WIND LOAD CALCULATION FOR DIFFERENT DIVISIONS OF BANGLADESH FOR DIFFERENT EXPOSURE BY MS EXCEL

Submitted by

Md. Faysal

(ID: 173-47-086)

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APPROVAL

The thesis titled **"Wind Load Calculation for Different Divisions of Bangladesh for Different Exposure by MS Excel"** submitted by Md. Faysal, Student ID.: 173-47-086, has been accepted as satisfactory in partial fulfillment of the requirements for the degree of Bachelor of Science in Civil Engineering on 16th January, 2023.

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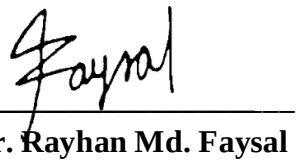

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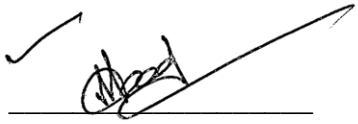

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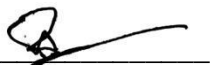

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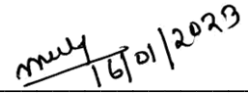

Dr. Muhammad Mukhlesur Rahman
Secretary Ministry of Textiles and Jute
Govt. of the people's republic of Bangladesh

External Member

DECLARATION

The dissertation entitled "**Wind Load Calculation for Different Divisions of Bangladesh for Different Exposure by MS Excel**" has been performed under the supervision of Mr. Rayhan Md. Faysal (Assistant Professor), Department of Civil Engineering, Daffodil International University, Dhaka, Bangladesh and got approved in partial fulfillment of the requirement for the Bachelor of Science in Civil Engineering. To the best of our knowledge and belief, the capstone contains no materials previously published or written by another person except where due reference is made in the capstone itself.

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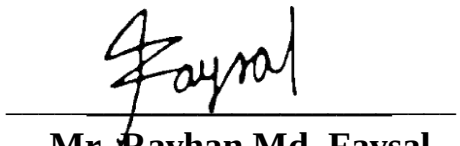
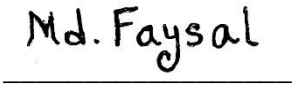


Mr. Rayhan Md. Faysal
Assistant Professor
Department of Civil Engineering
Daffodil International University

BY

Md. Faysal
ID: 173-47-086



ABSTRACT

The wind load effect on R.C.C. buildings has gotten a lot of attention for establishing specialized characteristics according to the BNBC 2020 which is gazetted in 2021. MS Excel can be used to assess wind load value for R.C.C Residential Buildings, and other structures. The values of wind loads for different storey displacement, for different palaces with different exposure was investigated. These results are compared with each-other. In this study, the maximum windward load and leeward load increases as the number of storeys increases, which increases due to wind loads. Again, the maximum windward load and leeward load increases as the exposure changes from A to B and C respectively. And percent maximum value for each division was found 32.61%. Maximum design wind load was found in Chattogram and minimum design wind load was found in Rajshahi division.

Keywords: Windward and leeward load, MS Excel, BNBC2020, exposure.

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First of all, thanks to Almighty who helped me to complete the practicum work and the practicum report, leading to the Bachelor of Science in Civil Engineering degree. I would like to thank every families and friends that to get me in this intensity and individuals who support and share idea and also helping me to be like this. I would like to pay my gratitude to our respected Head, Department of Civil Engineering, and Assistant Professor, Dr. Md. Hannan Mahmud Khan who gave me the opportunity to do the report on "**Wind Load Calculation for Different Divisions of Bangladesh for Different Exposure by MS Excel"** by Using Manual Calculation & Software Approach"

Then I would like to pay my gratitude to Mr. Rayhan Md. Faysal (Assistant Professor of DIU) for his endless support.

I would also like to thanks all teachers of Civil Engineering department who brought me to my present performance and shape me like this during the last four successive years, Special thanks to all faculty, Civil Engineering Department, DIU for providing me a lots of support to prepare this successful report.

Dedicated to

My Parents

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LIST OF ABBREVIATIONS

BNBC	Bangladesh National Building Code
RCC	Reinforced Concrete Cement
ASCE	American Society of Civil Engineers
SMRF	Special Moment Resisting Frame
MS	Microsoft
MWFRS	Main Wind Force Resisting System

LIST OF SYMBOLS

No.	Symbols	Full meaning
1	V	Basic wind speed
2	K_d	Wind directionality factor
3	I	Importance factor
4	K_z *or* K_h	Velocity pressure exposure coefficient
5	K_{zt}	Topographic factor
6	G *or* G_f	Gust effect factor
7	GC_{pi}	Internal pressure coefficient
8	C_p *or* GC_{pf}	External pressure coefficient
9	C_f	Force coefficient
10	q_z *or* q_h	Velocity pressure
11	P *or* F	Design wind load
12	h	Height
13	L	length
14,	B	Width
15	Wx	Windward x direction
16	Wz	Windward z direction
17	Lx	Leeward x direction
18	Lz	Leeward z direction

CHAPTER I

Introduction

1.1 General

Lateral loads, such as earthquakes and wind, can have a considerable impact on buildings and different structures. So it is important to calculate lateral loads properly. But these calculation sometimes needs trial and error to achieve desired perfection. For this type of work excel can be used to calculate big calculation in a short period of time. Excel is a spreadsheet program which can enables users to format, organize and calculate data in a spreadsheet. That's why in Civil Engineering it is used in many way such as for calculating wind loads. Wind load is the load, in pounds per square foot, placed on the exterior of a structure by wind of a building. The term "building" refers to a structure that includes foundations, walls, columns, floors, roofs, doors, windows, ventilators, stair lifts, and other types of surface finishes, among other things. The target of calculating wind loads is to design and originate a structure that can withstand maximum wind force applied in it, for the duration of its desired lifetime. Structural engineers are faced with the task of achieving the most efficient and cost-effective design while guaranteeing that the final design of a structure and the building must be functional for its intended use for the duration of its design life. Various software packages, such as Excel, RISA, STAAD PRO, ETABS, STRUDL, MIDAS, SAP, and RAM, are now available in the market for analyzing and calculating wind loads, for almost all sorts of structures.

This project is mainly concerned with the study of "Wind Loads Calculation for Different Divisions of Bangladesh for Different Exposure by MS Excel". The analysis of (G+8) storey building is done with the help of excel. The analysis is done for all eight divisions of Bangladesh with exposure A, B and C respectively.

1.2 Background of Thesis

I have worked for an eight storey residential building and have analyzed “Wind Loads for Different Divisions of Bangladesh for Different Exposure by MS Excel”.

1.3 Scope of the study

The main focus is to find out maximum windward and leeward load with the help of excel spreadsheet. My designed excel file can calculate up-to fifteen story buildings.

1.4 Objectives

The objectives of this thesis:

a) To analyze wind loads of a building by using Excel.

b) To calculate maximum windward load and leeward load.

c) To compare wind loads for different divisions of Bangladesh.

d) To compare wind loads for different exposure.

1.5 Summary

I have basically talked on what to do, how to use and how to accomplish it in this chapter. I have also talked about the study's principal goal. The goal of my study is to calculate wind loads for different divisions of Bangladesh for different exposure by MS Excel.

CHAPTER II

Literature Review

2.1 Introduction

Buildings and their components are to be designed to withstand the code-specified wind loads. Calculating wind loads is important in design of the wind force-resisting system, including structural members, components, and cladding, against shear, sliding, overturning, and uplift actions.

2.2 Previous Stories Regarding Wind Load Analysis

Trivedi, V. T. & S. Pahwa (2018, February): This journal tells us, with the rise of human civilization, towering building designs have gained relevance. So, it is crucial to take into account the impact of lateral loads, such as earthquakes and wind loads. Because the key causes of structural collapse include dynamic excitations like winds and earthquakes. [1]

Mir, A., Kuddus, Pritom Dey, P. (2017); Shaikh Muffassir 1 & L.G. Kalurkar 2 (2016): These study and journals describes, the term "wind" refers to moving air and is frequently used to refer to the atmosphere's horizontal motion within a building. Building wind action is dynamic and affected by outside elements such as terrain type, height, exposure category, building type, location, fundamental wind speed, and building configuration. According to the BNBC recommendations for calculating the wind load for the study. [2] [3]

Ashish Sadh, A., Pal. A Literature Study of Wind Analysis on High Rise Building. Retrieved June 29, 2022: In some circumstances, the wind load is more significant than the earthquake load. This depends on the location and zone factor, which are identified by regulations. [4]

Ahmed, M., & Banerjee, M. (n. d.). (2019): These informed us, when the wind blows, it creates stresses that are perpendicular to the surface of the building or on certain cladding components. So, it has a significant impact on vertically standing walls, columns, and beams, among other architectural components like roof structures, such as truss structures, and flat slabs, which can be easily analyzed. [5]

2.3 History of Wind Load Analysis by Excel Spreadsheet

ASCE705W is a spreadsheet program in MS Excel for wind loading analysis for buildings and structures per the ASCE7-05 Code. Specifically, wind pressure coefficients and related and required parameters are selected or calculated to compute the net design wind pressures.
The worksheet for "Simplified" analysis is suitable for low-rise constructions meeting the principles of Section 6.4.1. And in the worksheet for Simplified evaluation, the design MWFRS wind load is determined for each direction. The design MWFRS load is presumed to be the total wind load on either the width or the length of the construction, respectively.
The worksheet for "MWFRS (Low-Rise)" is suitable for low-rise buildings, as described in Section 6.2. Worksheets for "MWFRS (Any Ht.)", "Wall C&C," and "Roof C&C" are suitable for constructions with mean roof heights of up to 500 feet.

But for BNBC 2020, no specified program is written in MS Excel. In this paper, I will show how to manually analyze and calculate wind loads in MS-Excel with BNBC 2020 code for a residential building.

2.4 Necessity of Wind Load Analysis in a Residential Building

An infrastructure is an artificial structure having a roof and walls that remain in one place for the most part. Buildings appear in a range of fervidity, sizes, and performances and have been accommodated throughout history for various causes, including the availability of building materials, environmental situations, land values, ground circumstances, specific uses, and aesthetic considerations. Compares the list of non-building structures to better comprehend the term "building".

- Types of building:-
  1. Residential building
  2. Commercial and public building
- Mosque building
- Shopping mall
- Banking building
- Academic building
- Factory building
- Library building
- Theater building
- Castle building etc.

Wind engineering has gained importance as larger and slimmer structures have become necessary in Bangladesh. High-rise building design traditionally done by hand is time-consuming and prone to human error. Structural engineers frequently utilize the Excel spreadsheet tool to solve common problems like calculating the wind

analysis and verifying multiple codes with different load combinations. The aim of the study is to compare the effects of wind pressure on eight different locations in Bangladesh. This study was done on an 80-foot-tall residential building using Excel software and the BNBC-2020 code. The study's major goal is to calculate and compared maximum and minimum design wind pressure of eight divisions of Bangladesh. Based on the investigation findings, we attempted to determine their attitude to various wind pressures. According to analysis, wind pressure is primarily found in the South-East and South-West, where it is higher than in the North-East and North-West.

2.5 Summary

In this chapter I have basically talked about old study's regarding this topic and history of it. I have also talked about the necessity of this study in this chapter.

CHAPTER III

Methodology

3.1 Introduction

The previous Chapter deal with literature review. I have highlighted the detail theoretical procedure of my work through this chapter. In this chapter I will focus about some required criteria about RCC residential building according to BNBC 2020 for wind load calculation.

3.2 Procedure for analysis

Allowed Methods: One of the methods listed below may be used to calculate the design wind loads for buildings and other structures, including MWFRS and their component and cladding elements ;

• Method 1 - Simplified Procedure

• Method 2 - Analytical Procedure

• Method 3 - Wind Tunnel Procedure

In this paper I will use Method 2 - Analytical Procedure, for wind load analysis by

Using Excel spreadsheet.

3.3 Method 2 - Analytical Procedure (According to BNBC-2020)

A construction or different structure whose design wind loads are determined in accordance with this Section shall meet all of the following conditions:

(1) The building or other structure is a regular-shaped building or structure as defined in Sec 2.1.3.

(2) The building or other structure lacks response qualities that would make it vulnerable to cross-wind loading, vortex shedding, and instability brought on by galloping or flutter, or a site location that would form channeling effects or buffeting in the wake of upwind obstructions demand special consideration.

(3) No decreases in velocity pressure shall occur due to apparent shielding given by buildings, other structures, or topographic characteristics.

(4) Design wind loads driven from Sec 2.4.3 shall be used for air permeable cladding unless certified test evidence or acknowledged literature demonstrate lower loads for the type of air permeable cladding being considered.

3.4 Design Procedure (BNBC 2020)

(1) According to Sec. 2.4.4, the basic wind speed V and the wind directionality factor K_d must be computed.

(2) In line with Section 2.4.5, importance factor "I" must be determined.

(3) For each wind direction, an exposure category or exposure categories, as well as a velocity pressure exposure coefficient K_z or K_h, as applicable, must be computed in line with Sec. 2.4.6.

(4) According to Sec. 2.4.7, a topographic factor K_{zt} shall be determined.

(5) As necessary, a gust effect factor G or G_f, must be calculated in accordance with Sec. 2.4.8.

(6) An enclosure classification must be determined according to Sec 2.4.9.

(7) According to Section 2.4.10.1, the internal pressure coefficient, or GC_{pi} must be determined.

(8) It is necessary to determine the external pressure coefficients C_p or GC_{pf} force coefficients C_f in accordance with Sections 2.4.10.2 or 2.4.10.3, respectively, as applicable.

(9) According to Sec. 2.4.9.5, velocity pressure q_z or q_h, as applicable, must be determined.

(10) According to Sec. 2.4.11, the design wind load P or F must be determined.

3.5 Hand Calculation

For an example in this time I will calculate Windward and Leeward load P for x direction only for 2nd storey.

Location: Dhaka

Wind Speed: 65.7 m/s

Building Details: G+8 story building

Height h = 80 feet

Length L = 90 feet

Width B = 48 feet

We know that,

Velocity pressure $q_z = 0.000613\ K_z\ K_{zt}\ K_d\ v^2\ I$

Here, $K_z = 0.7$

$K_{zt} = 1$

$K_d = 0.85$

$v = 65.7$ m/s

$I = 1$

So, $q_z = 0.000613*0.7*1*0.85*(65.7)^2*1$

$=1.5744$ kN/m^2

Now, Design wind pressure,

$P = (q*G*C_p) - q_i\ (GC_{pi})$

Here, $G = 0.85$

C_p for wind ward wall = 0.8

C_p for lee ward wall = -0.325

$q = q_z = q_i = 1.5744$ kN/m^2

$GC_{pi} = \pm 0.18$

So, Windward P = (1.5774*0.85*0.8) - (1.5774*(-0.18))

= 1.356564 kN/m^2

= 0.0283 kip/ft^2

And, Leeward P = (1.5774*0.85*(-0.325)) - (1.5774*0.18)

= -0.71968875 kN/m^2

= -0.01503 kip/ft^2

3.6 Summary

In this chapter I have basically talked about method and design procedure of this study. I have also showed a hand calculation example in this chapter.

CHAPTER IV

Wind Load Analysis by MS Excel

4.1 Introduction

The previous Chapter deals with theoretical procedure review and hand calculation system. In this chapter, I will show a detailed wind load analysis of an RCC residential building according to BNBC 2020 through an excel spreadsheet.

4.2 Wind Load Consideration for MS Excel

Wind Speed: Total 8 divisions are used,

Location	Speed(m/s)
Barishal	78.7
Chattogram	80
Dhaka	65.7
Khulna	73.3
Mymensingh	67.4
Rajshahi	49.2
Rangpur	65.3
Sylhet	61.1

Table: 4.1

Exposure Type: A, B, C all three exposure are used.

Importance Factor: Importance factor I = 1 for RCC residential building according to BNBC 2020.

Topographical Factor: K_{zt} = 1 for RCC residential building on level place according to BNBC 2020.

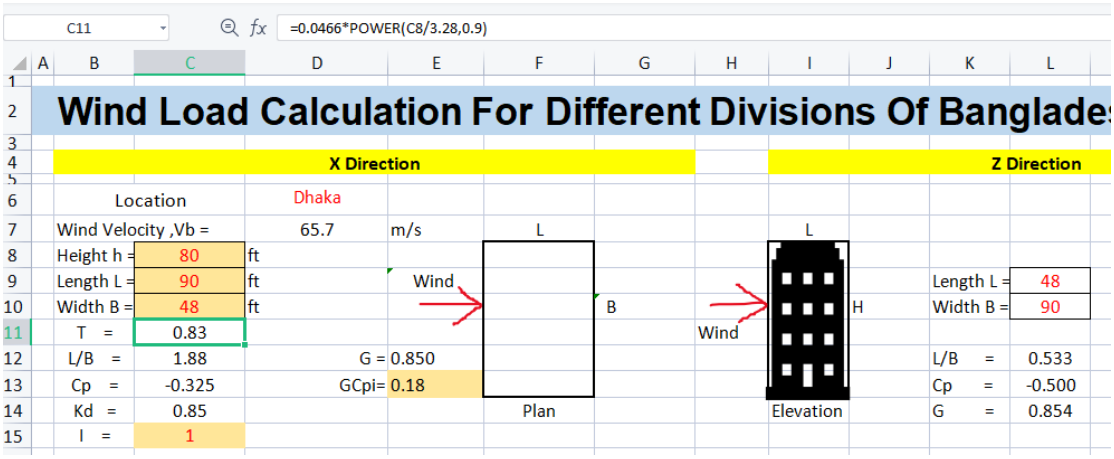
Gust Factor: G = 0.85 for Rigid building according to BNBC 2020.

Directionality Factor: K_d = 0.85 for Main Wind Force Resisting System according to BNBC 2020.

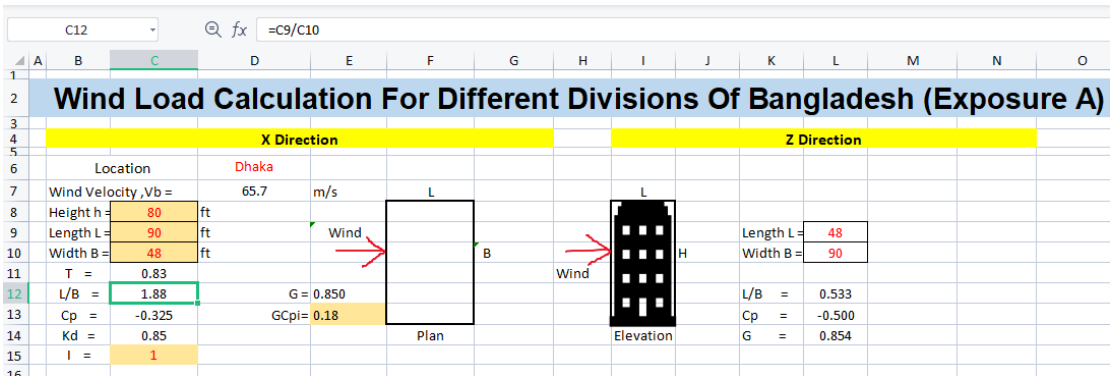
Building Properties: Height, h = 80 ft.; Length, L = 90 ft.; Width, B = 48 ft.

GC_{pi} = -0.18 for windward load, +0.18 for leeward load.

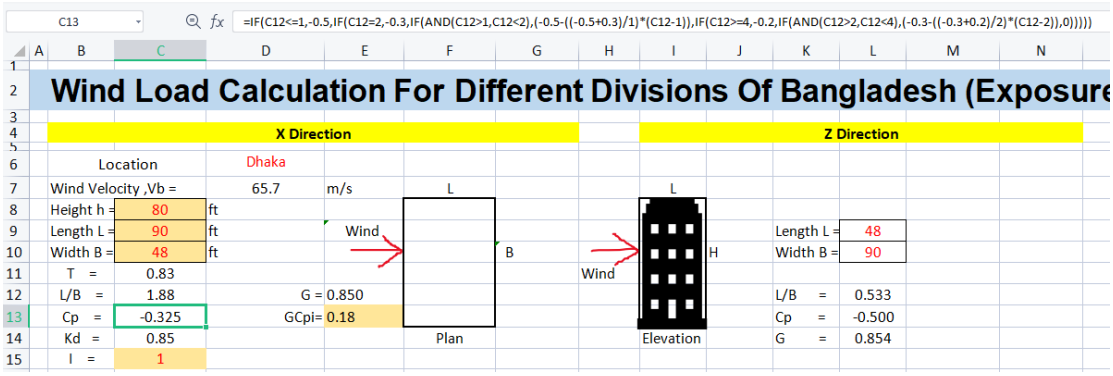
Other values are calculated according to the procedure with the help of excel spreadsheet which will be shown below,



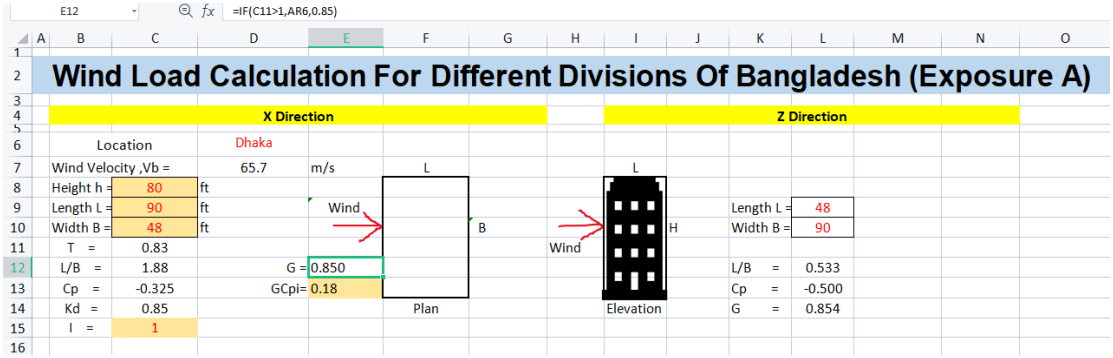
T, Excel Formula: =0.0466*POWER(C8/3.28,0.9)



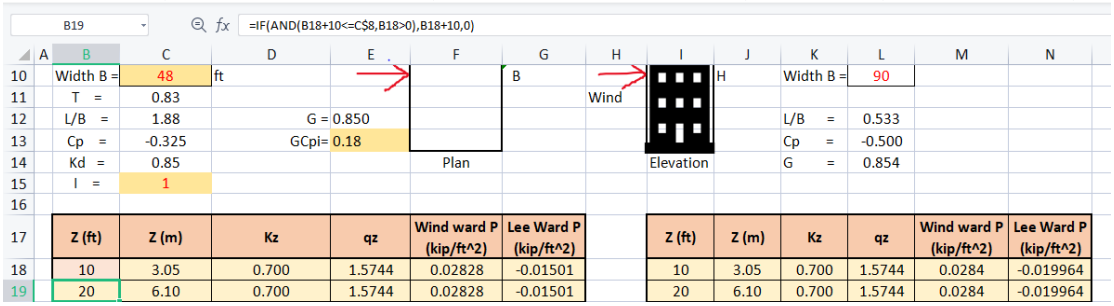
L/B, Excel Formula: =C9/C10



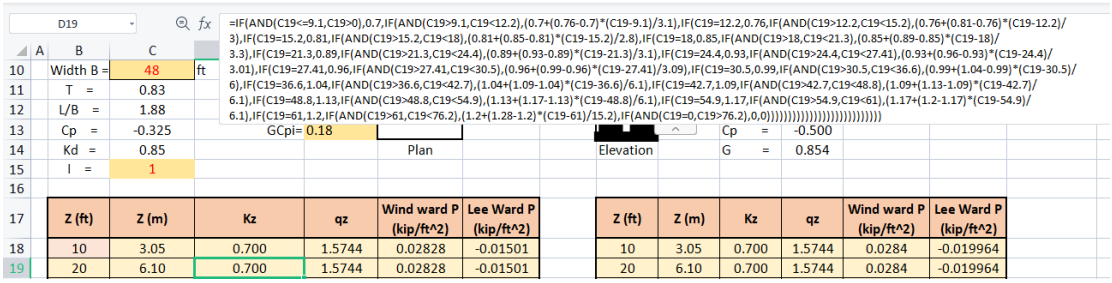
C_p, Excel Formula: =IF(C12<=1,-0.5,IF(C12=2,-0.3,IF(AND(C12>1,C12<2),(-0.5-((-0.5+0.3)/1)*(C12-1)),IF(C12>=4,-0.2,IF(AND(C12>2,C12<4),(-0.3-((-0.3+0.2)/2)*(C12-2)),0)))))



G, Excel Formula: =IF(C11>1,AR6,0.85)



z, Excel Formula: =IF(AND(B18+10<=C$8,B18>0),B18+10,0)



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
10		Width B =	48	ft											
11		T =	0.83												
12		L/B =	1.88												
13		Cp =	-0.325		GCpi=	0.18									
14		Kd =	0.85				Plan								
15		I =	1												
16															

	Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
18	10	3.05	0.700	1.5744	0.02828	-0.01501
19	20	6.10	0.700	1.5744	0.02828	-0.01501

	Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
18	10	3.05	0.700	1.5744	0.0284	-0.019964
19	20	6.10	0.700	1.5744	0.0284	-0.019964

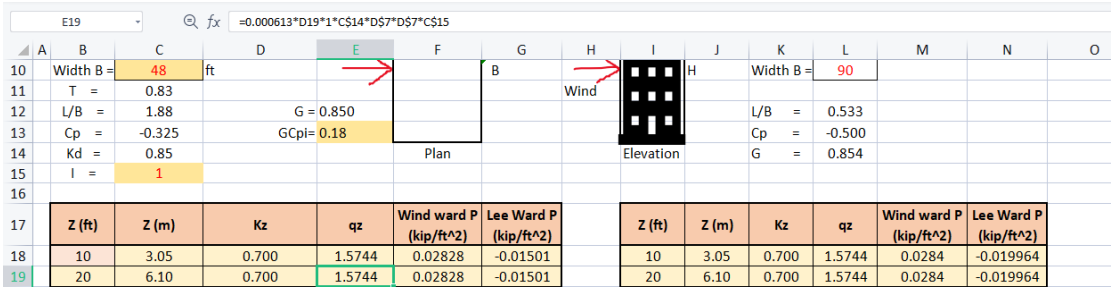
Elevation

Cp = -0.500

G = 0.854

K_z, Excel Formula:

