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CONCRETE SOCIETY
OF SOUTHERN AFRICA

Platinum members:
AfriSam, PPC and Lafarge

Accredited Technical Paper:
A Market Review on the use of Structural Precast Concrete in South Africa

Fulton Award Winner:
Ubuntu Education Centre
Blackburn Pedestrian Bridge

AfriSam
Build with Confidence

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President's Message

The mood in the construction industry seems to differ depending on who one talks to these days. For some we are on the slippery downward slope and concern punctuates most of the conversation, while others sense optimism and opportunities for the industry.

The FIFA 2010 World Cup hangover appears quite real with so much time, effort, and money spent on infrastructure requirements that not enough consideration was given to the aftermath.

The lull in the construction industry was expected, and forecast, but the depth and breadth of the trough appears to have caught many by surprise.

In the midst of this however there appear to be some green shoots that do warrant optimism. In some sectors, there has been renewed interest in pursuing proposals and opportunities that were not there immediately following the 'Great Event'.

Life at the Concrete Society has not skipped a beat. After a smooth transition from President of the Society to CEO of the Society, John Sheath and his team have focused primarily on hosting our own 'Great Event', the biennial Fulton Awards since the start of the year. The event was, once again, hosted in the picturesque Drakensberg at the acclaimed Champagne Sports Resort. If you were *unfortunate* enough to have missed the function, I can assure you that you missed a great time. With each edition, the event seems to get better and better and the projects submitted more impressive.

The focus of my speech for this year's Fulton Awards was, besides extending a massive thanks to all involved in making the event the success it was, that we are not primarily celebrating the grey matter, *concrete*, seen in the projects but the grey matter we possess between our ears. Looking at the way in which engineers, architects and contractors have innovated and solved complex problems in the projects is a testament to the intellectual genius of the individuals involved. Well done, once again, to all who entered and to those who won prizes. The year ahead, and into next year, looks promising with much on the cards for the Society and plans afoot for further seminars held at both regional and national level that will showcase concrete as an excellent construction material.

We certainly are looking forward to a vibrant and exciting year.

Nick van den Berg
President
The Concrete Society of Southern Africa

Cover: Winner of the Fulton Awards in the 'Building Projects' and the impressive 'Concrete in Architecture' award, the Ubuntu Education Centre.

VISION: To be the most relevant forum for those who have an interest in concrete and to promote the related services of the CSSA members.

MISSION STATEMENT: To promote excellence and innovation in the use of concrete and to provide a forum for networking and for the sharing of knowledge and information on concrete.

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Ubuntu Education Centre

The Ubuntu Education Centre won two prestigious 2011 Fulton Awards: the 'Building Projects' and the impressive 'Concrete in Architecture' award.

The health and education outreach and skills provider NGO, Ubuntu Education Fund, commissioned the construction of the new Ubuntu Education Centre in Zwide, Port Elizabeth.

The Ubuntu Education Centre is situated in an area with an 80% rate of unemployment and an HIV/Aids rate of over 30%. The Ubuntu Education Fund operates from the new centre, which was funded by American and South African contributions. The Fund has a policy to limit its outreach programmes to within 7km of the centre to ensure that it can provide adequate and continued support for vulnerable children in the community.

The Fund indicated that there was a need to create a sense of ownership of the centre by the staff and local community. Since then the centre has become an icon in the neighbourhood. Almost 95% of the Fund's staff contribute a percentage of their earnings to sustaining and running the centre.

The Ubuntu Education Centre houses a clinic which specialises in HIV and tuberculosis prevention services and counselling. It has an educational wing for group studies, career guidance and fully equipped computer learning facilities. The Fund appointed Field Architecture, of Palo Alto California, to create the concept. Their exciting design evolved in 2006, following discussions and workshops with local staff and community leaders in Zwide. John Blair Architects in association with Ngonyma Okpanum Hewitt-Coleman Architects were appointed and lead a full professional team in the detailed design process, documentation, and administration of the contract.

The design employs sloping folded off-shutter reinforced concrete elements, which double as walls and roofs. In the Spirit of Ubuntu, the elements were chosen as they work well together. The glazed external walls are fronted with horizontal gumpole screens, which provide shade and security for the internal space. The use of poured concrete to form walls and roofs was an initial design decision, which enabled the essential continuity between these elements to be achieved. Post tensioning was used on the main sloping roof slabs to limit cracking and maintain a waterproof concrete construction, without the need for an applied finish. The unconventional form of the building provided challenges to both the contractor and professional team with regard to construction techniques and detailing. The smooth finish required for the concrete was achieved by using phenolic resin-coated plywood shuttering. The finished palette is deliberately limited to the use of smooth concrete walls externally and, wherever possible, internally, acting as a contrast to the natural materials used for floors, ceilings and fittings.

The textured slate pathways and floors run from the edge of the site through the building as a continuation of the natural pathways of the surrounding township. Other natural flooring materials such as hardwood and woven sisal, contrast in the same way with the concrete walls, and gumpole ceilings echo the use of the same material externally.

The building is designed to grow out of its natural setting. The existing ground between the building and roads was lifted and re-laid with clean, compacted local red gravel to match surrounding surfaces. The soft landscaping involves the use of aloes and other succulents which are indigenous to the area and require little or no watering. The planting has been positioned on either side of the walkways interspersed with large rocks that can be used as seats. As with the natural timber and floor coverings, the soft and hard landscape provides a contrast in shape, form and texture to the smooth concrete walls. As far as possible the building relies on natural ventilation, but mechanical ventilation was required in the hall and a number of internal spaces. Air conditioning has been restricted to the pharmacy, the server room, the main conference room and two internal offices. The electrical installation has been designed to allow for the installation of photovoltaic panels which should be erected on the roof of the existing Ubuntu offices in the near future. These would work together with a battery system. Underground ducts have also been installed to allow for wind turbines to be incorporated at a later stage for additional power generation. The electrical installation system has been tiered so that in the event of a power failure the more important circuits can be maintained to operate from battery power. In an effort to reduce power and energy consumption, LED light fittings have been used for all fittings other than fluorescent units.

Understanding plastic shrinkage cracking of concrete

The cracking of concrete remains a major headache for engineers, contractors and property owners. It is not only unsightly, but also reduces the durability and serviceability of a concrete structure, by serving as pathways whereby aggressive corrosive agents, for example: air, water and chloride can enter the concrete.

One of the earliest forms of cracking in concrete is Plastic Shrinkage Cracking (PSC), which occurs in fresh concrete that is not stiff enough to transfer any stress.

This stress is caused by the loss of pore water from the concrete surface due to evaporation, which is referred to as capillary pressure.

Environments with high evaporation rates increase the capillary pressure in the concrete and are characterised by conditions with a low relative humidity, direct sunlight, as well as high wind speeds and air temperatures. Concrete elements with a large exposed surface, for example, industrial and residential floor slabs, are especially vulnerable to evaporation and therefore also PSC.

The capillary pressure has a vertical and a horizontal stress component. Furthermore, each of these components has a dominant influence on the deformation of the concrete body during certain periods.

The first period begins after the concrete has been compacted and is called the settlement period (A and B in Figure 1). During this period the solid particles in the fresh concrete settle downwards due to gravity, which in turn displaces water upwards. This bleeding results in a thin film of water on the surface of the concrete. Once this water has evaporated the capillary pressure starts to build up in the concrete (C and D in Figure 1). During this period the vertical stress component is dominant and mainly assists in vertical settlement. This period ends once the maximum vertical settlement has been reached and corresponds approximately to the time when bleeding ends and the initial set of the concrete occurs (D in Figure 1).

The second period is called the plastic shrinkage cracking period (E and F in Figure 1). During this time the horizontal stress component is dominant and causes plastic shrinkage cracks to form rapidly and stabilise before the concrete has hardened. In severe cases cracks can penetrate the full depth of the slab. The PSC period usually ends before the final setting time of the concrete has been reached. A summary of these stages is shown in Figures 1 and 2.

