

pillars

2007 Issue 01



**A Look At
Sustainable Construction
From Rain To Greener,
Cleaner Living
Including Everyone
On The Fringe
An Even Better Year Ahead**

Building and Construction Authority



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

Championing Singapore's built environment

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editorial committee

Chief Editor: Jeanna Das

Editor: Lam Fei Yen

Contributors:

Ireen Ho

Low Yee Mei

Phua Hui Chun

Rajesh Kannaya Nainani

Sok Cui Ping

Steven Tan

Circulation Officer: Nor Ainah Bte Ali

Pillars is published bi-monthly by the Corporate Communications Department, Building and Construction Authority
5 Maxwell Road #16-00 Tower Block MND Complex Singapore 069110

Tel: 6325 7720 Fax: 6325 4800 Email: bca_enquiry@bca.gov.sg Website: <http://www.bca.gov.sg>

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The Editor, Pillars if you send by post or fax to the BCA address above stated. Alternatively, you can email to bca_enquiry@bca.gov.sg.



Look around you. Imagine what our lives would be like if there were no one to build roads, apartments, offices, schools and hospitals. This goes to show that our building and construction industry plays a significant role in our built environment.

I am pleased to present to you the first issue of our revamped BCA magazine **“Pillars”**. The name **“Pillars”** reflects the importance of the industry - it is the pillar of support for Singapore’s economy as well as our everyday lives. This new name also represents the four key pillars of an excellent built environment that BCA is championing - Safety, Quality, Environmental Sustainability and User-Friendliness. These are qualities that are of critical importance to the community and are key ingredients that make a world-class built environment and distinguish Singapore from other global cities. These four areas are reflected in BCA’s new mission **“We shape a safe, high-quality, sustainable and friendly built environment”**.

“Pillars” will regularly highlight the initiatives and achievements of BCA and the industry in realising the four strategic outcomes of safety, quality, sustainability and user-friendliness in our built environment.

As stakeholders in the industry, you play an integral role in shaping our built environment. I look forward to working with you to advance towards our new vision for **“the best built environment for Singapore, our distinctive global city”**.

Dr John Keung
Chief Executive Officer
Building and Construction Authority



Message from BCA CEO:
**Championing
Singapore’s
Built Environment**

A LOOK AT SUSTAINABLE CONSTRUCTION

By Mr Look Boon Gee
Principal Partner, LOOK Architects



Very frequently, good buildings demonstrate the effective use of materials and creative construction technique.

Recently, I was shown a century old ancestral home in Fujian, China. Built in the Southern Region style, this large house, which remains a home to many generations, consists of a few courtyards with rooms flanking around them. The doorways and flooring are made of strong durable materials. The main structure is made of simple timber post and beam construction with local elm wood which is termite and fungal resistant. There are intricate workmanship for both the stone and timber works. Today, our buildings are pale in comparison in terms of the materials and construction skills used.

Architects often conceptualise and conceive spaces for people. However, there is a lack of attention on how the buildings are being constructed. If architecture is defined as an art of building and possess transcendental quality and experience, then the materials used and the constructional aspects are equally important as a means to an end.

I am fascinated by steel and prefabrication construction techniques and have explored them in various innovative ways in our works. They present us with exciting possibilities but require an open mind to learn and accept them as an alternative way.



House at Seletar Hills designed by Mr Look Boon Gee.



Structural steel frame with bondek decking was used for the house.

Traditionally, buildings in Singapore have relied heavily on concrete-based construction. It is now timely for us to look at sustainable construction which adopts environmentally friendly construction methods and recyclable materials. This is the trend in many developed countries such as the United Kingdom, the United States and Japan. There are many advantages for our society to switch from the current high reliance on concrete-based construction to sustainable construction such as using steel and drywall.

Steel construction affords greater flexibility in design. A significant saving in foundation is also possible as steel has a higher strength-to-weight ratio as compared to bulky concrete structures. As steel construction is faster, buildings could be completed earlier.

Some examples of steel construction applications

**Conventional
concrete-based
construction**

**Sustainable steel
construction**



ROOF



PARAPET



STAIRCASE



BEAMS AND COLUMNS

The use of **drywall**, another form of sustainable construction, is gaining popularity amongst the residential and commercial developments. Besides meeting statutory functional requirements such as fire rating, the drywalls have passed strength and robustness tests (e.g. stiffness, door slam, impact, anchorage tests) and are able to resist high impact and support loads such as cabinets. Performance-wise, the system is suitable for severe duty usage.