=IF(AND(C19<=9.1,C19>0),0.7,IF(AND(C19>9.1,C19<12.2),(0.7+(0.76-0.7)*(C19-9.1)/3.1),IF(C19=12.2,0.76,IF(AND(C19>12.2,C19<15.2),(0.76+(0.81-0.76)*(C19-12.2)/3),IF(C19=15.2,0.81,IF(AND(C19>15.2,C19<18),(0.81+(0.85-0.81)*(C19-15.2)/2.8),IF(C19=18,0.85,IF(AND(C19>18,C19<21.3),(0.85+(0.89-0.85)*(C19-18)/3.3),IF(C19=21.3,0.89,IF(AND(C19>21.3,C19<24.4),(0.89+(0.93-0.89)*(C19-21.3)/3.1),IF(C19=24.4,0.93,IF(AND(C19>24.4,C19<27.41),(0.93+(0.96-0.93)*(C19-24.4)/3.01),IF(C19=27.41,0.96,IF(AND(C19>27.41,C19<30.5),(0.96+(0.99-0.96)*(C19-27.41)/3.09),IF(C19=30.5,0.99,IF(AND(C19>30.5,C19<36.6),(0.99+(1.04-0.99)*(C19-30.5)/6),IF(C19=36.6,1.04,IF(AND(C19>36.6,C19<42.7),(1.04+(1.09-1.04)*(C19-36.6)/6.1),IF(C19=42.7,1.09,IF(AND(C19>42.7,C19<48.8),(1.09+(1.13-1.09)*(C19-42.7)/6.1),IF(C19=48.8,1.13,IF(AND(C19>48.8,C19<54.9),(1.13+(1.17-1.13)*(C19-48.8)/6.1),IF(C19=54.9,1.17,IF(AND(C19>54.9,C19<61),(1.17+(1.2-1.17)*(C19-54.9)/6.1),IF(C19=61,1.2,IF(AND(C19>61,C19<76.2),(1.2+(1.28-1.2)*(C19-61)/15.2),IF(AND(C19=0,C19>76.2),0,0))))))))))))))))))))))))))))))

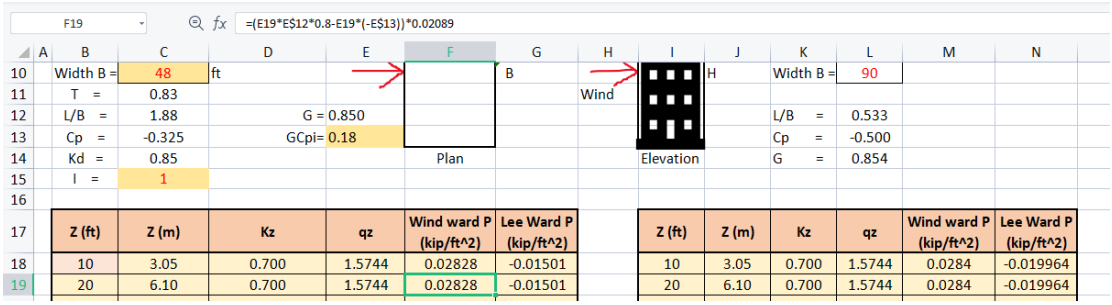


	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
10		Width B =	48	ft			B		H		Width B =	90			
11		T =	0.83					Wind							
12		L/B =	1.88		G =	0.850					L/B =	0.533			
13		Cp =	-0.325		GCpi=	0.18					Cp =	-0.500			
14		Kd =	0.85				Plan		Elevation		G =	0.854			
15		I =	1												
16															

	Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
18	10	3.05	0.700	1.5744	0.02828	-0.01501
19	20	6.10	0.700	1.5744	0.02828	-0.01501

	Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
18	10	3.05	0.700	1.5744	0.0284	-0.019964
19	20	6.10	0.700	1.5744	0.0284	-0.019964

q_z, Excel Formula: =0.000613*D19*1*C$14*D$7*D$7*C$15

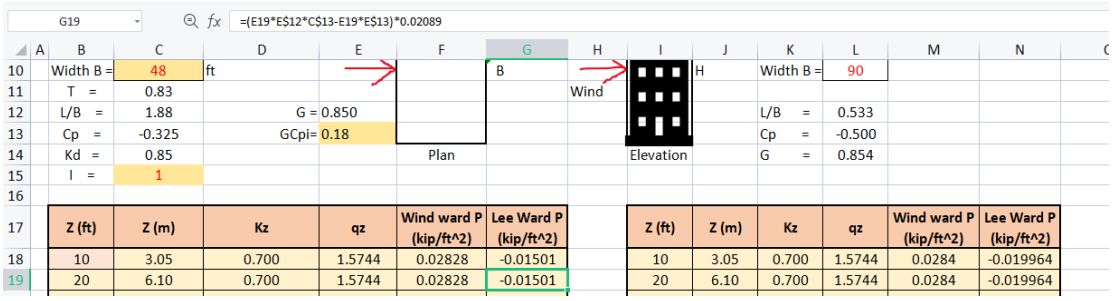


F19 =(E19*E$12*0.8-E19*(-E$13))*0.02089

Width B =	48	ft			B		H		Width B =	90					
T =	0.83					Wind									
L/B =	1.88		G =	0.850					L/B =	0.533					
Cp =	-0.325		GCpi=	0.18					Cp =	-0.500					
Kd =	0.85				Plan		Elevation		G =	0.854					
I =	1														

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)	Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.700	1.5744	0.02828	-0.01501	10	3.05	0.700	1.5744	0.0284	-0.019964
20	6.10	0.700	1.5744	0.02828	-0.01501	20	6.10	0.700	1.5744	0.0284	-0.019964

Windward P, Excel Formula: =(E19*E$12*0.8-E19*(-E$13))*0.02089



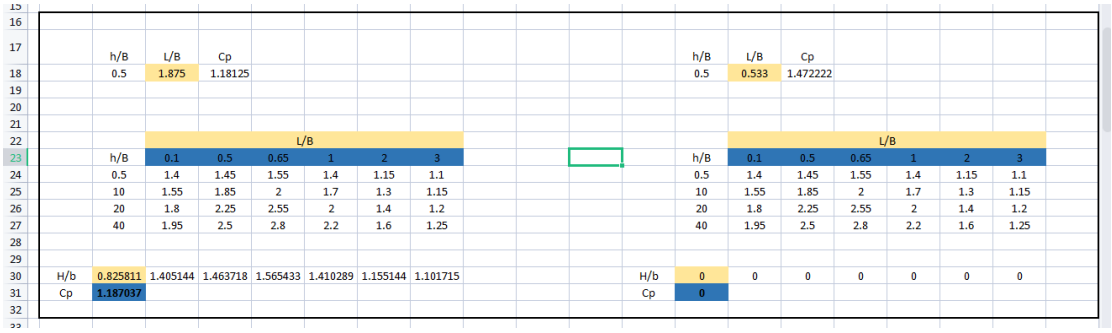
G19 =(E19*E$12*C$13-E19*E$13)*0.02089

Width B =	48	ft			B		H		Width B =	90					
T =	0.83					Wind									
L/B =	1.88		G =	0.850					L/B =	0.533					
Cp =	-0.325		GCpi=	0.18					Cp =	-0.500					
Kd =	0.85				Plan		Elevation		G =	0.854					
I =	1														

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)	Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.700	1.5744	0.02828	-0.01501	10	3.05	0.700	1.5744	0.0284	-0.019964
20	6.10	0.700	1.5744	0.02828	-0.01501	20	6.10	0.700	1.5744	0.0284	-0.019964

Leeward P, Excel Formula: =(E19*E$12*C$13-E19*E$13)*0.02089

I have used other data and tables to make these calculations successfully. These data and tables are shown below,



h/B	L/B	Cp
0.5	1.875	1.18125

	L/B					
h/B	0.1	0.5	0.65	1	2	3
0.5	1.4	1.45	1.55	1.4	1.15	1.1
10	1.55	1.85	2	1.7	1.3	1.15
20	1.8	2.25	2.55	2	1.4	1.2
40	1.95	2.5	2.8	2.2	1.6	1.25

H/b	0.825811	1.405144	1.463718	1.565433	1.410289	1.155144	1.101715
Cp	1.187037						

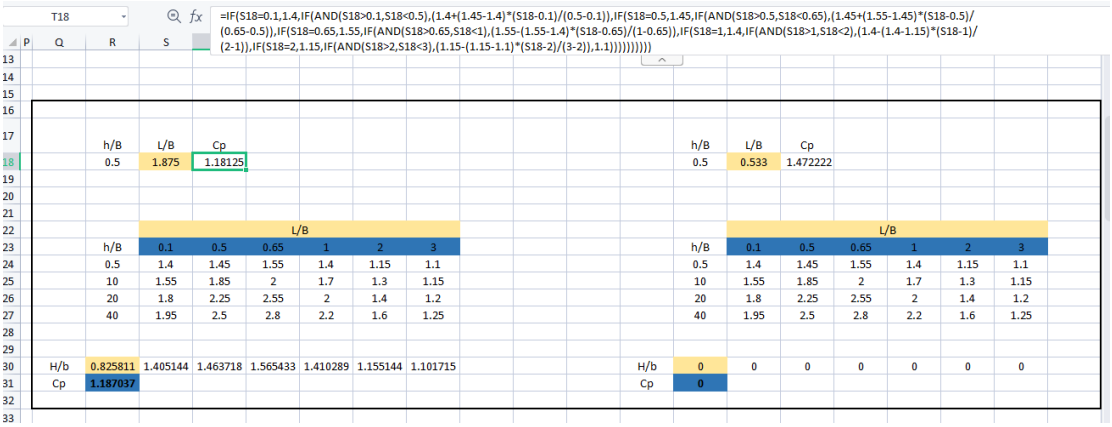
h/B	L/B	Cp
0.5	0.533	1.472222

	L/B					
h/B	0.1	0.5	0.65	1	2	3
0.5	1.4	1.45	1.55	1.4	1.15	1.1
10	1.55	1.85	2	1.7	1.3	1.15
20	1.8	2.25	2.55	2	1.4	1.2
40	1.95	2.5	2.8	2.2	1.6	1.25

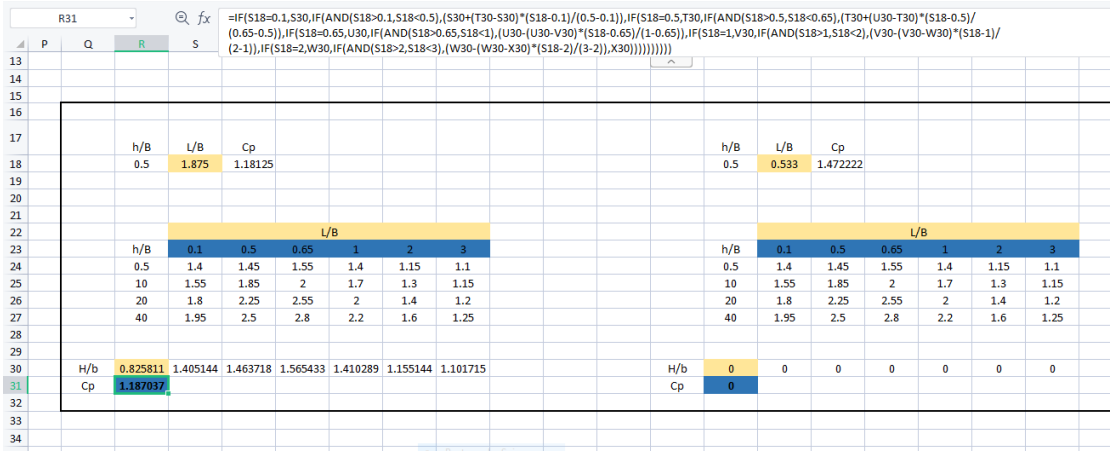
H/b	0	0	0	0	0	0	0
Cp	0						

Table 4.2: Data Table for C_p Calculation

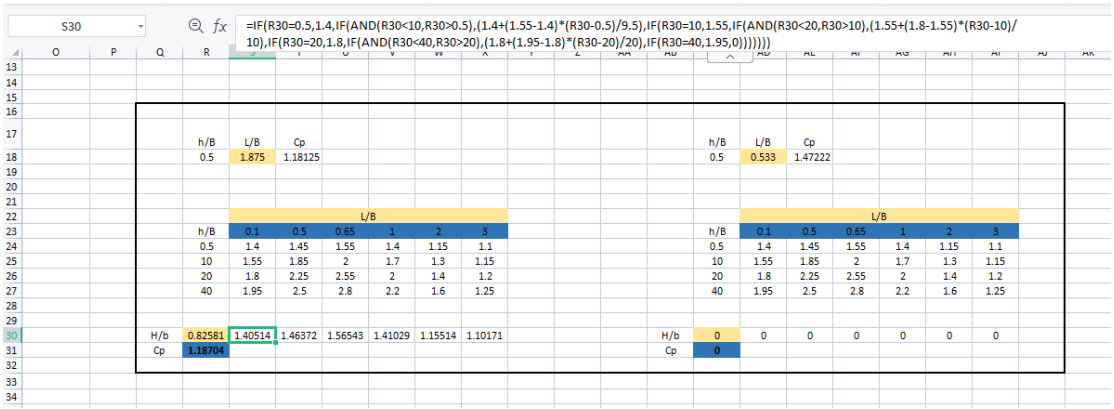
Here,



1st Cp, Excel Formula: =IF(S18=0.1,1.4,IF(AND(S18>0.1,S18<0.5),(1.4+(1.45-1.4)*(S18-0.1)/(0.5-0.1)),IF(S18=0.5,1.45,IF(AND(S18>0.5,S18<0.65),(1.45+(1.55-1.45)*(S18-0.5)/(0.65-0.5)),IF(S18=0.65,1.55,IF(AND(S18>0.65,S18<1),(1.55-(1.55-1.4)*(S18-0.65)/(1-0.65)),IF(S18=1,1.4,IF(AND(S18>1,S18<2),(1.4-(1.4-1.15)*(S18-1)/(2-1)),IF(S18=2,1.15,IF(AND(S18>2,S18<3),(1.15-(1.15-1.1)*(S18-2)/(3-2)),1.1)))))))))

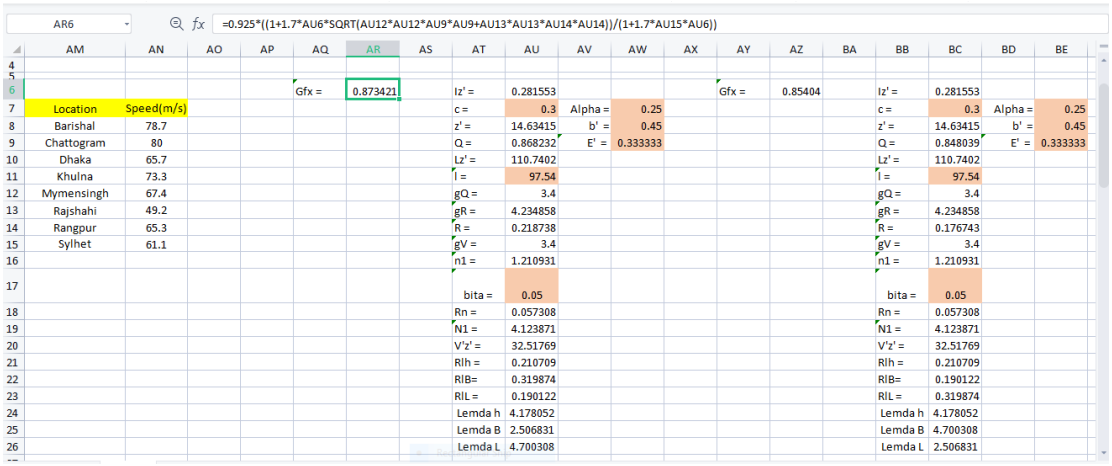


Final Cp, Excel Formula: =IF(S18=0.1,S30,IF(AND(S18>0.1,S18<0.5),(S30+(T30-S30)*(S18-0.1)/(0.5-0.1)),IF(S18=0.5,T30,IF(AND(S18>0.5,S18<0.65),(T30+(U30-T30)*(S18-0.5)/(0.65-0.5)),IF(S18=0.65,U30,IF(AND(S18>0.65,S18<1),(U30-(U30-V30)*(S18-0.65)/(1-0.65)),IF(S18=1,V30,IF(AND(S18>1,S18<2),(V30-(V30-W30)*(S18-1)/(2-1)),IF(S18=2,W30,IF(AND(S18>2,S18<3),(W30-(W30-X30)*(S18-2)/(3-2)),X30)))))))))

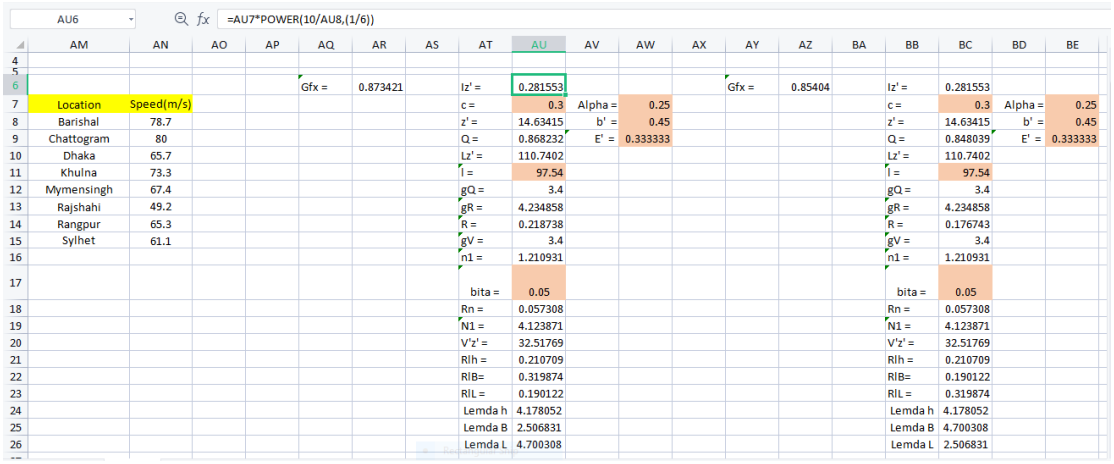


H/b, Excel Formula: =IF(R30=0.5,1.4,IF(AND(R30<10,R30>0.5),(1.4+(1.55-1.4)*(R30-0.5)/9.5),IF(R30=10,1.55,IF(AND(R30<20,R30>10),(1.55+(1.8-1.55)*(R30-10)/10),IF(R30=20,1.8,IF(AND(R30<40,R30>20),(1.8+(1.95-1.8)*(R30-20)/20),IF(R30=40,1.95,0)))))))

Other required values and their calculation formulas are shown below,

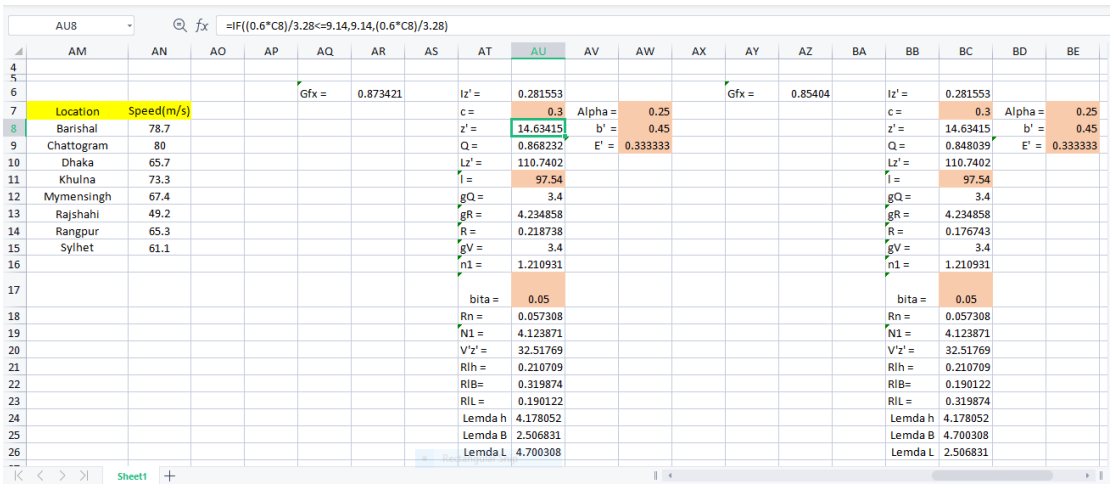


Gfx, Excel Formula: =0.925*((1+1.7*AU6*SQRT(AU12*AU12*AU9*AU9+AU13*AU13*AU14*AU14))/(1+1.7*AU15*AU6))



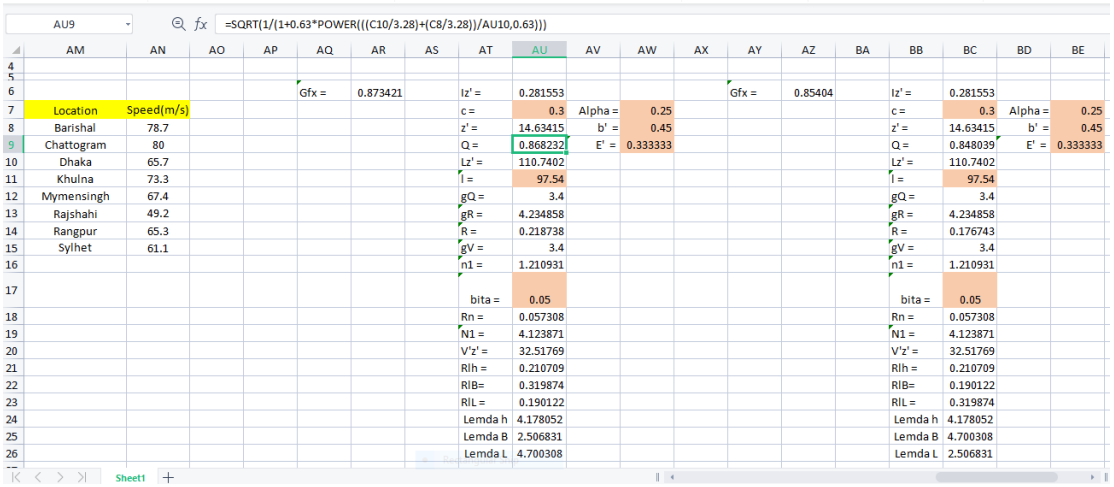
	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE
4																			
5																			
6					Gfx =	0.873421		Iz' =	0.281553				Gfx =	0.85404		Iz' =	0.281553		
7	Location	Speed(m/s)						c =	0.3	Alpha =	0.25					c =	0.3	Alpha =	0.25
8	Barishal	78.7						z' =	14.63415	b' =	0.45					z' =	14.63415	b' =	0.45
9	Chattogram	80						Q =	0.868232	E' =	0.333333					Q =	0.848039	E' =	0.333333
10	Dhaka	65.7						Lz' =	110.7402							Lz' =	110.7402		
11	Khulna	73.3						l =	97.54							l =	97.54		
12	Mymensingh	67.4						gQ =	3.4							gQ =	3.4		
13	Rajshahi	49.2						gR =	4.234858							gR =	4.234858		
14	Rangpur	65.3						R =	0.218738							R =	0.176743		
15	Sylhet	61.1						gV =	3.4							gV =	3.4		
16								n1 =	1.210931							n1 =	1.210931		
17								bita =	0.05							bita =	0.05		
18								Rn =	0.057308							Rn =	0.057308		
19								N1 =	4.123871							N1 =	4.123871		
20								V'z' =	32.51769							V'z' =	32.51769		
21								Rlh =	0.210709							Rlh =	0.210709		
22								RlB=	0.319874							RlB=	0.190122		
23								RlL =	0.190122							RlL =	0.319874		
24								Lemda h	4.178052							Lemda h	4.178052		
25								Lemda B	2.506831							Lemda B	4.700308		
26								Lemda L	4.700308							Lemda L	2.506831		

Iz', Excel Formula: =AU7*POWER(10/AU8,(1/6))



