

**NUMERICAL SIMULATION OF MEDIUM RISE
BUILDINGS (SUBJECTED TO WIND LOADS) USING
COMPUTATIONAL FLUID DYNAMICS (CFD)**

By

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DECLARATION

I hereby attest that the work I have submitted here is authentic and was created by myself for the partial fulfillment of master's degree in Structural Engineering at University of Moratuwa and has not been published or submitted elsewhere for the requirement of a degree Programme. Any literature, data or works done by others and cited within this dissertation has been given due acknowledgement and listed in the reference section.

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ABSTRACT

High-rise building industry has become more popular with the urbanization all over the world. Tall & medium rise buildings are more sensitive to the wind force than low-rise buildings. Wind action is more significant on the building when the building is getting taller. Therefore, wind induced action should be accurately predicted by considering the building height.

Traditional techniques, like code-based wind predictions, are unreliable on wind action when the height of the building increases. However, wind tunnel testing is widely used to predict the wind induced effect using a prototype with the geometric and dynamic similarity for all types of buildings and structures. But wind tunnel testing requires large, expensive equipment and time.

Numerical methods also can be used to simulate the wind flow behavior around the building. Computational Fluid Dynamic (CFD) method is a reliable option for wind analysis of tall buildings. Direct Numerical Simulation (DNS) is not possible because of insufficient computational power. Using turbulence models, solutions utilizing the Reynolds Averaged Navier-Stokes (RANS) equation can serve as a substitute for wind analysis. Various types of turbulent models can be developed in Midas NFX software for simulating the wind flow.

Nine rectangular-shaped buildings were subjected to rigid body modeling analysis using Midas NFX software inside a well-defined computational area. Obtained results were compared with the code base prediction results & wind tunnel testing results for all buildings. 2-equation $k-\omega$ (SST) turbulent model was used to predict the wind pressure distribution around the building and the normalized base overturning moment with the reasonable accuracy with 1m mesh size.

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TABLE OF CONTENTS

DECLARATION	1
ABSTRACT	2
ACKNOWLEDGEMENT	3
CHAPTER 1.....	8
INTRODUCTION	8
1.1 Background.....	8
1.2 Aim.....	9
1.3 Objectives of the Study.....	9
CHAPTER 2.....	10
LITERATURE REVIEW	10
2.1 Wind Induced Phenomenon.....	10
2.1.1 Wind Flow	10
2.1.2 Wind Flow around a Building	10
a) Along-Wind Response	11
b) Cross- Wind Response.....	12
(i) Vortex Shedding	12
(ii) Incident Turbulence Mechanism.....	13
(iii) Higher derivatives of crosswind displacement	13
c) Torsional Response	13
2.2 Prediction of Wind Induced Action by Codes	14
2.2.1 Wind Design Codes	14
2.3 Wind Tunnel Test	15
2.3.1 Wind Design Codes	15
2.3.2 Advantages of Wind Tunnel Testing	16
2.3.3 Disadvantages of Wind Tunnel Testing.....	17
2.4 Numerical Simulation	18
2.4.1 Turbulent Flow.....	18
2.4.2 Reynolds – Averaged Navier-Stokes Equations.....	20
2.4.3 Turbulence Models	21
2.4.4 Research Gap.....	25

CHAPTER 3.....	27
METHODOLOGY	27
3.1 Overview.....	27
3.2 Selection of Buildings.....	28
3.3 Code Base Prediction of Wind Response	29
3.4 Wind Tunnel Test Data.....	30
3.5 CFD Analysis	31
CHAPTER 4.....	35
RESULTS AND DISCUSSION.....	35
4.1 Results of Code Base Calculations.....	35
4.2 Results of Wind Tunnel Tests	45
4.3 Results of Numerical Simulation.....	49
4.4 Comparison of Results as per Case.....	62
CHAPTER 5.....	65
CONCLUSION	65
5.1 Conclusion	65
REFERENCES	67

LIST OF FIGURES

Figure 1 – Wind responds directions on rectangular buildings.....	11
Figure 2 – Vortex Formation.....	13
Figure 3 – wind tunnel model for a building structure.....	16
Figure 4 – Overview of The Wind Action Study.....	27
Figure 5 - Graphical output from wind tunnel test results	31
Figure 6 - Computational domain planar and side view with dimensions.....	32
Figure 7 - 3D view of Computational domain	32
Figure 8 - Sectional view of mesh in x-x axis.....	33
Figure 9 - Plan view of mesh in z-z axis (Elevation).....	34
Figure 10 - Comparison of Windward pressure according to code results	38
Figure 11 - Comparison of Leeward pressure according to code results.....	41
Figure 12 - Comparison of total wind pressure pressure according to code results.....	44
Figure 13 - Comparison of total wind pressure pressure according to code results.....	48
Figure 14 - Comparison of total wind pressure according to code results, CFD results & wind tunnel test results.....	52
Figure 15 - Comparison of Winward pressure according to code results & CFD results.....	56
Figure 16 - Comparison of Leeward pressure according to code results & CFD results.....	59
Figure 17 - Wind flow pattern around the building	59
Figure 18 - Wind pressure pattern along the building height.....	60
Figure 19 - Comparison of total pressure - Building height - 64m	62
Figure 20 - Comparison of total pressure - Building height - 80m.....	63
Figure 21 - Comparison of total pressure - Building height - 96m	64

LIST OF TABLES

Table 1 – Selected dimensions of buildings.....	28
Table 2 - Input data required to get wind tunnel test results.....	30
Table 3 - Tabular output taken from wind tunnel test results	30
Table 4 – Summarized results according to AS & EC approach	45
Table 5 - Summarized results according to AS, EC & AISC approach.....	49
Table 6 - Summarized results according to EC, AISC & CFD Approach	53