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2012 IFC Code & Commentary

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SECTION 1005

MEANS OF EGRESS SIZING

[B] 1005.1 General. All portions of the means of egress system shall be sized in accordance with this section.

Exception: Means of egress complying with Section 1028.

◆ This section is a charging paragraph for sizing for the means of egress system in a tenant space, floor or building. The exception is based on the understanding that the criteria for spaces that serve as assembly areas have unique criteria based on the high occupant load and possibility of stepped or sloped aisles.

[B] 1005.2 Minimum

width based on component. The minimum width, in inches (mm), of any means of egress component shall not be less than that specified for such component elsewhere in this code or the International Building Code.

◆ The code requires the utilization of two methods to determine the minimum width of egress components.

While this section provides a methodology for determining required widths based on the design occupant load, calculated in accordance with Section 1004.1, other sections provide minimum widths of various components. The actual width that is provided is to be the larger of the

two widths.

[B] 1005.3 Required capacity based on occupant load. The required capacity, in inches (mm), of the means of egress for any room, area, space or story shall not be less than that determined in accordance with Sections 1005.3.1 and 1005.3.2.

◆ For this section, the sum of the capacities of the means of egress components that serve each space must equal or exceed the occupant load of that space. For example, the combined width of all the exit stairways from a floor need to be considered to determine if the stairways have adequate capacity for everyone to evacuate the building. All



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elements must meet the minimum width requirements specified in other sections (e.g., Section 1008.1.1 for doors; Sections 1007.3 and 1009.1 for stairs).

This section establishes the necessary width of each egress component on a “per-occupant” basis.

Means of egress components are separated between “stairs” and “other;” “other” being doors, doorways, corridors, ramps, aisles, etc.

The traditional unit of measurement of egress capacity was based on a “unit exit width” that was to simulate the body ellipse with a basic dimensional width of 22 inches (559 mm)—approximately the

shoulder width of an average adult male. This unit exit width was combined with assumed egress movement (such as single file or staggered file) to result in an egress capacity per unit exit width for various occupancies. This assumption simplifies the dynamic egress process since contemporary studies have indicated that people do not egress in such precise and predictable movements. As traditionally used in the codes, the method of determining capacity per unit of clear width implies a higher level of accuracy than can realistically be achieved. The resulting factors preserve the features of the past practices that can be documented, while

providing a more straightforward method of determining egress capacity.

[B] 1005.3.1 Stairways. The capacity, in inches (mm), of means of egress stairways shall be calculated by multiplying the occupant load served by such stairway by a means of egress capacity factor of 0.3 inch (7.6 mm) per occupant.

Where stairways serve more than one story, only the occupant load of each story considered individually shall be used in calculating the required capacity of the stairways serving that story.

Exception: For other than Group H and I-2



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occupancies, the capacity, in inches (mm), of means of egress stairways shall be calculated multiplying the occupant load served by such stairway by a means of egress capacity factor of 0.2 inch (5.1 mm) per occupant in buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2 and an emergency voice/alarm communication system in accordance with Section 907.5.2.2.

◆The capacity factor for stairways is larger than “other egress components” due to the slowdown of travel to negotiate the steps. When the required

occupant capacity of an egress component is determined, multiplication by the appropriate factor results in the required clear width of the component in inches, based on capacity. Similarly, if the clear width of a component is known, division by the appropriate factor results in the permitted capacity of that component.

Per the exception, other than in Group H or I-2, if the building is sprinklered and has an emergency voice/alarm communication system, the capacity factor for stairways is permitted to be reduced to 0.2 inches (5.1 mm) per occupant. The 2009 edition of the code did not include the

exception for sprinklered buildings; however, editions previous to 2009 included similar allowances in a table.

