BCA'S Role in Shaping Singapore's Built Environment

Building and Construction Authority

BCA has a vision for the Republic's cityscape - to shape the best built environment for Singapore, our distinctive global city. To achieve this, we have aligned our thrusts strategically along four key areas. These are: enhancing building safety, raising construction quality, promoting sustainable construction and materials as well as enhancing user-friendliness.

These four strategic thrusts are succinctly summed up in our mission statement: to shape a Safe, High Quality, Sustainable and Friendly built environment. BCA's mission statement underlines the importance of our contribution to economic progress and the quality of life in Singapore.

Safety

BCA administers the Building Control Act which seeks to ensure that building

works comply with standards of safety, amenity and matters of public policy.

As part of BCA's long-term plan to raise safety standards within the construction sector, the Builder's Licensing Scheme came into effect in December 2008, as part of the Building Control (Amendment) Act 2007. This scheme would require builders whose specialist areas of work have a high impact on public safety to obtain a Builder's License from June 2009.

High Quality

To encourage the industry to strive for continual improvement in the workmanship and quality standards of buildings, BCA promotes greater adoption of the two benchmarking standards for quality amongst developers, builders and consumers. These schemes – Construction Quality Assessment System (CONQUAS) and Quality Mark Scheme for Good Workmanship – have led to the commitment of some 27,000 residential units by 34 developers to be certified with the Quality Mark since its introduction in 2002.

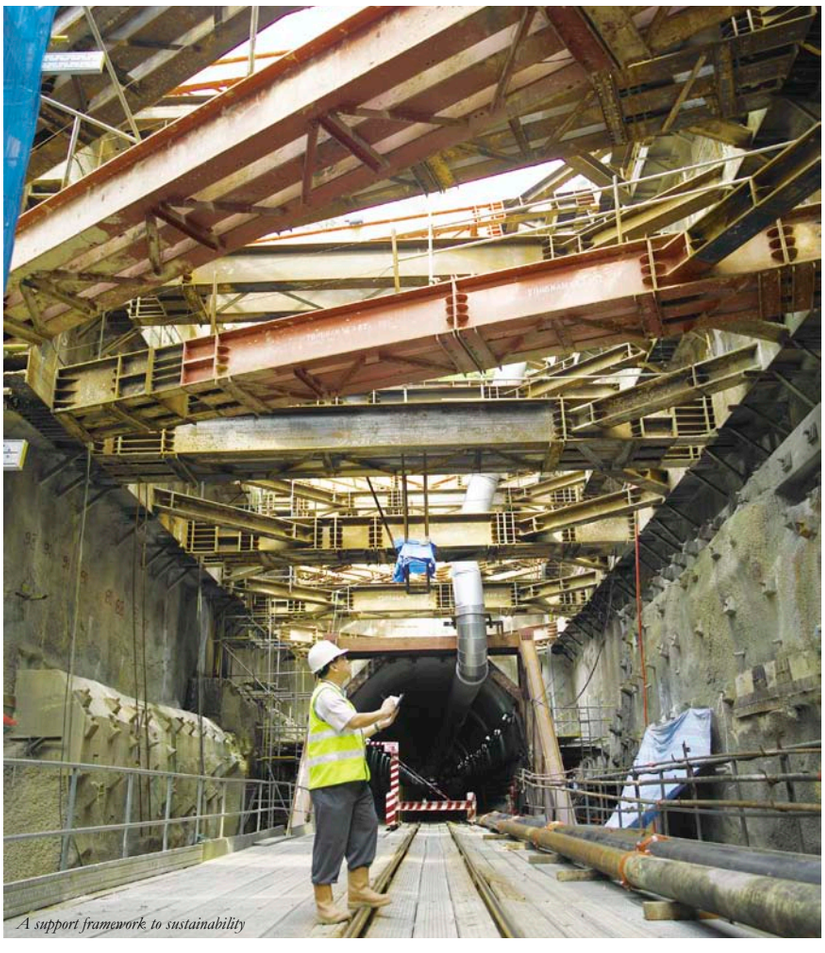
Sustainability

BCA champions a sustainable built environment, through pushing for more BCA Green Mark buildings in Singapore and facilitating the switch to sustainable construction. BCA launched its 2nd Green Building Masterplan in May 2009, mapping out a holistic plan to deliver a sustainable built environment For Singapore.