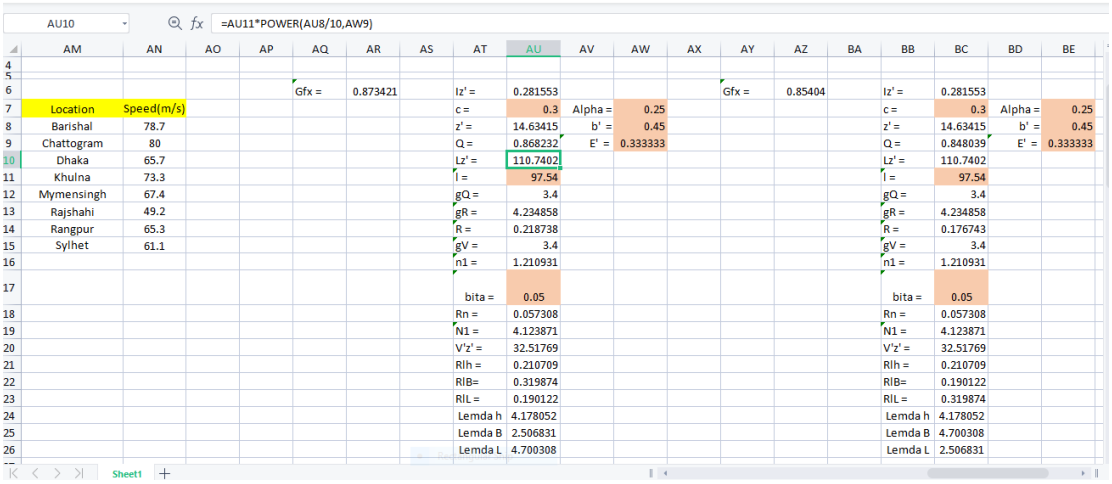
	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE
4																			
5																			
6					Gfx =	0.873421		Iz' =	0.281553				Gfx =	0.85404		Iz' =	0.281553		
7	Location	Speed(m/s)						c =	0.3	Alpha =	0.25					c =	0.3	Alpha =	0.25
8	Barishal	78.7						z' =	14.63415	b' =	0.45					z' =	14.63415	b' =	0.45
9	Chattogram	80						Q =	0.868232	E' =	0.333333					Q =	0.848039	E' =	0.333333
10	Dhaka	65.7						Lz' =	110.7402							Lz' =	110.7402		
11	Khulna	73.3						l =	97.54							l =	97.54		
12	Mymensingh	67.4						gQ =	3.4							gQ =	3.4		
13	Rajshahi	49.2						gR =	4.234858							gR =	4.234858		
14	Rangpur	65.3						R =	0.218738							R =	0.176743		
15	Sylhet	61.1						gV =	3.4							gV =	3.4		
16								n1 =	1.210931							n1 =	1.210931		
17								bita =	0.05							bita =	0.05		
18								Rn =	0.057308							Rn =	0.057308		
19								N1 =	4.123871							N1 =	4.123871		
20								V'z' =	32.51769							V'z' =	32.51769		
21								Rlh =	0.210709							Rlh =	0.210709		
22								RlB=	0.319874							RlB=	0.190122		
23								RlL =	0.190122							RlL =	0.319874		
24								Lemda h	4.178052							Lemda h	4.178052		
25								Lemda B	2.506831							Lemda B	4.700308		
26								Lemda L	4.700308							Lemda L	2.506831		

z', Excel Formula: =IF((0.6*C8)/3.28<=9.14,9.14,(0.6*C8)/3.28)



	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE
4																			
5																			
6					Gfx =	0.873421		Iz' =	0.281553				Gfx =	0.85404		Iz' =	0.281553		
7	Location	Speed(m/s)						c =	0.3	Alpha =	0.25					c =	0.3	Alpha =	0.25
8	Barishal	78.7						z' =	14.63415	b' =	0.45					z' =	14.63415	b' =	0.45
9	Chattogram	80						Q =	0.868232	E' =	0.333333					Q =	0.848039	E' =	0.333333
10	Dhaka	65.7						Lz' =	110.7402							Lz' =	110.7402		
11	Khulna	73.3						l =	97.54							l =	97.54		
12	Mymensingh	67.4						gQ =	3.4							gQ =	3.4		
13	Rajshahi	49.2						gR =	4.234858							gR =	4.234858		
14	Rangpur	65.3						R =	0.218738							R =	0.176743		
15	Sylhet	61.1						gV =	3.4							gV =	3.4		
16								n1 =	1.210931							n1 =	1.210931		
17								bita =	0.05							bita =	0.05		
18								Rn =	0.057308							Rn =	0.057308		
19								N1 =	4.123871							N1 =	4.123871		
20								V'z' =	32.51769							V'z' =	32.51769		
21								Rlh =	0.210709							Rlh =	0.210709		
22								RlB=	0.319874							RlB=	0.190122		
23								RlL =	0.190122							RlL =	0.319874		
24								Lemda h	4.178052							Lemda h	4.178052		
25								Lemda B	2.506831							Lemda B	4.700308		
26								Lemda L	4.700308							Lemda L	2.506831		

Q, Excel Formula: =SQRT(1/(1+0.63*POWER(((C10/3.28)+(C8/3.28))/AU10,0.63)))

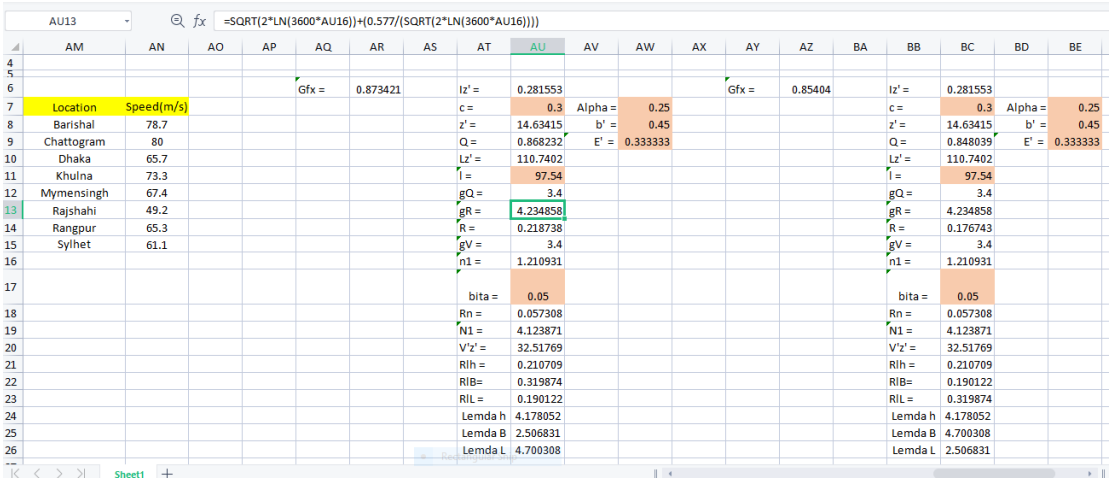


AU10 | =AU11*POWER(AU8/10,AW9)

Location	Speed(m/s)
Barishal	78.7
Chattogram	80
Dhaka	65.7
Khulna	73.3
Mymensingh	67.4
Rajshahi	49.2
Rangpur	65.3
Sylhet	61.1

				Gfx =	0.873421		Iz' =	0.281553				Gfx =	0.85404		Iz' =	0.281553		
							c =	0.3	Alpha =	0.25					c =	0.3	Alpha =	0.25
							z' =	14.63415	b' =	0.45					z' =	14.63415	b' =	0.45
							Q =	0.868232	E' =	0.333333					Q =	0.848039	E' =	0.333333
							Lz' =	110.7402							Lz' =	110.7402		
							l =	97.54							l =	97.54		
							gQ =	3.4							gQ =	3.4		
							gR =	4.234858							gR =	4.234858		
							R =	0.218738							R =	0.176743		
							gV =	3.4							gV =	3.4		
							n1 =	1.210931							n1 =	1.210931		
							bita =	0.05							bita =	0.05		
							Rn =	0.057308							Rn =	0.057308		
							N1 =	4.123871							N1 =	4.123871		
							V'z' =	32.51769							V'z' =	32.51769		
							Rlh =	0.210709							Rlh =	0.210709		
							RlB=	0.319874							RlB=	0.190122		
							RlL =	0.190122							RlL =	0.319874		
							Lemda h	4.178052							Lemda h	4.178052		
							Lemda B	2.506831							Lemda B	4.700308		
							Lemda L	4.700308							Lemda L	2.506831		

Lz', Excel Formula: =AU11*POWER(AU8/10,AW9)

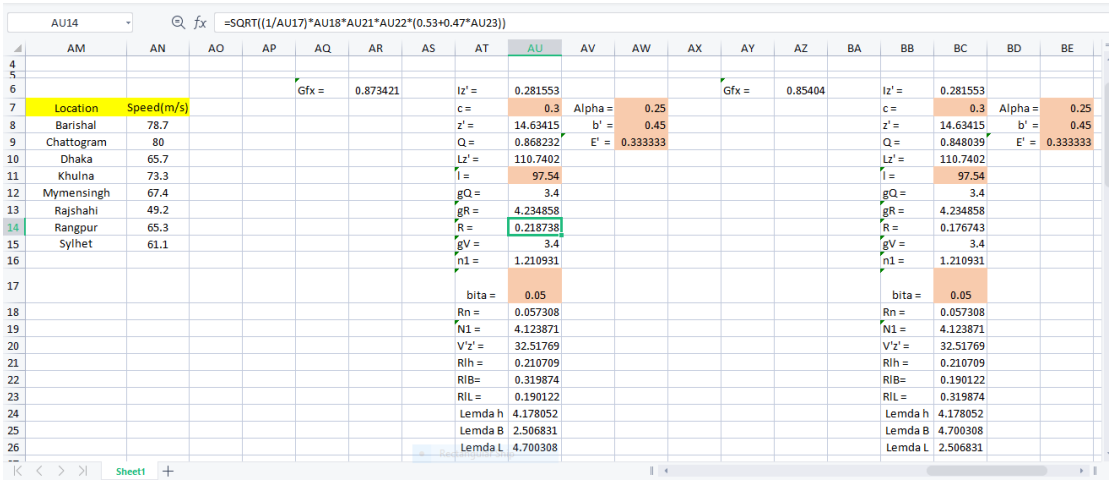


AU13 | =SQRT(2*LN(3600*AU16))+(0.577/(SQRT(2*LN(3600*AU16))))

Location	Speed(m/s)
Barishal	78.7
Chattogram	80
Dhaka	65.7
Khulna	73.3
Mymensingh	67.4
Rajshahi	49.2
Rangpur	65.3
Sylhet	61.1

				Gfx =	0.873421		Iz' =	0.281553				Gfx =	0.85404		Iz' =	0.281553		
							c =	0.3	Alpha =	0.25					c =	0.3	Alpha =	0.25
							z' =	14.63415	b' =	0.45					z' =	14.63415	b' =	0.45
							Q =	0.868232	E' =	0.333333					Q =	0.848039	E' =	0.333333
							Lz' =	110.7402							Lz' =	110.7402		
							l =	97.54							l =	97.54		
							gQ =	3.4							gQ =	3.4		
							gR =	4.234858							gR =	4.234858		
							R =	0.218738							R =	0.176743		
							gV =	3.4							gV =	3.4		
							n1 =	1.210931							n1 =	1.210931		
							bita =	0.05							bita =	0.05		
							Rn =	0.057308							Rn =	0.057308		
							N1 =	4.123871							N1 =	4.123871		
							V'z' =	32.51769							V'z' =	32.51769		
							Rlh =	0.210709							Rlh =	0.210709		
							RlB=	0.319874							RlB=	0.190122		
							RlL =	0.190122							RlL =	0.319874		
							Lemda h	4.178052							Lemda h	4.178052		
							Lemda B	2.506831							Lemda B	4.700308		
							Lemda L	4.700308							Lemda L	2.506831		

gR, Excel Formula:
=SQRT(2*LN(3600*AU16))+(0.577/(SQRT(2*LN(3600*AU16))))

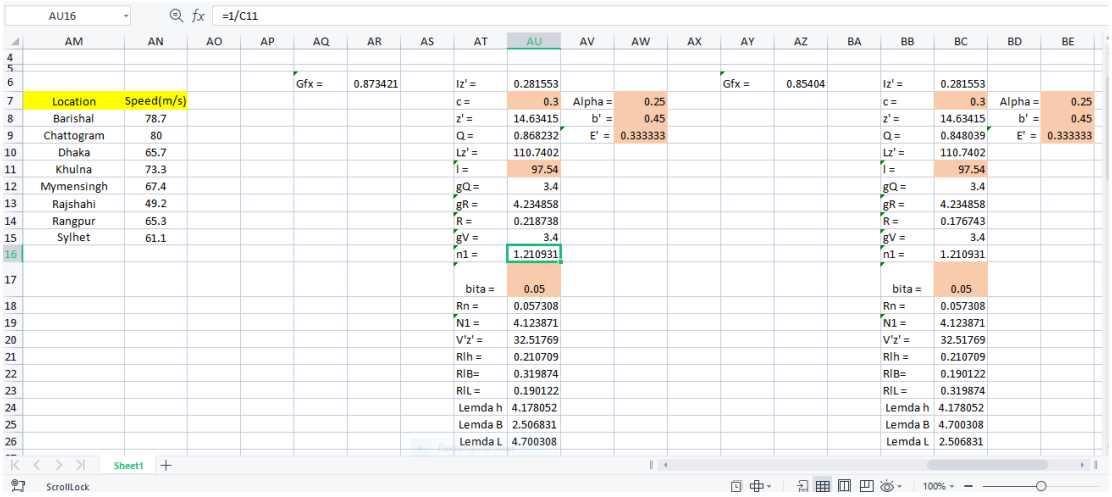


AU14 | =SQRT((1/AU17)*AU18*AU21*AU22*(0.53+0.47*AU23))

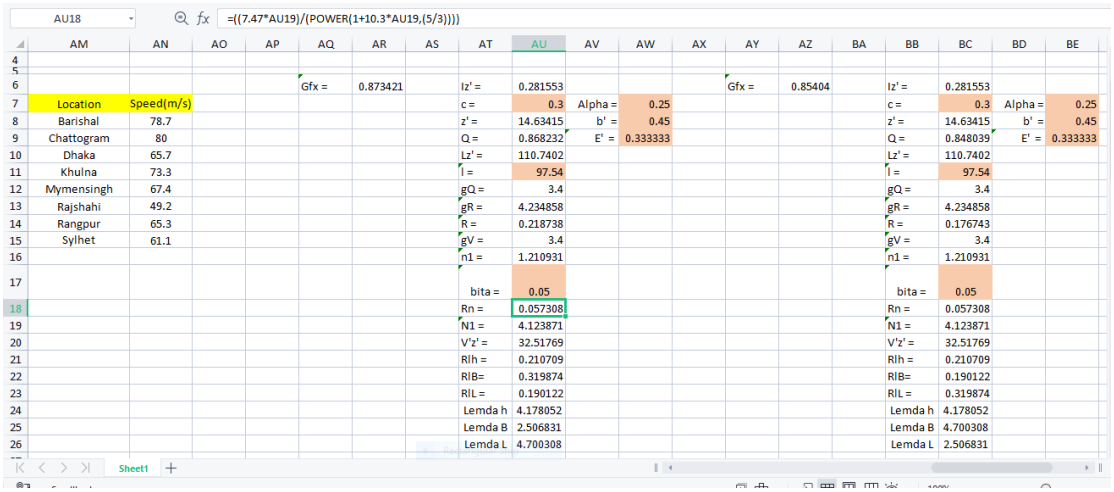
Location	Speed(m/s)
Barishal	78.7
Chattogram	80
Dhaka	65.7
Khulna	73.3
Mymensingh	67.4
Rajshahi	49.2
Rangpur	65.3
Sylhet	61.1

				Gfx =	0.873421		Iz' =	0.281553				Gfx =	0.85404		Iz' =	0.281553		
							c =	0.3	Alpha =	0.25					c =	0.3	Alpha =	0.25
							z' =	14.63415	b' =	0.45					z' =	14.63415	b' =	0.45
							Q =	0.868232	E' =	0.333333					Q =	0.848039	E' =	0.333333
							Lz' =	110.7402							Lz' =	110.7402		
							l =	97.54							l =	97.54		
							gQ =	3.4							gQ =	3.4		
							gR =	4.234858							gR =	4.234858		
							R =	0.218738							R =	0.176743		
							gV =	3.4							gV =	3.4		
							n1 =	1.210931							n1 =	1.210931		
							bita =	0.05							bita =	0.05		
							Rn =	0.057308							Rn =	0.057308		
							N1 =	4.123871							N1 =	4.123871		
							V'z' =	32.51769							V'z' =	32.51769		
							Rlh =	0.210709							Rlh =	0.210709		
							RlB=	0.319874							RlB=	0.190122		
							RlL =	0.190122							RlL =	0.319874		
							Lemda h	4.178052							Lemda h	4.178052		
							Lemda B	2.506831							Lemda B	4.700308		
							Lemda L	4.700308							Lemda L	2.506831		

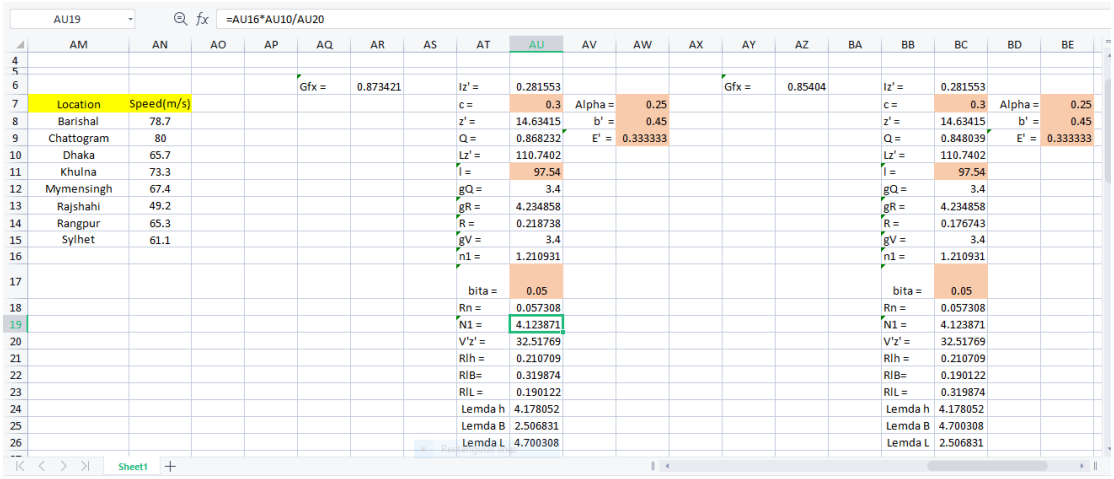
R, Excel Formula: =SQRT((1/AU17)*AU18*AU21*AU22*(0.53+0.47*AU23))



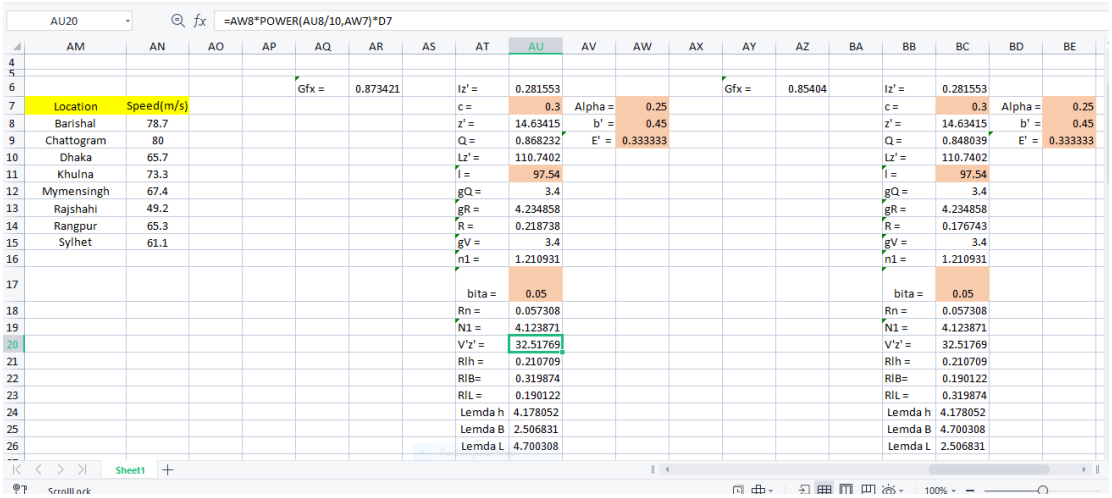
n1, Excel Formula: =1/C11



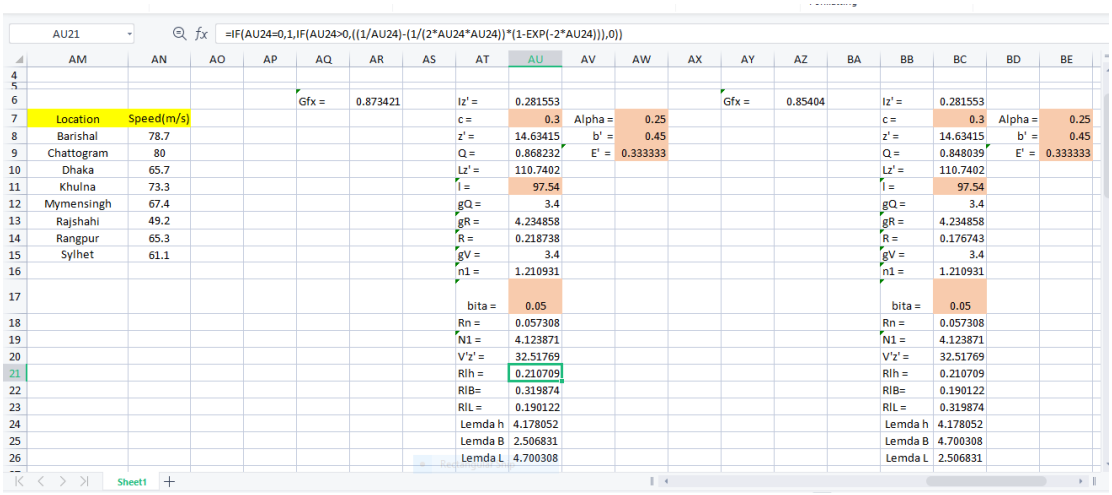
Rn, Excel Formula: =((7.47*AU19)/(POWER(1+10.3*AU19,(5/3))))



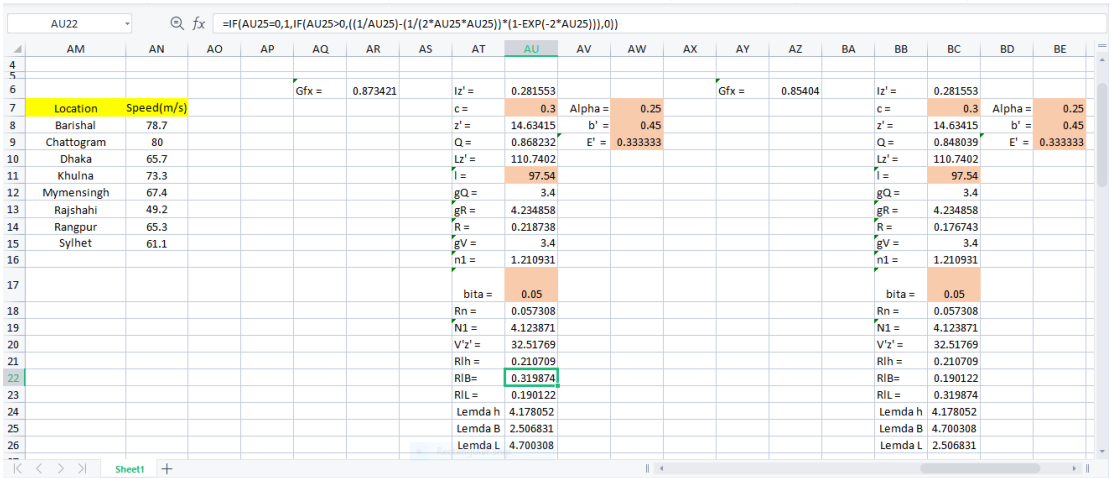
N1, Excel Formula: =AU16*AU10/AU20



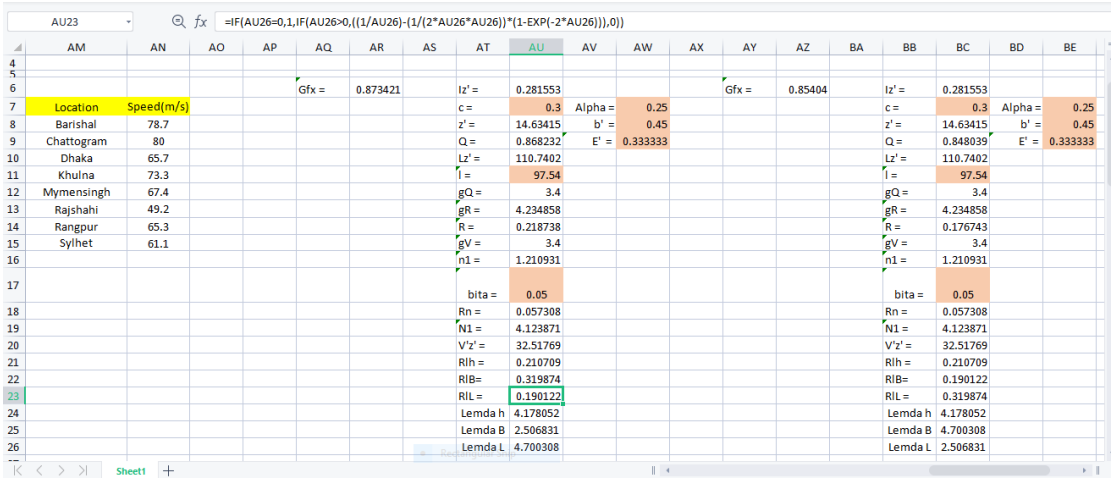
v'z', Excel Formula: =AW8*POWER(AU8/10,AW7)*D7



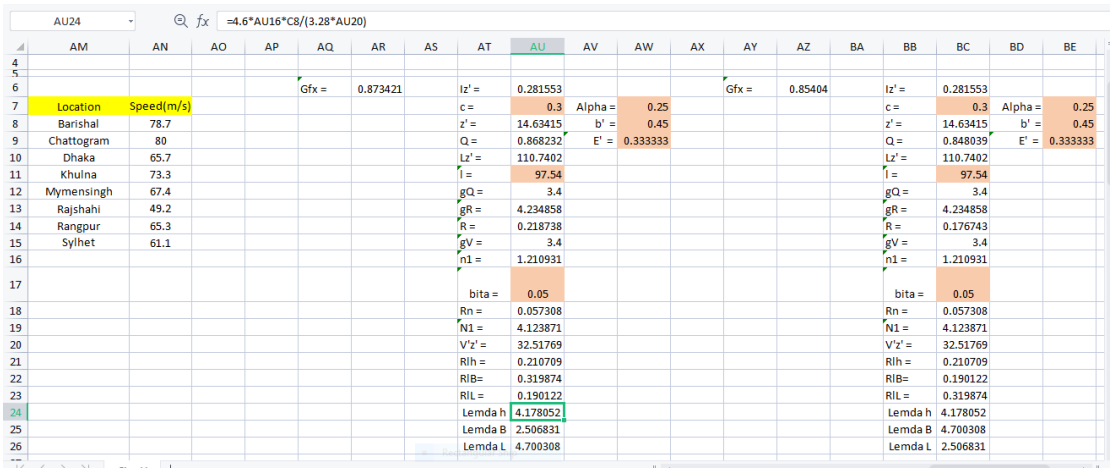
Rlh, Excel Formula: =IF(AU24=0,1,IF(AU24>0,((1/AU24)-(1/(2*AU24*AU24)))*(1-EXP(-2*AU24))),0))



