)</th>
<th>Time to Initiate Pre-Vertical Movement (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type A</td>
<td>Some walkers or canes possible</td>
<td>30(^{1})</td>
<td>0</td>
</tr>
<tr>
<td>Type B</td>
<td>Walkers</td>
<td>30(^{2})</td>
<td>20(^{3})</td>
</tr>
<tr>
<td>Type C</td>
<td>Wheel chairs</td>
<td>30(^{2})</td>
<td>30(^{3})</td>
</tr>
<tr>
<td>Type D</td>
<td>Wheel chairs</td>
<td>30(^{2})</td>
<td>30(^{3})</td>
</tr>
</tbody>
</table>

Note 1: Orientation time by Type A residents prior to initiating self-evacuation. Staff time is limited to 5-10 sec to give resident direction, check room and close room door.

Note 2: Time needed for staff to assists Type B, C and D residents from beds to their walkers or wheel chairs

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

For each scenario, speed of movement for each resident also needs to be taken into consideration, whether with staff help or unassisted. Horizontal movement can range from slow, for those residents that use walkers and canes, to faster for those being moved by wheelchair. Rate of horizontal travel values* can be assigned based on Table 3. Vertical movement of 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 3.


In any evacuation time evaluation, consideration must also be made of staff member’s time between each resident move. As such, the movement speeds of staff members returning for the next resident are also provided in Table 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.
Table 3 – Rates of Speed of Evacuation Movement

<table>
<thead>
<tr>
<th>Type of Resident or Staff</th>
<th>Type of Movement Aids</th>
<th>Rate of Horizontal Movement (m/sec)</th>
<th>Rate of Vertical Movement at Stairs (m/sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type A Resident</td>
<td>Some walkers or canes possible</td>
<td>0.5</td>
<td>0.3</td>
</tr>
<tr>
<td>Type B Resident</td>
<td>Walkers</td>
<td>0.3</td>
<td>0.1&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Type C Resident</td>
<td>Wheel chairs</td>
<td>1.3</td>
<td>0.1&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Type D Resident</td>
<td>Wheel chairs</td>
<td>1.3</td>
<td>0.1&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Supervisory Staff</td>
<td>-</td>
<td>1.5&lt;sup&gt;2&lt;/sup&gt;</td>
<td>0.6&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Note 1: Movement speed of Type B, C and D residents being carried down stairs by staff using carrying aids
Note 2: Movement speed of supervisory staff returning from evacuation run

If the secondary phase of the evacuation plans only requires residents to be moved to another zone on the same floor, there will be significant time savings and reductions in staffing resources when compared to evacuation plans that require residents to be evacuated down stairs to a lower floor. These zone separations can effectively serve to reduce the total distance traveled by staff and residents in the second phase of evacuation, and delay the need to carry out any vertical component of evacuation movement to a subsequent phase, when needed.

The above tabulated information provides estimates for a table top evaluation 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 resident.

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 residents in care facilities, and subsequently the staffing levels needed to do this in the time available.

**Example on Use of Tools**

The above tools are being illustrated by calculating the total time to evacuate a Type A and a Type C resident from their bedrooms on the second floor to the relative safety of the first floor in the second phase of evacuation of this facility. It also calculates the total staffing resource times needed to carry this out, as some residents need two staff members during certain portions of the evacuation and some need one or less.

This exercise would be required for each and every resident that would need to be evacuated from the floor area or zone of fire origin once the fire is contained to the room of origin.

1. **Condition: Evacuation of a Type A resident from bed in room on second floor, to safety of first floor. Exit stair is 20 m from resident’s room. Exit stair diagonal travel distance from 2nd floor to 1st floor is 5 m.**

Number of staff needed: 1
Time needed for staff to direct resident to exit stair, check bedroom and close bedroom door: 10 sec.

Time for Type A resident to evacuate to ground floor:
- [time for type A resident to wake up and get oriented] - 30.0 sec
- [time for horizontal movement (20 m ÷ 0.5 m/sec.)] - 40.0 sec
- [time for vertical movement (5 m of stairs ÷ 0.3 m/sec.)] - 16.7 sec
Total Time for Type A Resident to Evacuate to First Floor - 86.7 sec

Total Staff Resource Time Required to Evacuate Type A Resident to First Floor = 10 sec.

Therefore with fatigue factor (20%) the total time is 10 x 1.2 = 12 sec

2. **Condition: Evacuation of a Type C resident from bed on second floor to first floor. Exit stair is 15 m from resident’s room. Exit stair diagonal travel distance from 2nd floor to 1st floor is 5 m.**

Number of staff needed: 2 for wheel chair transfers and vertical movement, and 1 staff for horizontal movement

Time for staff to evacuate Type C resident to ground floor:
- [time to transfer resident to wheelchair] - 30.0 sec
- [time for horizontal movement (15 m ÷ 1.3 m/sec.)] - 11.5 sec
- [time to transfer resident from wheelchair to carry aid] - 30.0 sec
- [time for vertical movement (5 m of stairs ÷ 0.1 m/sec.)] - 50.0 sec
**Total Time for Type C Resident to be Moved to First Floor** - 121.5 sec

**Total Staff Resource Time Required to Move Type C Resident to 1st Floor and then Return for Next Resident** -

[(30 + 30 + 50) x 2] + [11.5 x 1] + [(15 m ÷ 1.5 m/sec.) x 1] + [(5 m of stairs ÷ 0.6 m/sec.) x 2]

220 + 11.5 + 10 + 16.7 = 258.2 sec

Therefore with fatigue factor (20%) the total time is 258.2 x 1.2 = 310 sec