



Means of Egress

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Means of Egress

- According to NFPA (National Fire Protection Agency) Life Safety Code, there must be a continuous and unobstructed pathway leading to a public way. This pathway must include exit access, the exit itself, and adequate space for discharge.

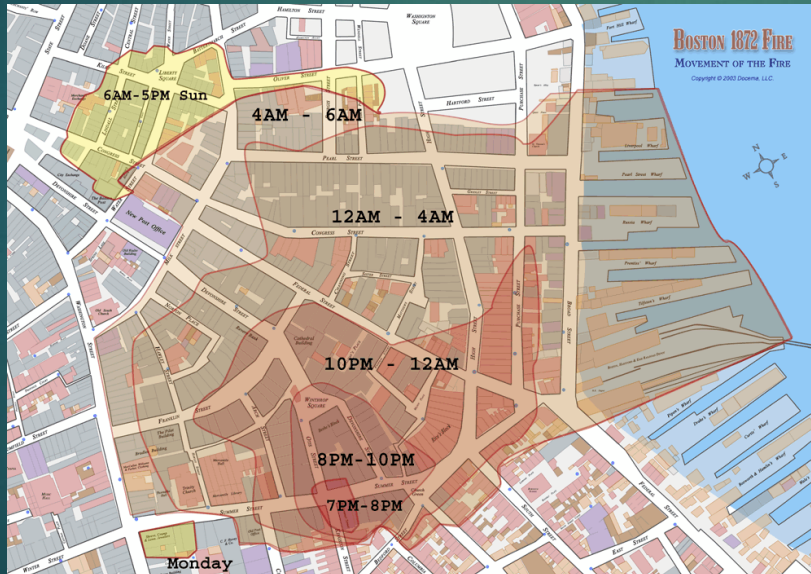
History

- ▶ Fire Code began in 1631 in Boston, Massachusetts by Governor John Winthrop. He made wooden chimneys, and thatched roofs of homes illegal due to the danger they posed to the community.



Other Causes of Prevention

- ▶ Great Chicago Fire
- ▶ Great Boston Fire
- ▶ Triangle Waist Company Fire



Great Chicago Fire



- ▶ October 9, 1871
 - ▶ Due to high winds, and wood construction fire spread quickly.
 - ▶ 1/3 of Chicago was burned, and 250 died.
- Response: New codes were created about the spacing of buildings, and the types of materials to be used.

The Great Boston Fire

- ▶ November 9, 1872
 - ▶ Buildings thought to be “fire proof” caught fire, and due to firefighting technology in this time they were only able to reach the 3rd floor of 5 to 7 story buildings allowing the fire to spread between buildings.
 - ▶ 60 acres of buildings were destroyed, and 2 fire fighters died.
- Response: Improved construction enforced by codes with better inspections.

Triangle Waist Company Fire

- ▶ March 25, 1911 in the Asch Building in New York.
- ▶ The company was on the 8th, 9th, and 10th floors. The fire started on the 8th.
- ▶ Workers on 8th floor had to notify the other floors because of no alarms system.
- ▶ One exit was locked, and another blocked by fire.
- ▶ Existing fire escapes collapsed under crowding workers.
- ▶ Others were forced to jump from the roof.
- ▶ Fire caused 146 deaths.

Response



- ▶ There were code changes in fire proofing, the use of sprinkler systems, and exits from high-rise buildings.
- ▶ Life Safety Code (NFPA 101): The National Fire Protection Association was created to create standards in fire protection nationwide.
- ▶ New York created New York City Bureau of Fire Protection.

New York City Building Code

- ▶ Chapter 10
- ▶ Buildings or portions thereof shall be provided with a means of egress system as required by this chapter. The provisions of this chapter shall control the design, construction and arrangement of means of egress components required to provide an approved means of egress from structures and portions thereof. BC 1001.1

General Requirements

BC 1003

- ▶ Ceiling height: Not less than 7 feet, 6 inches
BC 1003.2
- ▶ Protrusions BC 1003.3:
 - ▶ Headroom - 84 inches at all walking surfaces, but take up no more than 50% of the ceiling of the means of egress.
 - ▶ Door closers no less than 78 inches
 - ▶ Horizontal projections cannot be more than 4 inches between the heights of 27 and 80 inches. Handrails, however, can be no more than 4.5 inches.
- ▶ Egress floors must be slip resistant and securely attached. BC 1003.4
- ▶ Elevators, escalators, and moving walks cannot be used as an egress path. BC 1003.7