The acoustic performance of the drywalls can be enhanced with the installation of rockwool between boards. Electrical and mechanical services within boards can also be installed easily. Noise pollution is literally reduced as no hacking is required (unlike conventional brickwall) to embed the services.

Despite the “severe duty” label, the dry walls are lightweight (about one-tenth the weight of conventional brickwall) and allow designers to adopt lighter structures and foundations. This translated to savings for the developers.

Hence, it is no surprise that even high-end residential developments such as The Sail @ Marina Bay and St Regis Residences are using high impact resistance dry walls instead of conventional brick walls.



Conventional brickwalls (left) vs drywall (right)



For external masonry and concrete walls, alternatives to include concrete-based walls include cladding, glass facades and curtain walls. Glass walls are gaining popularity among architects as they provide unobstructed views and allow natural daylight for the users. Contrary to misperception that glass walls are not energy efficient, coatings on the glass panels can enhance the thermal insulation of curtain walls. Acoustics performance can also be enhanced through the use of double glazing.

More information on sustainable construction is available at the BCA website: www.bca.gov.sg



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ambassador
to create
impressions
overseas.

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With our increasing focus on creating a sustainable and user-friendly built environment, our talents are geared to build a better future. Discover how you can build a more sustainable world. Visit www.bca.gov.sg/buildingcareers



Sealing the agreement between Singapore's Ministry of National Development and Algeria's Ministry of Land Planning and Environment



Keen interest to forge partnerships at the networking dinner hosted by Mr Mah

Closer Ties With ALGERIA

Algeria – a fast growing economy driven by oil exports and strong foreign investments – could soon be another destination that Singapore-based construction firms could venture to.

A construction-focused mission led by Minister for National Development Mr Mah Bow Tan has paved the way for Singapore firms to play a role in the future development of Algeria. This first such mission to Algeria, which began on 23 January 2007, aimed to establish closer collaboration between the construction and real estate sectors of Algeria and Singapore, including more strategic business alliances among firms from both countries.

The trip culminated in the signing of a Memorandum of Understanding between Singapore's Ministry of National Development and Algeria's Ministry of Land Planning and Environment to collaborate in the fields of urban and land planning, development of parks and protected areas, as well as sustainable development and the preservation of biological diversity.

Over the three-day mission, Mr Mah called on Mr Cherif Rahmani, Minister for Land Planning and Environment; Mr Abdelhamid Temmar, Minister for Participation and Promotion of Investment; Dr Mohamed Nadir Hamimid, Minister for Housing and Urbanisation; and Dr Mohamed Bedjaoui, Minister for Foreign Affairs. In addition, Mr Mah hosted a successful business networking dinner for more than 40 Algerian business leaders.

Mr Mah was accompanied by representatives from BCA, Ministry of National Development, Housing & Development Board, National Parks Board, Urban Redevelopment Authority, International Enterprise Singapore, as well as 13 senior executives from Singapore construction and real estate companies. On the opportunities available in Algeria, Mr. Chan Sui Him, Chairman of DP Architects and business leader for this mission, said, "There are significant opportunities in infrastructure development projects, such as housing, highways, rails, dams, desalination and sewerage treatment plants. Singaporeans are not yet familiar with the country. But unfamiliarity breed opportunities!"

The BCA Green Mark booth at the Active, Beautiful, Clean Waters public exhibition has just shown how Water Sensitive Urban Design is important to sustainable development, integrated water management and waterway health in Singapore.

from rain to greener,

Did you know that rainwater can be used for irrigation and cleaning purposes? This was showcased at the 'Active, Beautiful, Clean Waters' Public Exhibition from 6 February to 11 February 2007, as an example of Water Sensitive Urban Design concepts which are implemented in BCA Green Mark projects.



Water Sensitive Urban Design integrates water cycle management into urban planning and design. Besides the harvesting of rainwater, designers are encouraged to incorporate other Water Sensitive Urban Design concepts in their projects.

The retention of storm water with vegetation types is one method of reducing downstream flow velocities and subsequent drain sizes while facilitating treatment. Bio-retention systems can combine various Water Sensitive Urban Design treatment types to carry out primary and secondary treatment processes of storm waters and retard flows. This retention or retardation can enable sediments to precipitate out of the water taking along with it some pollutants.



