The Green and Gracious Builder Guide (SMC)

Building and Construction Authority

We shape a **safe**, **high quality**, **sustainable** and **friendly** built environment.

Foreword

BCA launched the Green and Gracious Builder Scheme in February 2009. The scheme was introduced to raise the environmental consciousness and professionalism of builders. It is also a benchmark of a builder's corporate social responsibility to the environment and the general public. Apart from setting standards for green practices, it also sets standards for gracious practices. These gracious practices will improve the image of our builders and the construction industry particularly among neighbours and residents, some of whom may have been affected by construction activities near them.

To complement the scheme, BCA has produced the Green and Gracious Builder Guide to share with the industry, best practices of builders in addressing environmental concerns and mitigating possible inconveniences to the public caused by construction work. These best practices were compiled from on-site observations of various builders certified under the Green and Gracious Builder Scheme.

The Green and Gracious Builder Guide is meant for contractors managing larger value construction projects. All the practices listed therein may not be relevant to builders managing smaller value projects. Hence this guidebook, Green and Gracious Builder Guide (SMC), has been produced specifically for small and medium construction firms (SMC) working on smaller projects sited adjacent or close to existing buildings where it is important to carry out the works in a socially responsible manner. It is adapted from the Green and Gracious Builder Guide with a focus on gracious practices and manpower management. It illustrates some of the green technologies and methods to reduce dust generation and control vectors. It also includes gracious best practices to enhance accessibility, public safety, reduce noise and vibration, and improve communication and manpower management on construction sites.

Green and gracious construction practices are vital in our objective to achieve in a gracious manner, a truly sustainable built environment in Singapore. This guide should come in handy to those who are unsure how to do it but want to make a start. There is nothing better than learning from those that have embarked on and excelled in the same journey.

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Acknowledgement

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Contents

1 INTRODUCTION

BCA's efforts at developing a sustainable built environment have gained sufficient momentum and been well accepted by the industry. Many have responded enthusiastically to the BCA Green Mark Scheme – a scheme that recognizes the efforts of developers, architects and engineers in contributing to environmental sustainability in their development projects. However, one of the key players in the construction value chain, the builders, has not been well recognized. They also do contribute to environmental sustainability and environmental protection when they go green and adopt 'friendlier' construction site management and practices. Given the high visibility and impact of construction works, it is also important for builders to be socially responsible to the environment, the neighbours and general public by gracious practices during construction. Hence the Green and Gracious Builder Scheme was introduced to raise the environmental consciousness and professionalism of builders. Together with the BCA Green Mark Scheme, this scheme will form part of the holistic framework to shape a sustainable built environment for Singapore.

This Guidebook sets out the best green and gracious practices to assist builders in addressing environmental concerns and mitigating possible inconveniences to the public caused by construction works. It is intended for small and medium construction firms (SMC) working on smaller projects sited adjacent or close to existing buildings where it is important to carry out the works in a socially responsible manner. The gracious best practices encourage builders to address the public needs and concerns, such as enhanced communications, consideration for public accessibility, mitigating noise and vibrations, minimizing, if not eradicating disturbance in the vicinity and neighbourhood. There are also examples on good manpower management practices which the builder can implement to improve the working conditions of its workforce and thereby raise the image of the industry.

All the practical examples in this Guidebook have been gathered from the builders which participated in the Green and Gracious Builder Scheme. It is useful guide for builders who wish to benchmark their projects for environmental sustainability and corporate social responsibility to the environment and the general public.