During the construction process the PSC period corresponds to the period where finishing procedures such as floating and trowelling are normally applied to the concrete surface. This often leads to the temporary covering of several plastic shrinkage cracks, which gives a false sense of security, since these cracks are still present and therefore remain a

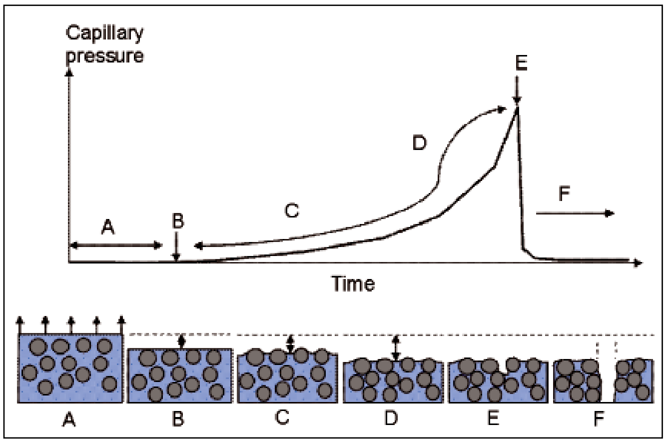

Figure 1: Typical capillary pressure build up before the onset of plastic shrinkage cracking.

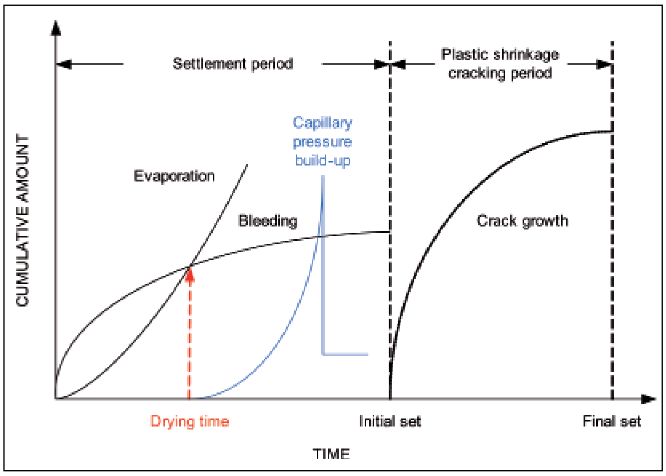

Figure 2: Typical development of plastic shrinkage cracking in fresh concrete.

problem. The position of cracks depends on the geometry of the slab. If the slab has a uniform thickness, cracks patterns are mostly random, although parallel patterns are also common. Large, water-filled pores on the concrete surface are often starting positions or weak points, where cracks may start if sufficient evaporation occurs. However, if the slab has a non-uniform thickness, as a result of a varying depth or rigid inclusions such as reinforcing steel, crack patterns are normally linked to the positions of these slab non-uniformities.

There are several external and internal measures that can be applied to prevent or reduce PSC. External measures influence the external environment of the concrete slab and are aimed at minimising water loss through evaporation. These include: casting during favourable conditions with low evaporation rates; shielding the concrete from wind and direct sunlight; spraying a fine mist of water continuously above the concrete surface as well as cooling the concrete aggregates and/or mixing water. Internal measures influence the internal structure and behaviour of the concrete. The most common and successful internal measure to reduce PSC is the addition of a low volume of synthetic fibres to the concrete, typically at a dosage of around 0.6 kg/m^3. The fibres reduce crack widening by transferring the stress induced by capillary pressure across the crack. Although fibres provide resistance to PSC, they do not always result in a 100% crack reduction and it therefore does not justify neglecting the application of external preventative measures. A common and worrying practice in the construction industry is the use of steel mesh to reduce PSC. This is a misconception as the steel mesh may in certain cases even aggravate the PSC of concrete by providing vertical and horizontal restraint. The steel mesh is meant to control cracking due to drying shrinkage which occurs long after PSC has finished. In conclusion, although PSC remains a problem with concrete slabs, it is believed that the basic understanding of the mechanisms involved with PSC will greatly increase the overall awareness of the problem as well as its effective prevention.

Figure 3: Climate chamber for the testing of plastic shrinkage cracking.

This article was submitted by Prof WP Boshoff of the Civil Engineering Department, Stellenbosch University. He is currently leading a research project with the aim of creating design guidelines for the use of a low volume of synthetic fibres in conventional concrete to reduce or eliminate plastic shrinkage cracking. The developed test setup can be seen in Figure 3. For further information email Professor Boshoff at bboshoff@sun.ac.za

A Market Review on the use of Structural Precast Concrete in South Africa

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ABSTRACT: Structural precast concrete is applied extensively in European and North American construction industries and the trend to use precast technology is generally growing. There are many benefits associated with precast construction including speed of construction, quality assurance, reduction in on-site labour and design freedom, all of which relate to an underlying economical benefit. However, in comparison to most European and North American countries, structural precast construction contributes only a small percentage to the construction industry in South Africa.

The local structural precast market is dominated by precast flooring systems and there is generally an absence of frame components such as beams and columns. A market review was carried out with the objective of identifying the extent of use of structural precast concrete in South Africa, and to acertain the mindset of the industry. The review indicated that engineers and architects are generally reluctant to specify precast construction methods for structural applications, which is partly based on a lack of knowledge of the subject.

Further, lack of planning of construction projects seems to hinder acceptance of precast technology. However, despite the current lack of structural precast technology in South Africa, there is large interest in the subject in the local industry. Recommendations to increase the use of structural precast concrete in the South African industry are provided.

KEYWORDS:

Precast concrete, structural design, construction techniques, frame structures, market review

1. INTRODUCTION

Some regions in North America and Europe make use of precast concrete technology as the favoured method of construction for large structural frames. Precast components used include various types of columns, beams, slabs and shear walls. In contrast, structural applications of precast concrete products in South Africa are mainly limited to hollow core slab systems and rib and block systems.

Based on detailed planning from the beginning of the project and proper communication between all parties involved, precast technology offers a great relief from the characteristic time pressures on clients and designers that are associated with in-situ concrete construction and can significantly increase the speed of construction.

Another important advantage includes design freedom, which however is not always acknowledged by individuals who favour in-situ construction techniques. From an architectural point of view, precast prestressed technology offers the possibility to use more slender members and longer spans, while precast concrete generally results in higher quality fair faced surfaces, compared to in-situ concrete. Site complications and labour requirements are generally reduced with the application of precast construction techniques, which is often overlooked by design engineers who are not directly involved in the construction.

The choice of an appropriate construction technique generally depends on economical considerations. Whether precast technology is economically beneficial depends on the particular project as the cost per volume of concrete is generally significantly higher, compared to in-situ concrete construction. A cost comparison needs to take all the above aspects into account, (where relevant), to decide on the most appropriate construction technique.

This paper investigates the precast concrete industry and how it has been applied in past developments both locally and globally. With a notorious shortage of skills and problems in quality assurance, precast concrete technology holds significant potential in local application. However, there are numerous issues that hinder the acceptance of structural precast technology by the South African market, which were investigated in this project through a market review in the local construction industry.

2. BRIEF REVIEW OF THE CHARACTERISTICS OF STRUCTURAL PRECAST CONCRETE

General advantages of precast construction

Construction methods employing precast technology have numerous advantages, compared to in-situ concrete construction (Hegger 2006). It is however difficult to rate the various advantages as each application has to be considered on its merits in specific circumstances. Advantages inherent in precasting are factory-controlled production methods, increased tolerances and improved standards of finish, reduction in site labour requirements, and the removal of large sections of work from the critical path determining overall contract duration (Richardson 1991).

The many advantages of precast concrete are described in most literature on the subject, however the majority relate to an economical advantage. The following advantages are prevailing: Design freedom for occupational floor area; Reduced on-site complications provided the connection details are good; High product quality; Reduced on-site labour; and High speed of construction.