General Requirements cont'd

▶ Elevation Change

- ▶ Less than 12 inches, a slope of 1 vertical unit to 20 horizontal units, or 5% must be used. Handrails between 34 and 38 inches are required (BC 1009.11.1). Less than 6 inches of elevation change handrails are not required, but there must be a contrast in floor finish from adjacent floors. BC 1003.5

▶ Continuity

- ▶ Egress paths shall not be interrupted by any building elements other than egress components specified. Obstructions cannot be in the egress width other than permitted projections. And the egress capacity cannot diminish over its entire path. BC 1003.6

Occupant Load

BC 1004

- ▶ In determining means of egress requirements, the number of occupants for whom means of egress facilities shall be provided shall be established by the largest number computed in accordance with Sections 1004.1.1 through 1004.1.3.

Area Per Occupant



MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT	
USE OF SPACE	FLOOR AREA IS SQ. FT. PER OCCUPANT
Assembly without fixed seats	
Concentrated (chairs only—not fixed)	7 net
Dance floor	5 net
Dance floor (ballroom)	10 net
Standing space	5 net
Unconcentrated (tables and chairs)	15 net
Business areas	100 gross
Educational	
Classroom area	20 net
Shops and other vocational room areas	50 net
Exercise room	50 net
Gymnasium	15 net
Kitchens, commercial	200 gross
Library	
Reading rooms	50 net
Stack areas	100 gross
Locker rooms	50 gross
Stages and platforms	15 net for performing area and 50 net remaining area
Accessory Storage area, mechanical equipment room	300 gross

- ▶ These are the most probable occupancies for our program.
- ▶ For the rest see BC Table 1004.1.2

Occupant Load Guidelines

- ▶ If any area of the code is provided to allow for increased occupancy load you cannot exceed one occupant per 5 sq. ft. of floor area. BC 1004.2
- ▶ In an assembly occupancy the occupant load must be posted in a conspicuous area near the main exit, or exit access doorway or space of that room. BC 1004.3
- ▶ When an exit serves more than one floor the occupant load of each floor individually should be used in calculating the required capacities of the exits on that floor. BC 1004.4
 - ▶ Therefore, you do not need to add the occupant load on each floor in the same egress path, as long as capacity does not decrease in that path (continuity).

Occupant Loads for Shared Egress Paths

- ▶ Egress Convergence: Where two or more egress pathways meet, and then share a pathway, the capacity of the shared pathway can not be less than the sum of meeting pathways at their intersecting points. BC 1004.5
- ▶ Mezzanine Levels: The occupant load from a mezzanine must be added to the load of the area below that it empties into, and the capacities of the exits must be designed to fit the sum of these loads. BC 1004.6

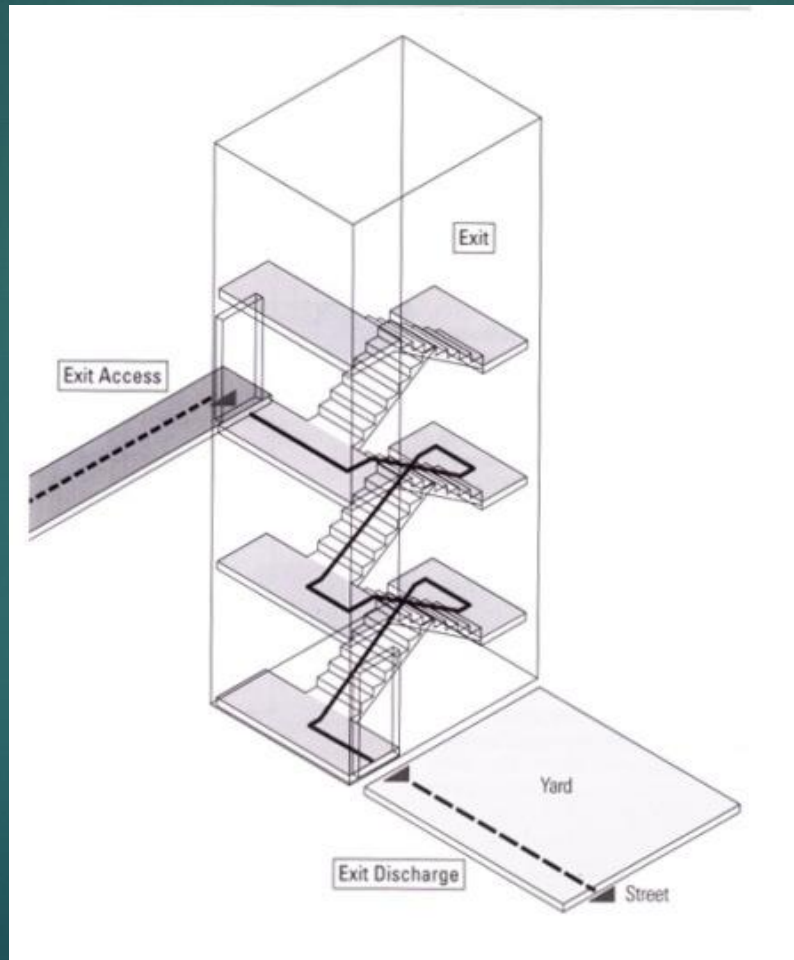
Occupant Loads for Fixed Seating & Outdoor Areas