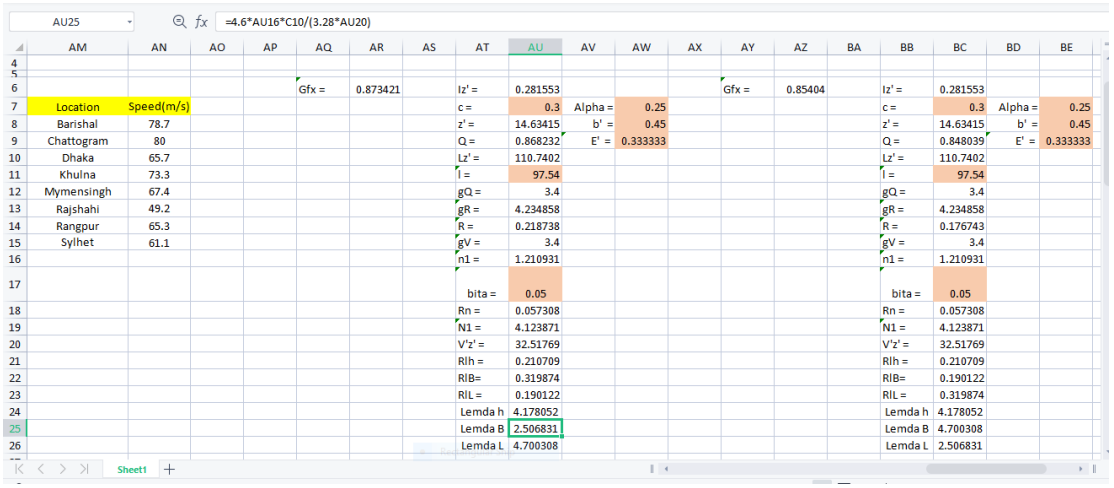
RlB, Excel Formula: =IF(AU25=0,1,IF(AU25>0,((1/AU25)-(1/(2*AU25*AU25)))*(1-EXP(-2*AU25))),0))



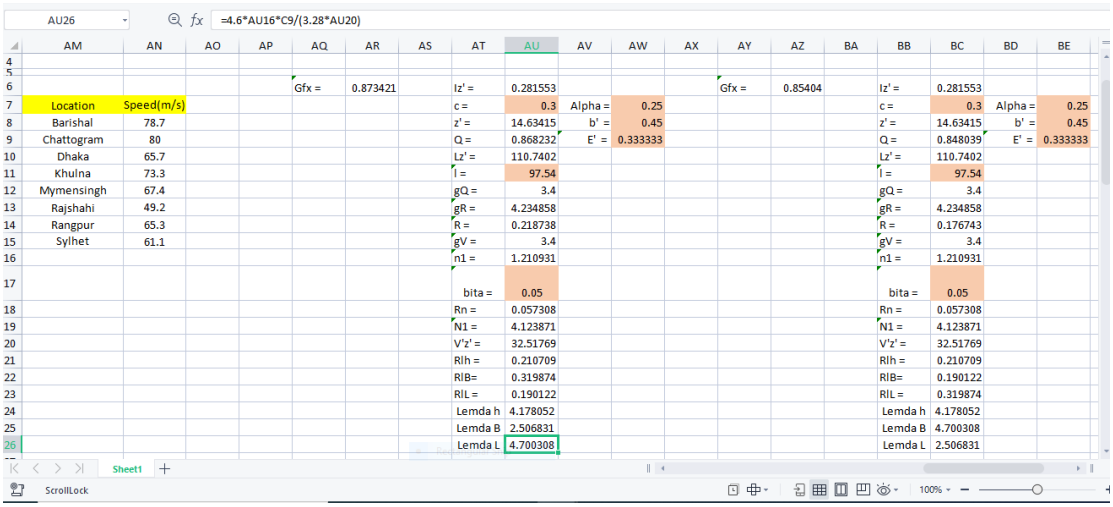
RlL, Excel Formula: =IF(AU26=0,1,IF(AU26>0,((1/AU26)-(1/(2*AU26*AU26))*(1-EXP(-2*AU26))),0))



Lemda h, Excel Formula: =4.6*AU16*C8/(3.28*AU20)



Lemda B, Excel Formula: =4.6*AU16*C10/(3.28*AU20)

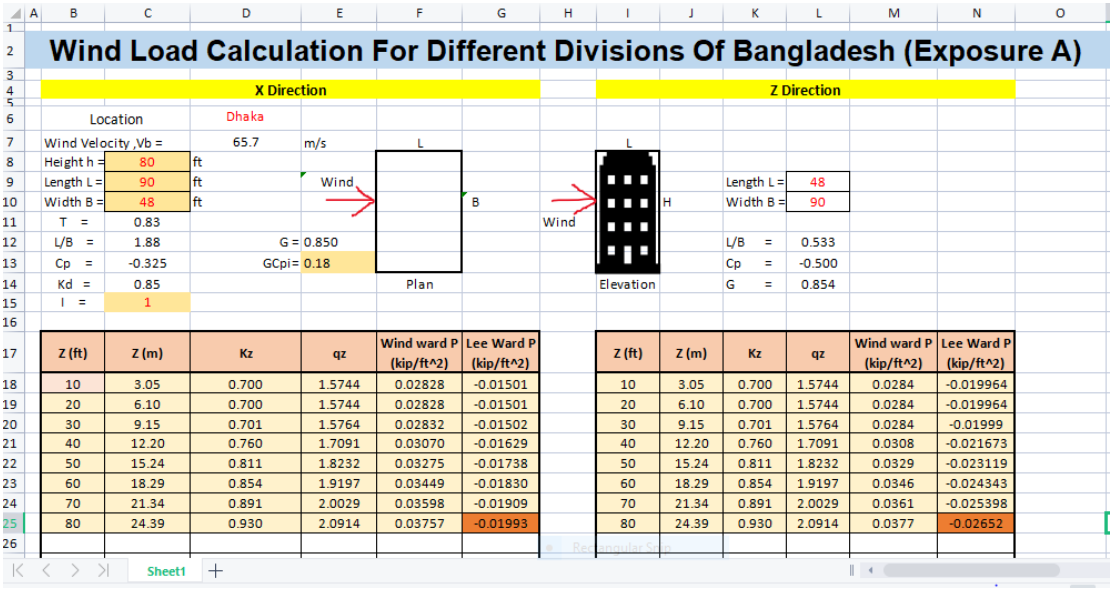


Location	Speed(m/s)
Barishal	78.7
Chattogram	80
Dhaka	65.7
Khulna	73.3
Mymensingh	67.4
Rajshahi	49.2
Rangpur	65.3
Sylhet	61.1

				Gfx =	0.873421		Iz' =	0.281553				Gfx =	0.85404		Iz' =	0.281553		
							c =	0.3	Alpha =	0.25					c =	0.3	Alpha =	0.25
							z' =	14.63415	b' =	0.45					z' =	14.63415	b' =	0.45
							Q =	0.868232	E' =	0.333333					Q =	0.848039	E' =	0.333333
							Lz' =	110.7402							Lz' =	110.7402		
							l =	97.54							l =	97.54		
							gQ =	3.4							gQ =	3.4		
							gR =	4.234858							gR =	4.234858		
							R =	0.218738							R =	0.176743		
							gV =	3.4							gV =	3.4		
							n1 =	1.210931							n1 =	1.210931		
							bita =	0.05							bita =	0.05		
							Rn =	0.057308							Rn =	0.057308		
							N1 =	4.123871							N1 =	4.123871		
							V'z' =	32.51769							V'z' =	32.51769		
							Rlh =	0.210709							Rlh =	0.210709		
							RlB=	0.319874							RlB=	0.190122		
							Rl L =	0.190122							Rl L =	0.319874		
							Lemda h	4.178052							Lemda h	4.178052		
							Lemda B	2.506831							Lemda B	4.700308		
							Lemda L	4.700308							Lemda L	2.506831		

Lemda L, Excel Formula: =4.6*AU16*C9/(3.28*AU20)

After all the calculation wind load for Dhaka divisions (Exposure A) is shown below,



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure A)

X Direction

Location		Dhaka	
Wind Velocity ,Vb =		65.7	m/s
Height h =	80	ft	
Length L =	90	ft	
Width B =	48	ft	
T =	0.83		
L/B =	1.88	G =	0.850
Cp =	-0.325	GCpi=	0.18
Kd =	0.85		
I =	1		

Plan

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.700	1.5744	0.02828	-0.01501
20	6.10	0.700	1.5744	0.02828	-0.01501
30	9.15	0.701	1.5764	0.02832	-0.01502
40	12.20	0.760	1.7091	0.03070	-0.01629
50	15.24	0.811	1.8232	0.03275	-0.01738
60	18.29	0.854	1.9197	0.03449	-0.01830
70	21.34	0.891	2.0029	0.03598	-0.01909
80	24.39	0.930	2.0914	0.03757	-0.01993

Z Direction

Length L =	48
Width B =	90
L/B =	0.533
Cp =	-0.500
G =	0.854

Elevation

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.700	1.5744	0.0284	-0.019964
20	6.10	0.700	1.5744	0.0284	-0.019964
30	9.15	0.701	1.5764	0.0284	-0.01999
40	12.20	0.760	1.7091	0.0308	-0.021673
50	15.24	0.811	1.8232	0.0329	-0.023119
60	18.29	0.854	1.9197	0.0346	-0.024343
70	21.34	0.891	2.0029	0.0361	-0.025398
80	24.39	0.930	2.0914	0.0377	-0.02652

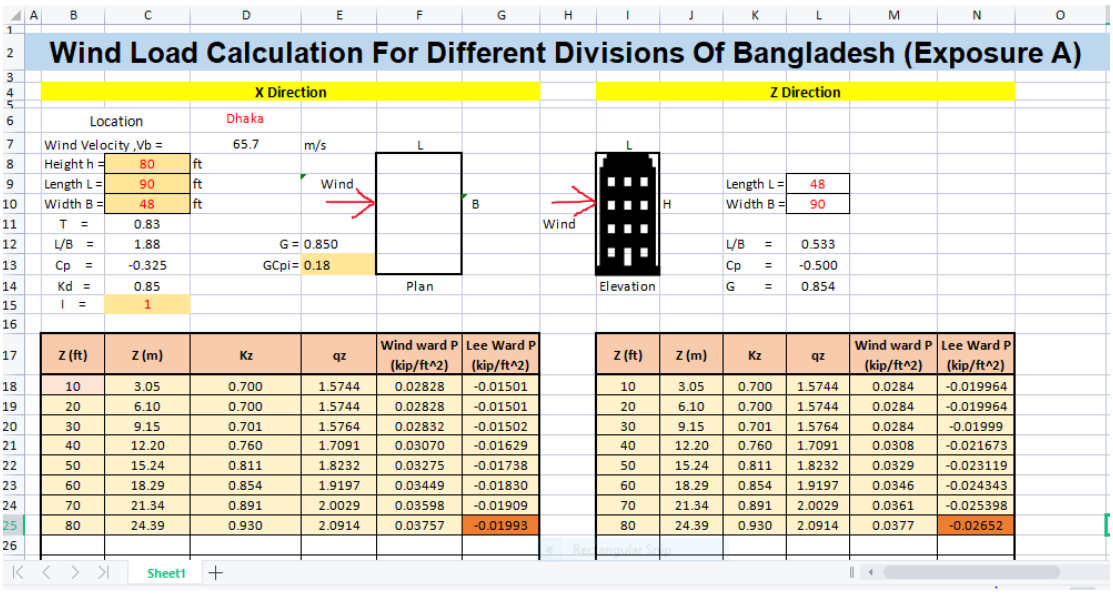
Fig. 4.1: Design Wind Load for Dhaka Division

Maximum value was found on the 8th storey. The direction is windward z and the result is $P = 0.0377$ kip/ft^2.

CHAPTER V

Results and Comparisons

5.1 Wind loads of eight divisions of Bangladesh for Exposure A, B and C.



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure A)

X Direction

Location	Dhaka		
Wind Velocity ,Vb =	65.7	m/s	
Height h =	80	ft	
Length L =	90	ft	
Width B =	48	ft	
T =	0.83		
L/B =	1.88	G =	0.850
Cp =	-0.325	GCpi =	0.18
Kd =	0.85		
I =	1		

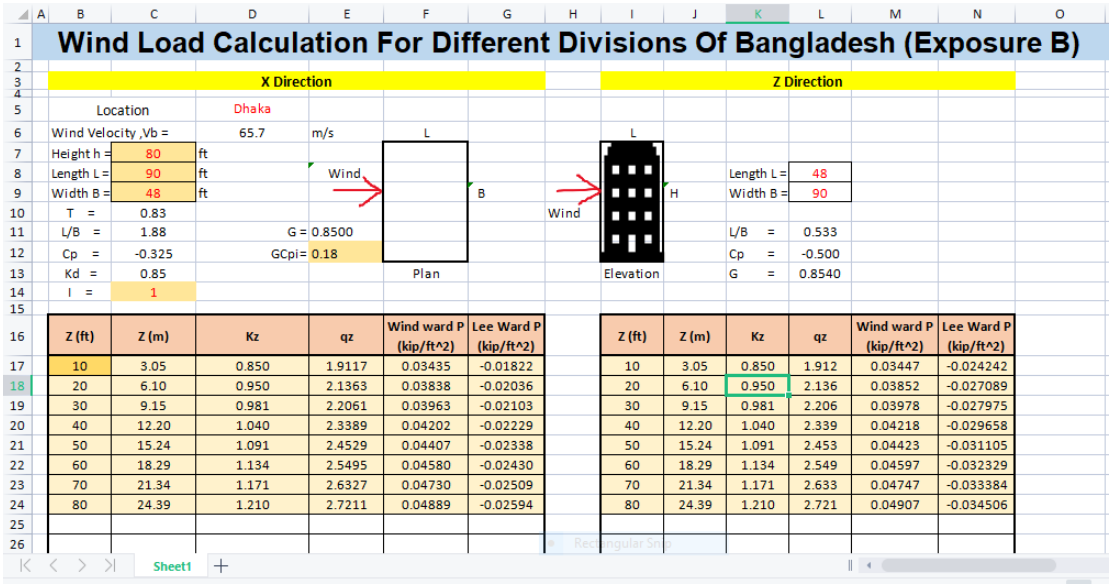
Z Direction

Length L =	48
Width B =	90
L/B =	0.533
Cp =	-0.500
G =	0.854

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.700	1.5744	0.02828	-0.01501
20	6.10	0.700	1.5744	0.02828	-0.01501
30	9.15	0.701	1.5764	0.02832	-0.01502
40	12.20	0.760	1.7091	0.03070	-0.01629
50	15.24	0.811	1.8232	0.03275	-0.01738
60	18.29	0.854	1.9197	0.03449	-0.01830
70	21.34	0.891	2.0029	0.03598	-0.01909
80	24.39	0.930	2.0914	0.03757	-0.01993

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.700	1.5744	0.0284	-0.019964
20	6.10	0.700	1.5744	0.0284	-0.019964
30	9.15	0.701	1.5764	0.0284	-0.01999
40	12.20	0.760	1.7091	0.0308	-0.021673
50	15.24	0.811	1.8232	0.0329	-0.023119
60	18.29	0.854	1.9197	0.0346	-0.024343
70	21.34	0.891	2.0029	0.0361	-0.025398
80	24.39	0.930	2.0914	0.0377	-0.02652

Fig. 5.1: Dhaka Division (Exposure A)



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure B)

X Direction

Location	Dhaka		
Wind Velocity ,Vb =	65.7	m/s	
Height h =	80	ft	
Length L =	90	ft	
Width B =	48	ft	
T =	0.83		
L/B =	1.88	G =	0.8500
Cp =	-0.325	GCpi =	0.18
Kd =	0.85		
I =	1		

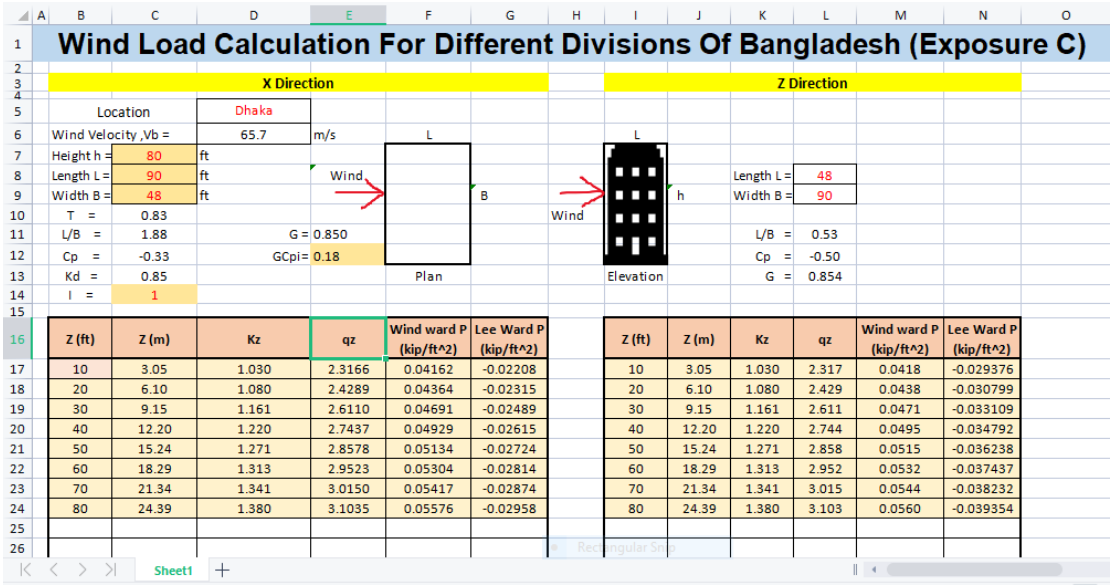
Z Direction

Length L =	48
Width B =	90
L/B =	0.533
Cp =	-0.500
G =	0.8540

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.850	1.9117	0.03435	-0.01822
20	6.10	0.950	2.1363	0.03838	-0.02036
30	9.15	0.981	2.2061	0.03963	-0.02103
40	12.20	1.040	2.3389	0.04202	-0.02229
50	15.24	1.091	2.4529	0.04407	-0.02338
60	18.29	1.134	2.5495	0.04580	-0.02430
70	21.34	1.171	2.6327	0.04730	-0.02509
80	24.39	1.210	2.7211	0.04889	-0.02594

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.850	1.912	0.03447	-0.024242
20	6.10	0.950	2.136	0.03852	-0.027089
30	9.15	0.981	2.206	0.03978	-0.027975
40	12.20	1.040	2.339	0.04218	-0.029658
50	15.24	1.091	2.453	0.04423	-0.031105
60	18.29	1.134	2.549	0.04597	-0.032329
70	21.34	1.171	2.633	0.04747	-0.033384
80	24.39	1.210	2.721	0.04907	-0.034506

Fig. 5.2: Dhaka Division (Exposure B)



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure C)

X Direction

Location	Dhaka	
Wind Velocity ,Vb =	65.7	m/s
Height h =	80	ft
Length L =	90	ft
Width B =	48	ft
T =	0.83	
L/B =	1.88	
Cp =	-0.33	
Kd =	0.85	
I =	1	
G =	0.850	
GCpi=	0.18	

Plan

Z Direction

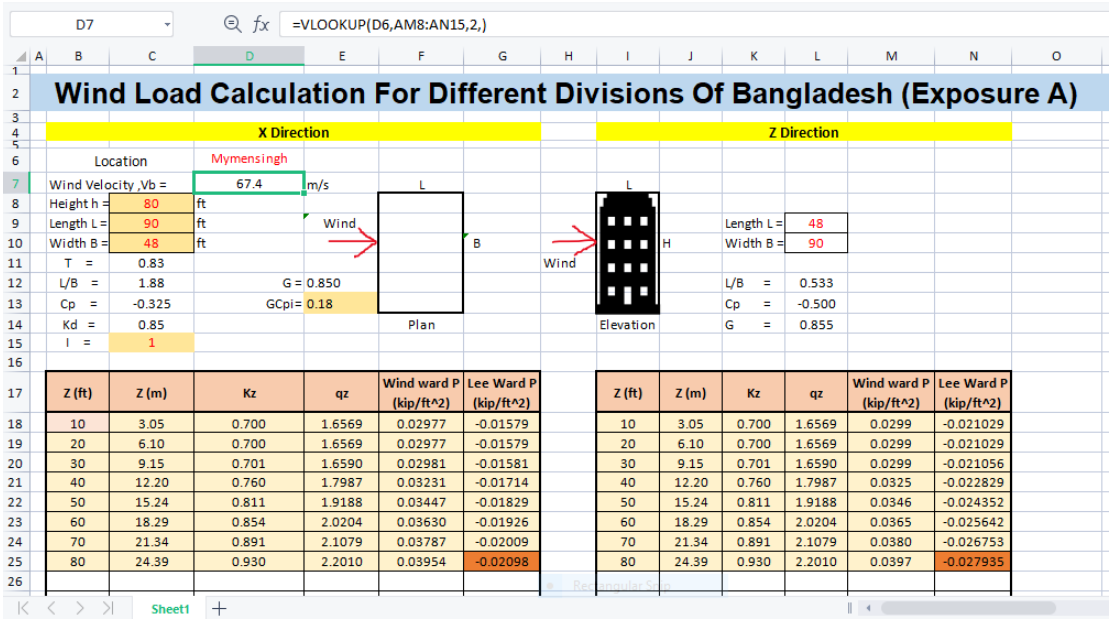
Elevation

Length L =	48
Width B =	90
L/B =	0.53
Cp =	-0.50
G =	0.854

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	1.030	2.3166	0.04162	-0.02208
20	6.10	1.080	2.4289	0.04364	-0.02315
30	9.15	1.161	2.6110	0.04691	-0.02489
40	12.20	1.220	2.7437	0.04929	-0.02615
50	15.24	1.271	2.8578	0.05134	-0.02724
60	18.29	1.313	2.9523	0.05304	-0.02814
70	21.34	1.341	3.0150	0.05417	-0.02874
80	24.39	1.380	3.1035	0.05576	-0.02958

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	1.030	2.317	0.0418	-0.029376
20	6.10	1.080	2.429	0.0438	-0.030799
30	9.15	1.161	2.611	0.0471	-0.033109
40	12.20	1.220	2.744	0.0495	-0.034792
50	15.24	1.271	2.858	0.0515	-0.036238
60	18.29	1.313	2.952	0.0532	-0.037437
70	21.34	1.341	3.015	0.0544	-0.038232
80	24.39	1.380	3.103	0.0560	-0.039354

Fig. 5.3: Dhaka Division (Exposure C)



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure A)

X Direction

Location	Mymensingh	
Wind Velocity ,Vb =	67.4	m/s
Height h =	80	ft
Length L =	90	ft
Width B =	48	ft
T =	0.83	
L/B =	1.88	
Cp =	-0.325	
Kd =	0.85	
I =	1	
G =	0.850	
GCpi=	0.18	

Plan

Z Direction

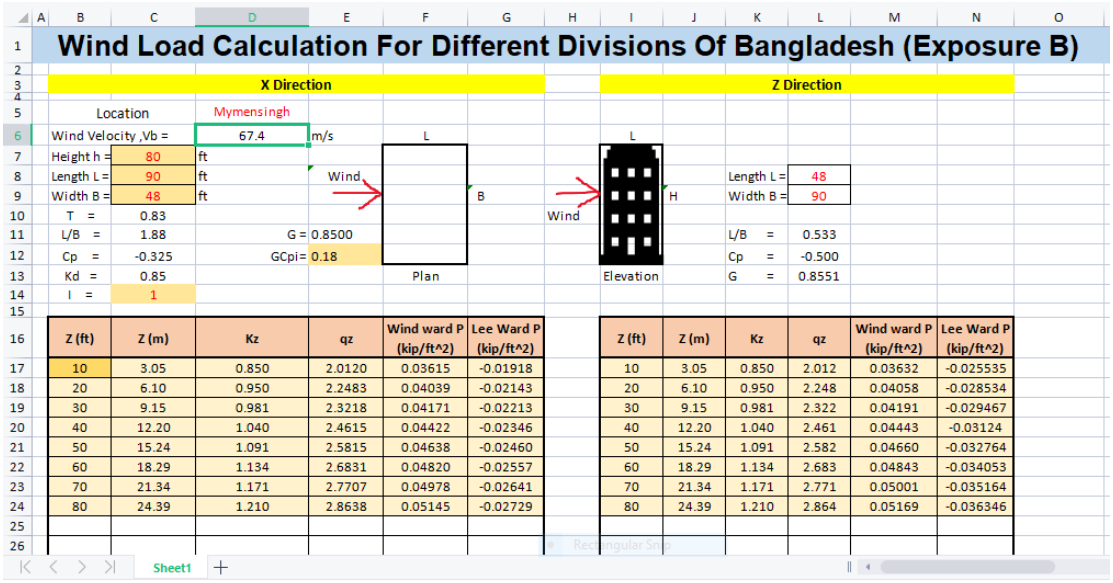
Elevation

Length L =	48
Width B =	90
L/B =	0.533
Cp =	-0.500
G =	0.855

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.700	1.6569	0.02977	-0.01579
20	6.10	0.700	1.6569	0.02977	-0.01579
30	9.15	0.701	1.6590	0.02981	-0.01581
40	12.20	0.760	1.7987	0.03231	-0.01714
50	15.24	0.811	1.9188	0.03447	-0.01829
60	18.29	0.854	2.0204	0.03630	-0.01926
70	21.34	0.891	2.1079	0.03787	-0.02009
80	24.39	0.930	2.2010	0.03954	-0.02098

