

***BCM USER GUIDE***  
*for*  
*Yangon, Myanmar*

(Version of the 07/06/2019)

June 2019

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## **1. INTRODUCTION.**

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This user guide is aimed to explain the civil servant of the YCDC involved into the construction permit procedure but also the professional (architects, engineers, etc.) the functioning of the Building Categorization Matrix (BCM) which will be part of the new construction permit approval procedure.

This user guide is aimed to explain the about the technical concepts and functioning of the building categorization matrix that will be a center element of the new computerized procedure in order to issue construction permit in Yangon, Myanmar. Once the matrix will be fully integrated into the new computerized building permit issuance process, a new integral user guide, that will take the whole system into account will have to be undertaken.

The first version of the matrix was presented to the authorities of the building department of the YCDC during the mission in Myanmar that took place from the 29<sup>th</sup> of September to the 9<sup>th</sup> of October 2018. This user guide is aimed to sustain the understanding of the underlying concepts of the proposed BCM.

## 2. GETTING STARTED.

The Building Categorization Matrix is composed of two different categorization systems:

- The evaluation of the risk level related to the construction itself – Construction Risk Level (CRL);
- The evaluation of the risk level related to the subsequent use of the construction – Use Risk Level (URL).

The result of both CRL and URL categorization system gives the final categorization of the building.

Both levels of risk are constituted of some parameters to which is applied a coefficient of risk. The coefficient depends of the level of each factors.

## 3. CONSTRUCTION RISK LEVEL.

The Construction Risk Level (CRL) is evaluated taking into account 4 different parameters:

- The slope related to the plot;
- The number of storeys;
- The number of storeys underground;
- The building live loads.

CONSTRUCTION RISKS		
TYPE OF RISK	Risk Factor	Coefficient
<b>PLOT RISKS (PR)</b>		
1	Slope (in degree)	Low - From 0 < 10
<b>STRUCTURAL RISKS (SR)</b>		
1	Number of storeys	GL+3 to GL+8 incl.
2	Number of storeys underground	0
3	Building live loads (psf)	Normal - ≤ 60
<b>CONSTRUCTION RISK LEVEL</b>		
Low: 4 < 8	Medium: 8 < 12	High: 12 < 30
		8,0 Medium

Select the risk factor

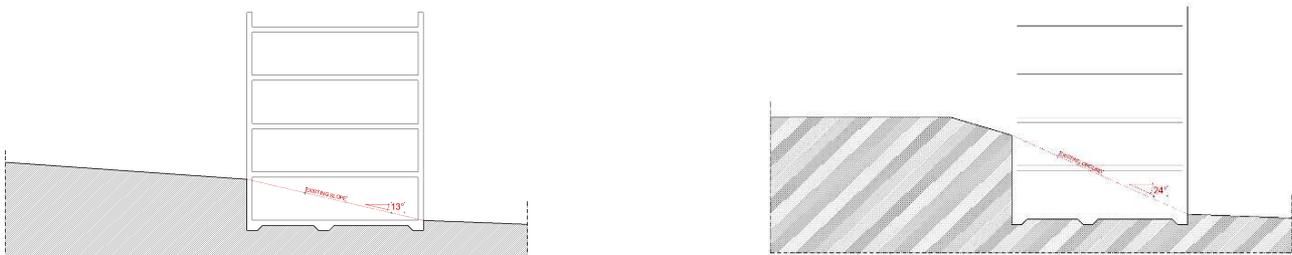
Level of Construction risk

### 3.1. The slope of the plot.

The slope of the plot (in degree) is calculated taking into account the characteristic of the plot where the building will be sited. In order to give a value to this parameter, the mean slope is taken upon four different levels to which is applied:

- Low: From 0 degree to 10 degrees (excl.) – Coefficient 1;
- Medium: From 10 degrees to 20 degrees (excl.) – Coefficient 2;
- High: From 20 degrees to 35 degrees (excl.) – Coefficient 7;
- Very high: Equal or higher than 35 degrees – Coefficient “Forbidden”.

The slope of the existing plot will be taken analyzing the sections of the project. In the case of a plot with different types of slope, it will be the slope with the major gradient that will be taken into account.

