



Commercial Plan
Examination

Mezzanines
MBOA
April 25, 2018



Commercial Plan
Examination

Mezzanines

What is a Mezzanine?

Code Definition

Mezzanine means an **intermediate floor assembly** between the floor and ceiling of any room or *storey* and includes an interior balcony.



Mezzanines

Where are they found?

Mezzanines are frequently constructed in *industrial* and *mercantile occupancies*. They are not, however, limited to these *major occupancy* groups.

Common uses include;

- Additional space above a sales floor, warehouse floor, production floor, used for offices, additional storage space, employee lunch rooms, etc.
- These uses are generally considered **subsidiary** to the *major occupancy* of the *building*.

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Mezzanines

What do they look like?

Open stairs leading to the floor below the *mezzanine* level. They are also not fire separated from the remainder of the *building*.

This **may or may not be permitted** by the Code.



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Mezzanines

What do they look like?



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Mezzanines

What do they look like?



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Mezzanines

Other Important Definitions

- *Floor Area* "...space on an *storey* of a *building* between exterior walls...but does not include *exits*..."
- *Suite* "...single room or series of rooms of complementary use, operated under a single tenancy..."
- *Fire Separation* "...assembly that acts as barrier against the spread of fire..."

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Mezzanines

Other Important Definitions

- *Mean of egress* "...continuous path of travel for the escape of persons from any point in the *building*...to a public thoroughfare..."
- *Access to Exit* "...part of the *means of egress* within a *floor area*..."
- *Exit* "...*means of egress*....that leads from the *floor area* it serves...to an open public thoroughfare...."

Means of Egress = Access to Exit + Exit

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Mezzanines


Steps in the design / analysis of a Mezzanine

Step 1 - Check to see if the *mezzanine* is required to be considered a *storey* in calculating *building height*.

Step 2 - Check to see if the *mezzanine* is required to terminate at a vertical *fire separation*.

Step 3 - Determine *means of egress* requirements for the *mezzanine*.

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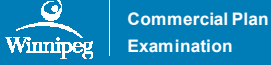
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Mezzanines

Why are these Steps Important?

- Can affect the *building* construction requirements determined from Subsection 3.2.2.
- Even though a *mezzanine* may not be required to be considered to be a *storey* in calculating *building height*, it may still **be required to terminate at a vertical *fire separation***, have a *fire resistance rating* or be of *noncombustible construction*.
- *Means of egress* requirements applicable to *mezzanines* need to be determined prior to construction. The *mezzanine* egress requirements will often dictate where a *mezzanine* can be located within a *floor area*.

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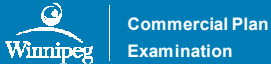
Mezzanines

National Building Code of Canada 1960

3.2.1.2.(6)

A mezzanine floor or floors shall not be considered as increasing the height of the building in stories provided that their aggregate area does not exceed 40 percent of the area of the room or storey in which they are located, provided further that the space beneath is not enclosed, and provided finally that the mezzanine overhang does not exceed 40 percent of the least dimension of any room in which it is located.

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Mezzanines

Step 1 - Is a Mezzanine Considered a Storey in Calculating Building Height?

3.2.1.1. Exceptions in Determining Building Height

We **MUST CHECK** Sentences 3.2.1.1.(3) and (4)

IMPORTANT: Check **Sentence 3.2.1.1.(3) FIRST**.

If Sentence 3.2.1.1.(3) **cannot be met** then check **Sentence 3.2.1.1.(4)**.

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Mezzanines

Sentence 3.2.1.1.(3) - 40% of the open area of the room

3) Except as required by Sentence (5), the space above a *mezzanine* need not be considered as a *storey* in calculating the *building height* provided

a) the aggregate area of mezzanines that are not superimposed does not exceed 40% of the area of the open area of the room in which they are located (see Appendix A), and

b) except as permitted by Sentences (7) and 3.3.2.12.(3) the space above the *mezzanine* is used as an open area without *partitions* or subdividing walls higher than 1 070 mm above the *mezzanine* floor.