The bio-retention system was used in the form of a rain garden in Punggol.

cleaner living



Rainwater collected can be used for irrigation and cleaning purposes.



Rainwater tanks can be sealed tanks designed to contain rainwater collected from roofs.



Rooftop greening is another concept, where building rooftops contain greenery, or vegetation, to filter off rainwater to be collected and stored for toilet flushing or landscape irrigation. Such runoffs from rooftop greening are generally of better quality than runoffs from streets and roads as they contain organic matter such as leaf litter, depositional pollutants from the atmosphere and heavy metals, such as zinc, from rooftops.

Porous pavements can also replace conventional impermeable pavements to allow water to percolate to a sub-surface course and to infiltrate into the soil. This results in increasing groundwater recharge and reducing the area of land dedicated solely to storm-water management.





You don't have to be a botanist to love green.

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Have you ever wished for more green features in our buildings, such as roof gardens, solar panels, energy-saving lights, rainwater harvesting and waste recycling? Now you can play a role in making it happen. The robust building industry offers challenging opportunities and rewards for passionate talents to innovate and build more green developments.

Discover how you can help Singapore blossom into a green global city. Visit www.bca.gov.sg/buildingcareers

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Meeting Future Industry Leaders at NUS and NTU

BCA's Manpower Development Department recently initiated job fairs for graduating students in civil and environmental engineering at National University of Singapore (NUS) and Nanyang Technological University (NTU). They were exclusive opportunities for consultant firms and contractors to meet potential employees who will shape the industry's future.

About 480 graduating students from Singapore's two universities were to find out just how exciting a career in the construction industry could be. This was when BCA's career promotion efforts led to the holding of exclusive job fairs at the two campuses.

The job fairs were held for graduating civil and environmental engineering students at NTU on 19 January 2007 and at NUS on 2 February 2007. Supported by The Singapore Contractors Association Ltd (SCAL), Association of Consulting Engineers Singapore (ACES) and The Institution of Engineers, Singapore (IES), the fairs drew the participation of 11 consultancy firms and contractors. They were Hexacon Construction, Kim Seng Heng Engineering, Kimly Construction, Meinhardt Singapore, Parsons Brinkerhoff, Woh Hup, Samwoh Group, TEP Consultant, TPS Construction, VSL and Connell Wagner.

Students were delighted with the wide variety of job positions such as civil engineers, design engineers, environmental engineers, geotechnical engineers, site engineers and structural engineers. Equally delighted were the hiring firms who discussed their completed and on-going projects and how potential employees could play a part in their companies. Besides offering jobs to students, all participating companies took the opportunity to promote their brand names. As a result, several firms received as many as 100 application forms from the fairs.

In addition to the fair, Mr Chan Ewe Jin representing IES; Mr Dominic Choy representing SCAL, and Associate Professor Choo YS, NUS Research Director, spoke to students about the challenges of the civil engineering profession, overall prospects in construction industry and offshore engineering opportunities. They shared their experiences and encouraged students to use their knowledge and skills to create a more vibrant and sustainable construction industry.

Students Say...



Privileged to have such a job fair exclusively at students' doorstep.
Lim Yu Siang (left), NTU



Passionate about discovering ways to put lessons into practice by joining the construction industry.
Tay Zhen Lin (Centre), NUS

Including Everyone on the Fringe

'Art and Disability' was the theme of the M1 Singapore Fringe Festival 07, which BCA supported this year. As part of the Festival, a 24-hour inclusive design challenge saw the creation of designs and prototypes of new products and environments, which were exhibited at VivoCity from 31 January to 11 February 2007. Apart from this public exhibition on a friendly built environment, BCA participated at a symposium on inclusive design for students and the architectural design community.



BCA's Initiatives Towards a Friendly Built Environment



Basic barrier-free features for commercial and institutional buildings

A \$40 million incentive is now available to encourage private building owners to provide basic facilities such as ramps, accessible first storeys and wheelchair-friendly toilets.

Accessibility of public sector buildings

BCA is working with various public agencies to take the lead in reviewing and improving the accessibility of their buildings.