- ▶ For areas with fixed seats without dividing arms the occupant load should equal 1 person for each 18 inches of seating space. For seating booths the occupant load should be based on 1 person for each 24 of booth seat measured on the backrest of the booth. BC 1004.7
- ▶ Occupant loads for useable and accessible outdoor areas is determined by the design professional and subject to the approval of the commissioner. Also, if the egress path is through the building the outdoor load must be added to the indoor load for that path. Similar to Egress Convergence. BC 1004.8

Multiple Occupancies

- ▶ Where there is more than one occupancy in a building the individual requirements for each occupancy should be used in any calculations. However, where two or more occupancies use the same egress path the most stringent requirements must be served.
 - ▶ For our project we have at least three occupancies that include Assembly, Educational, and Gymnasium. Therefore, if the floor area per occupant in a gym is 15 net, and for a class room is 20 net, and they share the same egress path you **MUST** use the floor area per occupant of the class room when making calculations.

Travel Distance and Codes





Definitions to Remember

- ▶ **Exit Access:** That portion of a means of egress system that leads from any occupied portion of a building or structure to an exit.

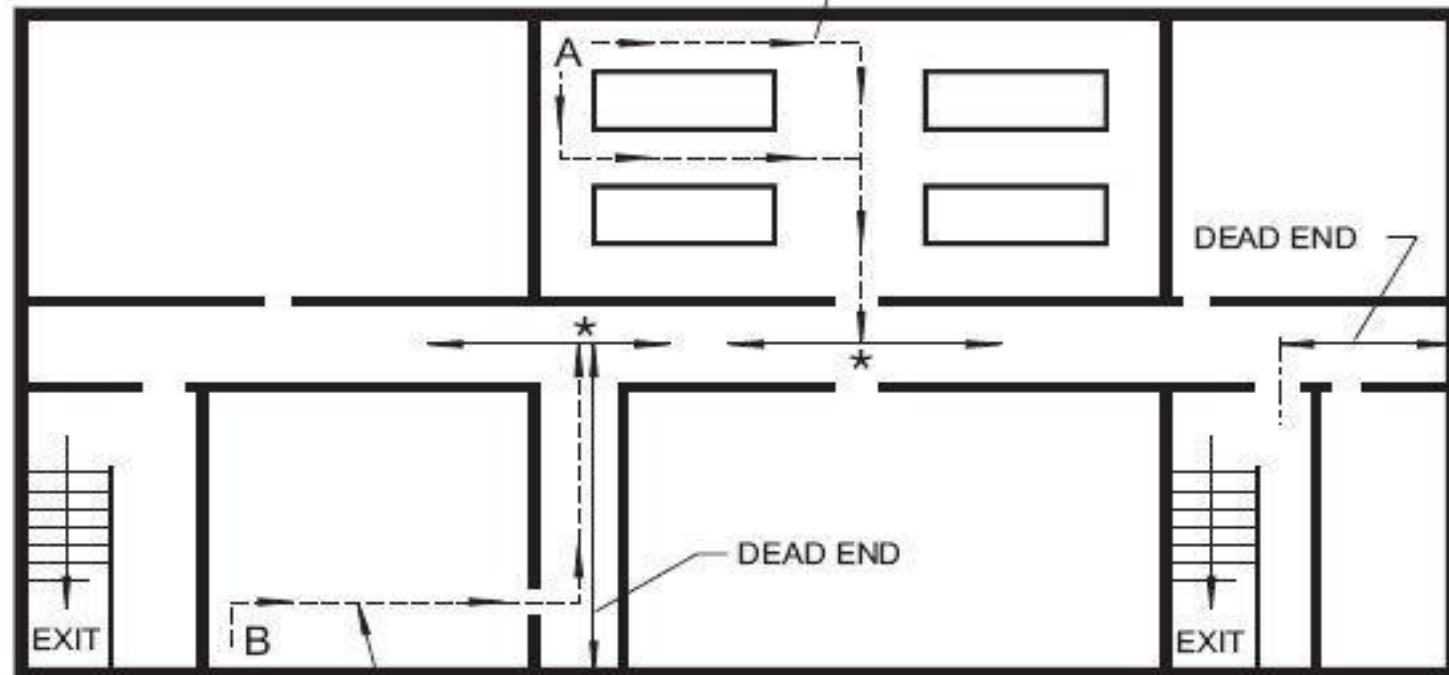
Ex: The corridor that leads to the start of the exit
- ▶ **Exit:** Protected corridor, ramp, or stairway leading out of the building
- ▶ **Exit Discharge:** That portion of a means of egress system between the termination of an exit and a public way