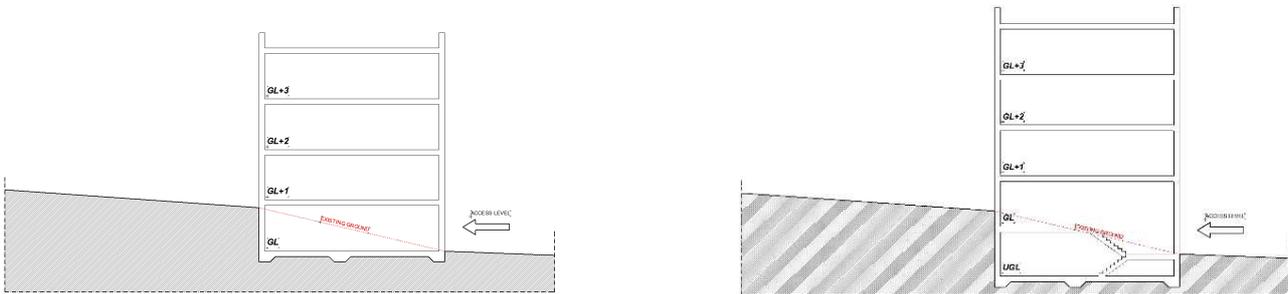


### 3.2. The number of storeys.

The number of storeys is referring to the project taking into account the number of storeys upon the ground level (GL).

There are three different levels to define the number of storeys to which is applied a coefficient in function of the number of storeys:

- a) GL to GL+2 incl. – Coefficient 1;
- b) GL+3 to GL+8 incl. – Coefficient 5;
- c) > GL+8 incl. – Coefficient 8.

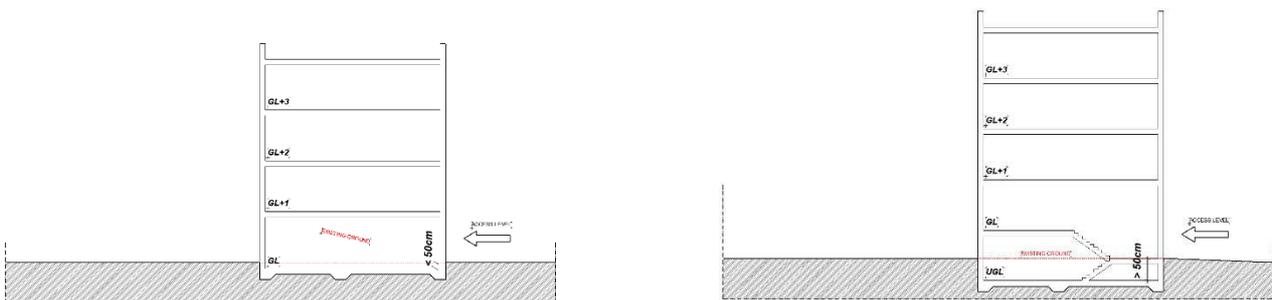


### **3.3. The number of storeys underground.**

The number of storeys is referring to the project taking into account the number of storeys under the ground level (UGL). A storey will be considered underground if the level of that storey is situated at a vertical distance of more than 50 cm from the principal ground entry level

There are three different levels to define the number of underground storeys to which is applied a coefficient in function of the number of underground storeys:

- a) 0 – Coefficient 1;
- b) 1 – Coefficient 3;
- c) 2 or more – Coefficient 6.



### **3.4. The building live loads in pounds per square foot (psf).**

The building Live Loads level is calculated taking into account the table 3.2.2. of the Myanmar Building Code<sup>1</sup>. There are three different levels of building live loads, to which is applied a coefficient in function of the level of building live loads:

- a) Normal -  $\leq 60$  psf – Coefficient 1;
- b) Medium - from  $60 < 90$  psf – Coefficient 5;
- c) High-  $\geq 90$  – Coefficient 7.

The user will analyze its project, and the different types of occupancy that are part of it, in order to define the value that he will refer to in the matrix. In the case of a building with different types of uses or occupancies, the occupancy or use with the highest building live load will be taken into account. In the case of a use or occupancy that not corresponds exactly to those expressed in the Myanmar Building Code, the occupancy that most nearly resembles to the proposed activity is taken into account and the user provides a written justification / explanation for that choice.