Accessibility route plans for buildings

Buildings are required to show how it can be accessed from neighbouring buildings and public facilities by wheelchair-users.

Bathrooms suitable for the elderly and wheelchair users

From 1 April 2007, all residential units, except landed properties, are required to have a bathroom large enough to cater for future bathroom fittings needed by the elderly and wheelchair users.





A barrier-free city in Singapore could become a reality with BCA's initiatives to create a friendly built environment for people with different abilities, according to BCA's Ms Goh Siam Imm at the symposium on inclusive design.

At the 48-hr inclusive design challenge, industry participants put on their creative hats to design new products and environments incorporating inclusive design aesthetics, and the designs were exhibited at VivoCity. BCA also participated in the exhibition to educate the public on how a friendly built environment can help people with varied degrees of abilities could continue to live in familiar surroundings with their relatives and friends.



Functionality of barrier-free facilities

The Building Control Act will be amended to ensure that barrier-free features that have been built will remain well-maintained and functional.

Elderly- friendly features in buildings

To let the elderly continue to enjoy living in familiar surroundings, more elderly friendly features will be introduced when BCA reviews the Code.

Promoting universal design for all people

Designers are encouraged to adopt Universal Design to cater to the diverse needs of all people, regardless of their physical status and abilities.



Barrier-free access outside buildings

To achieve a friendlier built environment, a review is ongoing to resolve accessibility issues between buildings and their surrounding public infrastructures.





You don't have to be a doctor to help those in need.

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- Mechanical Engineering
- Electrical Engineering
- Quantity Surveying
- Building Science
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- Real Estate and Facilities Management

Help transform Singapore's buildings to become more user-friendly for all.

We all want our buildings to be safe, environmentally friendly and of high quality. Now, more than ever, we need a built environment that is accessible and interconnected—for you and I, for our aged, our families, expectant mothers and people with disabilities.

These challenges and more are what await professionals and young talents in our building sector. If you have an interest in enhancing Singaporeans' quality of life, find out how this robust industry can help you shape a rewarding career. Find out more at www.bca.gov.sg/buildingcareers

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Lessons from **FORENSIC** Investigations

Forensic engineering investigates why failures occur and facilitates discussions on how they can be prevented in future.

Helping industry professionals understand the forensic investigation process in structural failures, BCA organised a one-day seminar on 8 February 2007. This fruitful seminar highlighted the different aspects of forensic engineering during the investigation of construction failures and subsequent litigation processes.

Kicking off the seminar, two legal professionals presented the legal perspective on construction failures and related issues such as degrees of culpability for building defects and failures, legal liability for design and construction and the role of expert evidence in investigative proceedings. This was followed by a talk on the role of forensic engineering in insurance claims and the duties of loss adjusters in determining the nature and extent of damages, quantifying loss and negotiating claims settlements.

The next speakers allowed participants to gain insights into the forensic investigation process and techniques. Professionals who wished to explore the field of forensic engineering learnt what constituted expert evidence, the roles and responsibilities of an expert witness and the expected conduct of an expert witness in court. Two officers from BCA's Building Engineering Division also discussed recent local and overseas failure cases for concrete structures and deep excavation and foundation works.

While the seminar introduced the science of gathering forensic evidence for structural failures, learning from past failures should be a continuous process. BCA will thus continue to feature more failure cases and learning points on its website.

The Way Forward

Key learning points from recent local and overseas failure cases

Concrete structures:

- Case studies on flat slab failure showed that localised failure through punching shear can lead to progressive collapse of the entire or significant portion of the building. Simple detailing, like extending the bottom bars of a flat slab continuously through the columns, can enhance the robustness of the flat slabs through catenary action to prevent progressive collapse.
- Case studies on anchorage failure in concrete highlighted the importance of adhering strictly to product specifications, such as anchorage depth and size of holes, when drilled-in anchor bolts are used and the need to conduct on-site tests to verify the capacity of the bolts installed.