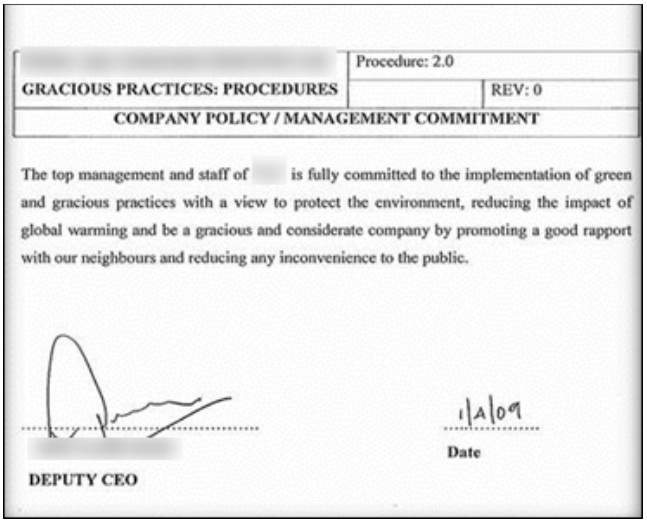
2 GREEN AND GRACIOUS BUILDER SCHEME (SMC) CRITERIA

2.1 Summary

Criteria	Points (Max)
Company Policy	2
Housekeeping & Air Quality	18
Accessibility	13
Public Safety	9
Noise & Vibration	27
Communication	11
Manpower Management	20
Innovation and Exemplary Practices	**5**
Total	**105**

2.2 Company Policy

Criteria	Maximum Possible Points
Company Policy	**Subtotal: 2**
Policy statement to adopt gracious practices	2



	Procedure: 2.0	
GRACIOUS PRACTICES: PROCEDURES		REV: 0
COMPANY POLICY / MANAGEMENT COMMITMENT		

The top management and staff of [redacted] is fully committed to the implementation of green and gracious practices with a view to protect the environment, reducing the impact of global warming and be a gracious and considerate company by promoting a good rapport with our neighbours and reducing any inconvenience to the public.

[redacted]

DEPUTY CEO

1/2/09

Date

Photo 2.2a: An example of a green and gracious company policy by a certified green and gracious builder

2.3 Housekeeping & Air Quality

Criteria	Maximum Possible Points
Housekeeping & Air Quality	**Subtotal: 18**
In-house procedures to encourage good housekeeping at site	3
a) Procedures on housekeeping at site	*1*
b) Designated storage space at site	*1*
c) Implementing good housekeeping measures at site	*1*

Photo 2.3a: Designated storage spaces allow materials to be properly stored on site.

Photo 2.3b: A good housekeeping program will ensure all subcontractors adopt good housekeeping practices.

Criteria	Maximum Possible Points
Measures to address dust generated from material storage and construction vehicles	6
a) Cover dust generating materials during storage/transportation	*1*
b) Provide water sprays to dampen dust generating materials during storage/transportation	*1*
c) Paved access at site	*1*
d) Spray main haul road with water	*1*
e) Control vehicle speed at site	*1*
f) Cover and secure all loads on vehicles before leaving site	*1*

Photo 2.3c: Covering stock piles with sheets help to mitigate dust generation on site.

Photo 2.3d: Spraying water on site access roads and during hacking works will reduce dust generation. This is especially effective during dry days.

Photo 2.3e: Spray water to dampen dust generating materials and cover them properly during transportation.

Criteria	Maximum Possible Points
Measures to address refuse accumulation and collection	4
a) Provide properly covered receptacles for food waste	*1*
b) Provide suitable designated refuse points	*1*
c) Inculcate good practice among staff, including subcontractor staff	*1*
d) Store refuse that is pending removal in receptacles with close fitting covers	*1*

Photo 2.3f: Keep refuse bin closed and properly covered.

Criteria	Maximum Possible Points
Proactive vector control measures at site *1 point for each implementation*	5

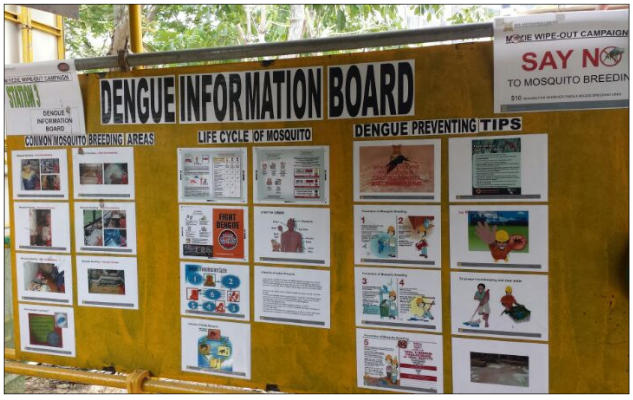


Photo 2.3g: Information board educating about mosquito prevention.