<sup>1</sup> Myanmar National Building Code; Table 3.2.2., Minimum Uniformly Distributed Live Loads - 2015 International Building Code (Chapter 16, table 1607.1)

#### 4. USE RISK LEVEL.

The Use Risk Level (URL) is evaluated taking into account 2 main parameters:

- The occupancy capacity;
- The type of occupancy;

It's the correlation between both main parameters that will define the final level of the use risk.

USE RISKS				
<b>OCCUPANCY CAPACITY</b>			Coefficient	AREA
1	Total gross floor area	Low	1	0
2	Maximum Premise Occupancy Rate	Low	1	0
<b>TYPE OF OCCUPANCY</b>			Coefficient	AREA
<b>A Assembly</b>				
A-1	Motion picture Theatre	0,0%	0,0	0
A-2	Restaurants	0,0%	0,0	0
A-3	Places of religious worship	0,0%	0,0	0
A-4	Arenas	0,0%	0,0	0
A-5	Other	0,0%	0,0	0
<b>B Business</b>				
B-1	Vehicle showrooms	0,0%	0,0	0
B-1	Professional services	0,0%	0,0	0
B-1	Airport traffic control towers	0,0%	0,0	0
<b>E Educational</b>				
E-1	Vocational Training Centre	0,0%	0,0	0
E-2	Educ.occupancies above High School	0,0%	0,0	0
<b>F Factory and Industrial</b>				
F-1	Beverages (up to 16" alcohol)	0,0%	0,0	0
F-2	Machinery	0,0%	0,0	0
<b>H High Hazardous</b>				
H-1	Hazardous and highly flam. materials	0,0%	0,0	0
H-2	Storage and handling of flammable m.	0,0%	0,0	0
H-3	Other	0,0%	0,0	0
H-4	Repair garages	0,0%	0,0	0
H-5	Aircraft repair hangars	0,0%	0,0	0
<b>I Institutional</b>				
I-1	Old Aged Centres	0,0%	0,0	0
I-2	Child care facilities	0,0%	0,0	0
I-3	Correctional Centres	0,0%	0,0	0
I-4	Adult care facility	0,0%	0,0	0
I-5	Civic administration	0,0%	0,0	0
<b>M Mercantile</b>				
M-1	Mini Stores	0,0%	0,0	0
M-1	Mini Stores	0,0%	0,0	0
M-1	Mini Stores	0,0%	0,0	0
<b>R Residential</b>				
R-1	Detached house	0,0%	0,0	0
R-2	Apartment houses	0,0%	0,0	0
R-3	Convents	0,0%	0,0	0
R-4	Assisted living facilities (16 p. max)	0,0%	0,0	0
R-5	Nursing home	0,0%	0,0	0
R-6	Service Apartments	0,0%	0,0	0
<b>S Storage</b>				
S-1	Ivory	0,0%	0,0	0
S-2	Books and paper in rolls or packs	0,0%	0,0	0
<b>U Utility and Miscellaneous</b>				
U-1	Livestock Shelters	0,0%	0,0	0
U-2	Other	0,0%	0,0	0
U-3	Private Garages	0,0%	0,0	0
			0,0%	VERIFY AREAS
<b>USE RISK LEVEL</b>				
Low: 2 < 12 Medium: 12 < 40 High: > 40		0,0 Low		

Fill with the gross area of the project

Fill the Occupancy Rate

Fill the different areas of occupancy

Select occupancy in the drop-down menu

Total gross areas of the building shall be equal to the sum of all areas of occupancy

Level of Use risk

#### 4.1. The Occupancy Capacity.

The occupancy capacity is measured taking into account:

- The Total Gross Floor Area of the Building in sq. feet and;
- The Maximum Premise Occupancy Rate.

**4.1.1. The Total Gross Floor Area (in sq. Feet). (TGFA)**

The Total Gross Floor Area of the building is considered as the closed and covered surface of the floors of a building, included under a ceiling of a height greater than 5,90 feet and calculated from the bare outer facade including the area occupied by interior walls but excluding the shafts, ducts, lift wells etc.