Anchorage failure

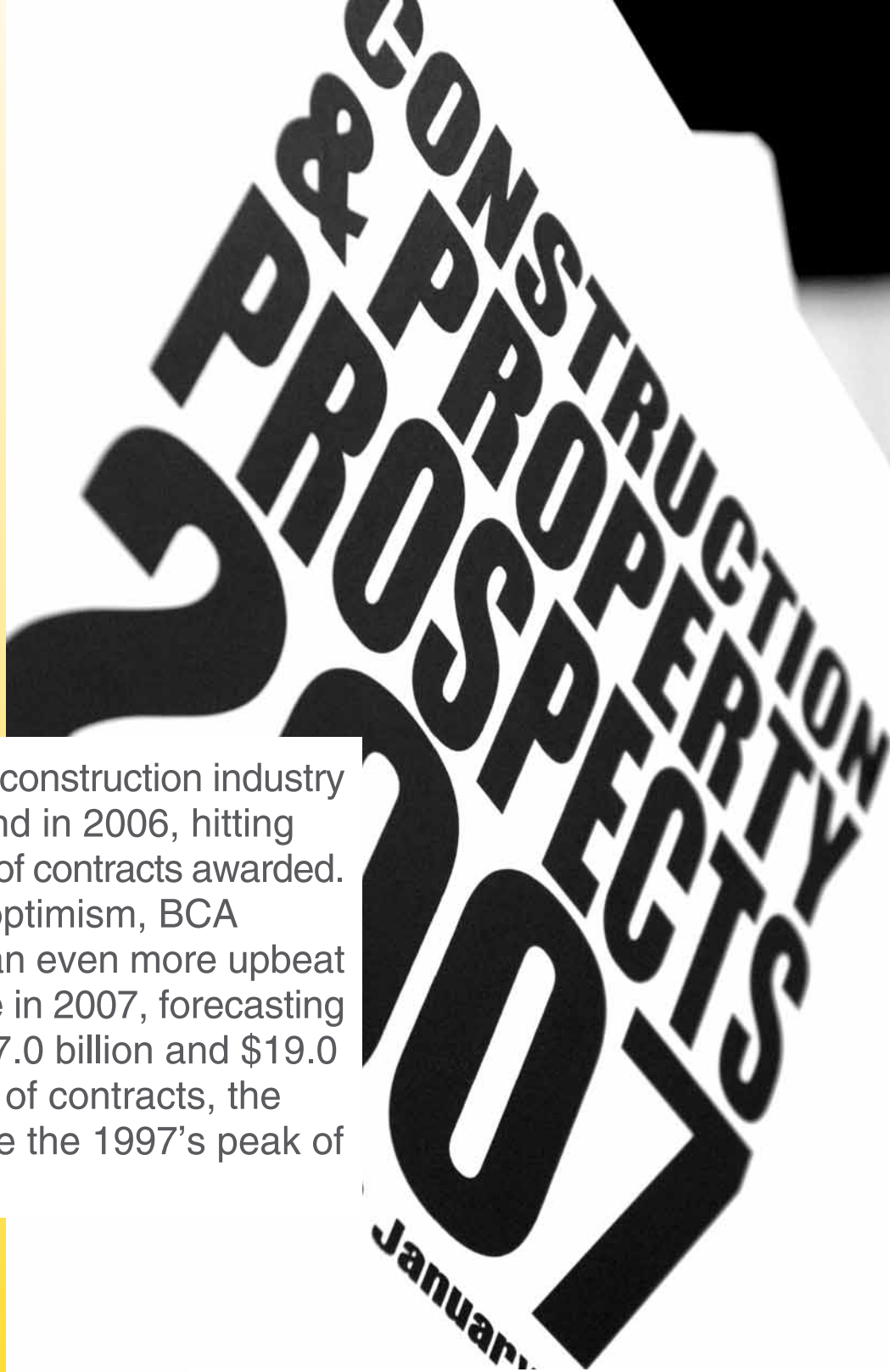
Deep excavation and foundation works

- Temporary earth-retaining structures (TERS) in underground construction works pose more uncertainties than permanent works. Such structures must be designed according to the provisions of the Building Control Act, Building Control Regulations and BCA Advisory Note 1/05 on Deep Excavation. All project parties must take reasonable steps and exercise due diligence to ensure safe design and good construction practices and to prevent failures.
- All project parties must consider the construction effects arising from piling in the selection of pile types. In particular, environmental friendly systems should be considered to avoid disturbance to the adjacent properties and members of the public.



TERS failure affecting permanent foundation piles

Singapore's construction industry turned around in 2006, hitting \$16.1 billion of contracts awarded. Riding this optimism, BCA anticipates an even more upbeat performance in 2007, forecasting between \$17.0 billion and \$19.0 billion worth of contracts, the highest since the 1997's peak of \$24 billion.