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.700	1.6569	0.0299	-0.021029
20	6.10	0.700	1.6569	0.0299	-0.021029
30	9.15	0.701	1.6590	0.0299	-0.021056
40	12.20	0.760	1.7987	0.0325	-0.022829
50	15.24	0.811	1.9188	0.0346	-0.024352
60	18.29	0.854	2.0204	0.0365	-0.025642
70	21.34	0.891	2.1079	0.0380	-0.026753
80	24.39	0.930	2.2010	0.0397	-0.027935

Fig. 5.4: Mymensingh Division (Exposure A)



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure B)

X Direction

Location	Mymensingh		
Wind Velocity ,Vb =	67.4	m/s	
Height h =	80	ft	
Length L =	90	ft	
Width B =	48	ft	
T =	0.83		
L/B =	1.88	G =	0.8500
Cp =	-0.325	GCpi=	0.18
Kd =	0.85		
I =	1		

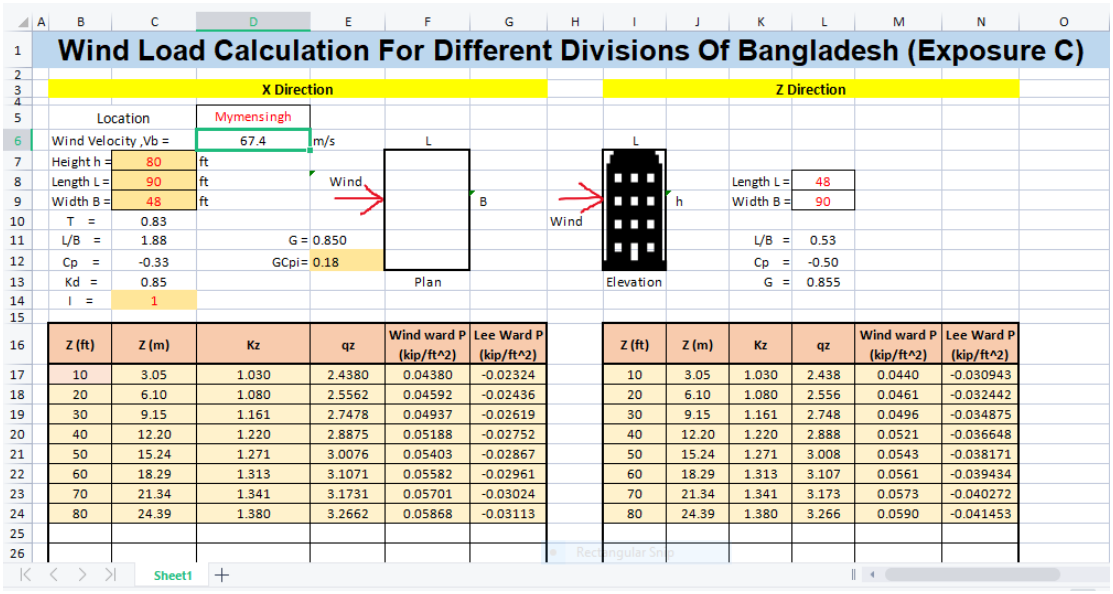
Z Direction

Length L =	48
Width B =	90
L/B =	0.533
Cp =	-0.500
G =	0.8551

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.850	2.0120	0.03615	-0.01918
20	6.10	0.950	2.2483	0.04039	-0.02143
30	9.15	0.981	2.3218	0.04171	-0.02213
40	12.20	1.040	2.4615	0.04422	-0.02346
50	15.24	1.091	2.5815	0.04638	-0.02460
60	18.29	1.134	2.6831	0.04820	-0.02557
70	21.34	1.171	2.7707	0.04978	-0.02641
80	24.39	1.210	2.8638	0.05145	-0.02729

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.850	2.012	0.03632	-0.025535
20	6.10	0.950	2.248	0.04058	-0.028534
30	9.15	0.981	2.322	0.04191	-0.029467
40	12.20	1.040	2.461	0.04443	-0.03124
50	15.24	1.091	2.582	0.04660	-0.032764
60	18.29	1.134	2.683	0.04843	-0.034053
70	21.34	1.171	2.771	0.05001	-0.035164
80	24.39	1.210	2.864	0.05169	-0.036346

Fig. 5.5: Mymensingh Division (Exposure B)



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure C)

X Direction

Location	Mymensingh		
Wind Velocity ,Vb =	67.4	m/s	
Height h =	80	ft	
Length L =	90	ft	
Width B =	48	ft	
T =	0.83		
L/B =	1.88	G =	0.850
Cp =	-0.33	GCpi=	0.18
Kd =	0.85		
I =	1		

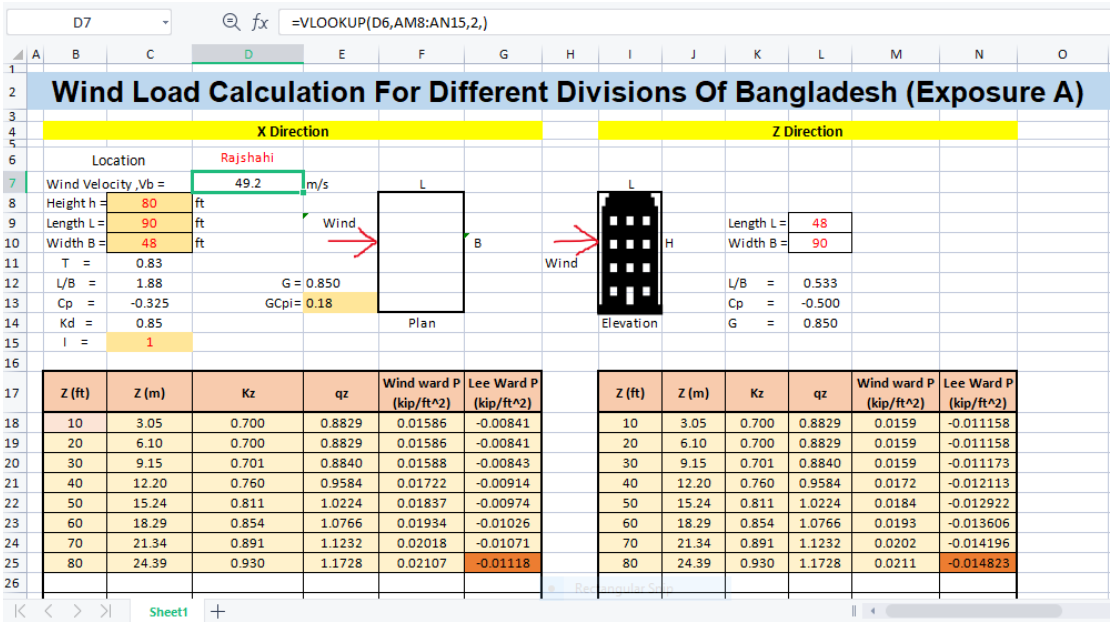
Z Direction

Length L =	48
Width B =	90
L/B =	0.53
Cp =	-0.50
G =	0.855

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	1.030	2.4380	0.04380	-0.02324
20	6.10	1.080	2.5562	0.04592	-0.02436
30	9.15	1.161	2.7478	0.04937	-0.02619
40	12.20	1.220	2.8875	0.05188	-0.02752
50	15.24	1.271	3.0076	0.05403	-0.02867
60	18.29	1.313	3.1071	0.05582	-0.02961
70	21.34	1.341	3.1731	0.05701	-0.03024
80	24.39	1.380	3.2662	0.05868	-0.03113

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	1.030	2.438	0.0440	-0.030943
20	6.10	1.080	2.556	0.0461	-0.032442
30	9.15	1.161	2.748	0.0496	-0.034875
40	12.20	1.220	2.888	0.0521	-0.036648
50	15.24	1.271	3.008	0.0543	-0.038171
60	18.29	1.313	3.107	0.0561	-0.039434
70	21.34	1.341	3.173	0.0573	-0.040272
80	24.39	1.380	3.266	0.0590	-0.041453

Fig. 5.6: Mymensingh Division (Exposure C)



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure A)

X Direction

Location	Rajshahi		
Wind Velocity ,Vb =	49.2	m/s	
Height h =	80	ft	
Length L =	90	ft	
Width B =	48	ft	
T =	0.83		
L/B =	1.88	G =	0.850
Cp =	-0.325	GCpi =	0.18
Kd =	0.85		
I =	1		

Plan

Z Direction

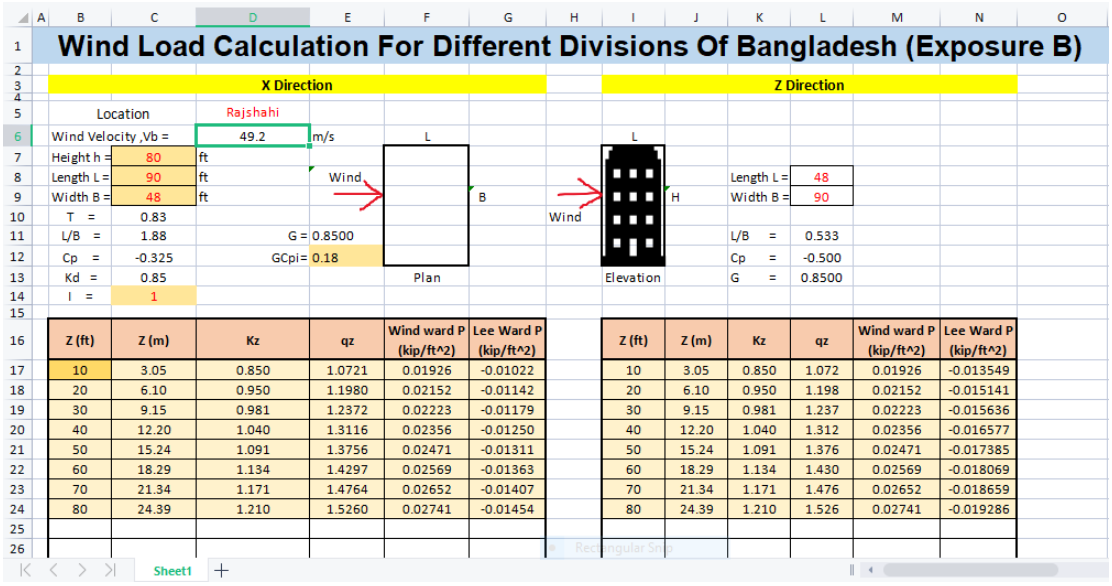
Length L =	48
Width B =	90
L/B =	0.533
Cp =	-0.500
G =	0.850

Elevation

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.700	0.8829	0.01586	-0.00841
20	6.10	0.700	0.8829	0.01586	-0.00841
30	9.15	0.701	0.8840	0.01588	-0.00843
40	12.20	0.760	0.9584	0.01722	-0.00914
50	15.24	0.811	1.0224	0.01837	-0.00974
60	18.29	0.854	1.0766	0.01934	-0.01026
70	21.34	0.891	1.1232	0.02018	-0.01071
80	24.39	0.930	1.1728	0.02107	-0.01118

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.700	0.8829	0.0159	-0.011158
20	6.10	0.700	0.8829	0.0159	-0.011158
30	9.15	0.701	0.8840	0.0159	-0.011173
40	12.20	0.760	0.9584	0.0172	-0.012113
50	15.24	0.811	1.0224	0.0184	-0.012922
60	18.29	0.854	1.0766	0.0193	-0.013606
70	21.34	0.891	1.1232	0.0202	-0.014196
80	24.39	0.930	1.1728	0.0211	-0.014823

Fig. 5.7: Rajshahi Division (Exposure A)



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure B)

X Direction

Location	Rajshahi		
Wind Velocity ,Vb =	49.2	m/s	
Height h =	80	ft	
Length L =	90	ft	
Width B =	48	ft	
T =	0.83		
L/B =	1.88	G =	0.8500
Cp =	-0.325	GCpi =	0.18
Kd =	0.85		
I =	1		

Plan

Z Direction

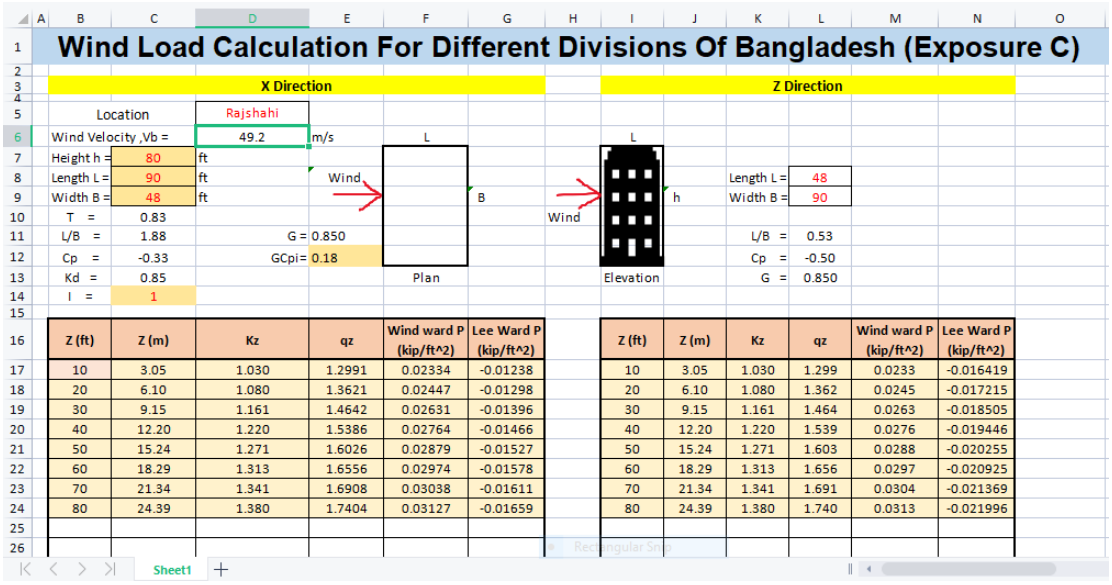
Length L =	48
Width B =	90
L/B =	0.533
Cp =	-0.500
G =	0.8500

Elevation

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.850	1.0721	0.01926	-0.01022
20	6.10	0.950	1.1980	0.02152	-0.01142
30	9.15	0.981	1.2372	0.02223	-0.01179
40	12.20	1.040	1.3116	0.02356	-0.01250
50	15.24	1.091	1.3756	0.02471	-0.01311
60	18.29	1.134	1.4297	0.02569	-0.01363
70	21.34	1.171	1.4764	0.02652	-0.01407
80	24.39	1.210	1.5260	0.02741	-0.01454

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.850	1.072	0.01926	-0.013549
20	6.10	0.950	1.198	0.02152	-0.015141
30	9.15	0.981	1.237	0.02223	-0.015636
40	12.20	1.040	1.312	0.02356	-0.016577
50	15.24	1.091	1.376	0.02471	-0.017385
60	18.29	1.134	1.430	0.02569	-0.018069
70	21.34	1.171	1.476	0.02652	-0.018659
80	24.39	1.210	1.526	0.02741	-0.019286

Fig. 5.8: Rajshahi Division (Exposure B)



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure C)

X Direction

Location	Rajshahi	
Wind Velocity ,Vb =	49.2	m/s
Height h =	80	ft
Length L =	90	ft
Width B =	48	ft
T =	0.83	
L/B =	1.88	
Cp =	-0.33	
Kd =	0.85	
I =	1	
G =	0.850	
GCpi=	0.18	

Wind, L, B — Plan

Z Direction

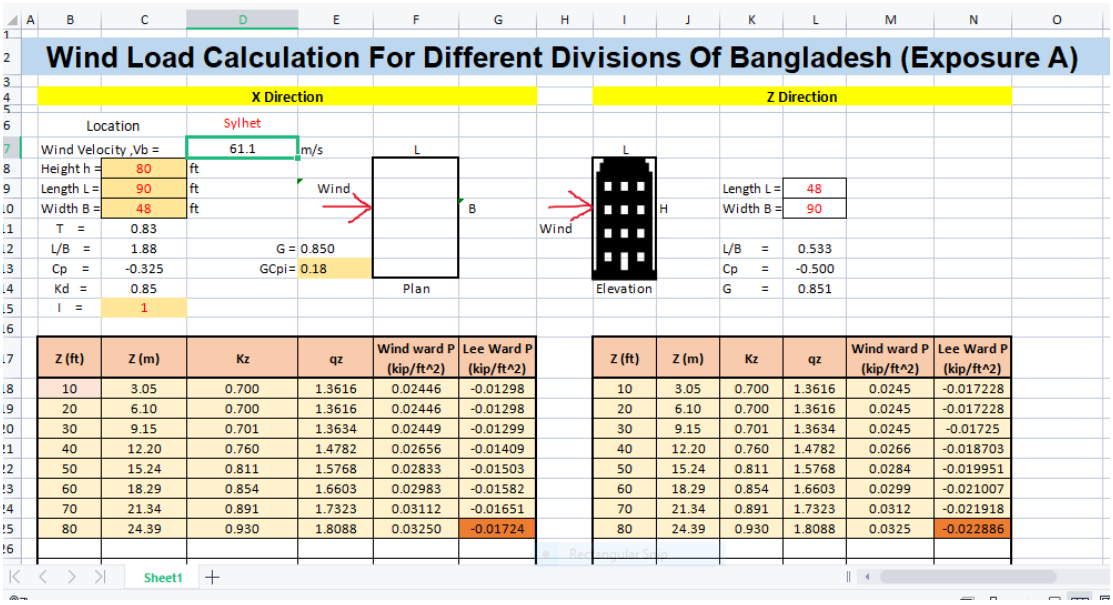
Wind, L, h — Elevation

Length L =	48	
Width B =	90	
L/B =	0.53	
Cp =	-0.50	
G =	0.850	

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	1.030	1.2991	0.02334	-0.01238
20	6.10	1.080	1.3621	0.02447	-0.01298
30	9.15	1.161	1.4642	0.02631	-0.01396
40	12.20	1.220	1.5386	0.02764	-0.01466
50	15.24	1.271	1.6026	0.02879	-0.01527
60	18.29	1.313	1.6556	0.02974	-0.01578
70	21.34	1.341	1.6908	0.03038	-0.01611
80	24.39	1.380	1.7404	0.03127	-0.01659

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	1.030	1.299	0.0233	-0.016419
20	6.10	1.080	1.362	0.0245	-0.017215
30	9.15	1.161	1.464	0.0263	-0.018505
40	12.20	1.220	1.539	0.0276	-0.019446
50	15.24	1.271	1.603	0.0288	-0.020255
60	18.29	1.313	1.656	0.0297	-0.020925
70	21.34	1.341	1.691	0.0304	-0.021369
80	24.39	1.380	1.740	0.0313	-0.021996

Fig. 5.9: Rajshahi Division (Exposure C)



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure A)

X Direction

Location	Sylhet	
Wind Velocity ,Vb =	61.1	m/s
Height h =	80	ft
Length L =	90	ft
Width B =	48	ft
T =	0.83	
L/B =	1.88	
Cp =	-0.325	
Kd =	0.85	
I =	1	
G =	0.850	
GCpi=	0.18	

Wind, L, B — Plan

Z Direction

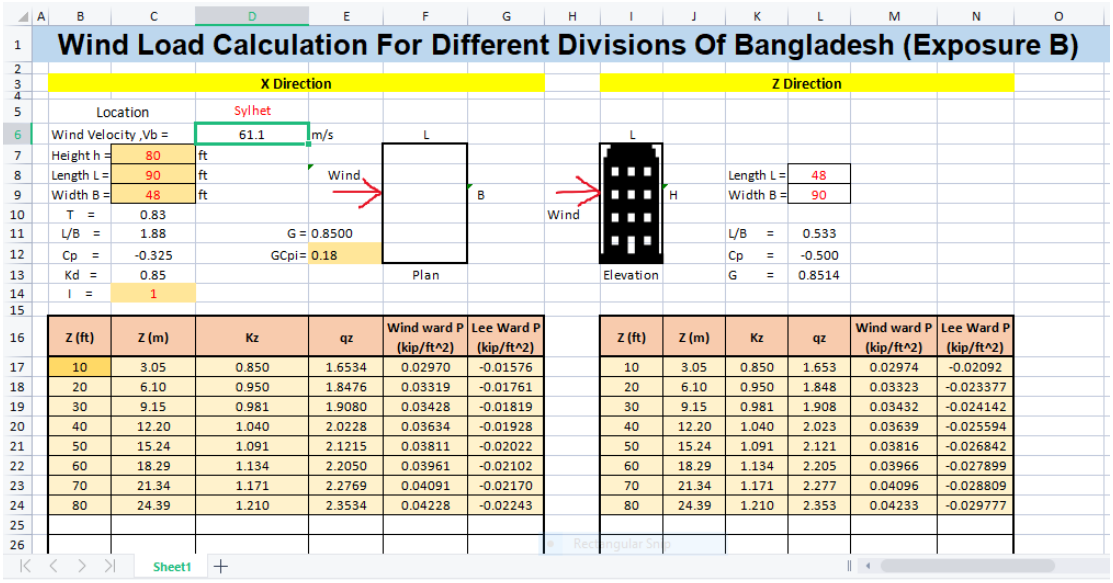
Wind, L, H — Elevation

Length L =	48	
Width B =	90	
L/B =	0.533	
Cp =	-0.500	
G =	0.851	

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.700	1.3616	0.02446	-0.01298
20	6.10	0.700	1.3616	0.02446	-0.01298
30	9.15	0.701	1.3634	0.02449	-0.01299
40	12.20	0.760	1.4782	0.02656	-0.01409
50	15.24	0.811	1.5768	0.02833	-0.01503
60	18.29	0.854	1.6603	0.02983	-0.01582
70	21.34	0.891	1.7323	0.03112	-0.01651
80	24.39	0.930	1.8088	0.03250	-0.01724

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.700	1.3616	0.0245	-0.017228
20	6.10	0.700	1.3616	0.0245	-0.017228
30	9.15	0.701	1.3634	0.0245	-0.01725
40	12.20	0.760	1.4782	0.0266	-0.018703
50	15.24	0.811	1.5768	0.0284	-0.019951
60	18.29	0.854	1.6603	0.0299	-0.021007
70	21.34	0.891	1.7323	0.0312	-0.021918
80	24.39	0.930	1.8088	0.0325	-0.022886

Fig. 5.10: Sylhet Division (Exposure A)



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure B)

X Direction

Location	Sylhet		
Wind Velocity ,Vb =	61.1	m/s	
Height h =	80	ft	
Length L =	90	ft	
Width B =	48	ft	
T =	0.83		
L/B =	1.88	G =	0.8500
Cp =	-0.325	GCpi=	0.18
Kd =	0.85		
I =	1		

Plan

Z Direction

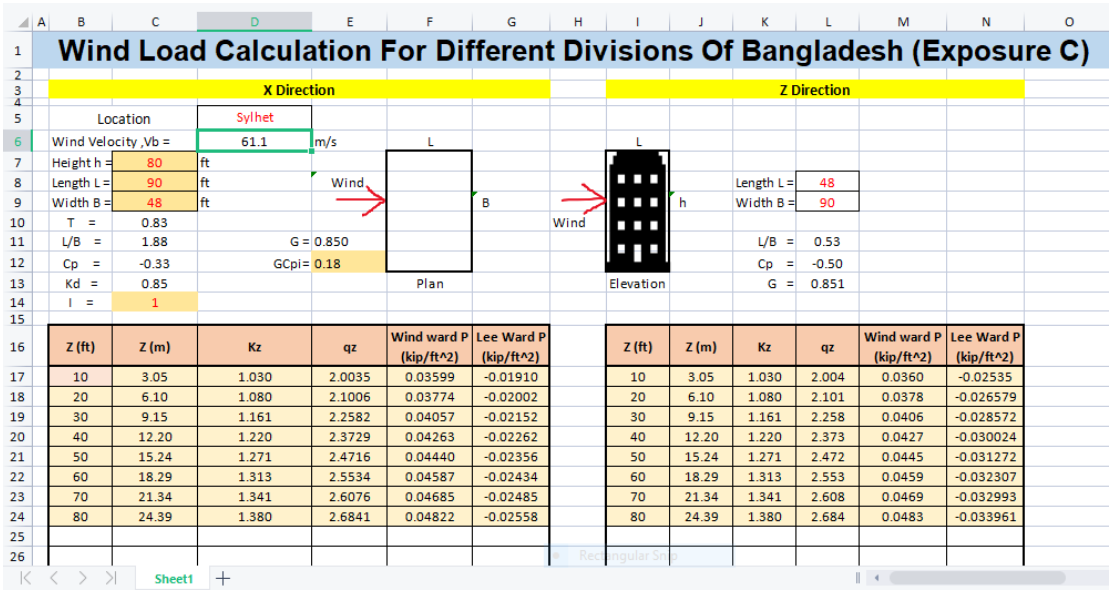
Length L =	48		
Width B =	90		
L/B =	0.533		
Cp =	-0.500		
G =	0.8514		

Elevation

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.850	1.6534	0.02970	-0.01576
20	6.10	0.950	1.8476	0.03319	-0.01761
30	9.15	0.981	1.9080	0.03428	-0.01819
40	12.20	1.040	2.0228	0.03634	-0.01928
50	15.24	1.091	2.1215	0.03811	-0.02022
60	18.29	1.134	2.2050	0.03961	-0.02102
70	21.34	1.171	2.2769	0.04091	-0.02170
80	24.39	1.210	2.3534	0.04228	-0.02243