Common Path Distances

- ▶ Exit access is determined by the furthest distance of a room that is occupied to the entrance of an exit.
- ▶ **1013.3 - Common path of egress width**
- ▶ the common path cannot exceed 75 feet but does not apply to hazardous spaces and buildings.
- ▶ In hazardous buildings or spaces, the common path cannot exceed 25 feet.
- ▶ If the common path exceeds the minimum requirement, another exit access is needed and that would not exceed the minimal distance.

* POINT AT WHICH A CHOICE OF 2 EXITS BECOMES AVAILABLE

COMMON PATH OF TRAVEL
(DEFINED IN SECTION 1002)



COMMON PATH OF EGRESS TRAVEL

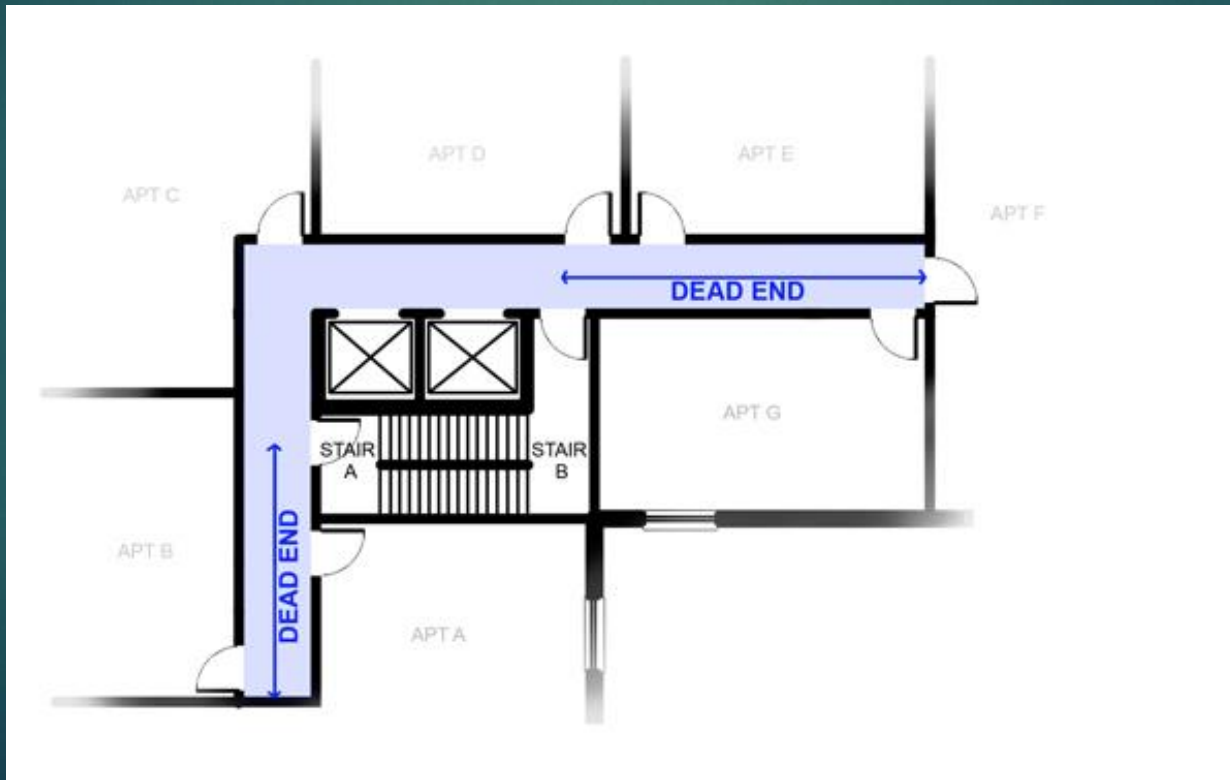
Corridor Width

- ▶ **1018.2 Corridor width.** The minimum *corridor* width shall be as determined in Section 1005.1, but **not less than 44 inches**
- ▶ **1005.1 minimum required egress width**
- ▶ States that the minimum required egress width is calculated by the following:
 - ▶ Occupant load X 0.2 (inches per occupant)
 - ▶ Hazardous: Occupant load X 0.4 (inches per occupant)

Dead Ends

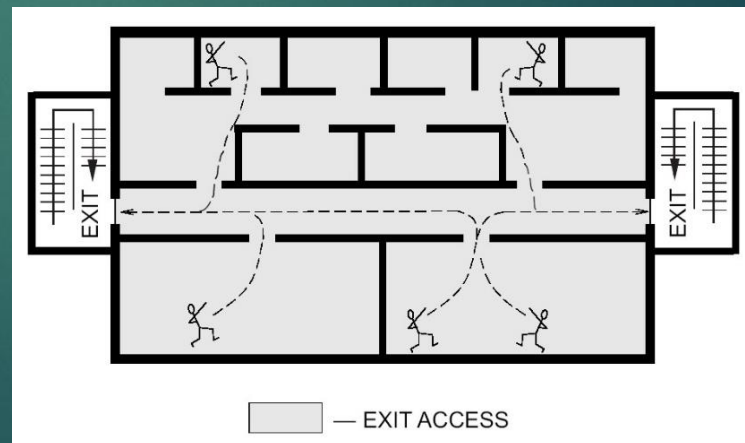
▶ 1018.4- Dead ends

Where more than one *exit* or *exit access doorway* is required, the *exit access* shall be arranged such that there are **no dead ends in corridors more than 20 feet (6096 mm)** in length.



