"We hereby declare that I have read this project report and in my opinion this project report is sufficient in terms of scope and quality for the award of the degree of Master Civil Engineer (construction management)"

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Date: 1 DECEMBER 2010

HOT CLIMATE AIR FLOW STUDY AND AFFECT OF STACK VENTILATION IN RESIDENTIAL BUILDING

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A project report submitted in partial fulfillment of the requirements for the award of the degree of Master of Science (construction management)

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DECEMBER 2010

I declare that this project report entitled "HOT CLIMATE AIR FLOW STUDY AND AFFECT OF STACK VENTILATION IN RESIDENTIAL BUILDING*"* is the product of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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Date : DECEMBER 2010

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ABSTRACT

Natural ventilation is the process of supplying and removing air through an indoor space by natural passive means. For comfort there are two major types of natural ventilation occurring in buildings: wind driven ventilation and stack ventilation. The majority of buildings employing natural ventilation rely primarily on wind driven ventilation, but stack ventilation has several benefits. The most efficient design for a natural ventilation building should implement both types of ventilation. Typical building design relies on rules of thumb for harnessing the power of wind for the purpose of natural ventilation. Design guidelines are offered in building regulations and other related literature may include only variety of recommendations on many specific areas such as building location, aesthetics, and orientation, or possibility feng-shui luck. Building form and dimensions, window typologies and operation, other aperture types (doors, chimneys) , construction methods and detailing (infiltration) , external elements (walls, screens) , and urban planning conditions is being established without the issue of sustainability in mind of the designer. In this project it is going to survey stack ventilation in building in three different terms and comparison the result for find the effect of stack on existing building in hot and humid climate. The result obtained from measurement from site with specific equipment.

ABSTRAK

Pengudaraan semulajadi adalah proses membekalkan dan memindahkan udara melalui ruangan dalam bangunan dengan cara pasif semulajadi. Untuk keselesaan, terdapet dua jenis utama pengudaraan semulajadi yang terjadi pada bangunan: pergerakan pengudaraan angin dan ventilasi bertindeh. Sebahagian besar bangunan menggunakan pengudaraan semulajadi yang bergantung pada pergerakan pengudaraan angin, tapi stack ventilasi mempunyai beberapa keuntungan. Rekaan yang paling efisyen harus melaksanakan kedua-dua kaedah pengudaraan. Rekaan bangunan khas bergantung pada aliran praktikal untuk memanfaatkan kekuatan angin untuk tujuan pengudaraan semulajadi. Garis panduan rekaan yang ditawarkan dalam peraturan pembinaan dan piawaian yang berkaitan boleh merangkumi hanya cadangan pada pelbagai ruang tertentu seperti lokasi bangunan, estetika, orientasi, atau kemungkinan keberuntungan feng-shui. Bentuk dan dimensi bangunan , topologi tetingkap, jenis-jenis lubang (pintu, cerobong asap), kaedah pembinaan dan perincian (infiltrasi), unsur-unsur luaran (dinding, skrin), dan keadaan perancangan bandar. Projek ini mengkaji selidik stack ventilasi di tiga jenis bangunar yang berbeza dan perbandingan keputusan untuk mengetahui pengaruh tetingkat pada bangunan yang ada di iklim panas dan lembap. Keputusan yang diperolehi daripada pengukuran dari tapak projek dengan peralatan khas juga dibincangkan.

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INTRODUCTION

1.3 Introduction

Almost all historic buildings were ventilated naturally, although many of these have been compromised by the addition of partition walls and mechanical systems. With an increased awareness of the cost and environmental impacts of energy use, natural ventilation has become an increasingly attractive method for reducing lost of energy use and cost it also for providing acceptable indoor environmental quality. It will also help in maintaining a healthy, comfortable, and productive indoor climate. In favorable climates and buildings types, natural ventilation can be used as an alternative to air-conditioning with saving up to 30% of total energy consumption.

Natural ventilation systems rely on air pressure differences to move fresh air through buildings. Pressure difference is from wind and buoyancy effect created by temperature and humidity, deference's in either case, the amount of ventilation will depend critically on the size and placement of openings in the building. It is useful to think of a natural ventilation system as a circuit, with equal consideration given to

supply and exhaust. Openings between rooms such as transom windows, louvers, grills, or open plans are techniques to complete the airflow circuit through a building. Code requirements regarding smoke and fire transfer present challenges to the designer of a natural ventilation system. For example, historic buildings used the stairway as the exhaust stack and a technique now prevented by code requirements in many cases. Natural ventilation, unlike fan-forced ventilation, uses the natural forces of wind and buoyancy to deliver fresh air into buildings.

Fresh air is required in buildings to alleviate odors, to provide oxygen for respiration, and to increase thermal comfort. At interior air velocities of 160 feet per minute (fpm), the perceived interior temperature can be reduced by as much as 5°F. However, unlike true air-conditioning, natural ventilation is ineffective at reducing the humidity of incoming air. This places a limit on the application of natural ventilation in humid climates.

Wind can blow air through openings in the wall on the windward side of the building, and suck air out of openings on the leeward side and the roof. Temperature differences between warm air inside and cool air outside can cause the air in the room to rise and exit at the ceiling or ridge, and enter via lower openings in the wall. Similarly, buoyancy caused by differences in humidity can allow a pressurized column of dense, evaporative cooled air to supply a space, and lighter, warmer, humid air to exhaust near the top.

1.2 Problem statement

All buildings consume very high energy with air conditioner mechanical system Thermally unsatisfied users in cold weather country might not be complaining if an active system is incorporated in the system expect the experience of energy. As a consequence of heat balance, air temperatures in densely built urban areas are higher than the temperatures of the surrounding rural country. The first essential point in effective ventilation is to consider to a wind. Direction and speed in windless district caring ventilation to not operate and perform without active support of mechanical device.

Another issue that has the utmost problem for wind catcher is humidity and orientation of site, facade of building that keep sunlight heat. Passive solar techniques are mainly a set of strategies that may be implemented due to the problem of humidity.

1.4 Aims

The aim of this study is to identify the best combination approach in term of finding and weather ventilation of passive ventilation. It also includes the effect of orientation, wind speed and direction using field measurement for others detail study on CFD.

1.5 Objectives of the research

1- Study of the use of passive ventilation approach in the building.
2- The effect of stack ventilation on existing building in Malaysia.
3- The effect of stack ventilation combines with fan.

1.6 **Scope of the study**

This study will create the best passive ventilation for single storey housing through combination study of stack with fan.