The Total Gross Floor Area of the building is expressed in square feet and take into account four distinct categories to which is applied a different coefficient:

- a) Smaller than 3000 sq. feet (< 278 m<sup>2</sup>) – Coefficient 1;
- b) Between 3000 sq. feet and 10.000 sq. feet (excl.) (between 278 m<sup>2</sup> and 929 m<sup>2</sup>) – Coefficient 3;
- c) Between 10.000 sq. feet and 30.000 sq. feet (excl.) (between 929 m<sup>2</sup> and 2787 m<sup>2</sup>) – Coefficient 7;
- d) Greater than 30.000 sq. feet (greater than 2787 m<sup>2</sup>) – Coefficient 9.

In order to perform a sound and easy verification of the different total gross areas related to the project, the user provides the polygons of the total gross areas related to its project.

**4.1.2. The Maximum Premise Occupancy Rate (MPOR)**

The Maximum Premise Occupancy Rate is the number of persons that can safely reside in the premises. It is calculated using the “occupancy rate” sheet dedicated exclusively to the calculation of the Maximum Premise Occupancy Rate. After calculating the occupant load of its projects, the user will fill the matrix with the result obtained

USE RISKS				
OCCUPANCY CAPACITY			Coefficient	
1	Total gross floor area (in sq. feet)	Medium	3	5890
2	Maximum Premise Occupancy Rate	High	5	388

The Occupant Load calculation sheet takes into account various occupancy type. The user will fill the total area (in sqf) related to each type of occupancy and will obtain the total occupation load of the building.

20.1.	Areas on other floors	60	Gross	0	0
20.2.	Basement and grade floor areas	30	Gross	10000	333
20.3.	Storage, stock, shipping areas	300	Gross	4500	15
21	Parking Garages	200	Gross	8000	40
22	Residential	200	Gross	0	0
23	Skating rinks, swimming pools				
23.1.	Rink and pool	50	Gross	0	0
23.2.	Decks	15	Gross	0	0
24	Stages and Platforms	15	Net	0	0
25	Warehouses	500	Gross	0	0
<b>Total</b>				<b>388</b>	

The occupant load sheet takes into account 38 different types of occupancy. The occupant load of each type of occupancy is defined by the Myanmar National Building<sup>2</sup> code and linked to a certain area in square feet per person. When a type of occupancy is not clearly mentioned in the occupant load calculation sheet, the occupancy that most nearly resembles to the proposed activity is taken into account and the user provides a written justification / explanation for that choice.

The Occupant Load of the building expresses the number of persons that can safely reside in the premises and take into account four distinct categories to which is applied a different coefficient:

- a) Low: Less than 50 people – Coefficient 1;
- b) Medium: Between 50 people and less than 150 people – Coefficient 3;

<sup>2</sup> MNBC, chapter 2.6.3., Occupant Load

- c) High: Between 150 people and less than 400 people – Coefficient 5;
- d) Very High: 400 or more people – Coefficient 8.

**4.2. The Type of Occupancy.**

The different types of occupancy are defined by the Myanmar National Building Code<sup>3</sup>. In total, there is 257 types of occupancy identified in the Myanmar National Building code and classified in 10 different groups:

- a) Group A: Assembly (A1 to A5);
- b) Group B: Business
- c) Group E: Educational
- d) Group F: Factory and Industrial (F1 & F2)
- e) Group H: Hazardous
- f) Group I: Institutional (I1 to I5)
- g) Group M: Mercantile
- h) Group R: Residential (R1 to R6)
- i) Group S: Storage (S1 & S2)
- j) Group U: Utility and Miscellaneous (U1 to U3)

Each group is divided in sub-groups with the different activities related to the principal type of occupancy. In order to be familiar with every types of occupancy, the user has to consult the MNBC before filling the matrix. The matrix also takes into account the possibility that various different activities can be part of the same building, possibility that is reflected into the algorithm. Though, the user has to fill the total gross area of each type of occupancy in the matrix.

Gross floor area of a building, means the total floor area calculated based on center of exterior walls, including the circulation area such as stairs, corridors, etc. but excluding the shafts, ducts, lift wells etc<sup>4</sup>.

