

# Research Report

## Green Design and Construction of Site Offices



Dr. Sam C. M. Hui and Ms. Allison Y. M. Law

Department of Mechanical Engineering  
The University of Hong Kong  
Pokfulam Road, Hong Kong

September 2002

Copyright ©2002 Sam C. M. Hui

This research report is prepared for Gammon Skanska Limited as a form of collaborative research study for promoting green building design and construction methods.

For any enquiries about the study, please address to the following person:

Dr. Sam C. M. Hui  
Department of Mechanical Engineering  
The University of Hong Kong  
Pokfulam Road  
Hong Kong  
Email: cmhui@hku.hk

# CONTENTS

	Page
Executive Summary .....	v
Acknowledgements.....	v
List of Figures .....	vi
List of Tables.....	vii
<b>1. Introduction.....</b>	<b>1</b>
1.1 Background .....	1
1.2 Objectives .....	2
1.3 Report organisation .....	2
<b>2. Evaluation of Existing Site Offices .....</b>	<b>3</b>
2.1 General information .....	3
2.2 Technical assessment .....	4
2.3 Site survey and measurements .....	7
2.4 Establishment of performance baseline .....	10
<b>3. Thermal Performance of Building Envelope.....</b>	<b>12</b>
3.1 Study methodology .....	12
3.2 Analysis of thermal performance.....	13
3.3 Recommendations.....	15
<b>4. Energy Performance of Site Offices .....</b>	<b>16</b>
4.1 Building energy simulation tool.....	16
4.2 Modelling assumptions .....	17
4.3 Major findings and results .....	19
<b>5. Lighting System and Daylighting Design .....</b>	<b>27</b>
5.1 Design and evaluation of lighting system.....	27
5.2 Assessment of daylighting potential .....	29
5.3 Recommended practices .....	32
<b>6. Assessment of Green Design Potential.....</b>	<b>34</b>
6.1 Building environmental assessment.....	34
6.2 Important issues for promoting green design.....	36
<b>7. Conclusions.....</b>	<b>40</b>
7.1 Green design and construction.....	40
7.2 Suggested further studies .....	40

## Appendices

Appendix I – Background information of existing site offices.....	42
Appendix II – Checklists for interview and site survey.....	50
Appendix III – Summary of site measurements in existing site offices .....	53
Appendix IV – Summary of the brief assessment on indoor air quality.....	55
Appendix V – Floor plans and design drawings of the new site office .....	59
Appendix VI – Lighting measurements in Tsing Yi site office .....	61
Appendix VII – Lighting design for the new site office .....	63
Appendix VIII – Summary of LEED assessment results.....	66

## Executive Summary

This study and report was commissioned by the Gammon Skanska Limited to provide an assessment of their construction site offices to help formulate the strategy for planning and design of green site offices. This work reflects a collaborative development process between the company and the University of Hong Kong, with the aim to promote green building design and construction. The study has set out a theme to address and investigate green design and construction of site offices. It attempts to gather the key information and evaluate practical solutions to improve the building's performance.

Analysis of thermal and energy performance of the sites offices indicates that there is lost of opportunities in the current practices. It is recommended to consider and adopt energy conservation measures to improve the building's environmental performance. Possible measures include thermal insulation, external shading, green roof and efficient lighting.

Evaluation of lighting system shows that green building can operate with lower costs and increased worker satisfaction. Design and calculation have been made for the new site office. It is found that with similar wattage and power consumption, the efficient lighting can provide a better lighting level and quality. It is also recommended to investigate further on task-ambient lighting and daylighting control.

A brief review has been conducted to assess the environmental performance of the site office and evaluate green design potential of future site offices. Important issues for promoting green design have been identified for consideration, implementation or further investigation. These issues include planning and design strategy, construction method and materials, as well as environmental policy and management.

## Acknowledgements

The authors would like to thank the Gammon Skanska Limited for sponsoring a Research Assistant to carry out the study in July to August 2002. Sincere thanks are expressed to the following persons for initiating the green design study and providing support during the investigation process. This work could not have been done without their guidance and collaboration.



- Mr. Andrew Kwan
- Mr. Eddie Tse
- Mr. K. K. Tse
- Ms. Jackie Lau
- Mr. K. M. Chiang

Thanks also go to the Departments of Architecture and Mechanical Engineering, The University of Hong Kong for providing technical and administrative supports.