IMPORTANT: Sentence 3.2.1.1.(3) refers to open area of the room in which the *mezzanine* is located (referred to as an open mezzanine)

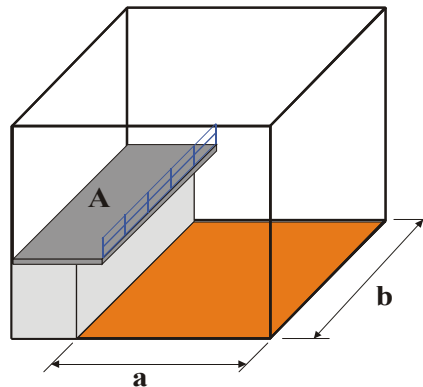
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Mezzanines

Clause 3.2.1.1.(3)(a) - 40% of the open area of the room

$$A \leq 0.4(a \times b)$$

Exclude enclosed areas below the mezzanine from the open area



A = area of the mezzanine

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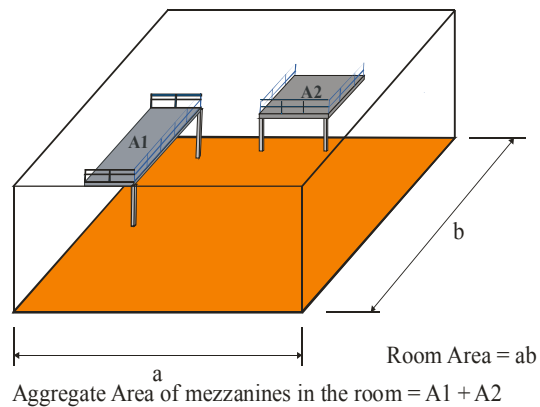


Mezzanines

Clause 3.2.1.1.(3)(a) - 40% of the open area of the room

Aggregate Area of
Mezzanines

$$A1 + A2 \leq 0.4(a \times b)$$



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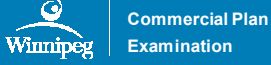


Mezzanines

Clause 3.2.1.1.(3)(b) Open Area Above the Mezzanine Floor

- No partitions or subdividing walls higher than 1070 mm above the mezzanine floor (changed in 2005 NBCC).
 - Visual communication with the open area of the room.
 - Exclude enclosed areas below the mezzanine from the open area
- Sentence (7) permits a portion of area above the mezzanine to be enclosed.
- Sentence 3.3.2.12.(3) exception for Open book shelves in a Library.
 - Above and below the mezzanine floor.
 - Max 2.1m but not more than 75% of the floor-to-ceiling height.

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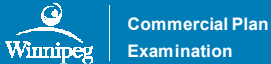
Mezzanines

Do Windows Constitute a Visual Obstruction?

Reference: *Fire Safety Design in Buildings – Canadian Wood Council*

“Solid glazing typically seen in rinks or arena mezzanines is not considered a visual obstruction. Limits to visual obstructions ensure that occupants of the mezzanine are alerted to a life-threatening situation at the same time as the occupants below.”

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Mezzanines

Do Windows Constitute a Visual Obstruction?

Maintaining visual openness with glazing (alternative solution).

- Persons on the *mezzanine* must be able to observe a developing situation on the floor below.
- Windows would have to be a sufficient size as to be considered as visually open.
- Covering of windows with drapes or blinds would not be permitted.
- Owner to acknowledge and maintain this condition.

Other jurisdictions have issued interpretation bulletins.

- BC Building Code Interpretation 98-0150 (May 16, 2006)

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Mezzanines

Sentence 3.2.1.1.(4) - 10% of the floor area

4) Except as required by Sentence (5), the space above a *mezzanine* need not be considered as a *storey* in calculating the *building height* provided

- a) the **aggregate area of mezzanines** that are not superimposed **and do not meet the requirements of Sentence (3)** does not exceed **10% of the floor area** in which they are located, and
- b) the area of a *mezzanine* in a *suite* does not exceed **10% of the area of that suite**.

IMPORTANT: Sentence 3.2.1.1.(4) refers to **floor area**.

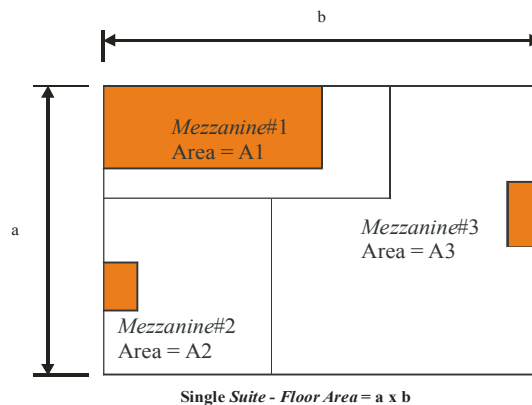
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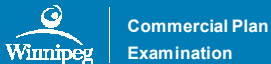
Mezzanines