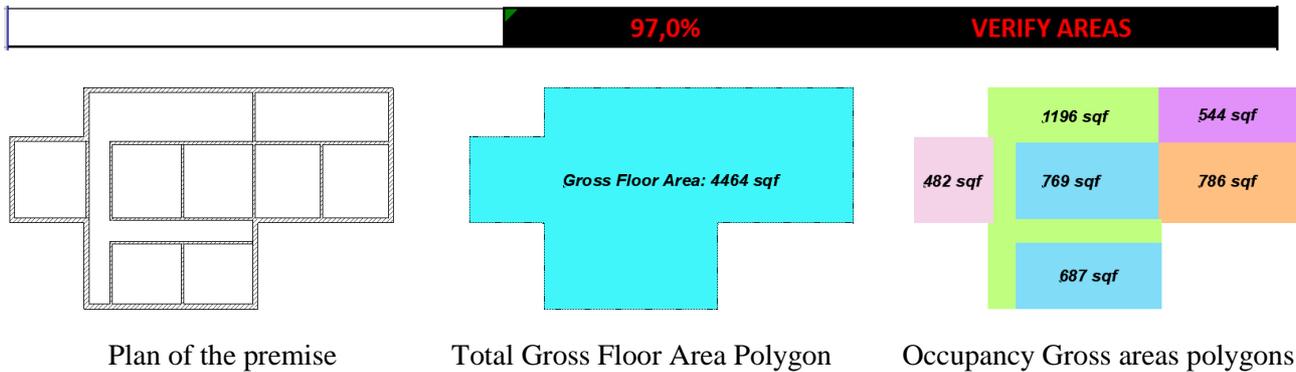
The sum of the gross area of each activity shall be the same as the total gross area of the building. Otherwise, the matrix will alert the user that both areas do not correspond. In order to perform a sound and quicker verification, the user provides the polygons of all areas related to each occupancy type gross floor area mentioned in the matrix.

USE RISKS				
OCCUPANCY CAPACITY			Coefficient	
1	Total gross floor area (in sq. feet)	Medium	3	5000
2	Maximum Premise Occupancy Rate	Medium	3	50
TYPE OF OCCUPANCY			Coefficient	AREA
<b>A</b>	<b>Assembly</b>			
A-1	Motion picture Theatre	60,0%	1,8	3000
A-2	Food courts	40,0%	1,2	2000
		100,0%		OK

USE RISKS				
OCCUPANCY CAPACITY			Coefficient	
1	Total gross floor area (in sq. feet)	Medium	3	5000
2	Maximum Premise Occupancy Rate	Medium	3	50
TYPE OF OCCUPANCY			Coefficient	AREA
<b>A</b>	<b>Assembly</b>			
A-1	Motion picture Theatre	60,0%	1,8	3000
A-2	Food courts	37,0%	1,1	1850

<sup>3</sup> MNBC, chapter 2.1.2., Classification of all Buildings by Use or Occupancy

<sup>4</sup> MNBC, chapter 2.3.3., Occupant Load



A list of value representing the grade of risk of each activity within a scale from 1 to 5 is provided with the matrix. These values can be modified in order to give more or less importance to a type of occupancy activity. Once the grade of risk is modified in the “value” sheet, the value of this activity is automatically modified in the matrix.

Type of occupancy		Grade of risk (from 1 to 5)	Very Low	1
Assembly			Low	2
A1	Motion picture Theatre	3	Moderate	3
	Symphony Hall	3	High	4
	Concert Hall	4	Very High	5

## **5. THE ALGORITHMS.**

### **5.1. CRL Algorithm.**

The algorithm to determine the construction risk level (CRL) is the sum of the different coefficients given for each parameter according to the project (slope, number of storeys, number of storeys underground, building live loads):

$$\text{CRL} = \text{S} + \text{NS} + \text{NSU} + \text{BLL}$$

Where CRL means Construction Risk Level, S means Slope coefficient, NS means Number of Storeys coefficient, NSU means Number of Storeys Underground coefficient and BLL means Building Live Loads coefficient.

The sum of each coefficient will give the final risk level for the CRL and subsequently the proper categorization based on three categories:

- a) **LOW RISK:** Below the level of 8;
- b) **MEDIUM RISK:** From 8 and below the level of 12;
- c) **HIGH RISK:** From the level of 12 and beyond.