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.850	1.653	0.02974	-0.02092
20	6.10	0.950	1.848	0.03323	-0.023377
30	9.15	0.981	1.908	0.03432	-0.024142
40	12.20	1.040	2.023	0.03639	-0.025594
50	15.24	1.091	2.121	0.03816	-0.026842
60	18.29	1.134	2.205	0.03966	-0.027899
70	21.34	1.171	2.277	0.04096	-0.028809
80	24.39	1.210	2.353	0.04233	-0.029777

Fig. 5.11: Sylhet Division (Exposure B)



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure C)

X Direction

Location	Sylhet		
Wind Velocity ,Vb =	61.1	m/s	
Height h =	80	ft	
Length L =	90	ft	
Width B =	48	ft	
T =	0.83		
L/B =	1.88	G =	0.850
Cp =	-0.33	GCpi=	0.18
Kd =	0.85		
I =	1		

Plan

Z Direction

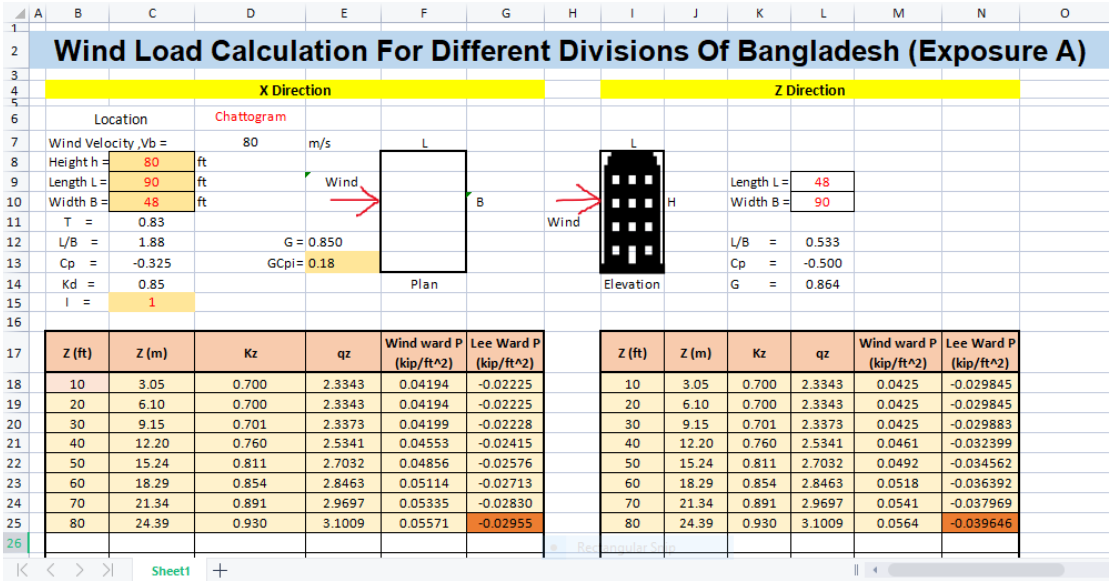
Length L =	48		
Width B =	90		
L/B =	0.53		
Cp =	-0.50		
G =	0.851		

Elevation

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	1.030	2.0035	0.03599	-0.01910
20	6.10	1.080	2.1006	0.03774	-0.02002
30	9.15	1.161	2.2582	0.04057	-0.02152
40	12.20	1.220	2.3729	0.04263	-0.02262
50	15.24	1.271	2.4716	0.04440	-0.02356
60	18.29	1.313	2.5534	0.04587	-0.02434
70	21.34	1.341	2.6076	0.04685	-0.02485
80	24.39	1.380	2.6841	0.04822	-0.02558

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	1.030	2.004	0.0360	-0.02535
20	6.10	1.080	2.101	0.0378	-0.026579
30	9.15	1.161	2.258	0.0406	-0.028572
40	12.20	1.220	2.373	0.0427	-0.030024
50	15.24	1.271	2.472	0.0445	-0.031272
60	18.29	1.313	2.553	0.0459	-0.032307
70	21.34	1.341	2.608	0.0469	-0.032993
80	24.39	1.380	2.684	0.0483	-0.033961

Fig. 5.12: Sylhet Division (Exposure C)



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure A)

X Direction

Location	Chattogram		
Wind Velocity ,Vb =	80	m/s	
Height h =	80	ft	
Length L =	90	ft	
Width B =	48	ft	
T =	0.83		
L/B =	1.88	G =	0.850
Cp =	-0.325	GCpi =	0.18
Kd =	0.85		
I =	1		

Plan

Z Direction

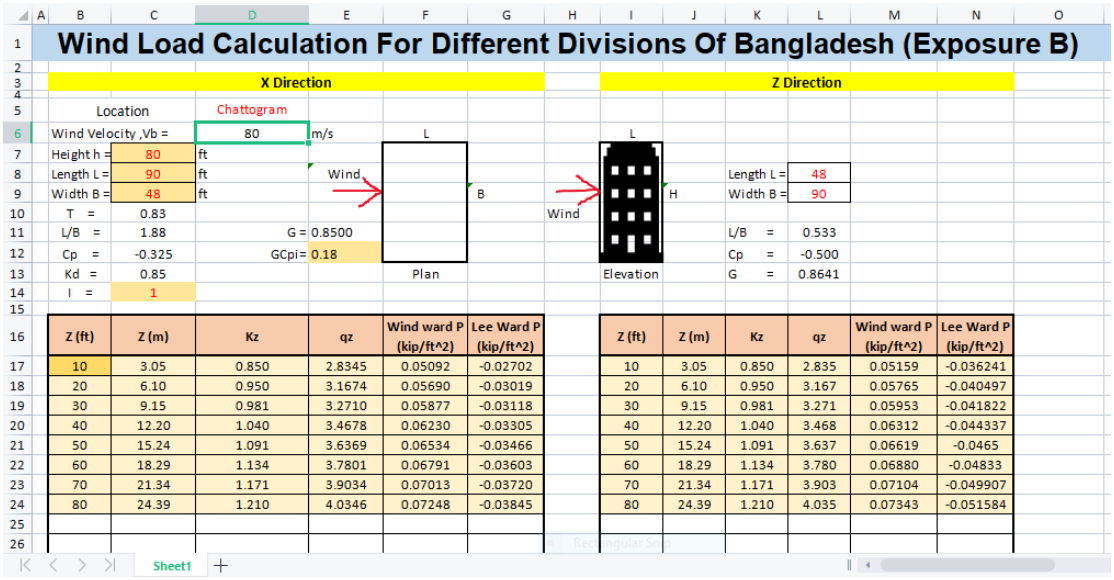
Length L =	48
Width B =	90
L/B =	0.533
Cp =	-0.500
G =	0.864

Elevation

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.700	2.3343	0.04194	-0.02225
20	6.10	0.700	2.3343	0.04194	-0.02225
30	9.15	0.701	2.3373	0.04199	-0.02228
40	12.20	0.760	2.5341	0.04553	-0.02415
50	15.24	0.811	2.7032	0.04856	-0.02576
60	18.29	0.854	2.8463	0.05114	-0.02713
70	21.34	0.891	2.9697	0.05335	-0.02830
80	24.39	0.930	3.1009	0.05571	-0.02955

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.700	2.3343	0.0425	-0.029845
20	6.10	0.700	2.3343	0.0425	-0.029845
30	9.15	0.701	2.3373	0.0425	-0.029883
40	12.20	0.760	2.5341	0.0461	-0.032399
50	15.24	0.811	2.7032	0.0492	-0.034562
60	18.29	0.854	2.8463	0.0518	-0.036392
70	21.34	0.891	2.9697	0.0541	-0.037969
80	24.39	0.930	3.1009	0.0564	-0.039646

Fig. 5.13: Chattogram Division (Exposure A)



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure B)

X Direction

Location	Chattogram		
Wind Velocity ,Vb =	80	m/s	
Height h =	80	ft	
Length L =	90	ft	
Width B =	48	ft	
T =	0.83		
L/B =	1.88	G =	0.8500
Cp =	-0.325	GCpi =	0.18
Kd =	0.85		
I =	1		

Plan

Z Direction

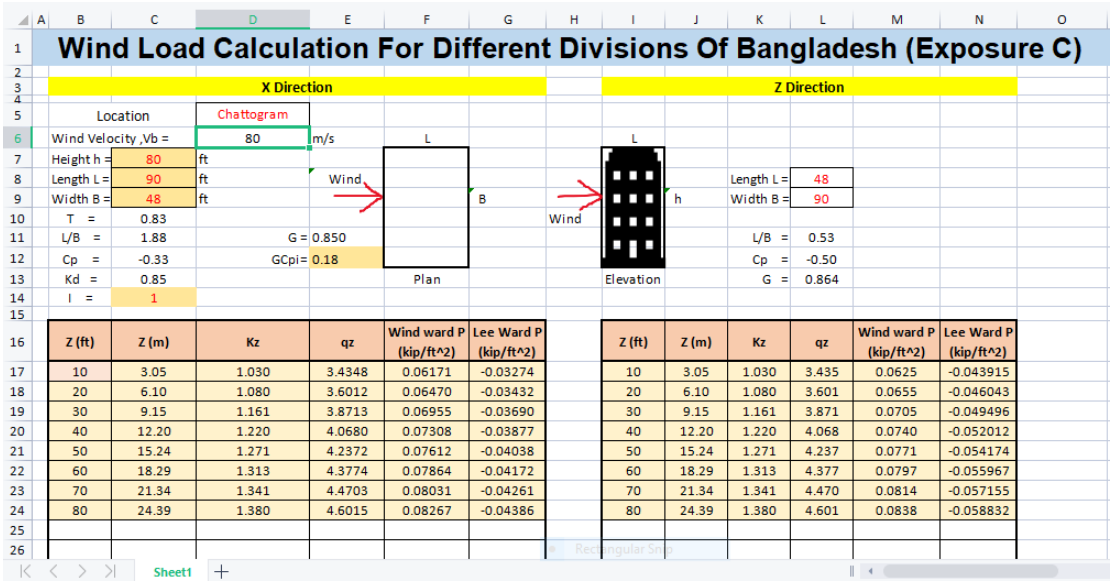
Length L =	48
Width B =	90
L/B =	0.533
Cp =	-0.500
G =	0.8641

Elevation

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.850	2.8345	0.05092	-0.02702
20	6.10	0.950	3.1674	0.05690	-0.03019
30	9.15	0.981	3.2710	0.05877	-0.03118
40	12.20	1.040	3.4678	0.06230	-0.03305
50	15.24	1.091	3.6369	0.06534	-0.03466
60	18.29	1.134	3.7801	0.06791	-0.03603
70	21.34	1.171	3.9034	0.07013	-0.03720
80	24.39	1.210	4.0346	0.07248	-0.03845

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.850	2.835	0.05159	-0.036241
20	6.10	0.950	3.167	0.05765	-0.040497
30	9.15	0.981	3.271	0.05953	-0.041822
40	12.20	1.040	3.468	0.06312	-0.044337
50	15.24	1.091	3.637	0.06619	-0.0465
60	18.29	1.134	3.780	0.06880	-0.04833
70	21.34	1.171	3.903	0.07104	-0.049907
80	24.39	1.210	4.035	0.07343	-0.051584

Fig. 5.14: Chattogram Division (Exposure B)



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure C)

X Direction

Location	Chattogram	
Wind Velocity ,Vb =	80	m/s
Height h =	80	ft
Length L =	90	ft
Width B =	48	ft
T =	0.83	
L/B =	1.88	
Cp =	-0.33	
Kd =	0.85	
I =	1	
G =	0.850	
GCpi =	0.18	

L, Wind, B — Plan

Z Direction

L, Wind, h — Elevation

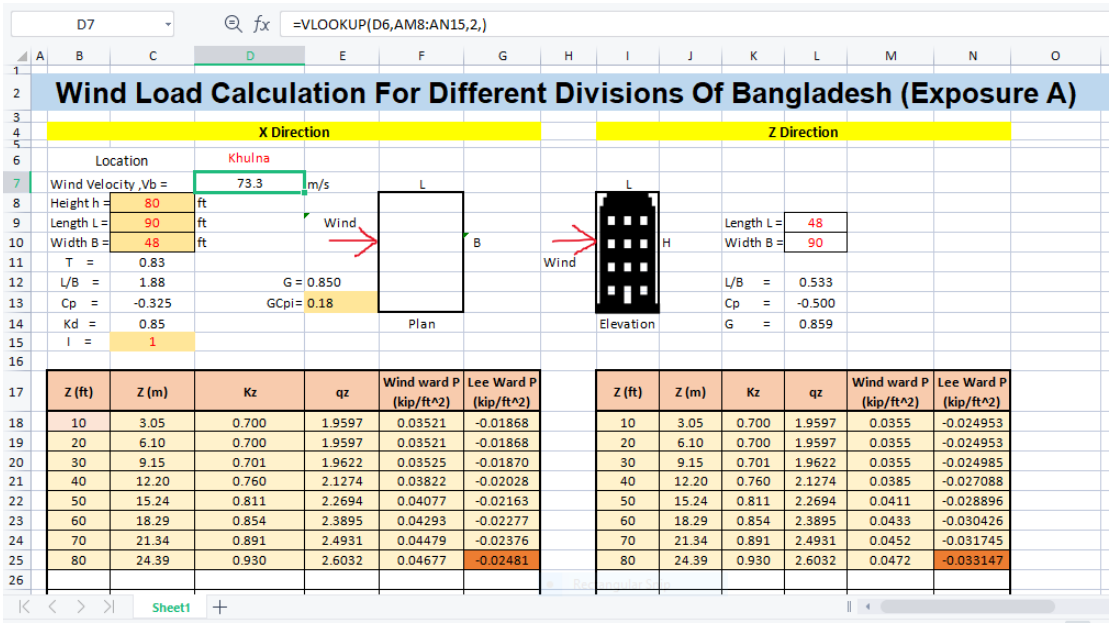
Length L =	48
Width B =	90
L/B =	0.53
Cp =	-0.50
G =	0.864

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	1.030	3.4348	0.06171	-0.03274
20	6.10	1.080	3.6012	0.06470	-0.03432
30	9.15	1.161	3.8713	0.06955	-0.03690
40	12.20	1.220	4.0680	0.07308	-0.03877
50	15.24	1.271	4.2372	0.07612	-0.04038
60	18.29	1.313	4.3774	0.07864	-0.04172
70	21.34	1.341	4.4703	0.08031	-0.04261
80	24.39	1.380	4.6015	0.08267	-0.04386

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	1.030	3.435	0.0625	-0.043915
20	6.10	1.080	3.601	0.0655	-0.046043
30	9.15	1.161	3.871	0.0705	-0.049496
40	12.20	1.220	4.068	0.0740	-0.052012
50	15.24	1.271	4.237	0.0771	-0.054174
60	18.29	1.313	4.377	0.0797	-0.055967
70	21.34	1.341	4.470	0.0814	-0.057155
80	24.39	1.380	4.601	0.0838	-0.058832

Sheet1

Fig. 5.15: Chattogram Division (Exposure C)



D7 =VLOOKUP(D6,AM8:AN15,2,)

Wind Load Calculation For Different Divisions Of Bangladesh (Exposure A)

X Direction

Location	Khulna	
Wind Velocity ,Vb =	73.3	m/s
Height h =	80	ft
Length L =	90	ft
Width B =	48	ft
T =	0.83	
L/B =	1.88	
Cp =	-0.325	
Kd =	0.85	
I =	1	
G =	0.850	
GCpi =	0.18	

L, Wind, B — Plan

Z Direction

L, Wind, H — Elevation

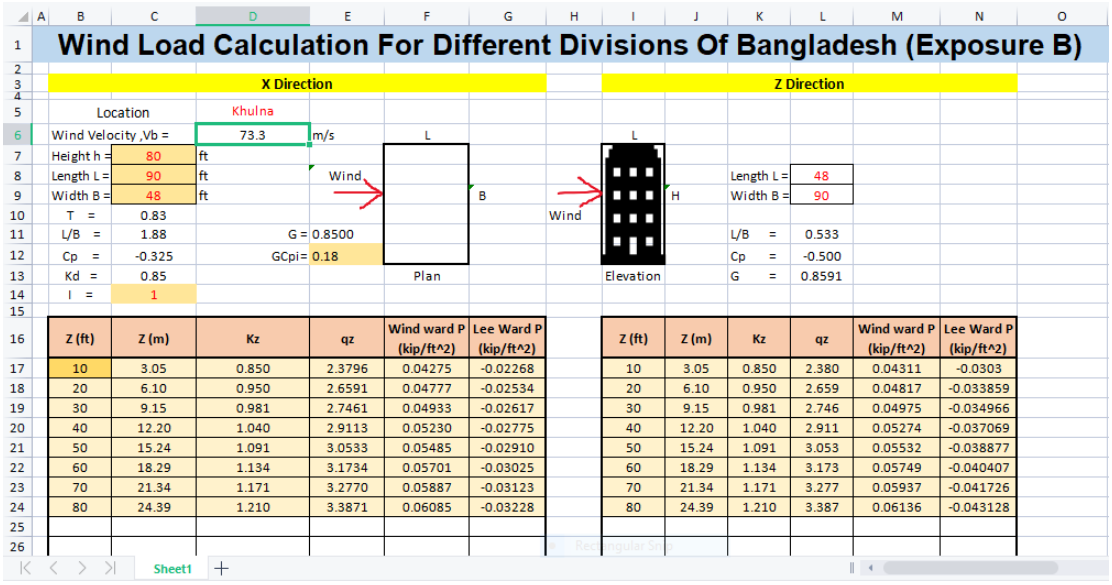
Length L =	48
Width B =	90
L/B =	0.533
Cp =	-0.500
G =	0.859

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.700	1.9597	0.03521	-0.01868
20	6.10	0.700	1.9597	0.03521	-0.01868
30	9.15	0.701	1.9622	0.03525	-0.01870
40	12.20	0.760	2.1274	0.03822	-0.02028
50	15.24	0.811	2.2694	0.04077	-0.02163
60	18.29	0.854	2.3895	0.04293	-0.02277
70	21.34	0.891	2.4931	0.04479	-0.02376
80	24.39	0.930	2.6032	0.04677	-0.02481

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.700	1.9597	0.0355	-0.024953
20	6.10	0.700	1.9597	0.0355	-0.024953
30	9.15	0.701	1.9622	0.0355	-0.024985
40	12.20	0.760	2.1274	0.0385	-0.027088
50	15.24	0.811	2.2694	0.0411	-0.028896
60	18.29	0.854	2.3895	0.0433	-0.030426
70	21.34	0.891	2.4931	0.0452	-0.031745
80	24.39	0.930	2.6032	0.0472	-0.033147

Sheet1

Fig. 5.16: Khulna Division (Exposure A)



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure B)

X Direction

Location	Khulna		
Wind Velocity ,Vb =	73.3	m/s	
Height h =	80	ft	
Length L =	90	ft	
Width B =	48	ft	
T =	0.83		
L/B =	1.88	G =	0.8500
Cp =	-0.325	GCpi =	0.18
Kd =	0.85		
I =	1		

Plan

Z Direction

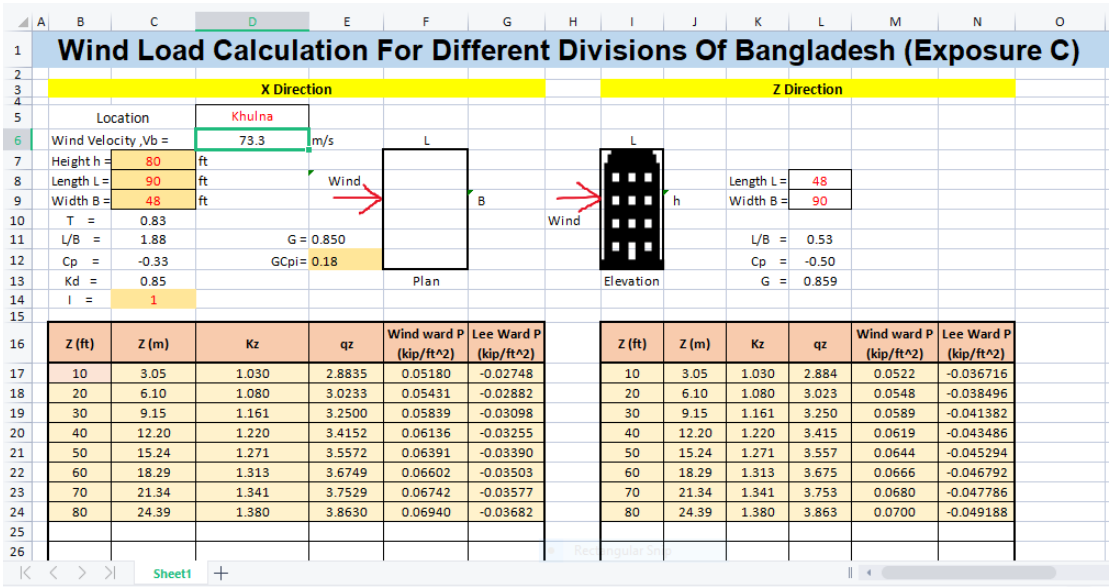
Elevation

Length L =	48
Width B =	90
L/B =	0.533
Cp =	-0.500
G =	0.8591

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.850	2.3796	0.04275	-0.02268
20	6.10	0.950	2.6591	0.04777	-0.02534
30	9.15	0.981	2.7461	0.04933	-0.02617
40	12.20	1.040	2.9113	0.05230	-0.02775
50	15.24	1.091	3.0533	0.05485	-0.02910
60	18.29	1.134	3.1734	0.05701	-0.03025
70	21.34	1.171	3.2770	0.05887	-0.03123
80	24.39	1.210	3.3871	0.06085	-0.03228

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.850	2.380	0.04311	-0.0303
20	6.10	0.950	2.659	0.04817	-0.033859
30	9.15	0.981	2.746	0.04975	-0.034966
40	12.20	1.040	2.911	0.05274	-0.037069
50	15.24	1.091	3.053	0.05532	-0.038877
60	18.29	1.134	3.173	0.05749	-0.040407
70	21.34	1.171	3.277	0.05937	-0.041726
80	24.39	1.210	3.387	0.06136	-0.043128

Fig. 5.17: Khulna Division (Exposure B)



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure C)

X Direction

Location	Khulna		
Wind Velocity ,Vb =	73.3	m/s	
Height h =	80	ft	
Length L =	90	ft	
Width B =	48	ft	
T =	0.83		
L/B =	1.88	G =	0.850
Cp =	-0.33	GCpi =	0.18
Kd =	0.85		
I =	1		

Plan

Z Direction

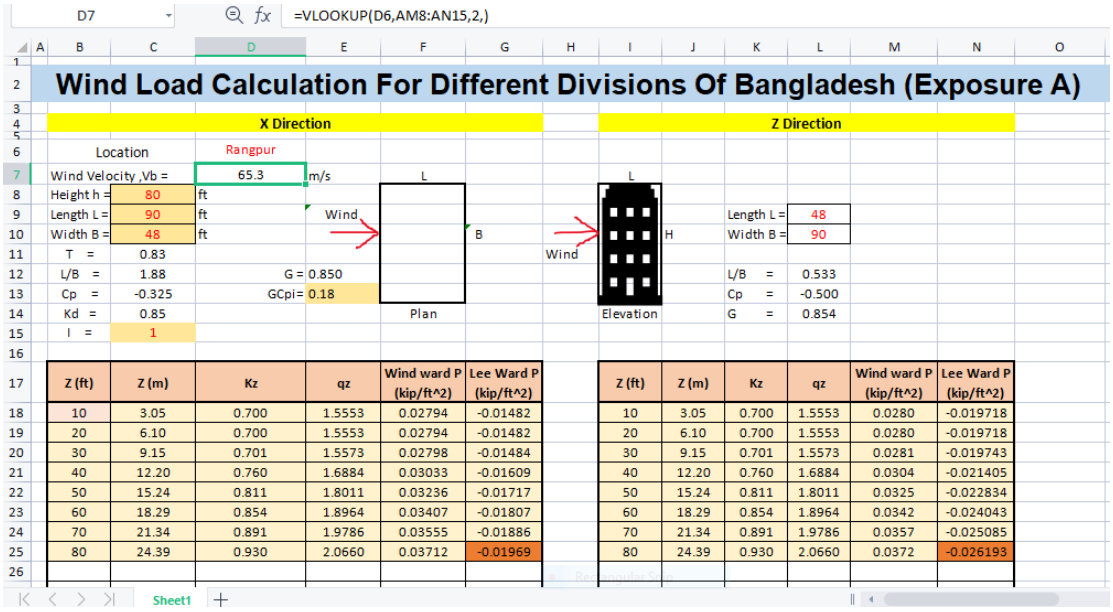
Elevation

Length L =	48
Width B =	90
L/B =	0.53
Cp =	-0.50
G =	0.859

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	1.030	2.8835	0.05180	-0.02748
20	6.10	1.080	3.0233	0.05431	-0.02882
30	9.15	1.161	3.2500	0.05839	-0.03098
40	12.20	1.220	3.4152	0.06136	-0.03255
50	15.24	1.271	3.5572	0.06391	-0.03390
60	18.29	1.313	3.6749	0.06602	-0.03503
70	21.34	1.341	3.7529	0.06742	-0.03577
80	24.39	1.380	3.8630	0.06940	-0.03682

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	1.030	2.884	0.0522	-0.036716
20	6.10	1.080	3.023	0.0548	-0.038496
30	9.15	1.161	3.250	0.0589	-0.041382
40	12.20	1.220	3.415	0.0619	-0.043486
50	15.24	1.271	3.557	0.0644	-0.045294
60	18.29	1.313	3.675	0.0666	-0.046792
70	21.34	1.341	3.753	0.0680	-0.047786
80	24.39	1.380	3.863	0.0700	-0.049188