2.4 Accessibility

Criteria	Maximum Possible Points
Accessibility	**Subtotal: 13**
Well signed site with clean and unobstructed site access/entrance	3
a) Keeping site access properly maintained and unobstructed	*1*
b) Providing signage from entrance to site office to facilitate entry by visitors	*1*
c) Providing conspicuous/effective signage	*1*

Photo 2.4a: A clean and unobstructed site entrance portrays a positive image of the builder to the public.

Criteria	Maximum Possible Points
Consideration given to wheelchair accessibility around site	2
a) Designing passageways/walkways that include barrier free consideration around site	*1*
b) Well-designed and effective passageways/walkways that include barrier free consideration around site (gradient 1:12)	*1*

Photo 2.4b A temporary ramp helps pedestrians at a walkway affected by construction works.

Photo 2.4c: A temporary ramp besides site hoardings is also useful to public users.

Criteria	Maximum Possible Points
Measures to address possible causes of traffic obstruction	4
a) Identify and address factors such as parking, location of rubbish skips, delivery routes	*1*
b) Provide trained traffic controllers to ensure smooth traffic in and out of site	*1*
c) Set restricted delivery times to avoid causing obstruction during peak hours	*1*
d) Provide traffic mirrors for blind spot	*1*

Photo 2.4d: The traffic controller guides traffic during concreting operations or materials delivery.

Photo 2.4e: A traffic mirror can be used to show blind spot.

Criteria	Maximum Possible Points
Ensure sufficient and effective signages around site to guide both motorists and pedestrians	4
a) Put up signage and directional signs to guide motorists and pedestrian	*1*
b) Ensure that existing road names, signboards, directional signs are not blocked by hoardings or construction works	*1*
c) Present signage in different languages	*1*
d) Provide variable messaging system	*1*

Photo 2.4f: Some examples of good signages around the construction site.

Photo 2.4g: Variable message sign (VMS) system complements role of traffic controller and usage of signages. This tool helps to minimize inconvenience to the public.

2.5 Public Safety

Criteria	Maximum Possible Points
Public Safety	**Subtotal: 9**
Sufficiently designed and well-maintained hoarding and walkways	2
a) Providing sufficiently designed and well-maintained hoarding	*1*
b) Providing well-maintained walkway with adequate lighting	*1*

Photo 2.5a: Covered walkways around the perimeter as well as within the site provides protection and shelter.

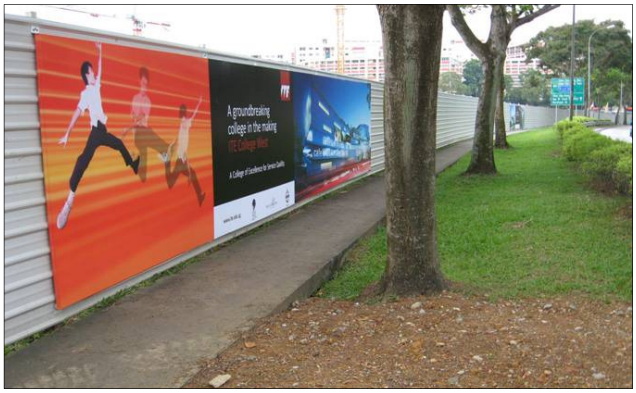


Photo 2.5b: Well-designed hoardings are aesthetically pleasing to the environment.

Photo 2.5c: Hoardings are maintained in good and clean condition through regular maintenance.

Photo 2.5d: Hoardings with vertical greens can look pleasing to the public.