Together with inputs from an International Panel of Experts for Sustainability of the Built Environment, and various monetary incentive schemes and research funds, BCA will continue to lead the building industry towards sustainable construction and green building development. The success of the recently concluded Singapore Green Building Week (26-30 Oct 2009) and the launch of the South-East Asia's first retrofitted Zero Energy Building is a testament that the green building movement in Singapore is gaining momentum and there is strong public-private partnership to propel Singapore to achieve the target of greening 80% of its buildings by 2030.

Friendly Built Environment

BCA has a part to play in making Singapore an inclusive society by creating a user-friendly built environment that addresses the needs of all age groups and people of different abilities. Its



A support framework to sustainability

Barrier Free Accessibility Master Plan was developed in 2006 to achieve better accessibility in the built environment.

To facilitate the upgrading of existing buildings to be barrier-free, the government has set aside a $40 million Accessibility Fund to encourage owners of existing buildings to upgrade their buildings voluntarily. The fund, which is administered by BCA, was introduced in April 2007 to assist building owners to defray some of the costs of providing barrier-free features in their buildings. The fund will co-pay up to 80% of the cost of upgrading with basic barrier-free accessibility features, subject to a cap of $300,000 per project. BCA also encourages the use of Universal Design to help building owners design buildings for all users.

Transforming the Industry

BCA aims to develop a knowledge and skilled workforce to support the construction industry in its drive to shape the best built environment for Singapore. It closely monitors the industry's manpower needs and tailors training courses for construction personnel at management, supervisory and technical levels and develops training and testing programmes for construction workers.

The BCA Academy of the Built Environment is the education and information hub of BCA. It plays a key role in ensuring the skills and expertise required to shape a safe, high quality, sustainable and friendly built environment are readily available. SCI

Enhancing Environmental Sustainability Through the Innovative Application of Prefabrication Technology

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Housing & Development Board

HOUSING & DEVELOPMENT BOARD

The Housing and Development Board (HDB) and the National Environment Agency (NEA) have collaborated to develop a Precast New Burial System (PNBS). The PNBS is developed with the objectives to enhance environment sustainability and ensure sustainability of burial ground for the next one hundred years.

In Singapore, land burial for the dead is commonly adopted by our multi-ethnic population. This is due to the religious practice and requirements of certain religions such as Islam, Judaism and Bahai. The conventional method of land burial requires large amount of land to be set aside as cemeteries and these cemeteries ground are managed by the Environmental Health Department, National Environment Agency (NEA).

The Challenge — Sustainability of Burial Ground

The Choa Chu Kang (CCK) Cemetery was developed in the 1940s and is currently the remaining active cemetery safeguarded for use as a burial ground. Based on usage of the grounds for traditional burial, the 318 hectares cemetery is expected to be utilized fully by year 2013.

Unlike other regional countries with no constraints in land resources, the options to expand existing burial land or develop new burial grounds in virgin lands are not viable in land scarce Singapore. Hence, there is a pressing need to intensify the land usage so as to extend the lifespan of the burial ground for our future generations.

The burial land is not utilised optimally and access by next-of-kin is not convenient

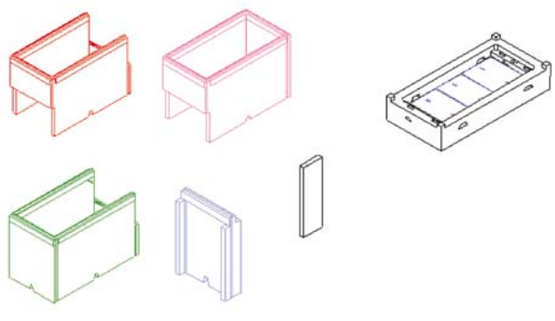
The LEGO-like Solution — -The Precast New Burial System

The Precast New Burial System (PNBS) is developed with the aim to extend the lifespan of the cemetery land by intensifying burial ground usage as well as to improve the burial operations. The PNBS eliminates the need to manually dig a grave before a burial can be carried out. The system will also facilitate subsequent exhumation of graves and re-interment work.

