

Connecticut Code Chronicle

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for the use and information of the design and code enforcement communities

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EXIT ACCES TRAVEL DISTANCE

The basics of measuring exit access travel distance and common path of travel haven't changed since the inception of the *International Building Code*® and, in reality, not since the inception of building codes. Despite this, it's obvious from looking at the plans we receive that many architects (and engineers, we can't forget them) must have slept through the class on the day egress was taught at their school or architecture.

The IBC defines exit access and common path of egress travel as follows:

EXIT ACCESS. That portion of a means of egress system that leads from any occupied portion of a building or structure to an exit.

COMMON PATH OF EGRESS TRAVEL. That portion of exit access travel distance measured from the most remote point of each room, area or space to that point where the occupants have separate and distinct access to two exits or exit access doorways.

But the definitions don't tell us how to measure either the exit access travel distance or the common path of travel. To find that we have to look in Chapter 10:

1017.3 Measurement. Exit access travel distance shall be measured from the most remote point of each room, area or space along the natural and unobstructed path of horizontal and vertical egress travel to the entrance to an exit. Where more than one exit is required, exit access travel distance shall be measured to the nearest exit.

What too many designers don't take into account is that the exit access travel distance is measured from the most remote point in each room or space. If there are a number of rooms or spaces, such as office cubicles, offices, or exam rooms, the only one we care about is the one that's the farthest away from any exit. The exit access distance is measured from the most remote point in that room or space. When there are multiple rooms, most will be closer to one exit than to the other(s). One room, though, will be the farthest from both or all exits. That's the one for which the exit access travel distance is critical. [If you have the IBC Commentary, look at Commentary Figure 1017.3(1) {2021 edition}]

The codes also says the exit access travel distance is to be measured "along the natural and unobstructed path of horizontal and vertical travel" This is where too many designers fail; they draw a line representing the path of egress travel across the diagonal of a space, forgetting that in real life there will be *things* in that space, and people trying to get out will have to walk around those things. This is elaborated on in the IBC Commentary, which (of course) is not enforceable, but which we can use as guidance.

(And, for what it's worth, the NFPA 101 *Life Safety Code Handbook* tells us the same thing.)

The route must be assumed to be the natural path of travel without obstruction. This commonly results in a rectilinear path similar to what can be experienced in most occupancies, such as a schoolroom or an office with rows of desks [see Commentary Figure 1017.3(2)]. The "arc" method, using an "as the crow flies" linear measurement, must be used with caution, as it seldom represents typical floor design and room layout and, in most cases, would not be the natural, unobstructed path.

The travel distance is measured from every occupiable point on a floor to the closest exit. While each occupant may be required to have access to a second or third exit, the travel distance limitation is only applicable to the distance to the nearest exit. In effect, this means that the distance an occupant must travel to the second or third exit is not regulated.

Ever since I can remember, exit access travel distance has (with a few exceptions) been measured using a rectilinear approach, not along diagonals. This is illustrated in Commentary Figure 1017.3(2).

I have always measured the exit access travel distance using 90-degree corners when changing directions. Once in a great while I see a plan with the changes in direction curved. This comes from NFPA 101, which has its own language for how to measure the travel distance:

7.6.1 The travel distance to an exit shall be measured on the floor or other walking surface as follows:

- (1) Along the centerline of the natural path of travel, starting from the most remote point subject to occupancy
- (2) Curving around any corners or obstructions, with a 12 in. (305 mm) clearance therefrom
- (3) Terminating at one of the following:
 - (a) Center of the doorway
 - (b) Other point at which the exit begins
 - (c) Smoke barrier in an existing detention and correctional occupancy as provided in Chapter 23

Since NFPA 101 mentions a 12-inch clearance to corners or obstructions, I have always regarded the most remote point as being 12 inches in each axis from the most remote corner of the room or space.