Precast concrete provides the same advantages as in-situ concrete with respect to the freedom in design of occupational floor area. European systems follow an open construction technique where the trend is to design a layout with free open spaces created by long spans between load bearing walls. This allows for the layout of the internal walls or partitioning, which serve no load bearing function, to be changed at a later stage during service. Furthermore, structural integrity can be achieved through a variety of layouts and structural compositions, making use of various frame and floor slab systems (Elliot 1996).

Constructing concrete members on site requires considerable skill in formwork erection, reinforcing steel placement, concrete placement and curing. If the concrete is mixed on-site, quality control becomes a further issue during the batching and mixing process. As a result of time constraints and lack of skilled workforce, the finished product may not be of acceptable quality, a problem, which is often encountered in the South African industry.

Another issue is the frequent application of complex geometric configurations, requiring the use of intricate formwork. If designed and implemented correctly, precast concrete allows for economical and easy installation and hence reduces the work load on the contractor (Yee 2001). This makes it considerably easier to meet the required quality standards. Noise pollution and waste disposal linked to concrete manufacturing are eliminated from site. Another advantage is that factory-controlled production reduces on-site dependency towards adverse weather conditions such as extreme heat, cold, or rain.

Precast concrete components are cast in a manufacturing plant under controlled conditions, resulting in generally higher quality, compared to in-situ concrete. This is of growing concern to the construction industry, in South Africa and worldwide, as concrete durability issues are increasingly being considered in the design of structures.

Precast concrete construction techniques require significantly less on-site labour compared to in-situ concrete construction. Despite the savings in on-site labour costs, total cost of construction may however be higher. The manufactured products are often more expensive compared to their in-situ counterparts, which may result in an increase in the total cost of the project. In North America and Europe, designers often favour precast construction as it can significantly speed up construction, allow early occupancy of the structure or building and therefore reduce total project costs.

Generally, the cost-effectiveness of precast construction needs to be established by considering construction time savings and improved product quality. However, transport costs may also play a role in cost-effectiveness and this will depend on how far from the site the precast plant is located.

Common applications and systems of structural precast concrete in Europe and North America

Precast technology is applied in many regions of the world. As an example, the precast industries in Europe and North America, being relatively well developed, were investigated in more detail. Even though precast technology is generally well accepted in these regions, the application of various precast systems and construction methods, as well as the percentage of construction being carried out using precast concrete members differ significantly between different countries. It is therefore difficult to give a general overview on the application precast technology overseas. However, a few important principles and developments in the application of precast technology were identified and are briefly discussed in this section.

Housing projects

Precast concrete can be incorporated into both low-income housing projects as well as upmarket residential developments covering the entire range of residential applications.

In Europe, there are two main systems used in housing development. The first is known as the cross-wall system. The configuration is such that a number of precast walls are load-bearing and are positioned perpendicular to the front façade. The exterior cladding and front façade can be of any suitable material - from brickwork to manufactured precast panels (Van Acker 2007). Another system incorporated by European designers is the envelope system. This makes use of precast concrete elements to envelop the building, i.e. to construct exterior walls. The internal walls are non load-bearing and are commonly made of materials other than precast concrete such as masonry or cement blocks however precast panels can be used. This means that the roof and floors span the entire width of the house or apartment (Van Acker 2007).

The authors consider it unlikely that vertical load-bearing members would currently be employed in individual housing projects in South Africa. However, the above construction principles may be useful in the low income housing market and township upgrading projects, where the speed of construction is of importance.

Office Buildings

In Europe, office buildings are often designed as frame structures made up of a configuration of precast beams, columns, slabs and façades. Hollow core slabs span between load bearing precast concrete façades to create large open spaces (figure 1). For designs which require longer spans, internal columns can be used to provide intermediate supports (figure 2) (Van Acker 2007). In South Africa, equivalent buildings are often constructed in-situ using frames made from concrete columns and beams in connection with post-tensioned flat slabs.

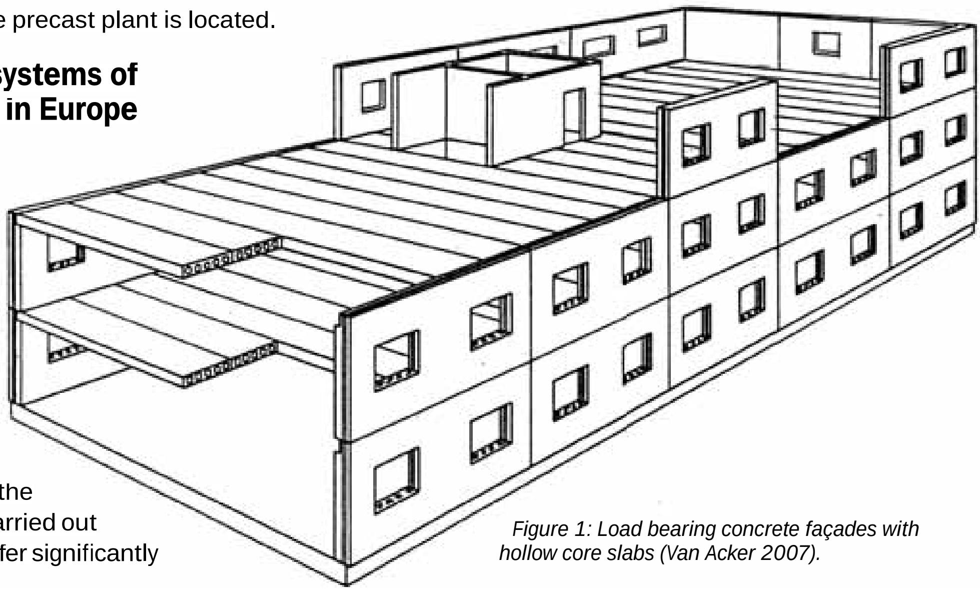


Figure 1: Load bearing concrete façades with hollow core slabs (Van Acker 2007).

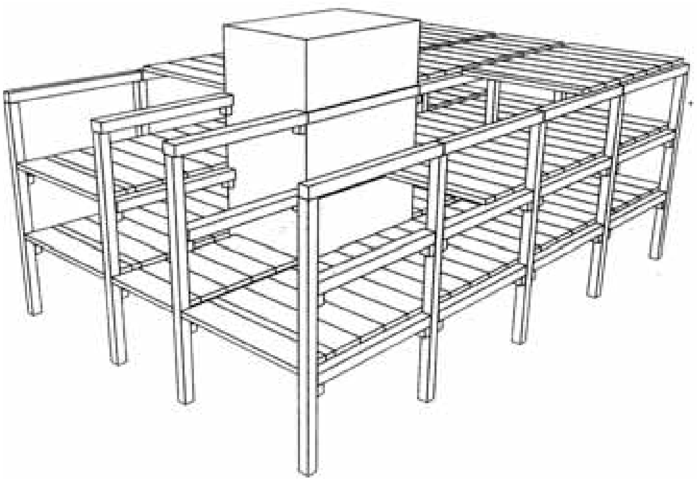


Figure 2: Skeletal frame design with internal columns (Van Acker 2007).

Figure 3: Example of skeletal frame design with internal columns (Spancrete, USA).

Industrial Buildings

It is common practice in South Africa for industrial warehouses to consist of a portal frame of structural steel with brickwork enclosing the rest of the structure. On a number of building projects in South Africa, tilt-up precast concrete columns have also been used. European designers have made the use of precast concrete in two different systems for industrial application. The first system is the portal frame system. The basic components of a portal frame include two columns and a roof beam or rafter (Van Acker 2007). The vertical forces are transferred into the rafter and further into moment resisting columns on which the beam/rafter is simply supported. The connection between column and beam is assumed to be pinned, however a clamped or moment resisting connection is necessary between the column and foundation so as to allow for a moment distribution within the column (Elliot 2002). Precast façades can be connected to a portal frame of columns and edge beams to support the horizontal panels.