Criteria	Maximum Possible Points
Consideration given for the provision of footpaths in the following: 1) Sufficient width to cater for pedestrian volume/demand 2) Provision of alternate footpath when existing footpath is being used for construction works	2 1 1
Provide vehicular barriers at passageways located close to/near to roads	3
a) Providing vehicular barriers at passageways located close to roads	*1*
b) Providing effective barriers	*1*
c) Providing temporary barriers for pedestrians	*1*

Photo 2.5e: Some examples of passageways provided around construction site.

Criteria	Maximum Possible Points
Comprehensive assessment and monitoring of surrounding buildings Examples: Carrying out comprehensive assessment and monitoring of surrounding buildings so as to prevent settlement, movement or damage to surrounding buildings	2

Photo 2.5f: Comprehensive monitoring of surrounding buildings can be done through the use of inclinometers, tilt meters, vibration meters and settlement markers.

2.6 Noise & Vibration

Criteria	Maximum Possible Points
Noise & Vibration	**Sub-total: 27**
Set specific goals and KPIs to address the following factors:	4
a) Noise	2
b) Vibration	2
Measures and efforts to minimise noise disturbance through careful scheduling of noisy construction activities Examples: Scheduling noisy activities in order to avoid sensitive time periods such as early mornings, evenings, weekends and public holidays	1
Operational procedures in place to mitigate noise and vibrations	4
a) Efforts to plan and locate noise source (Eg. vehicles, generators away from residents)	1
b) Procedures to ensure construction plant & machinery are properly maintained	1
c) Efforts to train workers to handle materials carefully to reduce impact noise	1
d) Use of noise barriers for construction plant & machinery	1

Note:

The Quiet Construction Fund by National Environment Agency can assist builders in the purchase of noise barriers. For more information, please refer to http://app2.nea.gov.sg/grants-awards/quieter-construction-fund.

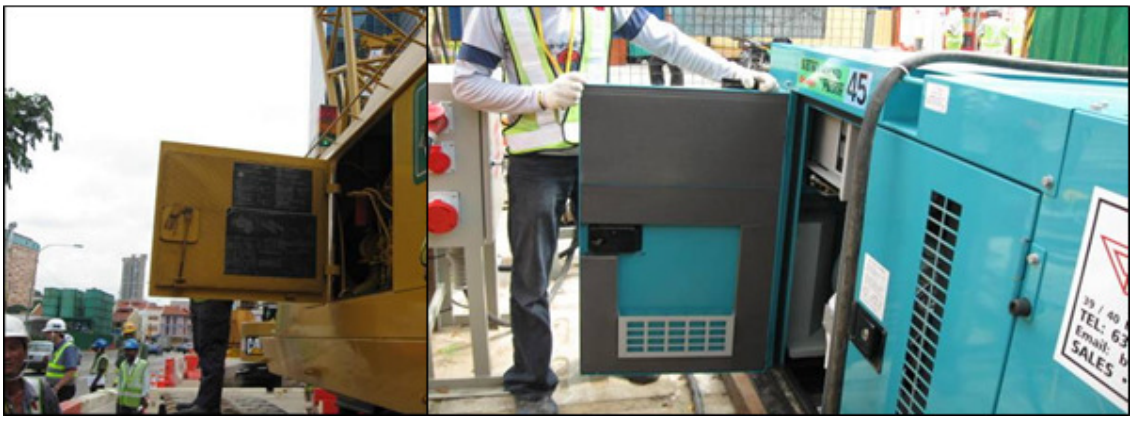


Photo 2.6a: Use of sound proof materials for machinery can help to contain noise at source.

Photo 2.6b: Noise barrier panels around generators and machinery help to reduce the noise transmitted.

Photo 2.6c: Use of movable noise barriers can also reduce the noise transmitted from machinery.

Photo 2.6d: Machinery is regularly maintained and workers are properly trained to handle them.