The following illustrate typical calculations for stairways from a nonsprinklered, two-story, two-exit office building:

1. Determine the minimum required stairway width with a second-floor occupant load of 350:

- 350 occupants divided by 0.3 inches = 105 inches (2667 mm) minimum;

- 105 inches divided by two stairways is 52 1/2 inches (1334 mm) minimum per stairway; or

- Section 1009.1



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prescribes that the width of an interior stairway cannot be less than 44 inches (1118 mm).

The capacity criteria are more restrictive and, therefore, the minimum required width for each stairway is 52 1/2 inches (1334 mm).

2. Determine the minimum required stairways width with a second-floor occupant load of 90:

- 90 occupants divided by 0.3 inches (7.62 mm) = 27 inches (686 mm) minimum;
- 27 inches (686 mm) divided by two stairways is 13 1/2 inches (343 mm); or
- Section 1009.1 prescribes that the

width of an interior stairway cannot be less than 44 inches (1118 mm). Note that the stair width reduction in Section 1009.1, Exception 1, is applicable only when the entire occupant load of a story is less than 50.

The minimum clear width requirements are more restrictive and, therefore, the minimum required width for each stairway is 44 inches (1118 mm).

The maximum capacity of a 44-inch (1118 mm) stairway is 44 inches divided by 0.3 inches (7.62 mm) per occupant = 146 occupants.

Therefore, a floor level with two exit stairways could have 292 occupants before the capacity would control

the stairway egress width.

Using the exception for sprinklered buildings, a 44-inch (1118 mm) stairway divided by 0.2 inches (5.08 mm) per occupant = 220 occupants. Therefore, a floor level with two exit stairways could have 440 occupants before the capacity would control the stairway egress width.

Keep in mind that accessible means of egress stairways in nonsprinklered buildings require a minimum clear width of 48 inches (1219 mm) between handrails.

[B] 1005.3.2 Other egress components. The capacity, in inches (mm), of means of egress components



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other than stairways shall be calculated by multiplying the occupant load served by such component by a means of egress capacity factor of 0.2 inch (5.1 mm) per occupant.

Exception: For other than Group H and I-2 occupancies, the capacity, in inches (mm), of means of egress components other than stairways shall be calculated multiplying the occupant load served by such component by a means of egress capacity factor of 0.15 inch (3.8 mm) per occupant in buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1

or 903.3.1.2 and an emergency voice/alarm communication system in accordance with Section 907.5.2.2.

◆The capacity factor for “other egress components” (i.e., doors, gates, corridors, aisles, ramps) is less than stairways due to the slowdown of travel to negotiate the steps. When the required occupant capacity of an egress component is determined, multiplication by the appropriate factor results in the required clear width of the component in inches, based on capacity.

Similarly, if the clear width of a component is known, division by the appropriate factor results in the permitted capacity of that

component.

Per the exception, other than in Group H or I-2, if the building is sprinklered and has an emergency voice/alarm communication system, the capacity factor for doors, corridors, aisles, etc., is permitted to be reduced to 0.15 inches (3.8 mm) per occupant. The 2009 edition of the code did not include the exception for sprinklered buildings; however, previous editions included similar allowances in a table.

For example, two exit access doorways from a room with an occupant load of 300 would each have a required capacity of not less than 150. Based on the minimum required clear door width [32-inch



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(813 mm) clear width per door divided by 0.2 inch (5.08 mm) per occupant = 160 occupants], two 32-inch (813 mm) clear width doors would meet both the minimum clear width (Section 1008.1.1) and the capacity requirements. Two exits from a space with an occupant load of 450 would each have a required capacity of not less than 225, necessitating more doors or larger door leaves.

0.2 inch (5.1 mm) per occupant in buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2 and an emergency voice/alarm

communication system in accordance with Section 907.5.2.2.

◆The capacity factor for stairways is larger than “other egress components” due to the slowdown of travel to negotiate the steps. When the required occupant capacity of an egress component is determined, multiplication by the appropriate factor results in the required clear width of the component in inches, based on capacity. Similarly, if the clear width of a component is known, division by the appropriate factor results in the permitted capacity of that component.