Clause 3.2.1.1.(4)(a) - 10% of the floor area (within a suite)

$A1 + A2 + A3 \leq 10\%$
of the **area of the**
floor area = $a \times b$



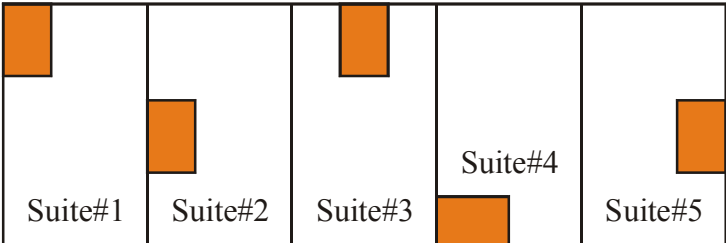
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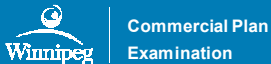
Mezzanines

Clause 3.2.1.1.(4)(b) – 10% of the area of the suite

Each *suite* in the five (5) *suite*, one *storey* strip centre is permitted by to have an **enclosed** *mezzanine* with an area = 10% of the area of the *suite*.

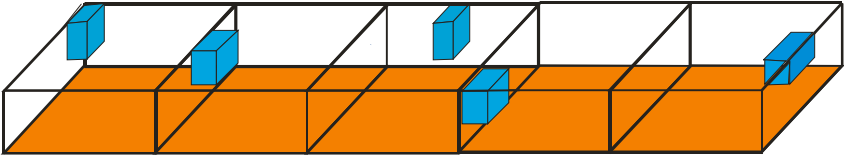


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Mezzanines

Clause 3.2.1.1.(4)(b) – 10% of the area of the suite



If the area of any one **enclosed** *mezzanine* exceeds 10% of the *suite* area the *building* becomes 2 *storeys* in *building height*.

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Mezzanines

Sentence 3.2.1.1.(5) Superimposed Mezzanines

Except as permitted by Sentence (6), each level of *mezzanine* that is partially or wholly superimposed above the first level of *mezzanine* shall be considered as a *storey* in calculating the *building height*

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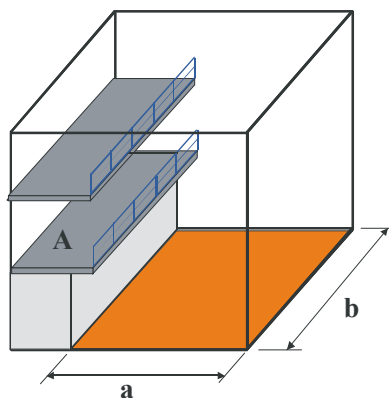


Mezzanines

Sentence 3.2.1.1.(5)

If $A \leq 40\%(a \times b)$ then the *building* would be considered a 2 *storey building* because of the 2nd level superimposed above the first.

If $A > 40\%(a \times b)$ then it would be considered a 3 *storey building*.



A = area of the lower mezzanine
2nd Level is considered a *storey*
in calculating *building height*

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Mezzanines

Sentence 3.2.1.1.(6)

Platforms intended solely for periodic inspection and elevated maintenance catwalks need not be considered as floor assemblies or *mezzanines* for the purposes of calculating *building height*, provided

- a) they are not used for storage, and
- b) they are constructed with *noncombustible* materials, unless the *building* is permitted to be of *combustible construction*.



Mezzanines

Sentence 3.2.1.1.(7) exception to Clause 3.2.1.1.(3)(b)

The space above a *mezzanine* conforming to Sentence (3) is permitted to include an enclosed space whose area does not exceed **10% of the open area of the room** in which the *mezzanine* is located provided the enclosed space does not **obstruct visual communication** between the open space above the *mezzanine* and the room in which it is located. (See A-3.2.1.1.(3)(a) in Appendix A.)

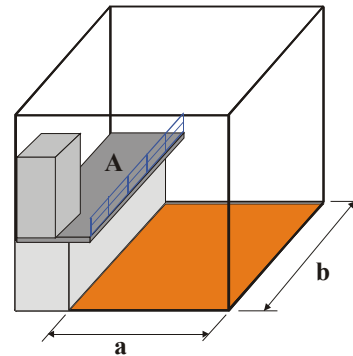


Mezzanines

Sentence 3.2.1.1.(7) exception to Clause 3.2.1.1.(3)(b)

The enclosed space on the *mezzanine* is permitted to have an area $\leq 0.1(a \times b)$ providing it does not create a visual obstruction between the open space on the *mezzanine* and the room in which it is located.