Criteria	Maximum Possible Points
Performance rating of noise and vibration	4
a) Meeting the KPI for noise that is set by company	*2*
b) Meeting the KPI for vibration that is set by company	*2*
Use of alternative construction methods/machines to address noise and vibrations *1 point for each alternate method/machine used* *Examples (non-exhaustive):* *a) Non percussion piling* *b) Low noise generators* *c) Robotic crusher* *d) Wire saw* *e) Hydraulic splitter* *f) QUI cutter*	10

Note:

There are some machines that are used primarily to enhance productivity. However, they can also indirectly generate lesser noise and thus are quieter than their conventional counterparts. For such equipment, builder can tap on the BCA MechC Scheme that provides funding for equipment which improves productivity. For more details, please refer to http://www.bca.gov.sg/MechC/mechc.html.

The Quiet Construction Fund by National Environment Agency can also assist builders in the purchase of quieter construction equipment. For more information, please refer to http://app2.nea.gov.sg/grants-awards/quieter-construction-fund.

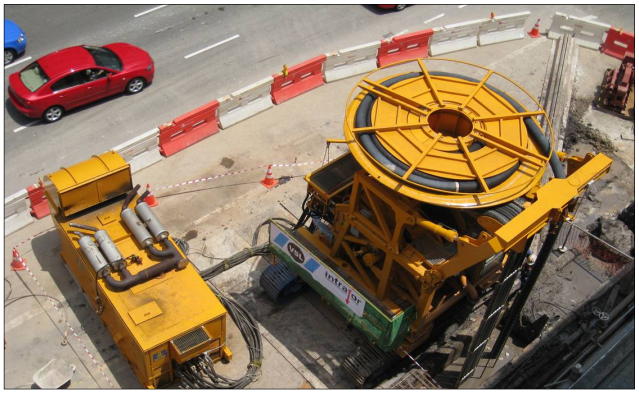


Photo 2.6e: State of the art technology cutter machine transmits little noise during operation.

Photo 2.6f: Silent jack in piles greatly reduce noise and vibration produced.

Photo 2.6g: Correct choice of piling system will mitigate noise and vibration felt by surrounding residents.

Criteria	Maximum Possible Points
Installation of noise and vibration monitoring meters both on and off site	4
a) Installing noise monitoring meter on site	*1*
b) Installing noise monitoring meter off site	*1*
c) Installing vibration monitoring meter on site	*1*
d) Installing vibration monitoring meter off site	*1*

Photo 2.6h: Noise and vibration meters are installed for monitoring purpose.

2.7 Communications

Criteria	Maximum Possible Points
Communications	**Sub-total: 11**
Send out letters and memos to neighbouring residents to inform key milestones or major construction works *1 point for "some key milestones"* *2 points for "most key milestones"* *3 points for "all key milestones"* *(1 additional point for use of social media eg, Facebook, Twitter, Instagram)* Examples of milestones (non-exhaustive): a) Introduction to commencement of work b) Commencement of demolition work c) Commencement of piling work d) Major delivery of materials e) Diversion of traffic	3

Photo 2.7a: Distributing newsletters to neighbouring residents to update them on progress of project creates better understanding.

Photo 2.7b: Where construction works affect business tenants, it is important that the builder hold regular meetings with the tenants to communicate the project progress and gather feedback.

Criteria	Maximum Possible Points
Provide designated hotline on company posters and banners for public to call	2
a) Providing designated hotline for public to contact builder	*1*
b) Displaying designated hotline on company banners and posters	*1*

Photo 2.7c: Banners with hotline number(s) at prominent locations allow public to contact the builder to give feedback.

Criteria	Maximum Possible Points
Guidelines and documents on the handling of feedback cases	2
a) Setting up a guideline to handle feedback cases	*1*
b) Keeping proper site record of feedback received and follow-up actions	*1*

Photo 2.7d: Tools like “feedback forms” or “suggestion box” placed at strategic locations can help to facilitate feedback from the public.