Per the exception, other than in Group H or I-2, if the building is

sprinklered and has an emergency voice/alarm communication system, the capacity factor for stairways is permitted to be reduced to 0.2 inches (5.1 mm) per occupant. The 2009 edition of the code did not include the exception for sprinklered buildings; however, editions previous to 2009 included similar allowances in a table.

The following illustrate typical calculations for stairways from a nonsprinklered, two-story, two-exit office building:

1. Determine the minimum required stairway width with a second-floor occupant load of 350:

- 350 occupants divided



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by 0.3 inches = 105 inches (2667 mm) minimum;

- 105 inches divided by two stairways is 52 1/2 inches (1334 mm) minimum per stairway; or

- Section 1009.1 prescribes that the width of an interior stairway cannot be less than 44 inches (1118 mm).

The capacity criteria are more restrictive and, therefore, the minimum required width for each stairway is 52 1/2 inches (1334 mm).

2. Determine the minimum required stairways width with a second-floor occupant load of 90:

- 90 occupants divided

by 0.3 inches (7.62 mm) = 27 inches (686 mm) minimum;

- 27 inches (686 mm) divided by two stairways is 13 1/2 inches (343 mm); or

- Section 1009.1 prescribes that the width of an interior stairway cannot be less than 44 inches (1118 mm). Note that the stair width reduction in Section 1009.1, Exception 1, is applicable only when the entire occupant load of a story is less than 50.

The minimum clear width requirements are more restrictive and, therefore, the minimum required width for each stairway is 44 inches (1118 mm).

The maximum capacity

of a 44-inch (1118 mm) stairway is 44 inches divided by 0.3 inches (7.62 mm) per occupant = 146 occupants. Therefore, a floor level with two exit stairways could have 292 occupants before the capacity would control the stairway egress width.

Using the exception for sprinklered buildings, a 44-inch (1118 mm) stairway divided by 0.2 inches (5.08 mm) per occupant = 220 occupants. Therefore, a floor level with two exit stairways could have 440 occupants before the capacity would control the stairway egress width.

Keep in mind that accessible means of egress stairways in nonsprinklered buildings



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require a minimum clear width of 48 inches (1219 mm) between handrails.

[B] 1005.3.2 Other egress components. The capacity, in inches (mm), of means of egress components other than stairways shall be calculated by multiplying the occupant load served by such component by a means of egress capacity factor of 0.2 inch (5.1 mm) per occupant.

Exception: For other than Group H and I-2 occupancies, the capacity, in inches (mm), of means of egress components other than stairways shall be calculated multiplying the occupant load served by such component by a means

of egress capacity factor of 0.15 inch (3.8 mm) per occupant in buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2 and an emergency voice/alarm communication system in accordance with Section 907.5.2.2.

◆The capacity factor for “other egress components” (i.e., doors, gates, corridors, aisles, ramps) is less than stairways due to the slowdown of travel to negotiate the steps. When the required occupant capacity of an egress component is determined, multiplication by the appropriate factor results in the required

clear width of the component in inches, based on capacity.

Similarly, if the clear width of a component is known, division by the appropriate factor results in the permitted capacity of that component.

Per the exception, other than in Group H or I-2, if the building is sprinklered and has an emergency voice/alarm communication system, the capacity factor for doors, corridors, aisles, etc., is permitted to be reduced to 0.15 inches (3.8 mm) per occupant. The 2009 edition of the code did not include the exception for sprinklered buildings; however, previous editions included similar allowances in a table.



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For example, two exit access doorways from a room with an occupant load of 300 would each have a required capacity of not less than 150. Based on the minimum required clear door width [32-inch (813 mm) clear width per door divided by 0.2 inch (5.08 mm) per occupant = 160 occupants], two 32-inch (813 mm) clear width doors would meet both the minimum clear width (Section 1008.1.1) and the capacity requirements. Two exits from a space with an occupant load of 450 would each have a required capacity of not less than 225, necessitating more doors or larger door leaves.