### **5.2. URL Algorithm**

On the other hand, the algorithm to determinate the use risk level (URL) integrates the Occupancy Capacity (OC) of the building and the Type of Occupancy (TO). A third factor, the Risk for Shared Activities (RSA) is added to the algorithm in order to include the fact that a building that shares various different activities should have a major grade of risk for different reasons (schedule, etc.).

The Occupancy Capacity (OC) value is measured taking into account the sum of the coefficients attributed to the Total Gross Floor Area and to the Maximum Premise Occupancy Rate.

$$\text{OC} = \text{TGFA} + \text{MPOR}$$

Where OC means Occupancy Capacity, TGFA means Total Gross Floor Area coefficient and MPOR means Maximum Premise Occupancy Rate coefficient.

The Type of Occupancy (TO) value is the sum of all coefficient related to the types of occupancy in function of their sizes in the premise.

$$\text{TO} = \text{sum of all coefficients related to the occupancies}$$

The Risk for Shared Activities (RSA) value is determined by the following formula (excel based):

$$\text{RSA} = 1 + 0,2 * ((\text{Number of activities}) - 1)$$

The RSA Coefficient rises in lineal proportion of 20% per added activities.

Finally, the algorithm for the Use Risk Level (URL) is shown hereafter:

<b>URL = OC * TO * RSA</b>
----------------------------

Where URL means Use Risk Level, OC means Occupancy Capacity value, TO means Type of Activity value and RSA means Risk for Shared Activities value.

Applying the formula to determine the URL will give the final risk level for the URL and subsequently the proper categorization based on three categories:

- a) LOW RISK: Below the level of 12;
- b) MEDIUM RISK: From 12 and below the level of 40;
- c) HIGH RISK: From the level of 40 and beyond.

### **5.3. Definition of the final category**

After having defined the categorization level for each risk, the final categorization will depend on the result of each CRL and URL referring to the project and based on the following table:

		CONSTRUCTION RISK LEVEL		
		LOW	MEDIUM	HIGH
USE RISK LEVEL	LOW	1	2	2
	MEDIUM	2	2	3
	HIGH	3	3	3

The third category is considered as the lowest risk category. The second corresponds to the medium risk projects and the first category correspond to the high-risk projects. Several aspects of the procedure are connected to the final categorization of the project:

- a) The type of documents to add to the application file;
- b) The departments which are in charge of reviewing the project;
- c) The type of inspections that applies to a project.

## **FREQUENTLY ASKED QUESTIONS.**

**Q: I can't find the exact type of occupancy corresponding to my project, what should I do?**

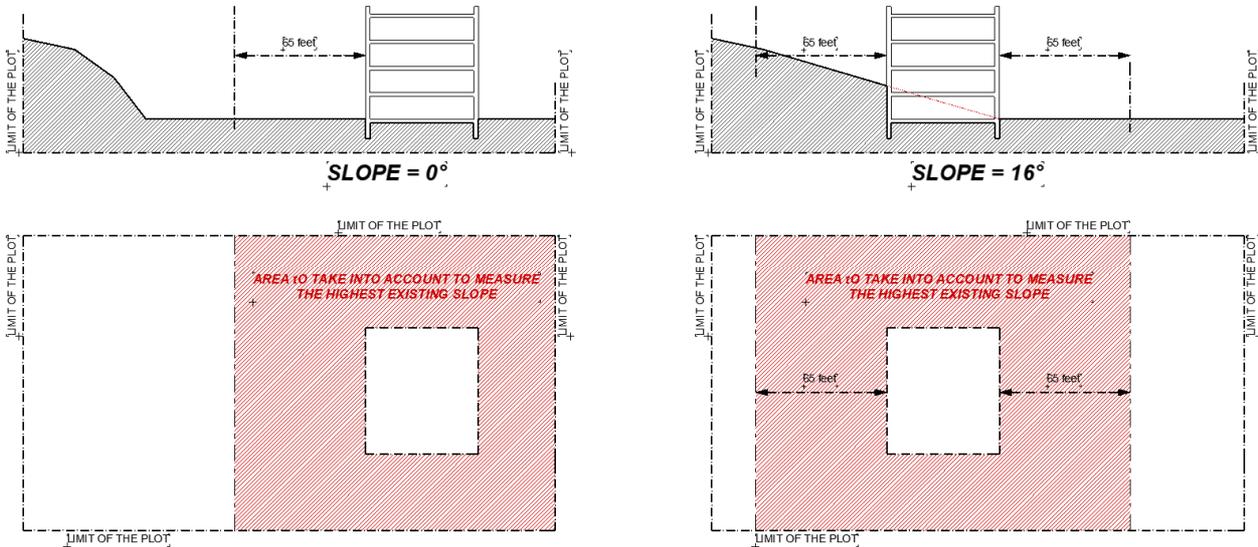
A: It may be possible that a very specific activity is not found in the 257 types of activity mentioned in the MNBC. In that case the user will have to choose the closest activity type in relation to its project. First, the user verifies in which principal category would be situated the project (assembly, business, etc.) and then chooses a sub-category that corresponds to its project. For example, an observation deck is not clearly mentioned in the MNBC but it can be considered as a place of assembly / amusement park structure. This category will be chosen in order to fill the matrix correctly. For the live loads, it will be the category 30.12. (*Roofs used for roof garden or assembly purposes*) that will have to be chosen.

