

1 RCNY §18-01

CHAPTER 18 RESISTANCE TO PROGRESSIVE COLLAPSE UNDER EXTREME LOCAL LOADS

§18-01 Considerations and Evaluation.

(a) *General considerations.* Unless all members are structurally connected by joints capable of transferring 100% of the members' working capacity in tension, shear, or compression, as appropriate, without reliance on friction due to gravity loads, the layout and configuration of a building and the interaction between, or strength of, its members shall provide adequate protection against progressive collapse under abnormal load, where progressive collapse is interpreted as structural failure extending vertically over more than three stories, and horizontally over an area more than 1,000 square feet or 20 percent of the horizontal area of the building, whichever is less. These criteria shall be satisfied while the building is subjected to its own weight D plus a superimposed load of $(1.0D + 0.25L)$, where D is computed according to Article 2 of Subchapter 9 of Chapter 1 of Title 27 of the Administrative Code and according to Reference Standard RS 9-1 of the same Code and L is computed according to Article 3 of Subchapter 9 of Chapter 1 of Title 27 of the Administrative Code and according to Reference Standard RS 9-2 of the same Code without allowance for the live load reduction permitted in Article 4 of Subchapter 9 of Chapter 1 of Title 27 of the same Code. A wind load of $0.2W$ shall be assumed to act in combination with $1.0D + 0.25L$, where W is computed according to Article 5 of Subchapter 9 of Chapter 1 of Title 27 of the Administrative Code and according to Reference Standard RS 9-5 of the same Code. These criteria shall be satisfied in accordance with structural analysis based on the Plastic Design or Ultimate Strength method, representing conditions at incipient failure and shall be considered as an independent check of a building designed in accordance with the usual procedures for Working Stress, Plastic Design, or Ultimate Strength design pursuant to Subchapters 9, 10, and 11 of Chapter 1 of Title 27 of the Administrative Code and all applicable Reference Standards thereto.

(b) *Methods of evaluation.*

Resistance to progressive collapse shall be determined by one of two methods:

(1) *The Alternate Path Method.*

(2) *The Specific Local Resistance Method.*

The specific local resistance method shall only be used if the alternate path method is not feasible.

(i) *The Alternate Path Method.*

Proof shall be provided, by analysis and/or physical simulation, that the following condition is satisfied while the building is subjected to the loads stipulated in the criteria:

(A) Should any one of the following combinations of structural elements at any one story lose its ability to carry load, there shall be no collapse of the structure more than one story above or below the element under consideration, or over a horizontal area in excess of that stipulated in the criterion:

(a) Any single "wall panel or nominal length thereof."

(b) Two adjacent "wall panels or nominal lengths thereof" forming an exterior corner to the building.

(c) One or more elements forming a "nominal extent of flooring".

(d) One column.

(e) Any other one element of the structural subsystem which is judged to be vital to the building's stability.

(B) The following definitions specifically apply to Method (b)(1):

(a) The designation "wall panel or nominal length thereof" is the smaller of the following lengths as appropriate to the design in question:

(1) The length between adjacent lateral supports.

(2) The length between a free edge and the nearest lateral support.

(3) A length equal to 2.25 times the clear height of the wall panel in those circumstances where the top and bottom attachment of the panel to the floor or roof will not fail under a force smaller than 3 kips [*sic*] per linear foot acting perpendicular to the wall in either direction.

(b) As used above, "lateral support" is considered to occur at:

(1) A substantial partition perpendicular to the wall, provided that its attachments to the wall and the partition itself are capable of resisting and transmitting without failure a horizontal force of 3 kips [*sic*] per foot of clear wall height in either direction in the plane [*sic*] of the partition. A partition may be considered substantial when that partition or a combination of such partitions, one above the floor and one below the floor and substantially in the same plane, is able to resist the following distributed force transmitted by the floor in the plane of the partition and in an upwards or downwards direction:

$0.18 \frac{S}{b} (2b - S)$ kips [*sic*] per foot of clear span.

b

where b is clear span and S is the clear spacing of partitions or the clear distance from a partition to an adjacent free edge of the floor.

(2) A strengthened vertical portion of the wall (not exceeding $1/3$ story height in the horizontal direction) which will not fail under a load of 3 kips [*sic*] per linear foot of clear wall height acting perpendicular to the plane of the wall in either direction along the interface between the strengthened wall portion and the portion of the wall that lost its load carrying capacity.

(c) The term "nominal extent of floor" denotes the following:

(1) For a floor spanning in one direction, the extent is the clear span. In the perpendicular direction the extent is to be taken as the smaller of the following:

(i) The distance between adjacent "substantial" partitions arranged in the direction of floor span.

(ii) The distance between a free edge and the nearest "substantial" partition arranged in the direction of the floor span.

(iii) In the case where partitions are not "substantial" the extent is to be taken as 2.25 times the clear span.

(2) For a floor spanning in two directions the extent shall be taken as the area bounded by the clear spans in both directions.

(ii) Specific local resistance methods.

Any single element essential to the stability of the structure, together with its structural connections, shall not fail under the loads stipulated in this criterion after being subjected to a load equivalent to that caused by a uniform static pressure of 720 psf. This pressure shall be applied in the most critical manner to the face of the element and to the face of all space dividers supported by the element or attached to it within the particular story. In those cases where the stability of the element depends upon the lateral support provided by the attached space dividers, these space dividers, or a portion of these space dividers which can provide adequate lateral support, must also satisfy requirements of this paragraph.