# STABILITY STUDY OF HIGH RISE IBS BUILDING USING STAAD PRO

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ENGKU MUHAMMAD AFNAN
BIN ENGKU AZMAN

SCHOOL OF ENVIRONMENTAL ENGINEERING
UNIVERSITI MALAYSIA PERLIS
2013

# STABILITY STUDY OF HIGH RISE IBS BUILDING USING STAAD PRO

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by

ENGKU MUHAMMAD AFNAN
BIN ENGKU AZMAN

Report submitted in partial fulfillment
of the requirements for the degree
of Bachelor of Engineering

JUNE 2013

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*This thesis is dedicated to my beloved father and mother*

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## APPROVAL AND DECLARATION SHEET

**This project report titled Stability Study of High Rise IBS Building Using STAAD PRO was prepared and submitted by Engku Muhammad Afnan Bin Engku Azman (Matrix Number: 091200220) and has been found satisfactory in terms of scope, quality and presentation as partial fulfillment of the requirement for the Bachelor of Engineering (Building Engineering) in Universiti Malaysia Perlis (UniMAP).**

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**Checked and Approved by**

_____

**(PUAN NORLIA BT MOHAMAD IBRAHIM)**
**Project Supervisor**

**School of Environmental Engineering**
**Universiti Malaysia Perlis**

**June 2013**

**KAJIAN KESTABILAN BANGUNAN TINGGI IBS MENGGUNAKAN STAAD PRO**

## ABSTRAK

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Kestabilan merupakan masalah asas dalam mekanik pepejal yang mesti dikuasai untuk memastikan keselamatan struktur daripada masalah keruntuhan. Teori kestabilan adalah amat penting bagi kejuruteraan struktur. Oleh itu kajian ini membentangkan tingkah laku dan kestabilan bangunan tinggi Sistem Binaan Berindustri (IBS). Perisian STAAD PRO telah digunakan untuk menganalisis keputusan output. Dua bangunan berbeza ketinggian dengan 40.0 m dan 150.0 m telah dibandingkan dari aspek momen lentur, nilai ricih, dan kelajuan angin yang berbeza. Penilaian struktur menunjukkan bahawa momen lentur di tingkat bawah bangunan adalah lebih besar daripada momen lentur di tingkat atas. Selain itu analisis terhadap daya ricih telah menunjukkan terdapat perbezaan kecil di setiap tingkat. Ini kerana setiap tingkat membawa beban hidup dan beban mati yang sama untuk menahan daya ricih. Peningkatan kelajuan angin meningkatkan nilai momen lentur struktur. Tambahan pula, kekuatan angin meningkat dengan ketinggian bangunan. Secara ringkas kajian ini membuktikan bahawa bangunan yang lebih rendah adalah lebih stabil daripada bangunan yang lebih tinggi kerana struktur telah membawa beban menegak dan beban angin sisi. Walau bagaimanapun, kajian perlu dipertingkatkan dengan meningkatkan saiz tiang secara beransur-ansur ke arah asas lantai untuk menahan beban sisi dan meningkatkan kestabilan bangunan.

## ABSTRACT

Stability presents a fundamental problem in solid mechanics which must be mastered to ensure the safety of structures against collapse. The theory of stability is crucial importance for structural engineering. Thus this study presents the behavior and stability of high rise building of Industrialised Building System (IBS). STAAD PRO software has been used to analyze the output of the results. Two different heights of building with 40.0 m and 150.0 m building are compared in term of bending moment, shear forces and different value of wind speed. The structural evaluation shows that bending moment at the lower floor of building are greater than the bending moment at the top floor. Besides, analysis had shown shear forces have slightly difference in every floor. This is due to each floor carry an equal live load and dead load to resist shearing forces. The increases of wind speed increase the value of bending moment of structure. Furthermore, the intensities of wind increase with height of the building. Shortly this study prove that lower building is more stable than the higher building because the structure has to carry more vertical loads and the lateral wind. However study has to be improved by increasing the column sizes progressively towards the base of the floor to resist lateral loads to increase the stability of building.

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## LIST OF ABBREVIATIONS

| | |
|---|---|
| IBS | Industialized Building System |
| CIDB | Construction Industry Development Board |
| STAAD | Structural Analysis And Design |
| ULS | Ultimate Limit State |
| SLS | Service Limit State |
| RCC | Rolled Compacted Concrete |
| CTBUH | Council on Tall Buildings and Urban Habitat |
| FE | Final Element |
| R&D | Research and Development |
| lbs/sqft | Pound per square foot |
| kg/sqm | Kilogram per square meter |
| $kN/m^3$ | Kilo Newton per cube meter |
| % | Percentages |
| m | Meter |
| q | Kinetic Energy |
| ρ | Density |
| V | Velocity |
| kN.m | Kilo Newton Meter |

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