AN EVEN

Ms Grace Fu, Minister of State for National Development, was the Guest-of-Honour for the Seminar. She announced the positive prospects for the industry and urged all stakeholders to work together to develop a world-class built environment for Singapore.



2007 Forecast of Contracts Awarded

	Private (\$b)	Public (\$b)	Total (\$b)
Total	11.8 – 13.0	5.2 – 6.0	17.0 - 19.0
Building Work	11.2 – 12.4	3.9 – 4.4	15.1 - 16.8
<i>Residential</i>	3.7 – 4.0	1.2 – 1.4	4.9 - 5.4
<i>Commercial</i>	3.3 – 3.6	0.1 – 0.1	3.4 - 3.7
<i>Industrial</i>	3.7 – 4.0	1.0 – 1.0	4.7 - 5.0
<i>Institutional & Others</i>	0.5 – 0.8	1.6 – 1.9	2.2 - 2.7
Civil Engineering Work	0.6 – 0.6	1.3 – 1.6	1.9 - 2.2

Source : BCA as at February 2007
Statistics exclude reclamation works

Higher construction demand in public and private sectors

At the Construction and Property Prospects 2007 seminar on 23 January 2007, BCA said that the public sector construction demand was expected to improve to between \$5.2 billion and \$6.0 billion, fuelled by expected increases in all development types. The most significant expansion would be likely to come from the industrial building category, underpinned by major projects in the pipeline such as JTC's underground caverns and Fusionpolis 2A.

Backed by the surge in investment property deals, driven mainly by acquisitions by real estate investment trusts (Reits) as well as collective sale sites snapped up by developers, the private sector construction demand was forecast to continue its strong growth momentum, reaching between \$11.8 billion and \$13.0 billion in 2007. In particular, residential construction demand would likely strengthen further taking into account the current bullish buying sentiment and the active en-bloc sale market. In addition, the upcoming development of two integrated resorts and the Marina Bay Financial Centre would likely propel commercial construction demand to a record high.

Promising outlook for next few years

Based on the current robust property market sentiments on account of the sustained economic growth and spin-offs from mega developments such as the integrated resorts, the outlook for the next few years looks promising. The industry can thus expect a significant upturn in construction activities at least over the next three years.

Opportunities in the emerging markets

Externally, construction and real estate sectors are also brimming with business opportunities, especially in emerging markets that are developing their infrastructure rapidly such as India and the Middle East, as well as other key regions like China and Southeast Asia. The good prospects in these regions due to economic structural transformations brought about by high oil prices and foreign direct investment flows are expected to continue for the next four to five years.

Besides seizing business opportunities arising from the turnaround of the local construction industry, BCA encouraged Singapore firms to leverage the strong Singapore brand name to take advantage of the booming construction and real estate sectors in the global market to upgrade their competences and sharpen their competitive edge for growth and advancement.

BETTER YEAR AHEAD

Smaller MCs exempted from holding AGMS

The Building Maintenance and Strata Management Act requires every management corporation to convene annual general meetings to elect the management council and office bearers and to manage the estate. However, a new order now exempts smaller management corporations from the need to hold annual general meetings.



Under the Building Maintenance and Strata Management (Exemption of Certain Management Corporations from Section 27 (1)) Order 2006, the exemption applies if the management corporation comprises not more than three subsidiary proprietors. It also applies if the strata estate is owned by a single owner or a group of joint subsidiary proprietors.

In such situations, all the subsidiary proprietors are, in fact, members of the management council automatically. They therefore do not need to convene an annual general meeting to elect council members as long as all subsidiary proprietors agree via a resolution by consensus to apply the exemption.

The new Order, which took effect on 1 December 2006, relieves these smaller management councils of the administrative process of convening annual general meetings. At the same time, it still protects the interest of all subsidiary proprietors who are required to give full agreement in the resolution by consensus. If the resolution by consensus is later revoked or the management corporation ceases to qualify under the Order, the exemption will cease or be revoked. In this situation, the management corporation will have to convene the annual general meeting within six months of the cessation or revocation.

SHELTER MATTERS

The air sirens scream. You rouse from your sleep, heart pounding. The enemy planes are closing in for yet another air raid. You gather your family members and rush them into the household shelter in your living room. As the cold steel door closes behind you, a deafening boom resonates through the carpark below. The bombs have landed.