IMPORTANT: Sentence 3.2.1.1.(7) refers to **open area of the room** in which the *mezzanine* is located.



A = area of the mezzanine

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Mezzanines

Why is this Building Height Important?

Increase in *Building Height* may change the Construction Article in which the *building* is regulated by.

- Change in building construction (*Combustible to Non-Combustible*).
- Roof assembly may have to be rated.
- Floor assembly has to be constructed a *fire separation*.
- Sprinklering could be required.
- Enclosed *Exits* would now be required.

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Mezzanines

Mezzanine as a Storey in Calculating Building Height

An existing one *storey industrial building* facing one (1) *street* has a *building area* of 800 m² has been designed to meet the requirements of **Article 3.2.2.78. Group F, Division 2, up to 2 Storeys (2015 NBCC).**

The roof is of *combustible construction*.

After the *building* is occupied, the owner wishes to construct a 100 m² **enclosed mezzanine** floor that now **will require the building to be considered a two (2) storey building.**

Mezzanine > 10% of the floor area



Mezzanines

Mezzanine as a Storey in Calculating Building Height

3.2.2.78. Group F, Division 2, up to 2 Storeys

- 1) A *building* classified as Group F, Division 2 is permitted to conform to Sentence (2) provided
- it is not more than 2 *storeys* in *building height*, and
 - it has a *building area* not more than the value in Table 3.2.2.78.

Table 3.2.2.78.
Maximum Building Area, Group F, Division 2, up to 2 Storeys
Forming Part of Sentence 3.2.2.78.(1)

No. of Storeys	Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	1 000	1 250	1 500
2	600	750	900

- 2) The *building* referred to in Sentence (1) is permitted to be of *combustible construction* or *noncombustible construction* used singly or in combination, and
- floor assemblies shall be *fire separations* and, if of *combustible construction*, shall have a *fire-resistance rating* not less than 45 min, and
 - loadbearing walls*, columns and arches supporting an assembly required to have a *fire-resistance rating* shall
 - have a *fire-resistance rating* not less than 45 min, or
 - be of *noncombustible construction*.



Mezzanines

Mezzanine as a Storey in Calculating Building Height

Option 1: Classify under **3.2.2.79. (2015 NBCC)**.

- 1800 m² for 2 storey
- **Sprinklered**
- Floor assemblies shall be a *fire separation* and if of *combustible construction* a 45 min FRR

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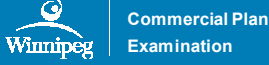
Mezzanines

Mezzanine as a Storey in Calculating Building Height

Option 2: Classify under **3.2.2.76. (2015 NBCC)**

- 1500 m² for 2 storey
- **Rate the roof** and supporting structure of the existing *building* for 45 min.
- Floor assemblies shall be *fire separations* with a *fire-resistance rating* not less than 45 min.

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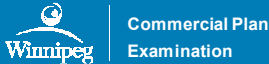
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Step 2 – Does the Mezzanine have to Terminate at a Vertical Fire Separation?

MUST CHECK

Subsection 3.2.8. Mezzanines and Openings through Floor Assemblies

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Mezzanines

3.2.8.1. Application

1) Except as permitted by Article 3.2.8.2. and Sentence 3.3.4.2.(3), the portions of a *floor area* or a *mezzanine* that do not terminate at an exterior wall, a *firewall* or a vertical shaft shall

a) **terminate at a vertical *fire separation*** having a *fire-resistance rating* not less than that required for the floor assembly and extending from the floor assembly to the underside of the floor or roof assembly above, **or**

b) be protected in conformance with the requirements of Articles 3.2.8.3. to 3.2.8.8.

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Mezzanines

3.2.8.2. Exceptions to Special Protection

1) A *mezzanine* **need not** terminate at a vertical *fire separation* nor be protected in conformance with the requirements of **Articles 3.2.8.3. to 3.2.8.8.** provided the *mezzanine*

- a) serves a Group A, Division 1 *major occupancy*,
- b) serves a Group A, Division 3 *major occupancy* in a *building* not more than 2 *storeys* in *building height*, or
- c) serves a Group A, C, D, E or F *major occupancy* and
 - i) is 500 m² or less in area, **and**
 - ii) conforms to Sentences 3.2.1.1.(3) or (4).