In another European application, load bearing façades are used to support saddle roof elements. The roof elements are precast double T slabs, which are light in weight and are capable of spanning large lengths.

Parking Structures

In Europe and North America precast concrete is often the most popular material in the construction of multi-level parking structures. The most common design of such structures is a skeletal frame system made of precast columns, beams and slabs (Van Acker 2007). In skeletal structures, vertical loads are transferred into the foundations through a network of beams and columns, and the horizontal loads by columns, elevator shafts, stairwells and shear walls.

Structural Stability and connection between elements

Structural stability is one of the most important considerations of structural precast concrete design as it involves both the design of the members as well as the connections between them. The transfer of forces through the components of a precast structure is vastly different to that of a continuous monolithic structure which is especially true at the connections (Elliot 2002).

The design of joints and connections is therefore of great importance and represents the single largest difference between the design of in-situ and precast structural frames. Educating structural engineers in the design of precast frame structures, emphasis has to be placed on connections. Design guidelines for connection types and details are provided in the literature (Van Acker 2007).

3. REVIEW ON THE SOUTH AFRICAN MARKET CONDITIONS FOR PRECAST CONCRETE

The first introduction of structural precast technology to South Africa occurred in the early 1960s, with much North American and European influence. During the past few decades, a sustainable trend towards structural precast could however not be established, and a number of precast facilities had to close following the recession in the mid 1990s (Beushausen 2004). The use of precast technology as a time-efficient method for erecting residential and industrial buildings should be encouraged by architects and engineers. However, despite the obvious advantages of precast construction for the local industry it is still far from being used to its full potential.

Market reviews in the form of questionnaires and personal interviews were undertaken in an attempt to investigate the current status of the structural precast concrete industry in South Africa. The objectives were to identify differences between the local and global applications of precast concrete, to investigate the mindset of the local industry towards precast technology, to identify the extent to which precast concrete applications were being used and to investigate the sustainability of the local precast industry.

The first part of the market review, the questionnaires, served mainly to identify application fields of structural precast components in South Africa and to establish whether the individuals taking part in the survey, acknowledge the various advantages of precast construction and design. A total of 20 questionnaires were sent out country-wide, of which 14 were returned by five architects, four consulting engineers and five contractors.

The second part of the market review involved discussions with 14 selected individuals from different regions in South Africa, in addition to those who had responded to the questionnaire, who are actively involved in the South African precast industry. This included for example manufacturers of precast components and representatives of official industry bodies such as the Cement and Concrete Institute and the Concrete Manufacturers Association.

Detailed discussions on possible reasons for the apparent reluctance of the South African market to adopt a sustainable and effective precast manufacturing industry were held. The most important information gathered and the main conclusions drawn from the market review are discussed in the following sections.

Questionnaire responses

General awareness of advantages of precast construction

All of the respondents claimed to be familiar with the benefits of structural precast concrete. The advantages that were listed are summarised in relevant categories, as shown in table 1.

Table 1: The advantages of structural precast construction as acknowledged by various professions in the industry.

Advantage	Contractors (5)	Consulting engineers (4)	Architects (5)	Total
Quality of products (durability)	4	3	4	11
Reduction of on-site labour	4	3	4	11
Increased speed of construction	4	3	3	10
Cost benefits	4	1	1	6
Reduced on-site complications	4	0	2	6
Variety of surface finishes	0	2	1	3

Most of the respondents (11 out of 14) acknowledged the high product quality that can be achieved through precast construction methods and linked this to superior durability of the structure. The same number of individuals stated that the reduction of on-site labour is a major advantage of precast construction, while increased construction speed was recognised by 10 respondents. It is interesting to observe that despite the awareness of the above advantages only six respondents linked these advantages to economical benefits.

Generally, the list of responses covered most of the advantages commonly ascribed to precast concrete, however only two people listed more than three advantages, which indicates a limited knowledge on the subject.

Another advantage generally attributed to precast concrete technology is freedom in architectural design of concrete surfaces, which local architects seem to be largely ignorant towards. It was found that both architects and consulting engineers are unaware of design flexibility and diversity offered by precast technology, which could possibly be attributed to a lack of interest on the subject.

As can be seen from Table 1, the advantages of precast technology are predominantly experienced by the contractor, who profits from reduced on-site complications and increased construction speed and links these advantages to economical benefits.

Awareness about economical advantages of precast construction

Most benefits commonly associated with precast technology relate to a direct or indirect economical advantage. Indirect economical benefits can, for example, result from high speed of construction in connection with early occupation of the structure and hence early return on investments.

Improved quality standards reduce repair and maintenance work and may result in considerable cost savings already during the construction period. In addition, the repetition in manufacturing standard elements can result in cost savings during fabrication.

In an attempt to explore the mindsets of the respondents in view of the economical advantages of precast concrete they were asked to state which of the following two general statements they would rather agree with:

Precast construction is economical as it reduces the cost of on-site labour, speeds up construction and ensures high quality surface finishes.

or

Precast concrete components are expensive which renders in-situ concrete construction a more economical option.

It should be noted that the 'correct' choice between the above two statements depends on the particular project under consideration. In the scope of this general review, the two statements were used to identify the general mindset of the industry.

In response, the majority of the respondents felt that precast concrete components were uneconomical in comparison to in-situ concrete (figure 4). Two individuals chose not to reply to the question. All of the four individuals who agreed with (a) were contractors, which suggests that the contractors are more accepting of precast construction as the advantages of the technology are experienced by them the most. This also suggests that the lack of structural precast in local construction is related to the mindsets of the designers and project leaders.

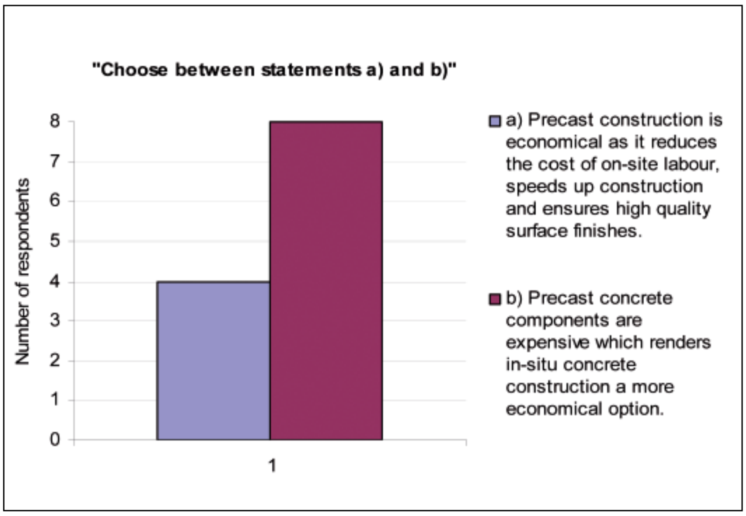


Figure 4: Graphic illustration of the number of responses to the question whether precast construction had economical advantages or disadvantages towards in-situ construction.

The use of structural precast components in South Africa

Most of the respondents had made use of precast components in some of their projects. Table 2 lists the applications, for which precast components have been used. As indicated, structural precast is mostly used in residential applications followed by commercial and industrial buildings.

The most commonly used elements are precast floor slab systems, such as hollow core or rib and block. Precast beams are used mainly in commercial applications where long spans are required. Other applications included non-structural components and precast products such as paving blocks, roof tiles and gutters as well as infrastructural elements in the form of bridge beams and storm water pipes, which are not discussed in the scope of this paper.

The responses, unfortunately, do not indicate to what extent or how often precast technology was applied for the various elements. However, they show a general trend on which types of elements have found a certain degree of acceptance in the local industry.

All of the respondents who had made use of structural precast technology for various applications agreed that they in fact had benefited from the use of precast concrete.