Common Path of Egress Travel

- ▶ COMMON PATH OF EGRESS TRAVEL. That portion of exit access which the occupants are required to traverse before two separate and distinct paths of egress travel to two exits are available. Paths that merge are common paths of travel. Common paths of egress travel shall be included within the permitted travel distance (for this case: 75 ft minimum)






- ▶ **1015.1 Travel distance limitations.**
- ▶ Exits shall be so located on each story such that the maximum length of exit access travel, measured from the most remote point within a story to the entrance to an exit along the natural and unobstructed path of egress travel, shall not exceed the distances given in Table 1015.1.

**TABLE 1015.1
EXIT ACCESS TRAVEL DISTANCE^a**

OCCUPANCY	WITHOUT SPRINKLER SYSTEM (feet)	WITH SPRINKLER SYSTEM (feet)
A	See Section 1024.7	
E, F-1, I-1, M, R, S-1	150	200 ^b
B	200	300 ^c
F-2, S-2, U	200	250 ^b
H-1	Not Permitted	75 ^c
H-2	Not Permitted	100 ^c
H-3	Not Permitted	150 ^c
H-4	Not Permitted	175 ^c
H-5	Not Permitted	200 ^c
I-2, I-3, I-4	150	200 ^c

Our Focus Area



Occupancy	Without sprinkler system (ft)	With sprinkler system (ft)
A (assembly)	See section 1024.7	1024.7
E (educational)	150	200
S-1 (storage)		