Mezzanines

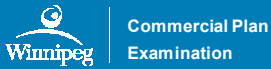
Clauses 3.2.8.1.(1)(a) and (b)



Burton Cummings Theatre – A1



Bell MTS Centre – A3



Mezzanines

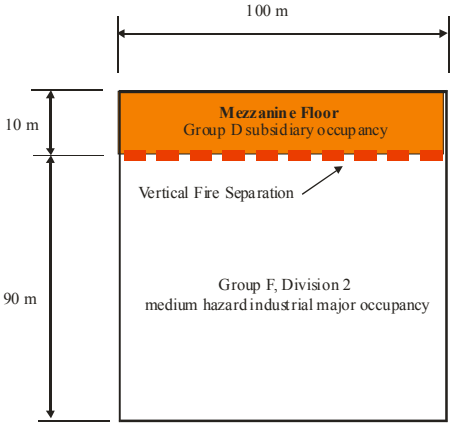
Clause 3.2.8.2(1)(c)

Building Area = 10 000 m²


Mezzanine Area = 1 000 m²

Conforms to 3.2.1.1.(4)
10% (enclosed mezzanine)

But, > 500 m²
Has to Terminate at a
Vertical Fire Separation

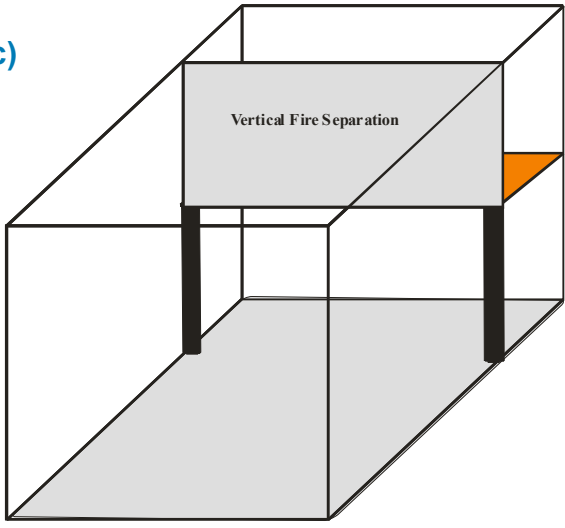


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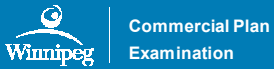


Mezzanines

Clause 3.2.8.2(1)(c)



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Mezzanines

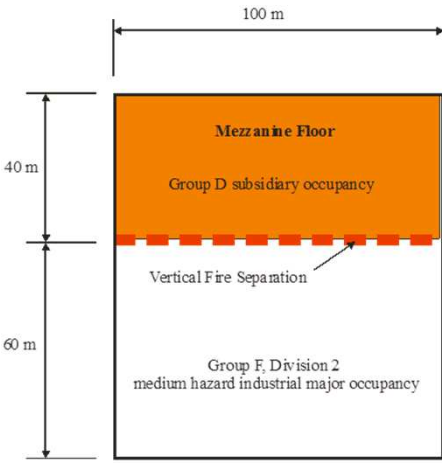
Clause 3.2.8.2(1)(c)

Building Area = 10 000 m²
Mezzanine Area = 4 000 m²

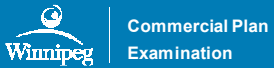
Conforms to 3.2.1.1.(3)
 40% (open mezzanine)

But, > 500 m²
 Has to Terminate at a
 Vertical Fire Separation

How will the open
 mezzanine concept be
 maintained?



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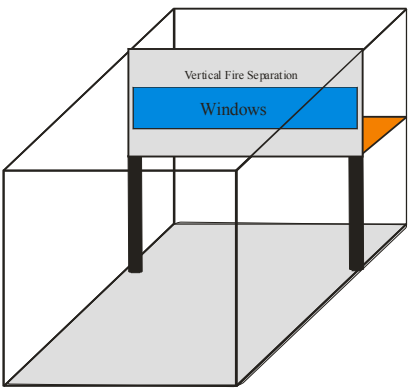


Mezzanines

Clause 3.2.8.2(1)(c)

How will the open
mezzanine concept be
 maintained?

Re-classify as a 2 storey
building?