Table 2: Questionnaire response: Applications of structural precast components in South Africa (14 respondents).

	Type of building structure		
Component	Residential	Commercial	Industrial
Suspended slabs	10	8	7
Beams	5	7	2
Columns	1	4	3
Walls	2	0	2
Load bearing façades	5	4	3
Non-load bearing façades	6	4	2

Acceptance of precast technology

The South African structural precast industry is small in comparison to European and North American standards, with only a very limited number of precast yards countrywide being equipped to produce structural elements such as columns, beams and slabs other than hollow core (e.g. double-T slabs).

In order for the precast industry to expand its facilities, there needs to be a demand for precast components and a willingness to consider precast concrete as a design alternative. The current lack of structural precast concrete in South Africa seems to be resulting mainly from the mindset of the industry, favouring traditional in-situ methods of construction for various reasons. However, almost all of the questionnaire respondents were willing to expand their knowledge and gain further insight into the use of structural precast concrete (figure 5). This reveals that the mindsets of engineers, architects and contractors can be altered through the development and expansion of the existing precast industry. Of the 14 respondents, 12 indicated a willingness to consider incorporating structural precast more frequently if a sustainable precast industry was to be established (figure 6).

It appears that professionals in the construction industry would accept structural precast more readily if a greater range of systems and components were available to them.

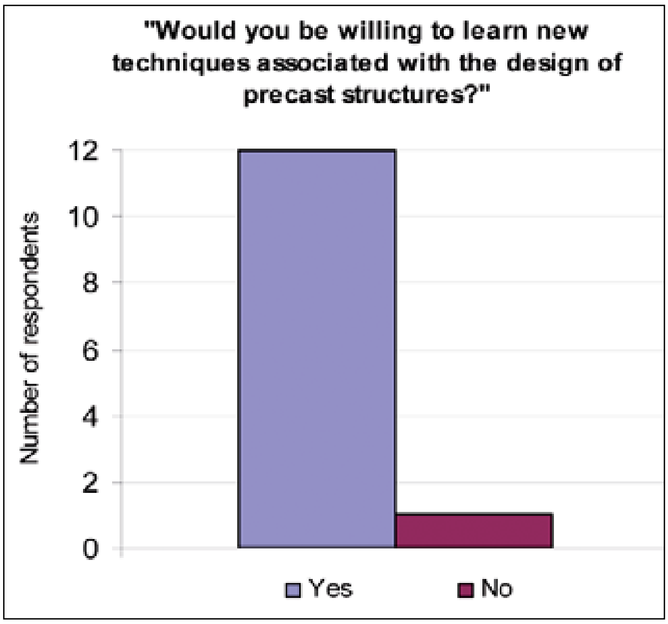


Figure 5: Number of respondents interested in learning more about the use of structural precast concrete. (One individual did not reply to the question).

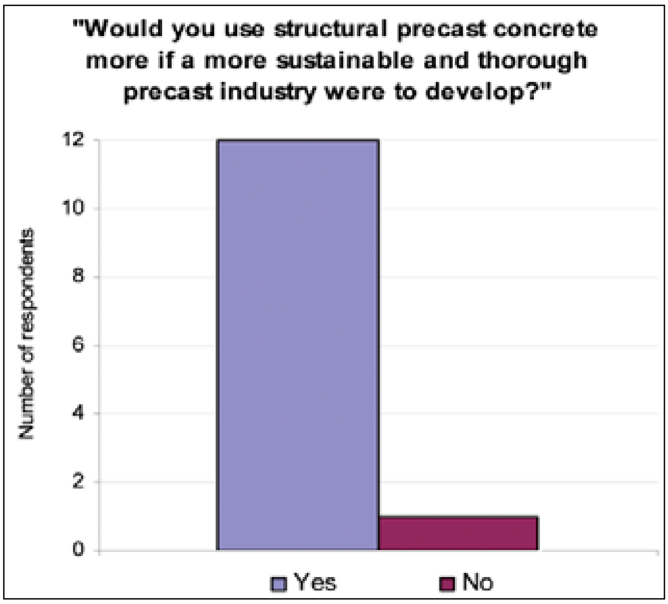


Figure 6: Number of respondents willing to apply precast concrete construction more frequently. (One individual did not reply to the question).

Individual interviews with selected experts

Reasons for the lack of structural precast concrete in South Africa

In the discussions it was discovered that the lack of precast concrete technology in South Africa can be attributed mainly to the following reasons: Conservative industry mindset; Lack of technical skills of construction workers; Lack of engineering knowledge in precast design; Lack of planning in the design phase; and Lack of diversity in precast components and limited design alternatives.

Conservative industry

The bulk of interviewees felt that the consulting engineering fraternity in South Africa is conservative and slow to adapt to new ideas. Seven individuals agreed that mindset is a major detrimental factor to precast in this country and they gave examples of projects where precast technology could have successfully been used in the design, but in-situ was preferred because the engineer was reluctant to look into alternative design and construction methods.

As a possible reason for this mindset it was identified that precast technology is generally not taught in the civil engineering programmes of the South African universities.

Lack of engineering knowledge in precast design

The absence of precast frame structures in South Africa was related to the lack of engineering knowledge required to manage complex connection details both in the design and construction phases.

Lack of technical skills among construction workers

Ten of the interviewees agreed that South Africa lacks the technical skills required for precast technology and related this to the shortage of skilled artisans and construction workers. It was felt that the degree of accuracy and precision necessary for precast component installation could not be achieved in South Africa.

Lack of planning in the design phase

For a project to incorporate precast successfully, interaction between the precast manufacturer, the contractor and the design engineer is vital at the earliest possible stage.

It was mentioned by three interviewees that insufficient planning in many South African construction projects is restricting the market from adopting structural precast technology.

In Europe, for example, it is common practice to commence site work only once the design has been finalised and completed. In contrast, in South Africa the design and construction stages are often carried out simultaneously, which does not suit precast construction.

Lack of diversity in precast components and limited design alternatives

Five individuals felt that the repetition of elements and the modular nature of precast construction restrict designs to standard layouts, which limits architectural diversity. In addition it was stated that design engineers generally favour in-situ construction as precast concrete limits the amount of design changes that can be made once construction has begun.

Methods for the promotion of structural precast in South Africa

Most of the interviewees were of the opinion that structural precast should be promoted in South Africa as the inherent advantages of precast construction would benefit the local industry. Changing the mindset of design engineers and architect seems to be one of the biggest challenges in developing a sustainable precast industry in South Africa. Suggestions were made to incorporate precast design in engineering education at universities and to regularly hold seminars and workshops on the subject. A number of interviewees felt that suitable marketing and awareness strategies should be implemented to improve the customers' perceptions of structural precast. Another suggestion was to promote a combination of precast and in-situ construction techniques. This could increase the acceptance of precast technology as it would gradually blend into the market and allow design engineers and architects to familiarise themselves with the technology.

A precast frame structure (columns, beams, slabs, shear walls) in Europe (Arnold van Acker, Belgium).

Three interviewees felt that precast framed structures would be more prominent if the structure of the contracts would allow for it. It was recommended that the design be carried out in cooperation with the contractor or project manager and that communication between different parties should commence at early stages of the design process.

Opinions on the future of the South African structural precast industry were both negative and positive. Three individuals felt that no future exists for structural precast manufacturers within South Africa, with the exception of precast floor systems. In contrast, other interviewees supported a positive outlook and suggested that efforts to promote precast technology may well increase its acceptance and application in South Africa.

4. DISCUSSION AND CONCLUSIONS

Structural precast concrete has various advantages that can be exploited to a great extent in the South African construction industry. Precast technology offers users the benefits of speed of construction and assured quality in products.

Furthermore, the use of precast components reduces both the amount of labour and complications present on site. The benefits associated with the use of structural precast concrete all filter through to an economical advantage, which results in precast technology being successful in the European and North American construction industries.