Doors in any position shall not reduce the required width by more than one-half.

Exceptions:

1. Surface-mounted latch release hardware shall be exempt from inclusion in the 7-inch maximum (178 mm) encroachment where:

1.1. The hardware is mounted to the side of the door facing away from the adjacent wall where the door is in the open position; and

1.2. The hardware is mounted not less than 34 inches (865 mm) nor more than 48 inches (1219 mm) above the finished floor.

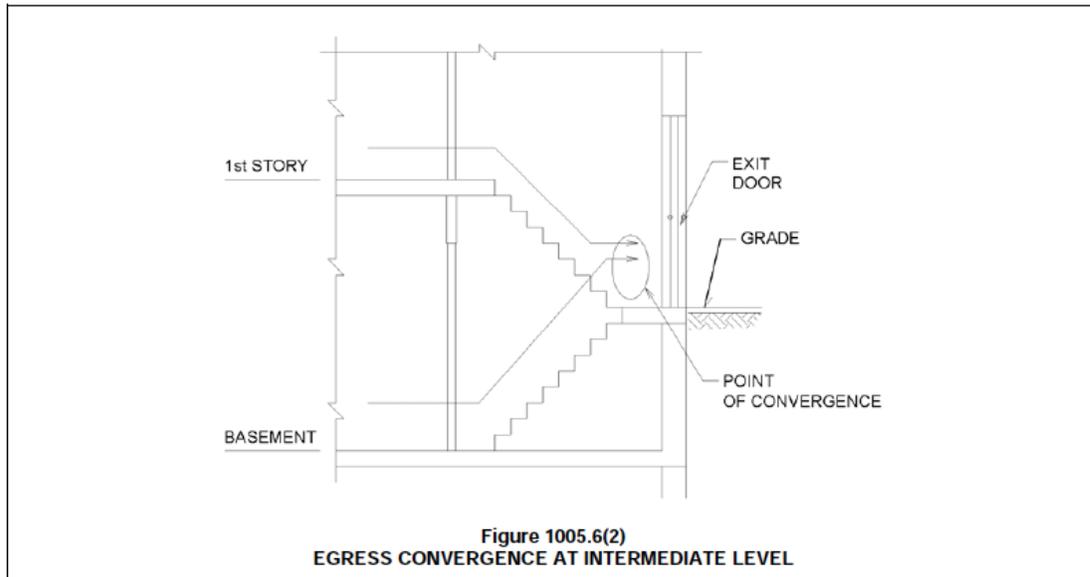
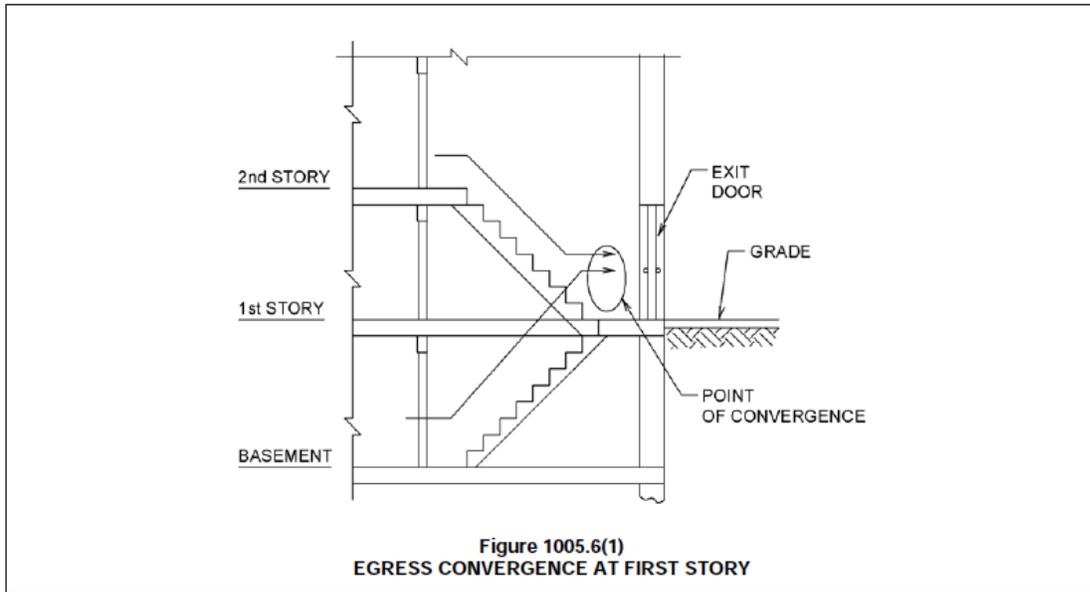
2. The restrictions on door swing shall not apply to doors within individual dwelling units