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Mezzanines

Step 3 – Determine the Means of Egress

In this step we determine if :

The space above the *mezzanine* must be served by *means of egress* leading to *exits* accessible at the floor level of the *mezzanine*,

OR

If **open stairs** leading to the floor of the space in which the *mezzanine* is located are permitted. *Access to exit* continues from this point to *exits* at this level.



Mezzanines

3.4.2.2. Means of Egress from Mezzanines

1) Except as permitted by Sentence (2) and (3), the space above a *mezzanine* shall be served by a *means of egress* leading to **exits accessible at the mezzanine level** on the same basis as *floor areas*.



Mezzanines

What does “exits accessible at the level of the *mezzanine* on the same basis of other *floor areas*” mean?

Unless permitted by Sentence (2) and (3) exits serving the *mezzanine* are provided at the level of the *mezzanine* just like any other *floor area*.

This typically means

- 2 enclosed *exit* stairs are fire separated from the remainder of the *building*.
- Lead to the outside of the *building*.
- The exits must be located at least $\frac{1}{2}$ the diagonal of the mezzanine floor apart.

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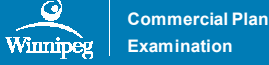
Mezzanines

3.4.2.2.(2) (Open Egress Stairs)

The means of egress from a mezzanine need not conform to Sentence (1) provided

- a) the mezzanine is not required to terminate at a vertical fire separation as permitted in Sentence 3.2.8.2.(1),
- b) the occupant load of the mezzanine is not more than 60,
- c) the area of the mezzanine does not exceed the area limits stated in Table 3.4.2.2., and
- d) the distance limits stated in Table 3.4.2.2. are not exceeded from any point on the mezzanine to
 - i) the egress door serving the space that the mezzanine overlooks, if the space is served by a single egress door, or
 - ii) the egress stairway leading to an access to exit in the space below if that space is required to be served by 2 or more egress doorways in conformance with Sentence 3.3.1.5.(1).

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Mezzanines

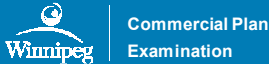
3.4.2.2.(2) (Open Egress Stairs)

The *means of egress* from a *mezzanine* need not conform to Sentence (1) provided

a) the *mezzanine* is **not required to terminate at a vertical fire separation** as permitted in Sentence 3.2.8.2.(1),

- < 500 m² in area
- Complies with 3.2.1.1.(3) or (4)

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Mezzanines

The *means of egress* from a *mezzanine* need not conform to Sentence (1) provided

b) the *occupant load* of the *mezzanine* is not more than 60,

- *Occupant load* must **not be less** than that determined from Table 3.1.17.1. of the 2015 NBC.
- Some variation may be justified, onus on the *designer* to demonstrate that the space will be occupied by fewer people.

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Mezzanines

The *means of egress* from a *mezzanine* need not conform to Sentence (1) provided

c) the area of the *mezzanine* does not exceed the area limits stated in **Table 3.4.2.2.**, and

- > 200 m² enclosed exits required

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Mezzanines

Clause 3.4.2.2.(2)(c) & (d)

Table 3.4.2.2. – 2015 NBCC
Criteria for Egress from Mezzanine Space
Forming Part of Sentence 3.4.2.2.(2)

<i>Occupancy of Space</i>	<i>Maximum Area, m²</i>	<i>Distance Limit, m</i>
<i>Assembly occupancy</i>	150	15
<i>Residential occupancy</i>	100	15
<i>Business and personal services occupancy</i>	200	25
<i>Mercantile occupancy</i>	150	15
<i>Medium-hazard industrial occupancy</i>	150	10
<i>Low-hazard industrial occupancy</i>	200	15

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Mezzanines

The means of egress from a mezzanine need not conform to Sentence (1) provided

d) the distance limits stated in Table 3.4.2.2. are not exceeded from any point on the *mezzanine* to

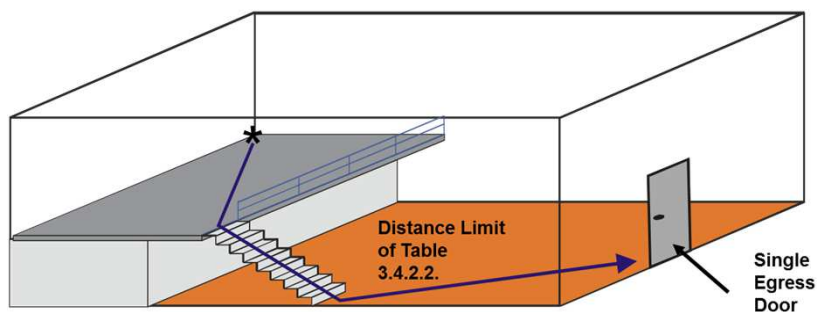
- i) the egress door serving the space that the *mezzanine* overlooks, if the **space is served by a single egress door, or**
- ii) the egress stairway leading to an *access to exit* in the space below if that **space is required to be served by 2 or more egress doorways** in conformance with Sentence 3.3.1.5.(1).