I consider the difference between square corners and radiused corners to be inconsequential. It's much more important to eliminate diagonal measurements in spaces that may be furnished when the building is occupied. For example, if I draw a space

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that's 20 feet by 30 feet with an door in one corner that opens into a 20-foot corridor, with square corners the exit access travel distance is 64'-1½". This path includes two 90-degree turns, one within the room and one when leaving the room to turn along the corridor. If the two turns are curved to a 12-inch radius, the exit access travel distance becomes 63'-3¾". The difference in this example is less than a foot — just over 1 percent. It's extremely rare when the exit access travel distance falls right at the limit. If a situation arises where the distance falls right on the allowable maximum and the designer wants to use the 12-inch radius around corners — I would allow it, because NFPA 101 allows it and (in theory) the building codes and NFPA were coordinated on this issue decades ago.

NOT ALL STAIRS ARE EXITS

The general rule-of-thumb is that interior stairs used as means of egress have to be enclosed in fire-resistance rated construction— 1-hour rated for up to three stories, and 2-hour rated construction for four stories or more. When a stair is properly enclosed in a rated stair enclosure, the stairway itself is the exit, and the exit access travel distance on any story ends at the door into the stair. Travel distance within exit stairs (and exit passageways) is not regulated by the codes.

Under certain conditions, however, an interior stair can be part of the exit access. Section 1006.2 of the IBC requires that, unless meeting one of the exceptions, all stories must have access to at least two exits.

1006.3.3 Egress based on occupant load. Each *story* and occupied roof shall have the minimum number of separate and distinct *exits*, or access to *exits*, as specified in Table 1006.3.3. A single *exit* or access to a single *exit* shall be permitted in accordance with Section 1006.3.4. The required number of *exits*, or *exit access stairways* or *ramps* providing access to *exits*, from any *story* or occupied roof shall be maintained until arrival at the *exit discharge* or a *public way*.

Reading the above carefully, it says that all stories must be provided with exits **OR** "access to" exits. This means that there must be some conditions under which the egress from a story may not have to be directly to an exit on that story. Where do we find that? In section 1017, Exit Access Travel Distance. IBC Section 1017.3 mentions horizontal *and vertical* travel as part of the exit access travel distance. Vertical travel can include open stairs and/or open ramps.

1017.3 Measurement. *Exit access* travel distance shall be measured from the most remote point of each room, area or space along the natural and unobstructed path of horizontal and vertical egress travel to the entrance to an *exit*. Where more than one exit is required, *exit access* travel distance shall be measured to the nearest exit.

The definitions in IBC Chapter 2 include a definition of Exit Access Stairway, so it must be a thing:

[BE] EXIT ACCESS STAIRWAY. A *stairway* within the *exit access* portion of the *means of egress* system.

IBC Section 1017.3.1 then introduces us to exit access stairways and ramps. This section tells us that such elements are included in the exit access travel distance, and it goes on to describe how to measure the exit access travel distance along stairways and ramps.

1017.3.1 Exit access stairways and ramps. Travel distance on *exit access stairways* or *ramps* shall be included in the *exit access* travel distance measurement. The measurement along *stairways* shall be made on a plane parallel and tangent to the *stair* tread *nosings* in the center of the *stair* and landings. The measurement along *ramps* shall be made on the walking surface in the center of the *ramp* and landings.

The same language appears in IBC section 1006.3.4, which is the section that tells us when a story can have a single exit or "access to" a single exit:

1006.3.4 Single exits. A single *exit* or access to a single *exit* shall be permitted from any *story* or occupied roof where one of the following conditions exists:

The above section is followed by a list of specific conditions under which a single exit (or access to a single exit) is allowed. For most purposes, it comes down to a combination of occupant load, occupancy classification, and exit access travel distance. These are summarized in Table 1006.3.4(1) [for R-2 occupancies] and Table 1006.3.4(2) [for all other occupancies].