The South African construction industry is growing continuously and the ability of the precast industry to participate equally in this growth is hindered by various inter-related factors that make this country unique to Europe and North America.

It is found that the mindset of the local industry is somewhat conservative towards new technology. Further, there is a large shortage of skilled labour in South Africa and this has resulted in a general lack of quality in building, which does not suit the precision of precast construction especially with regard to the complex connection details the technology entails. Local engineers are not educated on precast design principles at the universities, which leads to a lack of technical expertise associated with the subject. This has resulted in precast technology generally not being considered in the design phase of a project. Another issue that hinders application of precast technology is that the South African industry has developed a culture whereby construction commences prior to the completion of the final design, which is not conducive to precast construction as designs cannot be changed once the components have been ordered.

The results of the market survey further suggest that the perceived benefits of precast construction are, by and large, only experienced by the contractor.

Architects seem to be reluctant to consider precast in design due to the lack of diversity offered as only a limited range of elements and systems are currently available to the local market.

The mindset of the industry assumes precast components to be expensive but it has been found that the speed of construction and the early occupancy for the client, can offset this cost. Clients are further benefited in that the life cycle cost of the building is improved through the enhanced durability of precast concrete which reduces overall maintenance work.

A limited range of products exists in the local structural precast industry as it is dominated by floor manufacturers that supply hollow core and beam and block systems mostly for residential applications.

Other precast systems that are used in South Africa include tilt-up construction and hybrid construction. The latter marries the advantages of both precast and in-situ construction with significant benefits, which include solving the structural stability problems with purely precast construction and reducing the complexity of design of joints and connections.

In order for design engineers and architects to increasingly specify the use of precast components, a more diverse precast industry needs to be developed to ensure that designs can be realised in practice. This translates into the requirement to establish more precast facilities and produce a larger range of structural components.

However, facilities will not be established, or upgraded, to produce structural components unless there is a clear demand. To disrupt this vicious cycle, the different members of the industry, i.e. engineers, architects, contractors and precast manufacturers, need to cooperate to establish and sustain structural precast technology in South Africa and eventually profit from the potential advantages.

5. RECOMMENDATIONS

It is clear that the acceptance of structural precast concrete in South Africa is dependent on the ability to change the traditional mindset of the industry, which is largely due to the factors included in the conclusion. The following recommendations are aimed at altering the perceptions of the South African construction industry in respect to the use of structural precast concrete technology.

In an attempt to increase the level of skills within the industry it is recommended that both designers and contractors be educated on the design and applications of structural precast concrete. Universities need to include a course on the use of structural precast concrete (with specific attention given to connection details) within their curriculums.

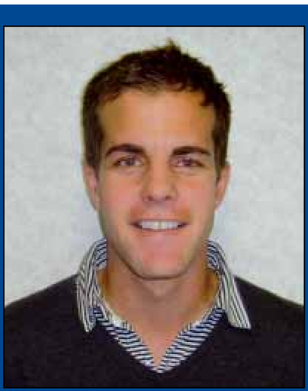
Training programmes aimed at addressing the poor standard of building must be initiated by precast manufacturers, who are also encouraged to create awareness amongst the engineers, architects and contractors on the use and design of their products. It is recommended that suppliers send out educational software to engineers and architects informing them of the advantages and applications of the various systems as this will familiarise the industry with the technology and hence increase its acceptance.

A fully precast structure in England (Martin Clarke, UK).

Increasing the level of technical skills through these recommendations will enable a more sophisticated industry to develop through which projects can be planned and finalised before the contractor starts on site.

It is also recommended that manufacturers are viewed as partners in the design and construction of the entire project and get involved at the earliest possible stage.

The authors feel the acceptance of precast will be a slow process of gradual change. Therefore, it is recommended that structural precast technology be blended into the market whereby composite construction is promoted. This will allow the industry to get used to the idea of structural precast concrete in various applications. Also, existing precast facilities extend the capacity of their plants incrementally through the introduction of precast components that work in collaboration with the systems that are currently being produced.



Ross Wainwright, L&S Consulting (Pty) Ltd

Hans-Dieter Beushausen, University of Cape Town, Department of Civil Engineering

From the CEO's desk

Dear Members,

Well, I guess the highlight of the past quarter has been the flurry of activity surrounding the Fulton Awards. Firstly, with completion of the judging and establishing the winners, and secondly the organisation of the various aspects of the celebration weekend - AV's, voice-overs, decor, bookings, the special Concrete Beton publication, the trophies, certificates, running the events and a lot, lot more.

My personal thanks to the Fulton Awards Organising Committee, Francois Bain, Chair, Hanlie Turner, C&CI, Armand van Vuuren, Chryso SA and Natasja and Jeanine from the Head Office. I have not received a single negative comment regarding the weekend in the Drakensberg, and once all our feedback questionnaires are returned we will see if there are any weak spots that we need to note for the future. Well done team on a fantastic job!

Having mentioned 'feedback', if you wish to complete the questionnaire you can do it online with the following link: http://www.surveymonkey.com/s/D5S2XNP

To all the Fulton Awards winners - congratulations; to the non-winners, certainly not losers, - it was a close call all round, as the standard of all the projects was incredibly high. We hope to see you back for the 2013 awards. But you do not have to wait until then to submit. We will be accepting submissions from now on for the next awards. Projects complete in 2011 or substantially complete in 2012 will qualify for entry.

Whilst all this work has been done over the last quarter, we have not been idle in other areas. The Consumer Protection Act came into force on April 1st and a detailed study of all our activities was carried out to ensure that we conform to all the new requirements relating to dealing with 'consumers'. Of course, individual members of our Society are deemed to be 'consumers' under the Act. I am glad to say that we now conform as far as systems and policies are concerned, but staff and office bearers will need to ensure that we practise the written word.

Now that the new Companies Act has been promulgated, work will start on bringing the Society into conformance with the new legislation. Some of the new requirements need us to conform straight away.

Certain of you will have noticed that we have launched a Facebook page I encourage you to utilise this for staying in touch with the Society, starting discussions and generally keeping our organisation alive and interactive. To view this, you just need to click on the Facebook logo on our website, which will take you straight through. If you wish to participate and/or communicate through this medium, however, you will need to register as a Facebook user. This is free of charge. The overall construction market still seems to be sluggish, and news that the Public Works Department has placed a six month moratorium on all new tenders being issued will not help this situation. Cement sales are continuing, however, to show some upturn, and if one looks at the statistics produced by the C&CI as at the end of May, the last two months have been higher in sales on a 'sales per day basis' than the equivalent months of last year. Nothing dramatic in this, except it does seem that there is some continual slowing of the negative growth that we have experienced in recent years.

Finally, can I appeal to those members who have not yet paid this year's membership fee, to please do so. You have probably forgotten that the renewal form is at the bottom of your in-trays, so please dig them out and let us have your payment shortly.

John Sheath

Chief Executive Officer
Concrete Society of Southern Africa

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Blackburn Pedestrian Bridge

Prior to construction of the Blackburn Pedestrian Bridge and Walkway in 2010, residents of Blackburn Village informal settlement walked alongside and crossed the dangerous N2 national freeway, which resulted in a number of pedestrians being killed or maimed on the freeway.

This resulted in the national roads agency investigating a bridge and protected walkway that would provide safer travel for both pedestrians and vehicle users of the road.

In order to ensure early buy-in, the agency approached SSI Engineers and Environmental Consultants to work with community leaders from the area to determine a preferred crossing location. The location proposed by the community was 300m south of Blackburn Village and crossed the N2 at a location with an 80m wide median.

Numerous proposals were provided to the client, which included conventional girder-types, arches, stress ribbon and cable-stayed solutions. The deep median and poor founding conditions coupled with an environmentally sensitive area between carriageways meant that numerous substructure footings would result in large foundation costs. The South African Roads Agency Limited favoured the cable-stayed bridge with a single central pylon and approved the concept for final design. In addition to the bridge, a 2km walkway connecting the bridge to Blackburn Village and Umhlanga was accepted.