Must comply with (a),(b),(c),(d) and(i) **OR** (a),(b),(c),(d) and(ii)

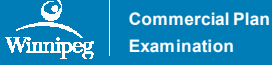
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Mezzanines

3.4.2.2.(2)(d)(i)



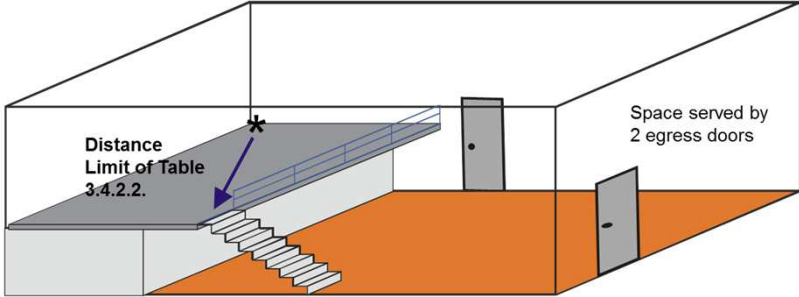
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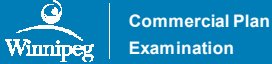
Mezzanines

3.4.2.2.(2)(d)(ii)

Doors spaced $\frac{1}{2}$ room diagonal apart

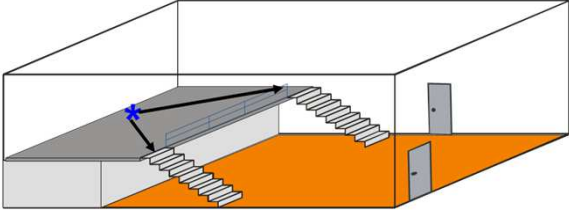


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Mezzanines

3.4.2.2.(2)(d)(ii)



Distance limit to egress **stair** = 15 m (sometimes two egress stairs may be required to meet this condition.)

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Mezzanines

Important – Open Stairs are NOT Exits

- Open stairs off of the *mezzanine* are not *exits*. Open stairs provide *access to exit* to an *exit* on the floor level below the *mezzanine*.
- Open stairs to the floor that the *mezzanine* overlooks should be correctly referred to as egress stairs NOT exit stairs.
- The travel distance requirements from any point on the *mezzanine* to an *exit* at the level of the *mezzanine* or to an *exit* on the floor level below the *mezzanine* cannot be exceeded. (Article 3.4.2.5.)

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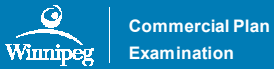
Mezzanines

Sentence 3.4.2.2.(3) – Exception to Sentence 3.4.2.2.(1) Requiring Two Enclosed Exit Stairs at the Mezzanine Level

Sentence 3.4.2.2.(3) At **least half** of the required *means of egress* from a *mezzanine* shall comply with Sentence (1) if the *mezzanine* is not required to terminate at a vertical *fire separation* as permitted by Sentence 3.2.8.2.(1).

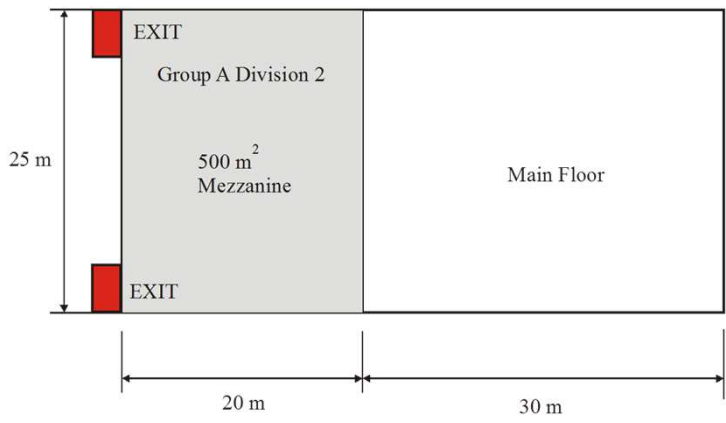
- Cannot meet open stair exception of Sentence 3.4.2.2.(2)
- One may be an *exit* at the level of the *mezzanine* and one may be an open egress stair to the floor below

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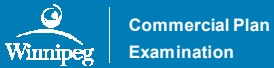


Mezzanines

Option 1: Two exits at the level of the mezzanine.