Fig. 5.18: Khulna Division (Exposure C)



D7 =VLOOKUP(D6,AM8:AN15,2,)

Wind Load Calculation For Different Divisions Of Bangladesh (Exposure A)

X Direction

Location	Rangpur		
Wind Velocity ,Vb =	65.3	m/s	
Height h =	80	ft	
Length L =	90	ft	
Width B =	48	ft	
T =	0.83		
L/B =	1.88	G =	0.850
Cp =	-0.325	GCpi =	0.18
Kd =	0.85		
I =	1		

Plan: L, B, Wind

Z Direction

Elevation: L, H, Wind

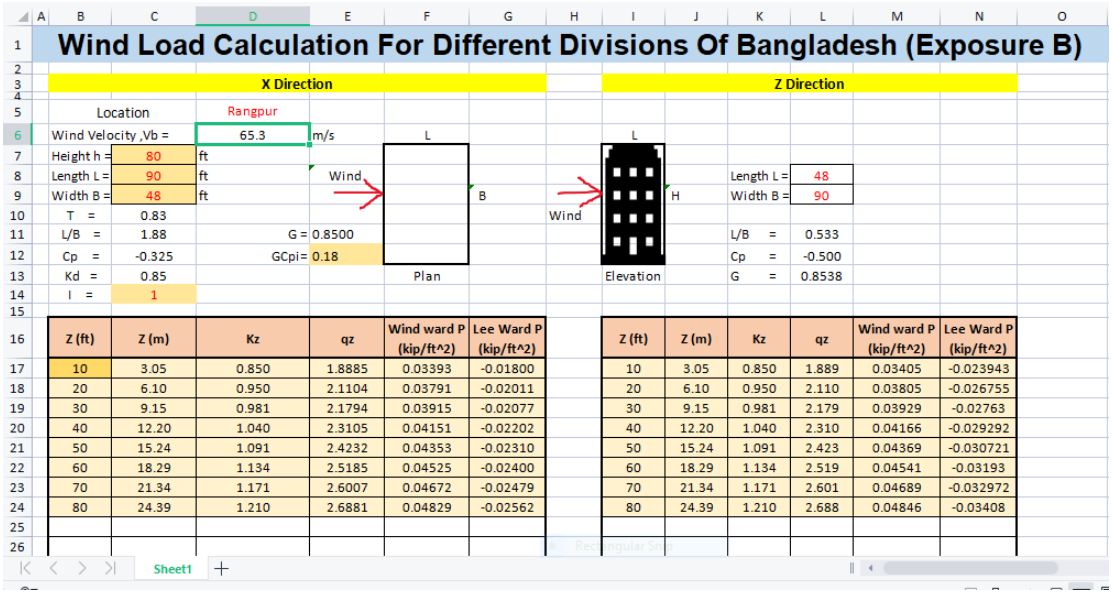
Length L =	48
Width B =	90
L/B =	0.533
Cp =	-0.500
G =	0.854

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.700	1.5553	0.02794	-0.01482
20	6.10	0.700	1.5553	0.02794	-0.01482
30	9.15	0.701	1.5573	0.02798	-0.01484
40	12.20	0.760	1.6884	0.03033	-0.01609
50	15.24	0.811	1.8011	0.03236	-0.01717
60	18.29	0.854	1.8964	0.03407	-0.01807
70	21.34	0.891	1.9786	0.03555	-0.01886
80	24.39	0.930	2.0660	0.03712	-0.01969

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.700	1.5553	0.0280	-0.019718
20	6.10	0.700	1.5553	0.0280	-0.019718
30	9.15	0.701	1.5573	0.0281	-0.019743
40	12.20	0.760	1.6884	0.0304	-0.021405
50	15.24	0.811	1.8011	0.0325	-0.022834
60	18.29	0.854	1.8964	0.0342	-0.024043
70	21.34	0.891	1.9786	0.0357	-0.025085
80	24.39	0.930	2.0660	0.0372	-0.026193

Sheet1

Fig. 5.19: Rangpur Division (Exposure A)



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure B)

X Direction

Location	Rangpur		
Wind Velocity ,Vb =	65.3	m/s	
Height h =	80	ft	
Length L =	90	ft	
Width B =	48	ft	
T =	0.83		
L/B =	1.88	G =	0.8500
Cp =	-0.325	GCpi =	0.18
Kd =	0.85		
I =	1		

Plan: L, B, Wind

Z Direction

Elevation: L, H, Wind

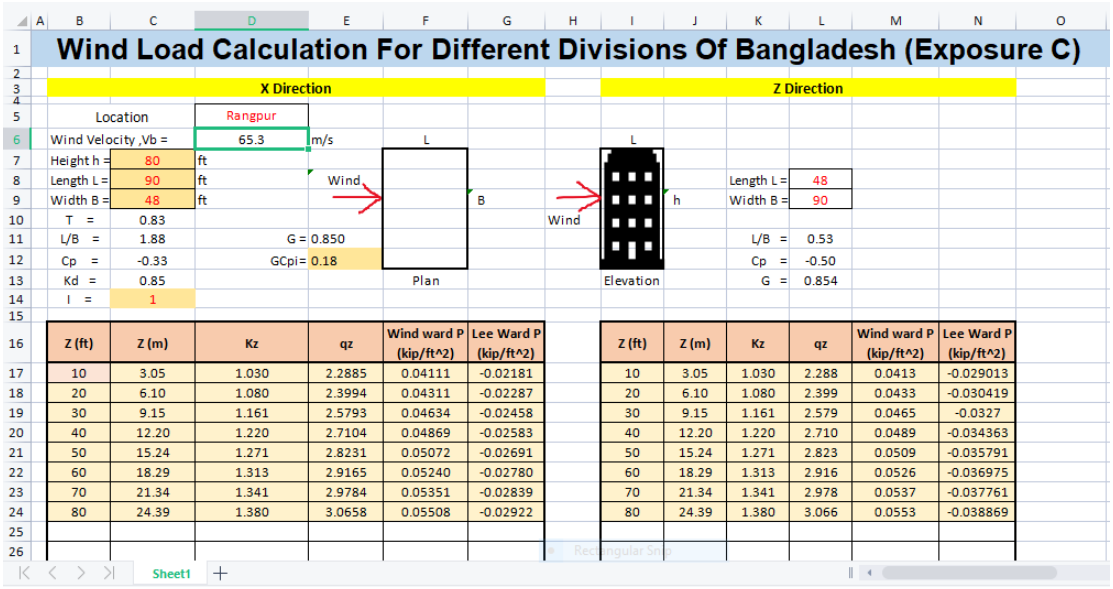
Length L =	48
Width B =	90
L/B =	0.533
Cp =	-0.500
G =	0.8538

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.850	1.8885	0.03393	-0.01800
20	6.10	0.950	2.1104	0.03791	-0.02011
30	9.15	0.981	2.1794	0.03915	-0.02077
40	12.20	1.040	2.3105	0.04151	-0.02202
50	15.24	1.091	2.4232	0.04353	-0.02310
60	18.29	1.134	2.5185	0.04525	-0.02400
70	21.34	1.171	2.6007	0.04672	-0.02479
80	24.39	1.210	2.6881	0.04829	-0.02562

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.850	1.889	0.03405	-0.023943
20	6.10	0.950	2.110	0.03805	-0.026755
30	9.15	0.981	2.179	0.03929	-0.02763
40	12.20	1.040	2.310	0.04166	-0.029292
50	15.24	1.091	2.423	0.04369	-0.030721
60	18.29	1.134	2.519	0.04541	-0.03193
70	21.34	1.171	2.601	0.04689	-0.032972
80	24.39	1.210	2.688	0.04846	-0.03408

Sheet1

Fig. 5.20: Rangpur Division (Exposure B)



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure C)

X Direction

Location	Rangpur	
Wind Velocity ,Vb =	65.3	m/s
Height h =	80	ft
Length L =	90	ft
Width B =	48	ft
T =	0.83	
L/B =	1.88	
Cp =	-0.33	
Kd =	0.85	
I =	1	
G =	0.850	
GCpi =	0.18	

Wind, L, B — Plan

Z Direction

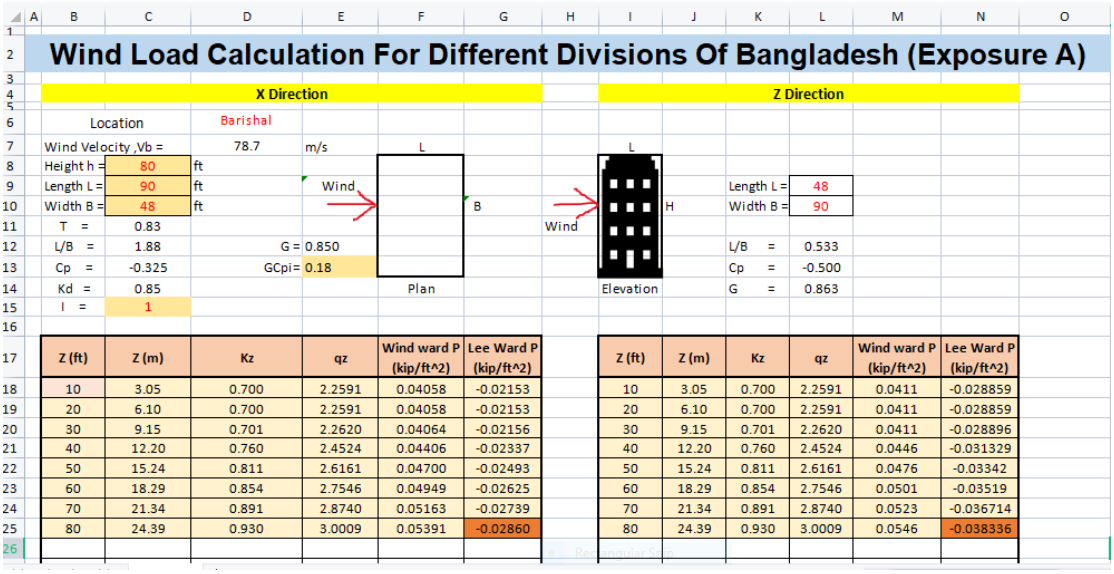
Wind, L, h, B — Elevation

Length L =	48	
Width B =	90	
L/B =	0.53	
Cp =	-0.50	
G =	0.854	

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	1.030	2.2885	0.04111	-0.02181
20	6.10	1.080	2.3994	0.04311	-0.02287
30	9.15	1.161	2.5793	0.04634	-0.02458
40	12.20	1.220	2.7104	0.04869	-0.02583
50	15.24	1.271	2.8231	0.05072	-0.02691
60	18.29	1.313	2.9165	0.05240	-0.02780
70	21.34	1.341	2.9784	0.05351	-0.02839
80	24.39	1.380	3.0658	0.05508	-0.02922

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	1.030	2.288	0.0413	-0.029013
20	6.10	1.080	2.399	0.0433	-0.030419
30	9.15	1.161	2.579	0.0465	-0.0327
40	12.20	1.220	2.710	0.0489	-0.034363
50	15.24	1.271	2.823	0.0509	-0.035791
60	18.29	1.313	2.916	0.0526	-0.036975
70	21.34	1.341	2.978	0.0537	-0.037761
80	24.39	1.380	3.066	0.0553	-0.038869

Fig. 5.21: Rangpur Division (Exposure C)



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure A)

X Direction

Location	Barishal	
Wind Velocity ,Vb =	78.7	m/s
Height h =	80	ft
Length L =	90	ft
Width B =	48	ft
T =	0.83	
L/B =	1.88	
Cp =	-0.325	
Kd =	0.85	
I =	1	
G =	0.850	
GCpi =	0.18	

Wind, L, B — Plan

Z Direction

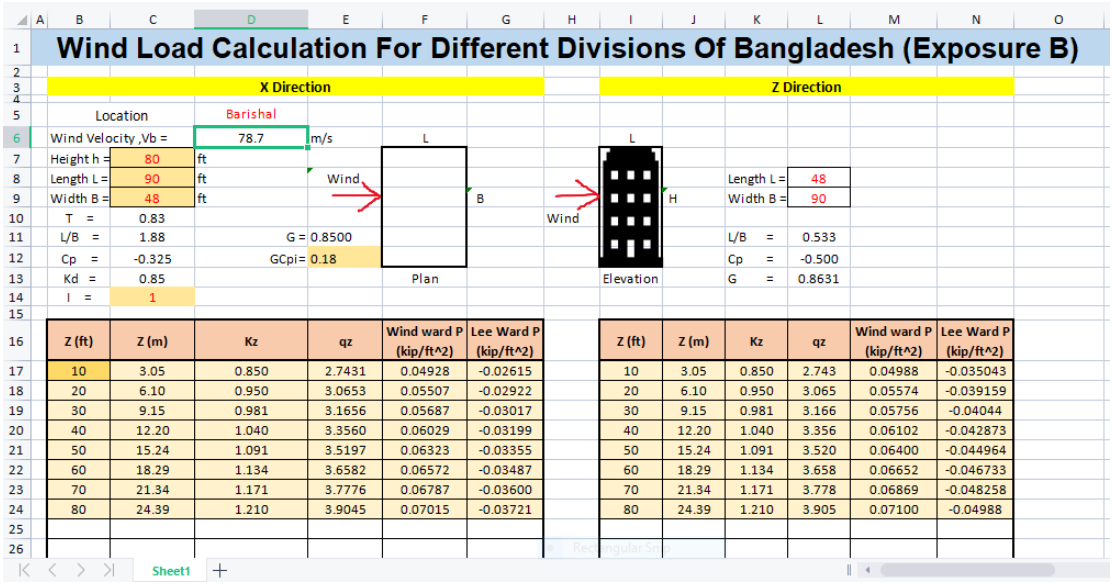
Wind, L, H, B — Elevation

Length L =	48	
Width B =	90	
L/B =	0.533	
Cp =	-0.500	
G =	0.863	

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.700	2.2591	0.04058	-0.02153
20	6.10	0.700	2.2591	0.04058	-0.02153
30	9.15	0.701	2.2620	0.04064	-0.02156
40	12.20	0.760	2.4524	0.04406	-0.02337
50	15.24	0.811	2.6161	0.04700	-0.02493
60	18.29	0.854	2.7546	0.04949	-0.02625
70	21.34	0.891	2.8740	0.05163	-0.02739
80	24.39	0.930	3.0009	0.05391	-0.02860

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.700	2.2591	0.0411	-0.028859
20	6.10	0.700	2.2591	0.0411	-0.028859
30	9.15	0.701	2.2620	0.0411	-0.028896
40	12.20	0.760	2.4524	0.0446	-0.031329
50	15.24	0.811	2.6161	0.0476	-0.03342
60	18.29	0.854	2.7546	0.0501	-0.03519
70	21.34	0.891	2.8740	0.0523	-0.036714
80	24.39	0.930	3.0009	0.0546	-0.038336

Fig. 5.22: Barishal Division (Exposure A)



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure B)

X Direction

Location	Barishal		
Wind Velocity ,Vb =	78.7	m/s	
Height h =	80	ft	
Length L =	90	ft	
Width B =	48	ft	
T =	0.83		
L/B =	1.88	G =	0.8500
Cp =	-0.325	GCpi=	0.18
Kd =	0.85		
I =	1		

Plan

Z Direction

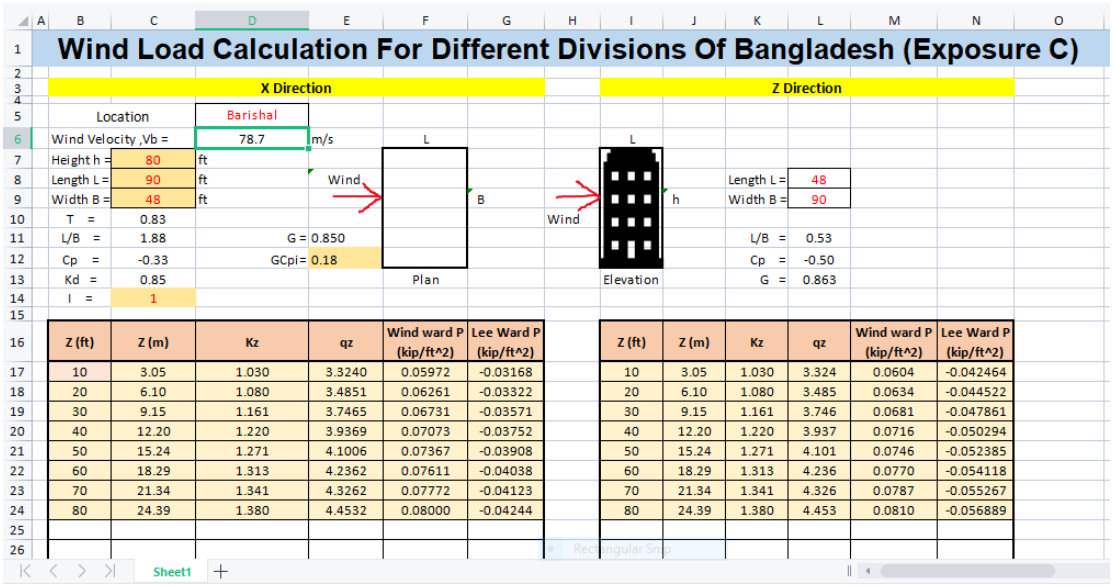
Length L =	48		
Width B =	90		
L/B =	0.533		
Cp =	-0.500		
G =	0.8631		

Elevation

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.850	2.7431	0.04928	-0.02615
20	6.10	0.950	3.0653	0.05507	-0.02922
30	9.15	0.981	3.1656	0.05687	-0.03017
40	12.20	1.040	3.3560	0.06029	-0.03199
50	15.24	1.091	3.5197	0.06323	-0.03355
60	18.29	1.134	3.6582	0.06572	-0.03487
70	21.34	1.171	3.7776	0.06787	-0.03600
80	24.39	1.210	3.9045	0.07015	-0.03721

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	0.850	2.743	0.04988	-0.035043
20	6.10	0.950	3.065	0.05574	-0.039159
30	9.15	0.981	3.166	0.05756	-0.04044
40	12.20	1.040	3.356	0.06102	-0.042873
50	15.24	1.091	3.520	0.06400	-0.044964
60	18.29	1.134	3.658	0.06652	-0.046733
70	21.34	1.171	3.778	0.06869	-0.048258
80	24.39	1.210	3.905	0.07100	-0.04988

Fig. 5.23: Barishal Division (Exposure B)



Wind Load Calculation For Different Divisions Of Bangladesh (Exposure C)

X Direction

Location	Barishal		
Wind Velocity ,Vb =	78.7	m/s	
Height h =	80	ft	
Length L =	90	ft	
Width B =	48	ft	
T =	0.83		
L/B =	1.88	G =	0.850
Cp =	-0.33	GCpi=	0.18
Kd =	0.85		
I =	1		

Plan

Z Direction

Length L =	48		
Width B =	90		
L/B =	0.53		
Cp =	-0.50		
G =	0.863		

Elevation

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	1.030	3.3240	0.05972	-0.03168
20	6.10	1.080	3.4851	0.06261	-0.03322
30	9.15	1.161	3.7465	0.06731	-0.03571
40	12.20	1.220	3.9369	0.07073	-0.03752
50	15.24	1.271	4.1006	0.07367	-0.03908
60	18.29	1.313	4.2362	0.07611	-0.04038
70	21.34	1.341	4.3262	0.07772	-0.04123
80	24.39	1.380	4.4532	0.08000	-0.04244

Z (ft)	Z (m)	Kz	qz	Wind ward P (kip/ft^2)	Lee Ward P (kip/ft^2)
10	3.05	1.030	3.324	0.0604	-0.042464
20	6.10	1.080	3.485	0.0634	-0.044522
30	9.15	1.161	3.746	0.0681	-0.047861
40	12.20	1.220	3.937	0.0716	-0.050294
50	15.24	1.271	4.101	0.0746	-0.052385
60	18.29	1.313	4.236	0.0770	-0.054118
70	21.34	1.341	4.326	0.0787	-0.055267
80	24.39	1.380	4.453	0.0810	-0.056889

Fig. 5.24: Barishal Division (Exposure C)

5.2 Total wind load result of eight divisions of Bangladesh for Exposure A, B and C.

D.A Wx	D.A Lx	St.	D.A Wz	D.A Lz
0.028284276	-0.015005466	1	0.028390567	-0.019964091
0.028284276	-0.015005466	2	0.028390567	-0.019964091
0.028320518	-0.015024693	3	0.028426945	-0.019989672
0.030704828	-0.016289625	4	0.030820215	-0.021672606
0.03275429	-0.017376913	5	0.032877379	-0.023119193
0.03448854	-0.018296973	6	0.034618146	-0.024343291
0.035983055	-0.019089847	7	0.036118277	-0.025398174
0.037572595	-0.019933135	8	0.03771379	-0.026520131

Table 5.1: Design Wind Load Result Dhaka Division Exposure A

D.B Wx	D.B Lx	St.	D.B Wz	D.B Lz
0.034345193	-0.018220923	1	0.03447426	-0.024242111
0.038379233	-0.020361076	2	0.03852346	-0.027089486
0.039634228	-0.02102688	3	0.039783171	-0.027975308
0.042018538	-0.022291812	4	0.042176442	-0.029658243
0.044068001	-0.023379099	5	0.044233605	-0.031104829
0.045802251	-0.024299159	6	0.045974373	-0.032328927
0.047296765	-0.025092034	7	0.047474504	-0.033383811
0.048886305	-0.025935322	8	0.049070017	-0.034505767

Table 5.2: Design Wind Load Result Dhaka Division Exposure B

Note: D.A Wx = Dhaka division Exposure "A" Windward x direction. Others are similar. St. = Storey.

D.C Wx	D.C Lx	St.	D.C Wz	D.C Lz
0.041618292	-0.022079472	1	0.041774691	-0.029375734
0.043635313	-0.023149548	2	0.043799292	-0.030799422
0.046907328	-0.024885428	3	0.047083603	-0.033108932
0.049291638	-0.02615036	4	0.049476873	-0.034791866
0.0513411	-0.027237648	5	0.051534037	-0.036238452
0.053039513	-0.028138695	6	0.053238833	-0.037437256
0.054165804	-0.028736219	7	0.054369356	-0.038232233
0.055755344	-0.029579507	8	0.055964869	-0.039354189

Table 5.3: Design Wind Load Result Dhaka Division Exposure C

Exposure	MAX. D. Wz
A	0.03771379
B	0.049070017
C	0.055964869
Max. Exp. C	0.055964869
Min. Exp. A	0.03771379
%Maximum	32.61167052 %

Table 5.4: Design Wind Load Result Comparison Dhaka Division

B. A Wx	B. A Lx	St.	B. A Wz	B. A Lz
0.040584836	-0.021531199	1	0.041077957	-0.028859161
0.040584836	-0.021531199	2	0.041077957	-0.028859161
0.040636839	-0.021558788	3	0.041130592	-0.028896139
0.044058062	-0.023373827	4	0.044593385	-0.031328911
0.046998816	-0.024933965	5	0.047569869	-0.033420029
0.049487275	-0.02625415	6	0.050088564	-0.035189528
0.051631739	-0.027391838	7	0.052259085	-0.036714419
0.053912555	-0.028601864	8	0.054567613	-0.038336267

Table 5.5: Design Wind Load Result Barishal Division Exposure A

B.B Wx	B.B Lx	St.	B.B Wz	B.B Lz
0.049281587	-0.026145028	1	0.049880377	-0.035043267
0.055069993	-0.029215912	2	0.055739114	-0.039159301
0.056870773	-0.030171268	3	0.057561775	-0.040439804
0.060291997	-0.031986306	4	0.061024568	-0.042872575
0.06323275	-0.033546445	5	0.064001052	-0.044963693
0.065721209	-0.03486663	6	0.066519747	-0.046733193
0.067865674	-0.036004318	7	0.068690267	-0.048258083
0.070146489	-0.037214344	8	0.070998796	-0.049879931

Table 5.6: Design Wind Load Result Barishal Division Exposure B

B.C Wx	B.C Lx	St.	B.C Wz	B.C Lz
0.059717687	-0.031681622	1	0.06044328	-0.042464194
0.062611891	-0.033217064	2	0.063372649	-0.044522211
0.067306874	-0.035707862	3	0.068124678	-0.047860731
0.070728097	-0.037522901	4	0.071587471	-0.050293502
0.073668851	-0.039083039	5	0.074563956	-0.05238462
0.076105888	-0.040375943	6	0.077030603	-0.054117554
0.077721991	-0.041233324	7	0.078666343	-0.055266737
0.080002807	-0.04244335	8	0.080974871	-0.056888585

Table 5.7: Design Wind Load Result Barishal Division Exposure C

Exposure	MAX. B.Wz
A	0.054567613
B	0.070998796
C	0.080974871
Max. Exp. C	0.080974871
Min. Exp. A	0.054567613
%Maximum	32.61167052 %

Table 5.8: Design Wind Load Result Comparison Barishal Division

C.A Wx	C.A Lx	St.	C.A Wz	C.A Lz
0.041936705	-0.022248397	1	0.042485869	-0.029845212
0.041936705	-0.022248397	2	0.042485869	-0.029845212
0.04199044	-0.022276905	3	0.042540308	-0.029883453
0.045525624	-0.024152402	4	0.046121785	-0.032399347
0.048564333	-0.025764508	5	0.049200286	-0.034561914
0.051135681	-0.027128668	6	0.051805307	-0.036391873
0.053351577	-0.028304253	7	0.05405022	-0.037968866
0.055708366	-0.029554584	8	0.056437871	-0.039646129