Adapting from HDB's prefabrication construction technology, the PNBS works like a LEGO System with the precast crypts components, innovatively designed and interlocked in such a way as to form a series of underground burial chambers. It provided a flexible and cost effective solution to pre-install the burial plots, turf them over, and hold for use when needed. The innovative and efficient arrangement has enabled materials saving of up to 40% and it is estimated to have an overall saving of 75 hectares of cemetery land area. In addition, a crypt-lifting mechanism is designed to complement the PNBS and allow burial process to be mechanised.

The PNBS Features:

- It is the only system that is designed and customized to suit Singapore's multi-cultural, multi-religious burial customs and Singapore's tropical climate.



Standard types of components used in the Precast New Burial System

- Precast crypts components are highly standardized. Innovative combination and interlocking arrangement by using only a few types of components.
- Crypt cover resembles a moveable green tray that facilitate identification, lifting and reinstatement by machine
- Able to be used at sites with different terrains and irregular plot shape

4 . Meeting the Objectives — Sustainable Environment and Burial Ground

The PNBS embraces the three fundamentals principles to enhance environmental sustainability through reduce, re-sue and recycle. The components are constructed from concrete, which is a durable material. Complementing NEA's burial policy (15 years bury-in period) and exhumation programme, the PNBS will effectively extend the cemetery lifespan for another 100 years as the precast crypts can be re-used for many burial cycles. This has ensured the sustainability of the burial ground for our future generations in land-scarce Singapore.

The PNBS presents a quantum leap improvement from traditional soil burial system and has set a new standard for cemetery planning and management through mechanization of burial operations. It promotes greenery as the structures are built underground and extensive greenery above is blended with the surrounding landscape. NEA's vision to turn future cemeteries into a pleasant, park-like environment can be achieved.

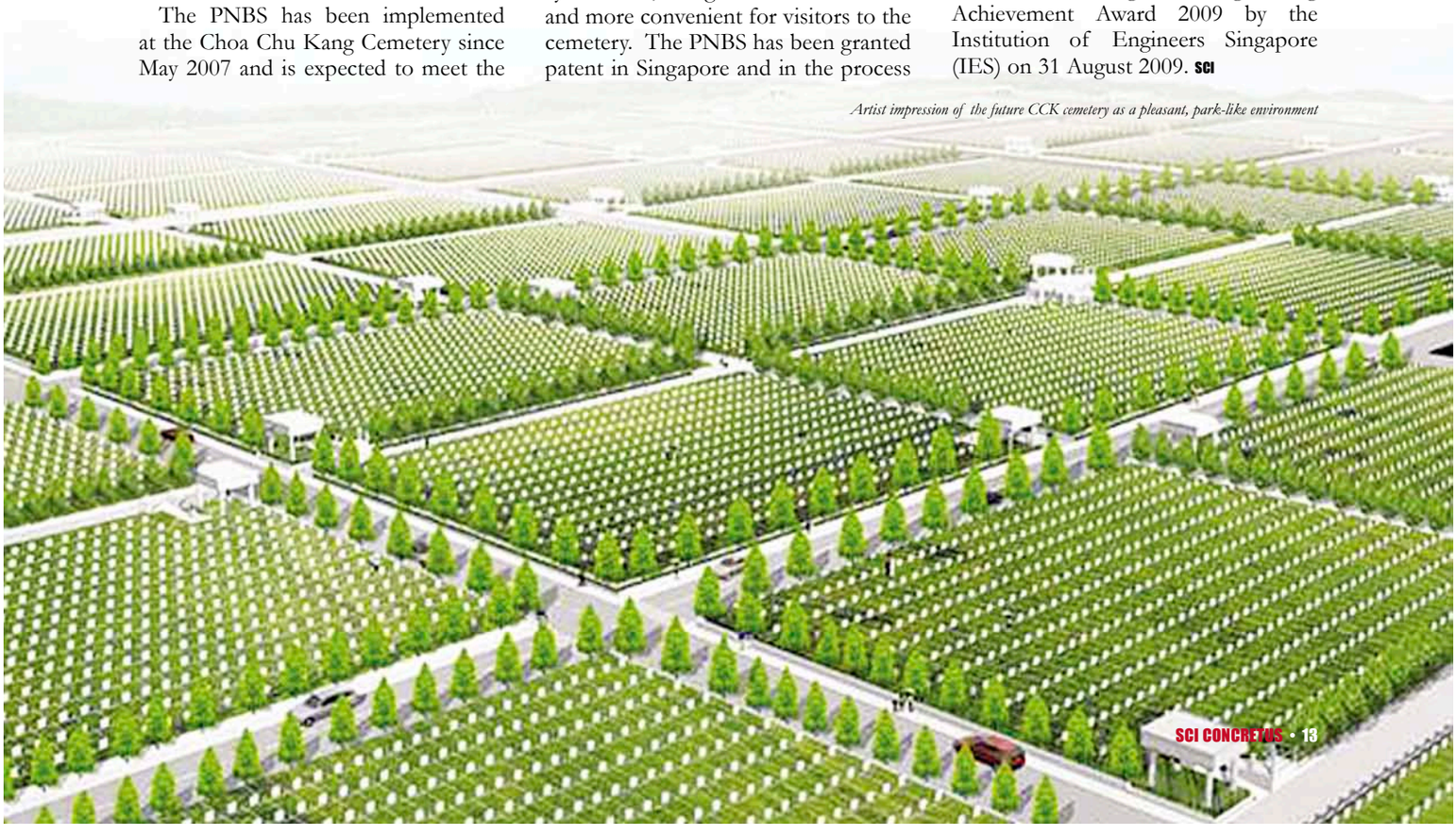
The PNBS has been implemented at the Choa Chu Kang Cemetery since May 2007 and is expected to meet the burial needs of Singapore until 2130. Religious groups have agreed that this system meets religious requirements and the public have also received the system well, citing that it is now neater and more convenient for visitors to the cemetery. The PNBS has been granted patent in Singapore and in the process of filing patent in other countries such as Malaysia, China/Hong Kong, Indonesia and UAE.