Project Overview

The bridge deck is 177,5m long by 4,9m wide (with a 3m walkway width) and has an average walkway slab thickness of less than 200mm. The walkway slab is supported by 750mm deep and 900mm wide concrete edge beams that contain the deck post-tensioning ducts and provide bearing anchor points for the stays. Stiffener ribs at 4m spacing provide transverse strength to the deck and provide a deck underside similar to a coffer slab. The edge beams also serve as raised kerbs upon which the 2,1m tall mesh safety screens are fixed. The bridge span is comprised of two 70m cable stay supported spans on either side of the pylon with an additional 18m back span between right abutment and pier column.

The bridge deck is primarily supported on the central pylon's base, a 9,5m x 9,5m x 1,8m spread footing founded over 7m below existing ground levels, onto sound shale with allowable bearing capacity of 500kPa. The large spread footing used a slower-curing concrete mix to minimise curing temperatures and avoid cracking.

The spread footing supports the 60m tall pylon which, at the base, consists of four 900mm x 900mm reinforced concrete columns. The legs are braced every 8m with stiffener beams to prohibit any rotation of the legs. These beams are set in from the leg faces. . The four legs combine to form two and then combine again into one central mast of 1,2m x1,3m at the top from which the stays are anchored. In total, 32 high-tensile low-relaxation cable stays are used to support the bridge deck from the central pylon. The concrete for the deck, pylon, pier and abutments is 40MPa concrete specified to comply with the client's durability specifications. The exposed concrete finishes were all high-quality F3 and U3 (as classified by COLTO), cast with custom-made steel shutters and hand finished.

Concrete as the Primary Building Material

Choosing concrete for the bridge deck provided countless benefits for the design team as well as the client. While the unique shape and softening fillets required customised steel shutters, these shutters could be reused as often as the programme allowed. The smooth shuttering and careful hand finishing provided by the contractor would result in a seamless finish, exceeding that of a welded or bolted steel deck.

Additionally, the weight of the concrete deck itself provided structural stability to the overall structure by reducing the impact of imbalanced pedestrian loading, as well as virtually eliminating the problematic design issue of pedestrian-induced resonant vibration. The concrete bridge deck has a very high stiffness and low modal frequency, which makes footfall-induced movements virtually imperceptible.

The post-tensioning ducts are concealed in the edge beams and provide adequate compression to ensure that the deck is never in tension (including periods during stay removal for maintenance purposes).

Concrete was also chosen as the building material for the 2km of walkway between Blackburn Village and Umhlanga, as this component of the project was to be built using labour-intensive methods and skills sourced from the Blackburn informal community. In keeping with the community outreach goals, children from Blackburn were invited to imprint their hands in concrete panels, which were then colourfully painted and erected at the bridge.

Unique Design Aspects

The 177,5m, Blackburn Pedestrian Bridge is one of the longest cable-stayed pedestrian bridges in Africa. It spans 60m high, and includes a 2km concrete barrier-protected walkway, lit by energy efficient LEDs. The project's tight 11 month deadline was constrained by two rigid deadlines: the FIFA 2010 World Cup and the opening of the Airports Company South Africa's new King Shaka International Airport, at La Mercy.

Even minor oversights could have caused extremely costly delays as work could not take place during two months around the FIFA World Cup. The bridge deck's edge beams contain not only the post-tensioning ducts and their bursting reinforcement but the sloping ducts for the cable-stays and the required bursting reinforcement that extends from the below-deck bearing blisters into the already congested area.

To further complicate the design, the deck's thin walkway results in localised splitting stresses due to deck post-tensioning (stresses applied at edge beams simply cannot flow directly out into the adjacent walkway slab). Splitting stresses were determined using 3D solids in Prokon and then checked by hand to ensure reliability of numbers. Additional transverse reinforcement then had to be squeezed into the walkway slab and properly detailed to tie into the edge beams.

Stressing of the cable stays required a stage-by-stage analysis of the structure to determine anticipated cable elongations for use by the cable-stay installation team, Structural Systems Africa. Pylon and deck flexibility, in conjunction with cable elongation and relieving forces from semi-elastic scaffolding, created a special challenge for SSI's design team. Adding to the challenge was the effect of each cable's stressing on all the previous cables.

The entire structure (pylon and deck) was continuously surveyed during the cable stay stressing process to ensure that actual values agreed closely with anticipated values. Additional stressing stages could have caused delays to the already tight programme. Prior to completion of the bridge's final design, bridge deck dynamics were given serious consideration. Lessons learned from wind-induced galloping at the Tacoma Narrows Bridge and footfall-induced sides way at the London Millennium Bridge were applied to the Blackburn Pedestrian Bridge project.

A wind-expert was consulted to ensure there were no site-specific wind-related issues. Potential for the deck shape to contribute to deck sway or resonance and pinging in cable stays were also investigated.

Footfall-induced vibrations, vertically, laterally and torsionally, were carefully investigated using 2D and 3D models. Both South African codes and developing international structural design concepts were consulted to ensure a stable bridge deck.

International design specifications for cable-stay bridges required that, due to maintenance or vandalism, the structure must be designed to accommodate the temporary removal of any single cable stay. This requirement resulted in edge beam and post-tensioning detailing that satisfied both conventional day-to-day live loading (basically 8m continuous spans) and the maintenance load behaviour (a 16m edge beam span anywhere along the deck). Determining a single design that could satisfy all load criteria required an innovative solution in the bridge's post-tensioning profile.

Completion and Use

The roads agency and environmental consultants have scheduled a second phase to the follow-up pedestrian survey. This will include interviews to determine these users' destinations and motivations. These surveys illustrate a commitment by the roads agency to ensure the project has completely achieved the aims of improved safety for both pedestrians and vehicle users of the N2.

The Blackburn Pedestrian Bridge has turned the previously dangerous section of the N2 into a landmark of Durban North. The towering pylon and fanning stays now highlight the impressive capabilities of civil engineering and construction in South Africa.

Fulton's Weekend

'It is always good to look back over an event and savour the successes and ponder the hiccups. I am pleased to say that I had a problem with identifying any negatives that came out of the recent Fulton Awards weekend in the Drakensberg, except of course to commiserate with those project teams that did not receive an award or commendation.'

Quote from John Sheath


Marcelle Botha, Shirley Dube and John and Mollie Sheath


Duncan Leith wanted to say a few words


Former President, Francois Bain


Arriving for the Fulton's weekend, Nick and Bronwyn van den Berg

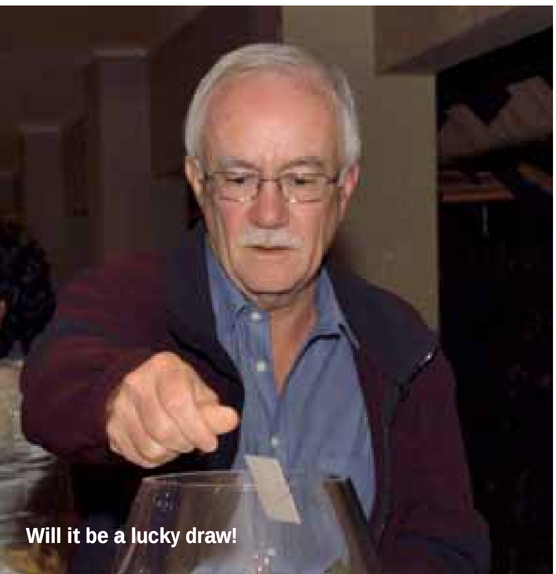
Bryan Perrie checks-out the banners


Fulton weekenders

Duncan Leith


Checking-in Hanlie and Quentin Turner


Enjoying the moment


Will it be a lucky draw!