1024.7 Travel distance.

Exits and aisles shall be so located such that the travel distance to an exit door shall be provided in accordance with Table 1024.7. At least one exit opening shall be available from every attached seat or standee space in an assembly space

Exit Access Travel Distances- Occupancy A

- ▶ For occupancy A-1 (assembly with fixed seating used for viewing films, performances etc.), The maximum distance is not to exceed the primary exit of that particular seat, 100 feet. It is not to exceed 200 feet from a secondary exit. For this case, the distances are for “non- sprinklered” assembly.
- ▶ If there is a sprinkler system, The primary exit within a seat must not exceed 150 feet. The secondary exit must also not exceed 250 feet.

**TABLE 1024.7
TRAVEL DISTANCE**

OCCUPANCY	NON- SPRINKLERED		SPRINKLERED	
	PRIMARY	SECONDARY	PRIMARY	SECONDARY
A-1, A-2, A-3, A-4	100	150	150	250
A-5	200	300	200	300

Exits Signs

- Exits access doors shall be mark by an approved exit sign visible from any direction of egress travel.
- Section 1011.2 Illumination exit signs shall be internally or externally illuminated.
- Section 1011.4 Exits shall be illuminated at all times.
- Section 1011.4.1 Colored exit signs shall be red.
- Section 1011.4.2 Letters shall be 6 inches in group A, and in R-1 it shall be 8in.
- Section 1011.5.3 in case of a power loss, the sign shall be connected to an emergency power.
- ▶ These codes are needed for an individual's safety. All exits should be illuminated, and have letters sized 6 inches so it can be visible. Exits signs are require to have a connection to a energy power in case of a power outage.

Exits Enclosures

- ▶ 1019.1 Interior exit stairways and interior exit ramps shall be Enclosed by fire barriers.
- ▶ 1019.2 Penetration into an opening through an exit enclosure is prohibited except for required exit doors.
- ▶ 1019.1.8.1 A smoke proof enclosure or pressurized stairway shall exit into a public way or into an exit passageway, yard or open space having direct access to public way.
- ▶ 1019.1.8.2 Access to the stairways within a smoke proof enclosure shall be by way of a vestibule or an open exterior balcony.

Exits Enclosures Cont'd

- ▶ Exit enclosures are needed for a quick and easy way out for an individual in a building. Anything that will affect the main purpose of an exit enclosure is not permitted because it will affect people's ways out to safety.



Number of Exits

- ▶ Table 1014.1 shows the means of egress maximum occupant load per occupancy. When occupant exceeds the maximum occupant load more than one exit access door is required.

TABLE 1014.1 SPACES WITH ONE MEANS OF EGRESS

OCCUPANCY	MAXIMUM OCCUPANT LOAD
A, B, E, M, U	74
F	50
H-1, H-2, H-3	3
H-4, H-5, I-1, I-3, I-4	10
I-2	See Section 1013.2.2
R	20
S	30

Doors

- ▶ 1008.1.1.3 Heights of doors shall not be less than 80 inches
- ▶ 1008.1.2.1 Doors shall have side hinged swings
- ▶ 1008.1.2.3 The opening for internal side-swing doors shall not exceed a 5-pound force.
- ▶ 1008.1.4 There shall be a floor or landing on each side of the door.
- ▶ 1008.1.5 Landings shall have a width not less than the width of the door or stairway. When doors are fully open it shall not reduce a required dimension by more than 7 inches.

Stair Widths

- ▶ Multiply the capacity by the number indicated for your occupancy to get the stairs width.

TABLE 1005.1 EGRESS WIDTH PER OCCUPANT SERVED

OCCUPANCY	STAIRWAYS (inches per occupant)	OTHER COMPONENTS (inches per occupant)
Occupancies other than those listed below	0.3	0.2
Hazardous: H-1, H-2, H-3 and H-4	0.7	0.4

For SI: 1 inch = 25.4 mm.‡

References

- ▶ History: www.dps.state.ia.us
- ▶ Means of Egress Definition: <http://magazine.sfpe.org/occupants-and-egress/means-egress>
- ▶ http://www2.iccsafe.org/states/newyorkcity/Building/PDFs/Chapter%2010_Means%20of%20Egress.pdf
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