and sleeping units of Group R-2 occupancies and dwelling units of Group R-3 occupancies.



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◆ Projections or restrictions in the required width can impede and restrict occupant travel, causing egress to occur less efficiently than expected. The swinging of a door, such as from a room into a corridor, and any handrails along the route are permitted projections.

Historically this section has looked at doors on one wall at a time. Doors located across the hall from one another are not considered additive when considering protrusion limits. Doors would not typically be opened to the full extent at exactly the same moment, nor can they remain open at 90 degrees and totally blocking the hall

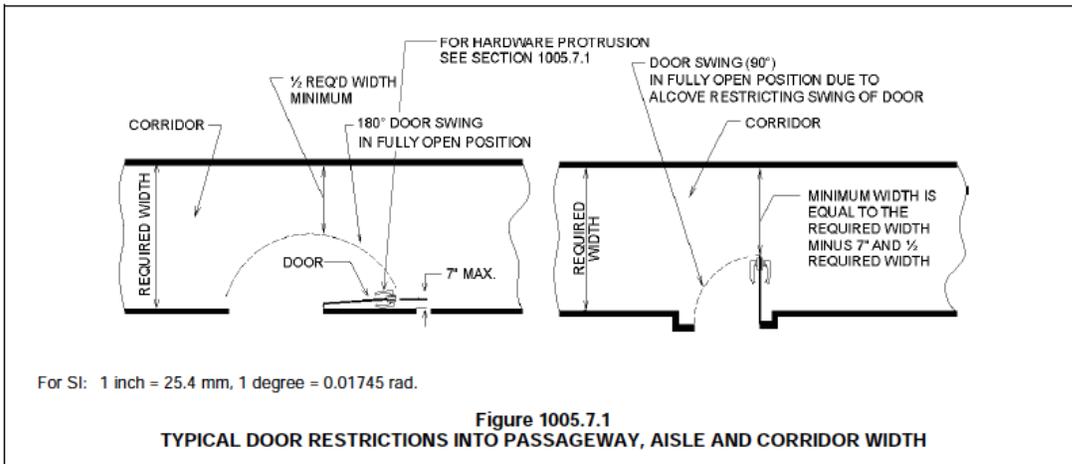
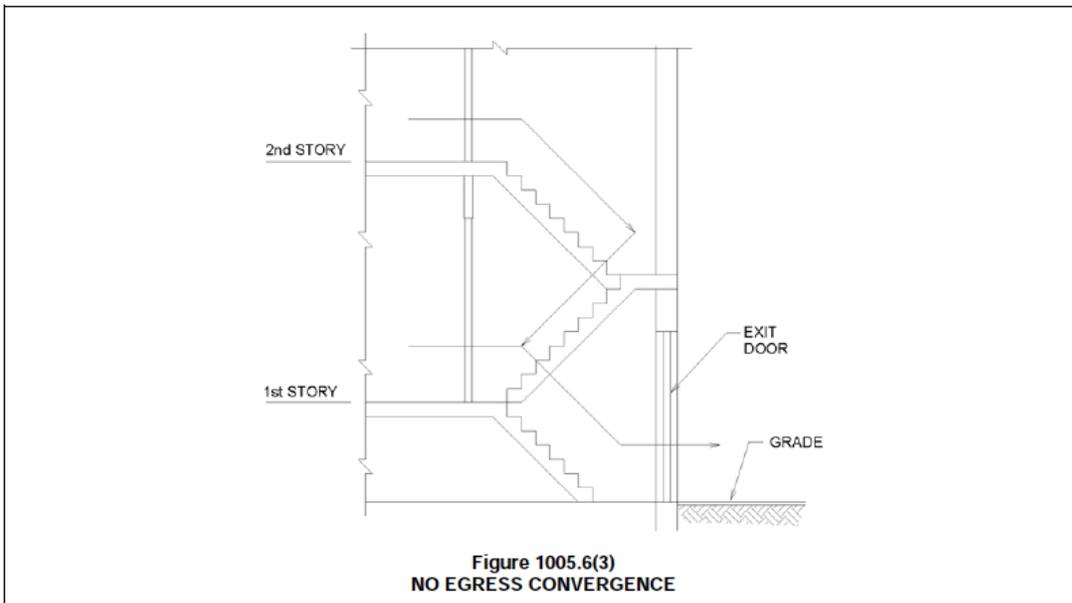
because of the maximum limitation of 7 inches (178 mm) when fully open (typically approaching 180 degrees). Regarding door encroachment there are two tests. The arc created by the doors outside edge cannot project into more than one-half of the required corridor width. When opened to its fullest extent, the door cannot project more than 7 inches (178 mm) into the required width, which is the dimension of the leaf thickness excluding the hardware as shown in Figure 1005.7.1. Door hardware encroachment is addressed separately in Exception 1. These projections are permitted because they are considered to be temporary and do not