Working out the illusion


There is no fooling Adele de Lange

Even the children enjoyed the illusionist

Armand van Vuuren's enjoying the act

Karin and Mark Hovy

An excited Armand van Vuuren

The winning golfers collect some prizes

'We have succeeded in damming up some of the most powerful rivers in the world to harness their power. We have not only harnessed the power in water but also the power of the sun and become experts at harnessing the power in fossil fuels, and now other natural fuels. We have built impressive structures such as tall buildings which rise over 800m into the air. And, if this is not enough, there are plans for buildings reaching as high as 1,6km within the next decade. We have built long span bridges with clear spans of over 1,5km and others that stand over 400m high above the ground. And the list continues.'

From the President's speech

The President shows he's in form

Mesmerised

Illusionist, Stan Sussman

Dinner guests, Rheena and Avi Boora, standing behind Garth Gamble and Hennis van Zyl

Confidense and Amos Masitenyane

It's all about the swing for Trueman Goba

Avid golfers


Steve Sotiralis


Another winner

The prestigious Fulton Award and scroll

‘The Fulton Awards event is considered by many as the “Oscar of the Concrete Construction Industry”. It represents a golden opportunity to recognise and reward the effort taken by our peers in the industry in finding unique solutions to often tricky and difficult problems and impress us with their skills and creativity.’

From the President’s speech


Billy Boshoff


Warren Goliath and Marlene Corrie


Louw Kannemeyer, Edwin Kruger, Nazir Alli and Bryan Perrie


Eldred Boonzaaier, Tim Hewitt-Coleman and Nick van den Berg


The President with Society staffer, Jeanine Steenkamp


Nick van den Berg thanks Natasja Pols for making the Fulton’s weekend a success!


It’s the end of the weekend and judge, Fanuel Motsepe, hits the road home

Western Cape chatter

The Western Cape Branch has had an eventful past couple of months and we would like to thank all our members for attending the various events. Without our members supporting the meetings, we would have a very poor time convincing ourselves that the CSSA is indeed valuable as a Society.

A special word of thanks goes to our sponsors for helping to make a success of all the events. We hope our members have enjoyed the functions this year. Reviewing events that took place over the last couple of months - in April the Western Cape Branch arranged a site visit of the extension of the Blue Route Mall.

The event was sponsored by the main contractor, Grinaker-LTA, and Aurecon, the structural engineers, who hosted the site visit. The Blue Route Mall, located in the lush suburb of Tokai, was built in the early 1970s and has, over the past four decades evolved from a small convenience strip centre of only ten shops to an established shopping centre offering 48,000m² of retail space. This site has an estimated cost of redevelopment of about R862 million and the new shopping precinct will comprise two retail floors of about 29 000m² each, with a covered parking level below.

Following the first site meeting of the year, the Western Cape Branch's annual golf day took place on a rather misty Friday 13th in May, at the Kuilsriver Golf club on the outskirts of the city. The event attracted a total of 18 x 4 ball entries. The number of entrants compared well to the field last year. It was good to note, however, that a number of entrants from previous years took part on the day. It is hoped that the Branch will be able to attract more entrants next year by combining the player lists from 2010 and 2011.

The event dinner was kindly sponsored by PPC. The Branch was able to get seven course sponsors with three 'watering holes' among them. The Committee would like to thank all the sponsors and players for making the day a success.

The branch has started to make preparations for next year's event, which will hopefully be another fun day aimed at getting the players in the concrete industry together. The 2012 event will take place at the Parow Golf Course.

The Western Cape Branch Fulton Review dinner took place on June 9th. It was again held at the popular Kelvin Grove Club Ballroom. The dinner was once more sponsored by PPC as the Branch's Anchor Sponsor. The Western Cape Branch of the Concrete Society of Southern Africa would like to acknowledge this gracious sponsorship, which enables us to host a successful Fulton dinner. Three table sponsors supported the event and 144 guests attended.

The Society received five entries from Cape Town for the Fulton Awards. It was great that two projects won awards. The Hospital Bend Preselection Scheme took the honours in the category of Construction Techniques, while in the category of Unique Design Aspects, the Mountain House Roofs walked away with a very well deserved award. It is the hope of the Western Cape Committee that our region will once more be able to stand shoulder to shoulder with the rest of South Africa, come 2013!

Congratulations to all the entrants and may these projects inspire everyone for many years to come. Finally, the Committee would like to call on our members to become actively involved in the Society. We always welcome suggestions for possible Technical Meetings and Site Visits. Please contact the Western Cape Branch Chairman at any time if you would like to discuss future or past events.

Eastern Cape chatter

The Fulton Awards' year started off with a lot of activity in the Eastern Cape Branch. Before the Annual General Meeting in March, preparations for the regional Fulton Awards Gala Dinner by the Committee started with enthusiasm, which was reflected in the turn out by the local industry to support the event.

The Branch held a well attended seminar on the Euro code in June.

The committee has continued to grow with new members eager to contribute ideas and create awareness about the Society. In the last two months, two engineers, Mario May and Ruan Swart, attended committee meetings and are eager to take over some roles and responsibilities. The Society is relevant to the industry and there is an exciting programme ahead for the rest of 2011.

CONCRETE SOCIETY OF SOUTHERN AFRICA NATIONAL OFFICE PROGRAMME 2011			
DATE	**MEETING/EVENT**	**VENUE**	**CONVENOR**
July	Concrete Beton	Sent to all the CSSA Members	Crown Publications
13th October	Council Meeting	Emperor's Palace	CSSA President
31st October	Membership Renewal Forms	Sent to all the CSSA Members	CSSA Administration
November	Concrete Beton	Sent to all the CSSA Members	Crown Publications
November	Council Nominations	Sent to all the CSSA Members	CSSA Administration
CONCRETE SOCIETY OF SOUTHERN AFRICA EASTERN CAPE BRANCH 2011			
12th July	Committee Meeting	Goba Offices	Tseli Maliehe
August	Concrete Mix Design and selection of Materials	To be confirmed	Fanie Smith/Tseli Maliehe
October	Site visit – Olifantskop Reservoir	Olifantskop Reservoir Site	Fanie Smith
November/ December	VW Press Shop	VW Plant Uitenhage PE	Rob McSporran
TBC	Wind Turbine Site Visit	Coega CDC PE	Fanie Smith/Nvd Berg
CONCRETE SOCIETY OF SOUTHERN AFRICA WESTERN CAPE BRANCH 2011			
28th July	Technical Meeting – Prof David W Fowler	University of Cape Town Chemical Engineering Building	Etienne van der Klashorst (evdklash@sun.ac.za)
2nd August	Branch Committee Meeting	Aurecon Century City (TBC)	Etienne van der Klashorst (evdklash@sun.ac.za)
18th August	Site visit	To be confirmed	Ken Newton (ktw@mweb.co.za)
6th September	Branch Committee Meeting	Aurecon Century City (TBC)	Etienne van der Klashorst (evdklash@sun.ac.za)
14th September	Annual Cube crushing competition – CASTING DATE	NA	Eljse Fraser/Josef Mofokeng (eljsef@bks.co.za) (josef.mofokeng@lafarge.co)
4th October	Branch Committee Meeting	Aurecon Century City (TBC)	Etienne van der Klashorst (evdklash@sun.ac.za)
13th October	Annual Cube crushing competition	To be confirmed	Eljse Fraser/Josef Mofokeng (eljsef@bks.co.za) (josef.mofokeng@lafarge.co)
1st November	Branch Committee Meeting	Aurecon Century City (TBC)	Etienne van der Klashorst (evdklash@sun.ac.za)
17th November	Annual Cocktail party	CPUT Hotel School	Riaan van Dyk (riaanvd@kls.co.za)
28th November	MTM Prof Andreij Brandt (To be confirmed)	Stellenbosch University Civil Engineering Building	Etienne van der Klashorst (evdklash@sun.ac.za)

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