Table 5.9: Design Wind Load Result Chattogram Division Exposure A

C.B Wx	C.B Lx	St.	C.B Wz	C.B Lz
0.050923142	-0.027015911	1	0.051589984	-0.036240614
0.056904358	-0.030189085	2	0.057649525	-0.040497283
0.058765122	-0.031176264	3	0.059534655	-0.041821538
0.062300306	-0.033051761	4	0.063116132	-0.044337432
0.065339015	-0.034663867	5	0.066194634	-0.046499999
0.067910363	-0.036028027	6	0.068799654	-0.048329958
0.070126259	-0.037203611	7	0.071044568	-0.049906951
0.072483048	-0.038453943	8	0.073432219	-0.051584213

Table 5.10: Design Wind Load Result Chattogram Division Exposure B

C.C Wx	C.C Lx	St.	C.C Wz	C.C Lz
0.061706866	-0.032736927	1	0.062514922	-0.043915098
0.064697474	-0.034323515	2	0.065544692	-0.046043432
0.069548846	-0.03689728	3	0.070459593	-0.049496021
0.07308403	-0.038772777	4	0.07404107	-0.052011915
0.076122739	-0.040384883	5	0.077119571	-0.054174482
0.078640953	-0.041720854	6	0.079670761	-0.055966626
0.080310888	-0.042606794	7	0.081362564	-0.057155074
0.082667677	-0.043857125	8	0.083750216	-0.058832336

Table 5.11: Design Wind Load Result Chattogram Division Exposure C

Exposure	MAX. C. Wz
A	0.056437871
B	0.073432219
C	0.083750216
Max. Exp. C	0.083750216
Min. Exp. A	0.056437871
%Maximum	32.61167052 %

Table 5.12: Design Wind Load Result Comparison Chattogram Division

K.A Wx	K.A Lx	St.	K.A Wz	K.A Lz
0.035206454	-0.018677842	1	0.035503206	-0.024952801
0.035206454	-0.018677842	2	0.035503206	-0.024952801
0.035251565	-0.018701775	3	0.035548698	-0.024984774
0.038219401	-0.020276281	4	0.03854155	-0.027088247
0.04077044	-0.021629667	5	0.041114091	-0.028896313
0.042929124	-0.022774898	6	0.04329097	-0.030426293
0.044789399	-0.023761818	7	0.045166926	-0.031744776
0.046767957	-0.024811489	8	0.047162161	-0.033147091

Table 5.13: Design Wind Load Result Khulna Division Exposure A

K.B Wx	K.B Lx	St.	K.B Wz	K.B Lz
0.042750694	-0.022680237	1	0.043111036	-0.03029983
0.047772009	-0.025344162	2	0.048174676	-0.03385872
0.049334146	-0.026172912	3	0.04974998	-0.034965895
0.052301983	-0.027747418	4	0.052742832	-0.037069368
0.054853022	-0.029100804	5	0.055315374	-0.038877433
0.057011705	-0.030246035	6	0.057492253	-0.040407414
0.058871981	-0.031232955	7	0.059368209	-0.041725896
0.060850538	-0.032282626	8	0.061363443	-0.043128212

Table 5.14: Design Wind Load Result Khulna Division Exposure B

K.C Wx	K.C Lx	St.	K.C Wz	K.C Lz
0.051803782	-0.027483111	1	0.052240432	-0.036716265
0.054314439	-0.028815073	2	0.054772252	-0.03849571
0.058387234	-0.030975786	3	0.058879376	-0.041382329
0.061355071	-0.032550292	4	0.061872228	-0.043485802
0.06390611	-0.033903677	5	0.06444477	-0.045293868
0.066020186	-0.035025244	6	0.066576665	-0.046792233
0.06742212	-0.035769002	7	0.067990416	-0.047785862
0.069400677	-0.036818673	8	0.069985651	-0.049188178

Table 5.15: Design Wind Load Result Khulna Division Exposure C

Exposure	MAX. K. Wz
A	0.047162161
B	0.061363443
C	0.069985651
Max. Exp. C	0.069985651
Min. Exp. A	0.047162161
%Maximum	32.61167052 %

Table 5.16: Design Wind Load Result Comparison Khulna Division

M.A Wx	M.A Lx	St.	M.A Wz	M.A Lz
0.029766935	-0.015792051	1	0.029908161	-0.021028959
0.029766935	-0.015792051	2	0.029908161	-0.021028959
0.029805077	-0.015812286	3	0.029946484	-0.021055904
0.032314372	-0.017143526	4	0.032467684	-0.022828605
0.034471267	-0.018287809	5	0.034634812	-0.024352351
0.036296426	-0.019256098	6	0.036468631	-0.025641742
0.037869283	-0.020090535	7	0.03804895	-0.026752892
0.039542147	-0.020978028	8	0.03972975	-0.027934692

Table 5.17: Design Wind Load Result Mymensingh Division Exposure A

M.B Wx	M.B Lx	St.	M.B Wz	M.B Lz
0.036145564	-0.019176062	1	0.036317053	-0.025535165
0.040391069	-0.021428402	2	0.0405827	-0.028534417
0.041711851	-0.022129107	3	0.041909748	-0.029467488
0.044221146	-0.023460346	4	0.044430949	-0.031240189
0.046378041	-0.024604629	5	0.046598076	-0.032763935
0.0482032	-0.025572919	6	0.048431895	-0.034053325
0.049776057	-0.026407356	7	0.050012214	-0.035164476
0.051448921	-0.027294849	8	0.051693015	-0.036346276

Table 5.18: Design Wind Load Result Mymensingh Division Exposure B

M.C Wx	M.C Lx	St.	M.C Wz	M.C Lz
0.043799919	-0.023236876	1	0.044007723	-0.030942611
0.045922672	-0.024363045	2	0.046140547	-0.032442237
0.049366206	-0.02618992	3	0.049600418	-0.034874934
0.051875501	-0.02752116	4	0.052121619	-0.036647635
0.054032396	-0.028665443	5	0.054288747	-0.038171381
0.05581984	-0.029613723	6	0.056084671	-0.039434128
0.05700517	-0.030242568	7	0.057275625	-0.040271509
0.058678034	-0.031130061	8	0.058956425	-0.041453309

Table 5.19: Design Wind Load Result Mymensingh Division Exposure C

Exposure	MAX. M. Wz
A	0.03972975
B	0.051693015
C	0.058956425
Max. Exp. C	0.058956425
Min. Exp. A	0.03972975
%Maximum	32.61167052 %

Table 5.20: Design Wind Load Result Comparison Mymensingh Division

Raj. A Wx	Raj. A Lx	St.	Raj. A Wz	Raj. A Lz
0.01586151	-0.0084149	1	0.01586151	-0.011158388
0.01586151	-0.0084149	2	0.01586151	-0.011158388
0.015881834	-0.008425682	3	0.015881834	-0.011172686
0.017218929	-0.009135042	4	0.017218929	-0.012113316
0.018368245	-0.009744781	5	0.018368245	-0.012921847
0.019340793	-0.010260741	6	0.019340793	-0.013606023
0.0201789	-0.010705376	7	0.0201789	-0.014195622
0.021070297	-0.011178283	8	0.021070297	-0.014822709

Table 5.21: Design Wind Load Result Rajshahi Division Exposure A

RaJ. B Wx	RaJ. B Lx	St.	RaJ. B Wz	RaJ. B Lz
0.019260405	-0.010218093	1	0.019260405	-0.013549471
0.021522651	-0.011418267	2	0.021522651	-0.015140935
0.022226438	-0.011791642	3	0.022226438	-0.015636041
0.023563533	-0.012501002	4	0.023563533	-0.016576672
0.024712849	-0.013110741	5	0.024712849	-0.017385202
0.025685397	-0.013626701	6	0.025685397	-0.018069378
0.026523504	-0.014071336	7	0.026523504	-0.018658977
0.027414901	-0.014544243	8	0.027414901	-0.019286064

Table 5.22: Design Wind Load Result Rajshahi Division Exposure B

RaJ. C Wx	RaJ. C Lx	St.	RaJ. C Wz	RaJ. C Lz
0.023339079	-0.012381924	1	0.023339079	-0.016418771
0.024470202	-0.012982011	2	0.024470202	-0.017214503
0.026305112	-0.013955474	3	0.026305112	-0.018505341
0.027642207	-0.014664834	4	0.027642207	-0.019445971
0.028791523	-0.015274572	5	0.028791523	-0.020254502
0.029743974	-0.01577987	6	0.029743974	-0.02092454
0.030375586	-0.016114955	7	0.030375586	-0.021368871
0.031266982	-0.016587861	8	0.031266982	-0.021995958

Table 5.23: Design Wind Load Result Rajshahi Division Exposure C

Exposure	MAX. RaJ. Wxz
A	0.021070297
B	0.027414901
C	0.031266982
Max. Exp. C	0.031266982
Min. Exp. A	0.021070297
%Maximum	32.61167052 %

Table 5.24: Design Wind Load Result Comparison Rajshahi Division

Ran. A Wx	Ran. A Lx	St.	Ran. A Wz	Ran. A Lz
0.027940919	-0.014823308	1	0.028039572	-0.01971777
0.027940919	-0.014823308	2	0.028039572	-0.01971777
0.027976721	-0.014842301	3	0.0280755	-0.019743035
0.030332087	-0.016091877	4	0.030439182	-0.021405205
0.03235667	-0.017165966	5	0.032470913	-0.022833943
0.034069867	-0.018074857	6	0.034190159	-0.024042938
0.035546239	-0.018858106	7	0.035671744	-0.025084806
0.037116483	-0.019691157	8	0.037247532	-0.02619292

Table 5.25: Design Wind Load Result Rangpur Division Exposure A

Ran. B Wx	Ran. B Lx	St.	Ran. B Wz	Ran. B Lz
0.033928259	-0.017999731	1	0.034048052	-0.023943006
0.037913329	-0.020113903	2	0.038047192	-0.02675525
0.039153089	-0.020771624	3	0.039291329	-0.027630143
0.041508455	-0.022021201	4	0.041655011	-0.029292313
0.043533037	-0.023095289	5	0.043686742	-0.030721051
0.045246235	-0.02400418	6	0.045405988	-0.031930046
0.046722606	-0.024787429	7	0.046887573	-0.032971914
0.04829285	-0.02562048	8	0.048463361	-0.034080028

Table 5.26: Design Wind Load Result Rangpur Division Exposure B

Ran. C Wx	Ran. C Lx	St.	Ran. C Wz	Ran. C Lz
0.041113067	-0.021811438	1	0.041258228	-0.02901329
0.043105602	-0.022868524	2	0.043257798	-0.030419412
0.046337897	-0.024583332	3	0.046501505	-0.032700427
0.048693263	-0.025832908	4	0.048865187	-0.034362597
0.050717845	-0.026906996	5	0.050896918	-0.035791335
0.052395641	-0.027797106	6	0.052580637	-0.036975347
0.053508258	-0.028387375	7	0.053697183	-0.037760516
0.055078502	-0.029220426	8	0.055272971	-0.038868629

Table 5.27: Design Wind Load Result Rangpur Division Exposure C

Exposure	MAX. Ran. Wz
A	0.037247532
B	0.048463361
C	0.055272971
Max. Exp. C	0.055272971
Min. Exp. A	0.037247532
%Maximum	32.61167052 %

Table 5.28: Design Wind Load Result Comparison Rangpur Division

S.A Wx	S.A Lx	St.	S.A Wz	S.A Lz
0.02446227	-0.012977803	1	0.02449307	-0.017228172
0.02446227	-0.012977803	2	0.02449307	-0.017228172
0.024493614	-0.012994432	3	0.024524453	-0.017250247
0.026555736	-0.014088436	4	0.026589172	-0.018702549
0.028328258	-0.0150288	5	0.028363926	-0.019950892
0.029828162	-0.015824534	6	0.029865718	-0.021007238
0.031120725	-0.016510269	7	0.031159909	-0.021917558
0.032495474	-0.017239604	8	0.032536388	-0.022885759

Table 5.29: Design Wind Load Result Sylhet Division Exposure A

S.B Wx	S.B Lx	St..	S.B Wz	S.B Lz
0.029704185	-0.015758761	1	0.029741585	-0.020919924
0.033193112	-0.017609718	2	0.033234905	-0.023377089
0.034278522	-0.018185553	3	0.034321681	-0.024141516
0.036340644	-0.019279557	4	0.0363864	-0.025593818
0.038113166	-0.020219921	5	0.038161154	-0.026842161
0.03961307	-0.021015655	6	0.039662946	-0.027898507
0.040905633	-0.02170139	7	0.040957137	-0.028808827
0.042280381	-0.022430726	8	0.042333616	-0.029777028

Table 5.30: Design Wind Load Result Sylhet Division Exposure B

S.C Wx	S.C Lx	St.	S.C Wz	S.C Lz
0.035994483	-0.01909591	1	0.036039803	-0.025350025
0.037738947	-0.020021389	2	0.037786463	-0.026578608
0.04056882	-0.021522702	3	0.040619899	-0.028571618
0.042630942	-0.022616706	4	0.042684618	-0.030023919
0.044403464	-0.02355707	5	0.044459371	-0.031272263
0.045872374	-0.024336361	6	0.04593013	-0.032306779
0.04684647	-0.024853142	7	0.046905454	-0.032992812
0.048221218	-0.025582478	8	0.048281933	-0.033961013

Table 5.31: Design Wind Load Result Sylhet Division Exposure C

Exposure	MAX. S. Wz
A	0.032536388
B	0.042333616
C	0.048281933
Max. Exp. C	0.048281933
Min. Exp. A	0.032536388
%Maximum	32.61167052 %

Table 5.32: Design Wind Load Result Comparison Sylhet Division

5.3 Comparison between wind load results of eight divisions of Bangladesh for Exposure A, B and C.

Exp.	MAX. D. Wz	Exp.	MAX. B. Wz	Exp.	MAX. C. Wz
A	0.03771379	A	0.054567613	A	0.056437871
B	0.049070017	B	0.070998796	B	0.073432219
C	0.055964869	C	0.080974871	C	0.083750216
Max. Exp. C	0.055964869	Max. Exp. C	0.080974871	Max. Exp. C	0.083750216
Min. Exp. A	0.03771379	Min. Exp. A	0.054567613	Min. Exp. A	0.056437871

Exp.	MAX. K. Wz	Exp.	MAX. M. Wz	Exp.	MAX. RaJ. Wxz
A	0.047162161	A	0.03972975	A	0.021070297
B	0.061363443	B	0.051693015	B	0.027414901
C	0.069985651	C	0.058956425	C	0.031266982
Max. Exp. C	0.069985651	Max. Exp. C	0.058956425	Max. Exp. C	0.031266982
Min. Exp. A	0.047162161	Min. Exp. A	0.03972975	Min. Exp. A	0.021070297

Exp.	MAX. Ran. Wz	Exp.	MAX. S. Wz	Overall Max. & Min.	
A	0.037247532	A	0.032536388	Max. P	Min. P
B	0.048463361	B	0.042333616	0.083750216	0.021070297
C	0.055272971	C	0.048281933	Chattogram	Rajshahi
Max. Exp. C	0.055272971	Max. Exp. C	0.048281933	Exp. C Wz	Exp. A Wxz
Min. Exp. A	0.037247532	Min. Exp. A	0.032536388	%Maximum	74.8415013 %

Overall Design Wind Load Result Comparison of All Eight Division

CHAPTER VI

Discussion, Conclusion and Recommendation

6.1 Discussion & Conclusion

- It has been found that over all maximum design wind load is 0.083750216 kip/ft^2 and minimum design wind load is 0.021070297 kip/ft^2.
- Maximum design wind load is found in windward z direction for exposure C in Chattogram division.
- Maximum design wind load is found in Chattogram because wind speed in Chattogram is comparatively higher than other division.
- Maximum design wind load is found in windward z direction because here gust factor *G* value is higher than x direction.
- Maximum design wind load is found for exposure C because of its flat, unobstructed areas.
- Over all minimum design wind load is found in windward x and z direction for exposure "A" in Rajshahi division.
- Minimum design wind load is found in Rajshahi because wind speed in Rajshahi is comparatively lower than other division.
- Minimum design wind load is found in windward x and z direction because here gust factor *G* value is same in both direction.
- Minimum design wind load is found for exposure "A" because numerous closely spaced obstructions block the direct wind in urban and suburban areas.
- It was found that percent maximum between maximum design wind load and minimum design wind load for every division is 32.61%.
- It was found that with this % maximum value we can justify that our excel calculation is accurate.
- Over all final percent maximum value was found between Chattogram and Rajshahi is 74.84%.

6.2 Recommendation

- Lateral loads effect like design wind load on RCC buildings can be calculated by ETABS or STAAD Pro software.
- It is better to have a sample hand calculation copy before trying to calculate design wind load in MS Excel.
- It is recommended to perform percent maximum value check between maximum and minimum design wind load for this type of calculation in MS excel.

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Appendix

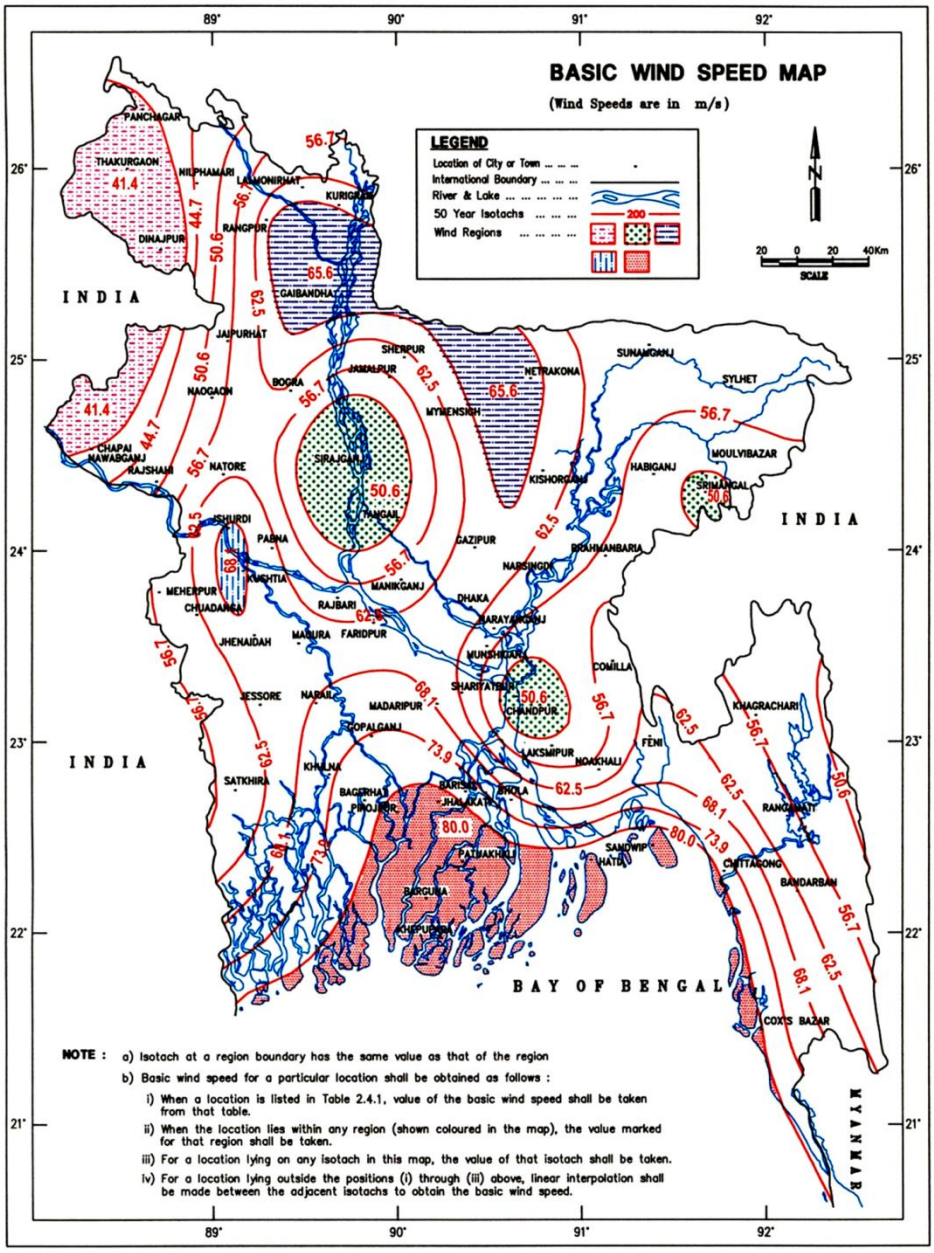

Fig. 7.1: Basic wind speed (*V*, m/s) map of Bangladesh

Table 7.1: Velocity Pressure Exposure Coefficient K_h and K_z

Height above ground level, z	Exposure (Note 1)			
	A		B	C
(m)	Case 1	Case 2	Case 1 & 2	Case 1 & 2
0-4.6	0.70	0.57	0.85	1.03
6.1	0.70	0.62	0.90	1.08
7.6	0.70	0.66	0.94	1.12
9.1	0.70	0.70	0.98	1.16
12.2	0.76	0.76	1.04	1.22
15.2	0.81	0.81	1.09	1.27
18	0.85	0.85	1.13	1.31
21.3	0.89	0.89	1.17	1.34

Table 7.2: Wind Directionality Factor K_d^*

Structure Type	Directionality Factor K_d*	Structure Type	Directionality Factor K_d*
Buildings		Solid Signs	0.85
Main Wind Force Resisting System	0.85	Open Signs and Lattice Framework	0.85
Components and Cladding	0.85	Trussed Towers	
Arched Roofs	0.85	Triangular, square, rectangular	0.85
Chimneys, Tanks, and Similar Structures		All other cross section	0.95
Square	0.90		
Hexagonal	0.95		
Round	0.95		

* Directionality Factor K_d has been calibrated with combinations of loads specified in Sec 2.7. This factor shall only be applied when used in conjunction with load combinations specified in Sections 2.7.2 and 2.7.3.

Table 7.3: Importance Factor *I*

Occupancy Category[1] or Importance Class	Non-Cyclone Prone Regions and Cyclone Prone Regions with V = 38-44 m/s	Cyclone Prone Regions with V > 44 m/s
I	0.87	0.77
II	1.0	1.00
III	1.15	1.15
IV	1.15	1.15

Table. 7.4: Internal pressure coefficient, GC_{pi} main wind force resisting system component and cladding

Enclosed, Partially Enclosed, and Open Buildings: Walls & Roofs

Enclosure Classification	GC_{pi}
Open Building	0.00
Partially Enclosed Building	+0.55 -0.55
Enclosed Building	+0.18 -0.18

Notes:
1. Plus and minus signs signify pressures acting toward and away from the internal surfaces, respectively.
2. Values of GC_{pi} shall be used with q_z or q_h as specified in Sec 2.4.11.
3. Two cases shall be considered to determine the critical load requirements for the appropriate condition:
   (i) a positive value of GC_{pi} applied to all internal surfaces
   (ii) a negative value of GC_{pi} applied to all internal surfaces.

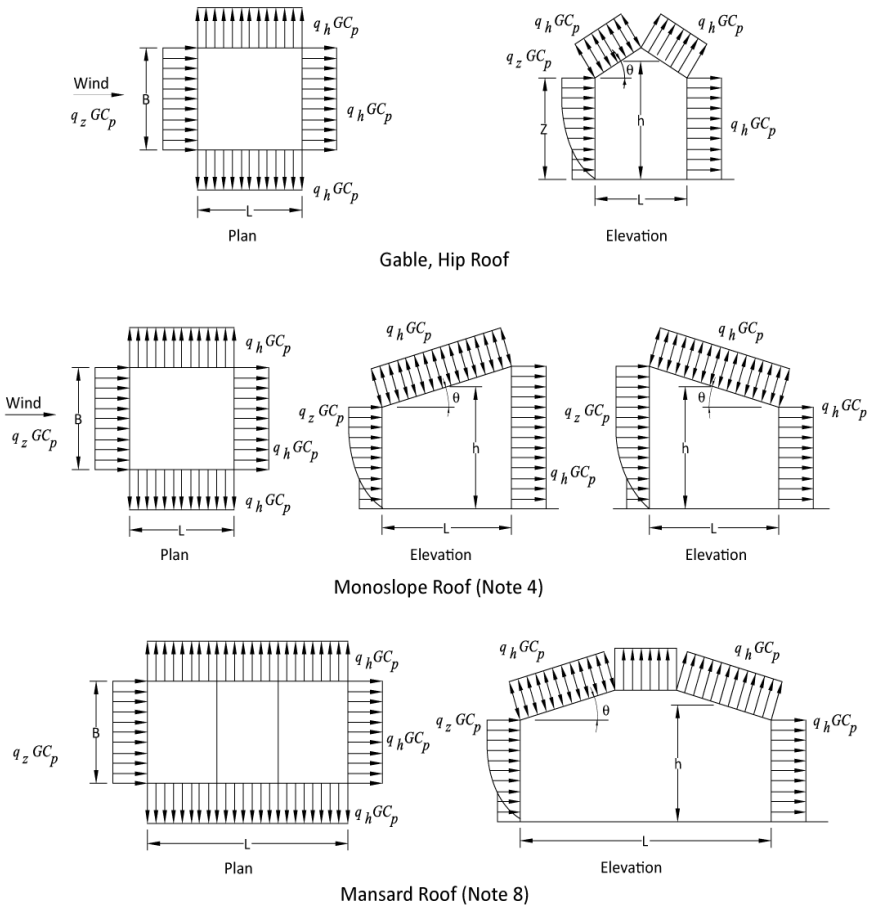

Fig. 7.2: Enclosed, Partially Enclosed Buildings; Walls & Roofs

Table 7.5: Wall Pressure Coefficients, C_p

Wall Pressure Coefficients, C_p			
Surface	*L/B*	C_p	Use With
Windward Wall	All values	0.8	q_z
Leeward Wall	0-1	-0.5	q_h
	2	-0.3	
	$\geq$ 4	-0.2	
Side Wall	All values	-0.7	q_h

THE END