**Q: I have a mezzanine at the ground level of my project, is it considered as a full storey?**

A: Yes, a mezzanine has to be considered as a full storey as it has an impact on the total height of the building and is above 5,90 feet.

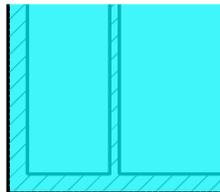
**Q: My plot is very big and most of its surface can be considered as flat, nonetheless there is a part of it that possesses a steeper slope, do I have to take that slope into account for the matrix?**

A: The slope to take into account is the slope of the ground above which will be built the premise equidistant of 65 feet from every limit of the building.

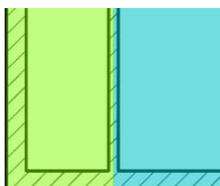


**Q: How do I have to do to draw the polygons?**

A: The polygon representing the gross floor area of the entire building is drawn from the external side of the exterior wall.

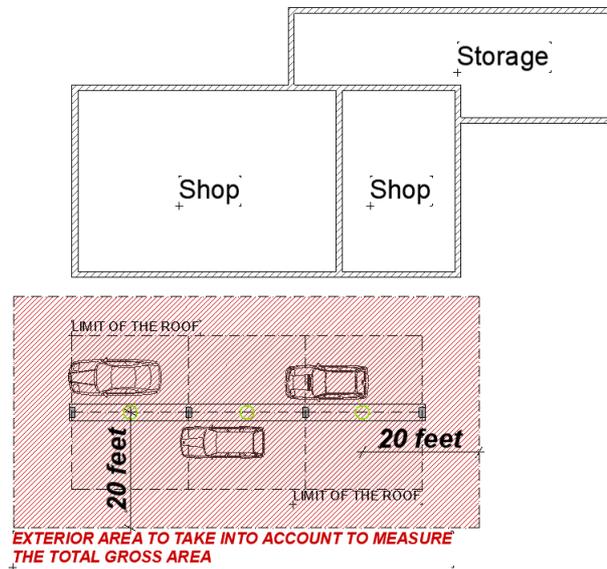


The polygons representing the gross floor areas of each type of occupancy will be drawn from the external side of the exterior wall (if the activity is located next to an exterior wall) or from the middle of the wall separating two types of occupancies.



**Q: I have a project of a filling gas station; how do I calculate the gross area of my project?**

A: - In the particular case of a filling gas station, the covered service area concerned by the filling should also be considered for the gross area. The filling area (covered or no) is part of the gross area of the project to take into account. This area to calculate includes every point within a distance of less than 20 feet from the filling points.



**Q: In the case of an enlargement of an existing building, do I have to take into account the existing building to calculate the total gross area and the maximum premise occupancy rate?**

A: - In the case of an enlargement, it's only the enlargement itself that will be taken into account in order. Nonetheless, in the case of a refurbishment of the existing building and if the structure of the existing building is affected, the existing and projected building have to be taken into account.