Although a remote possibility, this was the scenario planned for when the Civil Defence Shelter Act was enacted in May 1998. It required household shelters to be included in the construction of all new dwelling units. As the technical authority in civil defence and protective engineering, BCA has approved the construction of shelters in about 180,000 dwelling units since then.

The household shelter has strengthened walls, floors and doors to protect its occupants within minutes. A common misconception is that if the rest of the building was not strengthened, it would collapse like a pack of cards, leaving the shelter tower standing tall and alone. This, however, would not happen as buildings are designed to withstand some amount of force through the redistribution of excess loads. In addition, experience from conflicts overseas has shown that buildings impacted by conventional weapons usually suffer localised damage. Hence, the shelter can provide a protected refuge against devastating weapon effects such as blasts and building or bomb fragments.



A household shelter inside a dwelling unit

Since July 2004, the staircase shelter has been added as another option for high-rise residential developments. However, household shelters are still required in all new landed properties. A separate approval for the plans of the shelter, apart from the normal building and structural plan submission, is required to be made to the Civil Defence Shelter Engineering Department of BCA's Special Functions Division. Qualified Persons must ensure that these approvals have been obtained before the commencement of shelter works.

Localised damage to a building impacted by conventional weapons



upcoming events

Date	Event	Contact
29 & 30 Mar 07 or 29 & 30 May 07	Course on "Universal Design Guideline for Town Council"	Ms Xanna Tan DID: 62489824 / 62489843 Email: bca_citi@bca.gov.sg
2, 4, 5, 9, 11, 13 & 30 Apr 07	The Singapore Certified Energy Manager (SCEM) programme - Full Time Training Programme on "Energy Audit and Measurements (Professional Level)"	Ms Xiaoman DID: 62489843 / 62489824 Email: bca_citi@bca.gov.sg
9, 10, 11 Apr 07	Comprehensive Training on "Green Building Design and Systems for Water Efficiency"	Ms Xiaoman DID: 62489843 / 62489824 Email: bca_citi@bca.gov.sg
11, 12, 13 & 27 Apr 07	The Singapore Certified Energy Manager (SCEM) programme - Full Time Training Program on "Energy Management and Economics (Associate Level)"	Ms Xiaoman DID: 62489843 / 62489824 Email: bca_citi@bca.gov.sg
18, 19 & 20 Apr 07	Course on "Certified CONQUAS/QM Managers Course"	Ms Xiaoman DID: 62489843 / 62489824 Email: bca_citi@bca.gov.sg
24 Apr 07 (Tentative)	BCA-REDAS Quality Seminar 2007	Ms Xanna Tan DID: 62489824 / 62489843 Email: bca_citi@bca.gov.sg
2 May 07	Seminar on "Sustainable Construction"	Ms Xanna Tan DID: 62489824 / 62489843 Email: bca_citi@bca.gov.sg
3, 4, 7 & 8 May 07	Course on "Enhanced Automation and Controls for Sustainable Buildings"	Ms Xiaoman DID: 62489843 / 62489824 Email: bca_citi@bca.gov.sg
7, 9, 11, 14, 16, 18 & 30 May 07	The Singapore Certified Energy Manager (SCEM) programme - Full Time Training Programme on "Energy Audit and Measurements (Associate Level)"	Ms Xiaoman DID: 62489843 / 62489824 Email: bca_citi@bca.gov.sg
10 May 07	International Conference on "Sustainable Construction"	Ms Xanna Tan DID: 62489824 / 62489843 Email: bca_citi@bca.gov.sg
10 & 11 May 07	Risk Management Course (Safety)	Ms Xiaoman DID: 62489843 / 62489824 Email: bca_citi@bca.gov.sg

Contest

What does a safe, high-quality, sustainable and friendly built environment mean to you? Share with us your views, in not more than 200 words. Selected entries will stand to win attractive shopping vouchers!

Send in your entries latest by 20 Apr 2007 to Editor Pillars, Building and Construction Authority, 5 Maxwell Road, #16-00, Tower Block MND Complex, Singapore 069110. Or e-mail: bca_enquiry@bca.gov.sg or fax to 63254800. Please indicate your name, designation, company, phone number and address.

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