significantly impede the flow. Occupants will compensate for the projection by a reduction in the natural cushion they retain between themselves and a boundary, known as the edge effect.



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For SI: 1 inch = 25.4 mm, 1 degree = 0.01745 rad.



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Per Exception 2, the door swing restrictions do not apply within dwelling units since the occupant load is very low. Based on the intent of this section, other situations that could be approved by the official having jurisdiction would be situations where the opening door would not block the egress, such as the door at the end of a corridor, or the room was not typically occupied, such as a janitor's closet.

The provision in Exception 1 indicates that hardware facing the corridor when the door is fully open need not be considered when determining the allowable door encroachment into a corridor of 7 inches (178

mm) maximum. The allowance is applicable provided the hardware is mounted within height range of 34 inches to 48 inches (865 to 1220 mm) which is consistent with the range for means of egress door hardware height as established in Section 1008.1.9.2. Where hardware extends across a door, such as panic hardware, the 4-inch (102 mm) projection in the door opening is addressed in Section 1008.1.1.1.

[B] 1005.7.2 Other projections. Handrail projections shall be in accordance with the provisions of Section 1012.8.

Other nonstructural projections such as trim and similar decorative features shall be

permitted to project into the required width a maximum of 11/2 inches (38 mm) on each side.

◆ Handrails are not required along corridors, level aisles, exit passageways and exit corridors; however, if provided, Section 1012.8 would be applicable.

Handrails are sometimes provided along the hallways in hospitals or nursing homes to aid the residents.

Bumper guards along the walls are not handrails. Items such as baseboards, chair rails, pilasters, etc., are limited to protruding over the required width of the corridor a maximum of 11 /2



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inches (38 mm); however, once again, Section 1003.3.3 would be applicable when the corridor was wider than required.

[B] 1005.7.3 Protruding objects. Protruding objects shall comply with the applicable requirements of Section 1003.3.

◆ This section is a reminder that protruding objects are applicable when looking at encroachments into a confined path of travel.

The difference, however, is that door and other projections are applied to the required minimum width, while protruding object provisions apply to paths of travel even when wider than required.

Next Month: SECTION 1006

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