The PNBS was also being awarded the IES Prestigious Engineering Achievement Award 2009 by the Institution of Engineers Singapore (IES) on 31 August 2009. SCI

Assembly of crypt components. Arrangement of the crypts is compact, neat and scalable

Crypt cover with turf is lifted for burial and easily reinstated. Mechanized lifting frame can be used to break the suction force on the crypt cover

Completed cemetery plots are seamless blended with the surrounding landscape.



Artist impression of the future CCK cemetery as a pleasant, park-like environment

Singapore Polytechnic's role as a tertiary institution towards environmental sustainability

There is the urgency to address the evident climatic change which has caused havoc to many countries. The signals are clear and everyone can contribute to reverse the situation and help to build a better environment for future generations.

Singapore Polytechnic has been fortunate to have a very green campus for staff and students to work and study in but we cannot afford to take the natural beautiful environment for granted. There are plans to rejuvenate existing buildings as well as build new development that will have sustainable design features and meet the Green Mark criteria. An example is the Innovillage, which has obtained the Green Mark Platinum Award, for the creative usage of old

Construction of a reinforced concrete (RC) bridge (2008) by civil engineering students at a Makassar (Indonesia) village community project

SP green campus

containers and other sustainable design features to create living labs for sharing of knowledge through collaboration with industries.

Our Principal, Mr Tan Hang Cheong, is passionate about developing SP into an eco-campus and SP won the Water Mark Award in 2008.

As a tertiary institution, SP sees the vast potential to influence and develop environmental awareness in our students who are future decision-makers and citizens. We collaborate with organisations like NParks Board, PUB and NEA to incorporate related programmes such as the ABC Waters Design into the curriculum as well as participate in adoption schemes like that of the Marina Barrage and Singapore Costal Parks. Students are also encouraged to focus their final year projects in areas of sustainability. For example, a team of civil engineering students, in collaboration with a prominent construction company, are working on a project on the usage of green concrete.

In addition SP students also participate in community projects and competitions related to sustainability such as the Green Wave Competition. Last year a student won a merit award in the design of building facade that permits architectural design variations and integration with greenery that can help to cool the interior. Students also go for overseas study trips that allow them to observe nature as well as programmes that help to improve the environment.

Recently a Diploma plus Certificate in Sustainability has been developed and this will be offered to students in the coming academic year 2010. This course touches on the triple bottom-line of sustainability that is environment, social and economic sustainability.

In conclusion, SP as a learning institution can work with different sectors of people locally and overseas to contribute in initiatives towards sustainable development. A right mindset and culture is important to drive and implement in the midst of the sceptic perception about the environmental problem. **SCI**