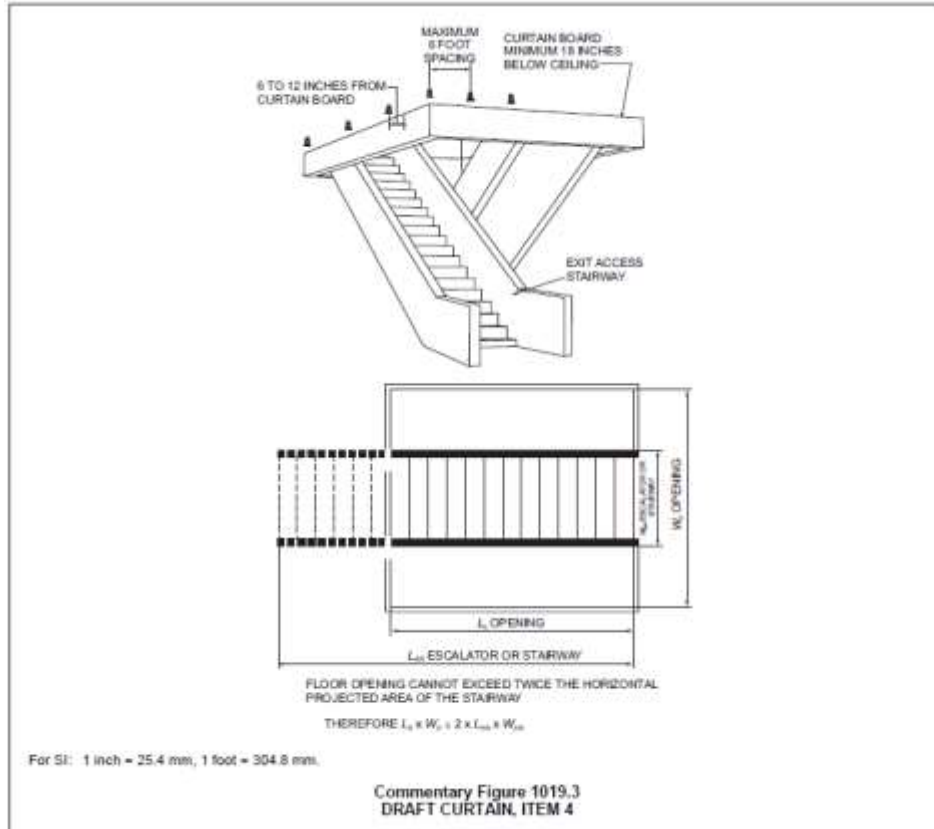
IBC section 1019 spells out the criteria for exit access stairways and ramps. It's important to note that Connecticut heavily amended this section when we adopted the 2022 Connecticut State Building Code. In short, if the design doesn't satisfy one of the ten specific conditions set forth in section 1019.3, unenclosed exit access stairs are not allowed. The most general of these conditions is number 1, which limits the use of unenclosed exit access stairs to occupant loads of less than 10 (NOT "10 or less"), in sprinklered buildings, and not more than one story above the level of exit discharge. This is significantly more restrictive than the language of the 2021 IBC model code, which may trip up architects from other states doing work on projects in Connecticut.

It's also worth noting that the model 2021 IBC requires unenclosed exit access stairway floor openings to be protected by draft curtains, such as those required around escalator floor openings. For whatever reason, Connecticut removed that requirement in amending section 1019.3. If an architect from another state chooses to provide a draft curtain around an unenclosed floor opening for an exit access stair, I would not object. The purpose is to prevent (or delay) smoke from a fire on the lower level from escaping through the floor opening, thereby

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contaminating the atmosphere in the upper level and also possibly delaying the activation of smoke alarms on the lower level. This is what a draft curtain looks like:

From the ICC 2021 IBC Commentary:



If the above illustration looks a lot like an escalator, that's not an accident. The function and purpose of the draft curtain are exactly the same. I think it's unfortunate that Connecticut removed this provision, but the Connecticut Amendment also severely restricts when unenclosed exit access stairways can be used compared to the model IBC, so that may have been the trade-off.

MEZZANINES

Mezzanines are always, by definition, within a story, so stairs from a mezzanine to the main level of the story within which the mezzanine is located are not required to be enclosed. These are always exit access stairways.