Criteria	Maximum Possible Points
Measures and procedures to minimise security concerns to neighbouring residents	4
a) Out of office security measures	*1*
b) Crime prevention talks	*1*
c) 24-hr security guard on site	*1*
d) Providing CCTV around site	*1*

Photo 2.7e: CCTV can be used by the builder to enhance the security on site and minimize security concerns of neighbouring residents.

2.8 Manpower Management

Criteria	Maximum Possible Points
Manpower Management	**Sub-total: 20**
Taking care of site personnel welfare a) Facilities b) Initiatives *1 point for implementing the following (non-exhaustive):* *a) Hot/cold water points* *b) Proper workwear and footwear* *c) Recreational activities / site canteen* *d) Rest area* *e) Boot washing points*	10

Photo 2.8a: Workers' welfare at housing quarters can be improved by the provision of hot water supply and recreational facilities.

Criteria	Maximum Possible Points
Ensure proper living conditions for site personnel a) Living conditions b) Transportation *1 point for implementing the following (non-exhaustive):* *a) Clean, ventilated dormitory rooms that are not overcrowded* *b) Provision of proper sanitary facilities* *c) Provision of facilities e.g. cooking/ washing machines/ dryers* *d) Enforcing house rules to control disturbances to neighbourhood* *e) Provision of transport (bus, lorry with seats)*	5

Photo 2.8b: Designated cooking area and proper food storage should be provided for the workers and kept clean to reduce rodents on site.

Criteria	Maximum Possible Points
Management of site personnel a) Site operation b) Conduct *1 point for implementing the following (non-exhaustive):* *a) Conduct tool box meetings* *b) Provide clear instructions via handbooks, posters & leaflets* *c) Brief workers on site regulations & conduct* *d) Set-up of disciplinary procedures*	5

Photo 2.8c: Briefing workers on work procedures and conduct help the builder to manage their workers.

3 INNOVATION AND EXEMPLARY PRACTICES

Innovation and Exemplary Practices	Maximum Possible Points
Procedures or innovative use of construction technology and/or special construction methods to address environmental concerns, site challenges, best manpower management practices and/or exemplary practices to minimise concerns of the public Guidelines: They should be proposed / counter-proposed by builder "Think out of the box" approach Gracious gestures towards the community and public stakeholders	5

3.1 Green and Conducive Site Environment

Photo 3.1a: The conservation of trees on site helps preserve the environment and provides shade and greenery for site staff. Specialists may need to be employed to monitor and recommend ways to preserve the health of the trees

Photo 3.1b: Where space is available, plants and flowers can be planted extensively to beautify the site environment. These plants can also double up as erosion control measures to enhance the quality of water discharged out of the site.

Photo 3.1c: Netting and false ceiling for canteen area ensure staff and workers can rest and eat in a cooler and dust free environment.

Photo 3.1d: Providing washing and drying facilities enable workers to have clean and dry clothing faster and the site would look tidier without rows and rows of hanging wet clothes.

Photo 3.1e: Recreational spaces and equipment for workers could promote healthy lifestyle and hence improve their productivity.

3.2 Other Exemplary Practices

Photo 3.2a: Movable noise barrier can be used extensively at various locations where construction works are ongoing. It is an effective and easy way to reduce noise transmission to the public. There is also cost saving as no permanent noise barrier needs to be installed.

References

1. Considerate Constructors Scheme by Construction Umbrella (Holdings) Ltd, United Kingdom.
2. Engineering News Record (ENR) Ranking of Green Contractors by ENR Magazine.
3. Considerate Construction Site Award by Environment, Transport and Works Bureau, Hong Kong.
4. Green Contractors Award by Architectural Services Department, Hong Kong Special Administrative Region Government.
5. Comprehensive Environmental Performance Assessment Scheme for Buildings by Buildings Department, Hong Kong Special Administrative Region Government.
6. Guidebook on Erosion And Sediment Control At Construction Sites by Singapore Contractors Association Ltd and Public Utilities Board.
7. Best Environment Practices:- Noise Control at LTA Sites by Land Transport Authority.
8. Singapore Standard SS ISO 14001:2004 Environmental Management Systems – Requirements.