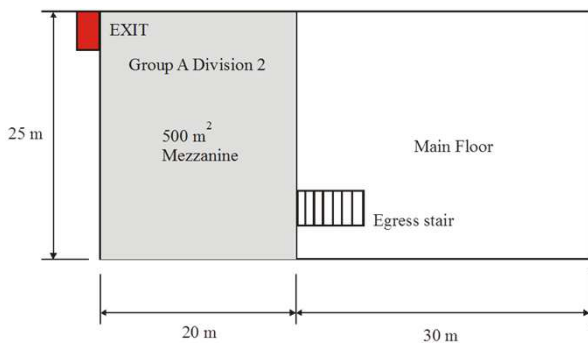


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Mezzanines

Option 2: One exit at the level of the mezzanine and One egress stair



Sentence 3.4.2.2.(3) At least half of the required means of egress.....

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Mezzanines

Don't Forget - Travel Distance to an Exit

The travel distance requirements from any point on the *mezzanine* to an *exit* at the level of the *mezzanine* or to an *exit* on the floor level below the *mezzanine* cannot be exceeded. (Article 3.4.2.5.)



Mezzanines

3.4.2.5.(1)

.....if more than one *exit* is required from a *floor area*, the *exits* shall be located so that the travel distance to at least one *exit* shall be not more than

- b) 40 m in a *business and personal services occupancy*,
- c) 45 m in a *floor area* that contains an *occupancy* other than a *high hazard industrial occupancy*, provided it is *sprinklered* throughout,
- f) 30 m in any *floor*



Mezzanines

Measuring Travel Distance

Travel distance is measured from any point on the *mezzanine* to an *exit* at the level of the *mezzanine* or to an *exit* on the floor that the *mezzanine* overlooks.

In the case where a *mezzanine* is permitted to be served by an egress stair or egress stairs to the floor below, travel distance is measured from any point on the *mezzanine* to a stair serving the *mezzanine*, down the stair and then to an *exit* serving the floor below the *mezzanine*.

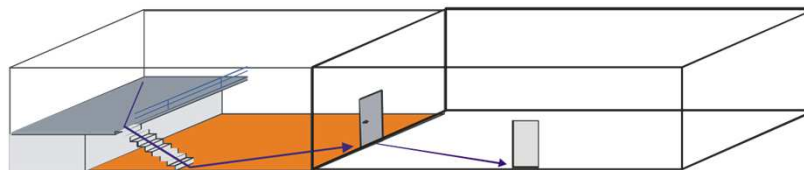
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Mezzanines

Travel Distance to an Exit (2 exits from the Building)

Mezzanine in a room served by a single egress door.



Maximum 15 m from any point on the mezzanine floor to room egress door

Maximum 30 m from room egress door to main floor exterior exit door.

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Mezzanines

Part 9 References

Step 1

Article 9.10.4.1. Mezzanines not Considered as Storeys

Article 9.10.4.2. More Than One Level of Mezzanine

Step 2

Article 9.10.12.1. Termination of Floors or Mezzanines

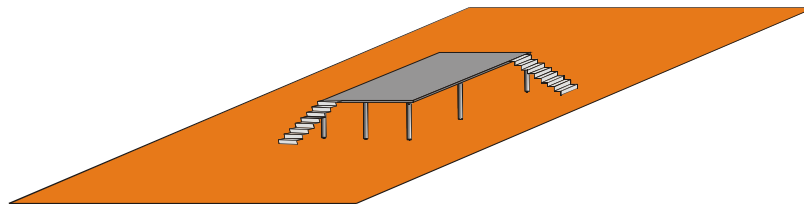
Step 3

Article 9.9.8.6. Mezzanine Means of Egress

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Mezzanines

The Problem Mezzanine



In light of the previous discussion on mezzanines, what are some of the problems we can anticipate?

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Mezzanines

Questions?



Thank you to John Frye, P.Eng. for his consultation and use of the diagrams.