EXTERIOR STAIRS

Like interior stairs, exterior stairs may also be different animals. We mostly encounter stairs that lead from the level of exit discharge to grade; such stairs are exit discharge stairs. In the case of multi-story buildings with exterior egress stairs that traverse multiple stories, we have probably all encountered those and we know that, pursuant to IBC section 1027.6, such stars are

classified as exterior exit stairs and they have to be protected from the interior of the building by rated wall construction with protected openings with 10 feet in any direction from the stair. But there's also something (unhelpfully, not defined in the IBC) as an exterior exit access stair. The only place I have found this mentioned is in the 2021 Commentary for section 1027.1. It says:

Stairways and ramps can be exit access, exit or exit discharge elements. Exterior exit access and exit discharge stairways and ramps typically involve a change of elevation of less than a story. Exterior exit access stairways or ramps between stories must comply with Section 1019.3 and, where permitted as part of the required means of egress, are limited by Section 1006.3. Exit stairways and ramps traverse a full story or more. Interior exit stairways and ramps must be enclosed in accordance with Section 1023. This section addresses exterior stairways and ramps that function as exit elements.

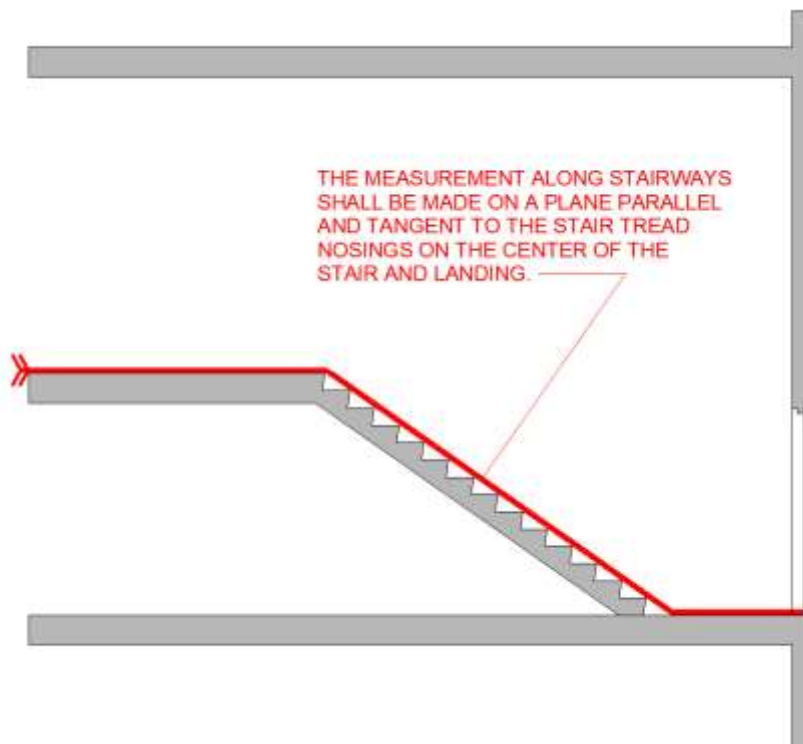
Where a stair is classified as an exterior access stairway, this means that the exit access travel distance measurement has to

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include travel along the stair. How do we measure that? The answer is found in IBC 1017.3.1:

1017.3.1 Exit access stairways and ramps. Travel distance on *exit access stairways* or *ramps* shall be included in the *exit access* travel distance measurement. The measurement along *stairways* shall be made on a plane parallel and tangent to the *stair tread nosings* in the center of the *stair* and landings. The measurement along *ramps* shall be made on the walking surface in the center of the *ramp* and landings.

I thought the IBC Commentary included a figure to illustrate this, but I don't see one, so I created one. To simplify plan reviews, for a typical stair with 11-inch treads and 7-inch risers, multiplying the plan dimension of the stair by 1.25 results in a good approximation of the distance along the incline. If the total exit access travel distance result is borderline, then a more accurate measurement may be required.



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The editor is a licensed architect and a licensed building official, with more than 40 years experience. I offer non-structural plan review services for projects of any size, with special rates for municipal building departments.

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What topics would you like to see discussed in future issues? It helps all of us if we can all be on the same page, to avoid those "But I never have to do that in [town]" complaints.

Send me an e-mail if you think of any issues that affect all building officials, everywhere.