Concrete Beton

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CONCRETE SOCIETY
OF SOUTHERN AFRICA

Platinum members:
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Accredited Technical Paper:
The use of Recycled Building Materials as Aggregate in Concrete

Fulton Awards:
Nasweto N17 Highway

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President's Message

Even though it feels like the end of year is arriving almost unexpectedly, it has been a long hard year. The economy is still taking its toll, literally and figuratively, despite an upswing that has been predicted for some time now. Not to mention the added pressure caused by the recent 'activity' in the mining sector.

The Concrete Society is moving forward in spite of this current environment. Even if one just judges by our membership growth, it shows that we are going in the right direction.

We had to make some small changes in our management structure to comply with the, not so new, Companies Act. But the only significant difference will be the establishment of a larger Board of Directors to replace the current National Council.

The Board will be the governing body of the Society as required by the Act. The Board is committed as ever to ensure that we consistently work towards our mission of promoting excellence in the innovation and use of concrete, creating a platform for networking and sharing of knowledge and information about concrete.

We have a number of events planned for 2013, which will ensure our members get value for their money. The highlight of course, will be the biennial 2013 Fulton Awards, culminating in the gala weekend in early June, in the Drakensberg.

The large number of nominations we have received certainly reflects that, even though we are in difficult times, our industry still strives for excellence.

After the recent seminar on concrete cracking, ConCrax 2012, I once again realised the value of a Society such as ours. Such an event would not have been possible if it were not for some members willing to share their knowledge and experience at the four events countrywide.

We are always extremely thankful to our members who offer their time to the Society.

My thanks also go to my colleagues on the National Council. They have been a great support team in my first Presidential term, and I look forward to reaching new heights with them in the coming year.

I appreciate the loyalty and constant support of our members and I am looking forward to meeting you at future events.

I wish you all an enjoyable, safe and peaceful summer break.

Sincerely,

Billy Boshoff

COVER: Group Five Civil Engineering in a joint venture with Vela VKE, and subcontractor EsorFranki, completed the largest bridge jack in the country on the N17 between the Soweto Highway and Nasrec Road. The project was awarded a Commendation in the prestigious 2011 Fulton Awards 'Civil Engineering' category.

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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Bridge jack on N17 at Nasweto

Group Five Civil Engineering, in a joint venture with Vela VKE and subcontractor EsorFranki, completed the largest bridge jack in the country on the N17 between the Soweto Highway and Nasrec Road, south of Johannesburg. The project was awarded a Commendation in the prestigious 2011 Fulton Awards 'Civil Engineering' category.

At the time of construction, this was the largest bridge jack ever undertaken in South Africa and required close co-operation between the contractors and designers. Although the bridge is a concrete reinforced structure, the technique that was used required the bridge to be jacked into position without disrupting the busy passenger railway service. This made the project unique compared to the typical in-situ reinforced concrete rail-over-road-bridge.

Also, it was not a typical rail-over-road-bridge for a single lane, but a double lane highway, which passed underneath four operational railway lines. The owner, South African National Roads Agency Limited (SANRAL), needed to ensure that there would be no interruptions to the New Canada passenger rail service.

Concrete was chosen for its strength and durability.

Designers Jones & Wagner created the temporary works to allow the bridge to be jacked into position. This involved: designing and detailing the foundations, which were constructed in advance of the bridge.

This included designing the jacking nose for the bridge and the strapping of the railway tracks which allowed the embankment to be excavated before the bridge was jacked into position. Heavily reinforced concrete was used for the project due to its strength and durability. Construction of the bridge

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Nasweto

The Team

Client: South African National Roads Agency Limited, Northern Region

Principal Agent 1: VelaVKE Consulting Engineers

Principal Agent 2: Jones & Wagner

Subcontractor 1: Esorfranki Civils

Subcontractor 2: Afrimix

Submitted by: Group Five Civil Engineering

foundations required jacking large diameter concrete pipes through the railways' embankment. The 'bird cage' strapping of the railway tracks allowed for the bridge to be jacked beneath the operating railway lines without disrupting the passenger rail service. This involved jacking of the bridge from its constructed position alongside the 14m high railway embankment into position beneath the railway tracks on one of Gauteng's busiest rail lines.

Working closely with the Esor team, Group Five constructed the bridge adjacent to the railway line and aligned with the position into which it would be jacked. The asymmetrical structure comprised three supporting walls or legs varying in height from 14.54m high to 11.35m high to accommodate the uneven ground level. The deck was cast using a movable scaffold system resting on a series of I-beams. Custom-made steel sliding plates were fitted at the base of each leg to allow the structure to run along the jacking tracks. The structure itself was heavily reinforced to withstand the extremely high compressive and tensile forces during the jacking process.

As the jacking proceeded, the ground was excavated under the railway line ahead of the bridge. To eliminate the danger of undermining the railway line embankment, a jacking nose was constructed on the front of the bridge to support the line during the entire process.

As the hydraulic pumps jacked the structure slowly forward, the ground ahead was excavated at the same angle as the embankment allowing the jacking nose to move into position to ensure the integrity of the railway line. The bridge which weighs 6 800 tons was jacked a total of 61,5m in six

N17

weeks with not a single interruption to the train schedule. The critical design element was the support of the railway tracks while the bridge was being jacked into position beneath the operational lines. This requires supporting the individual sleeper of the railway lines on way beams, which span from the railway embankment onto the nose cone of the bridge while it was being jacked forwards.

Working under live rail traffic conditions, extra precautions were taken to ensure the safety of employees and the public. Flagmen were constantly on duty.

Judges' Citation

This project was the largest bridge jack in the country as was part of the link road on the N17 between Soweto Highway and Nasrec Road. The bridge was constructed adjacent to the railway line and aligned with the position into which it was jacked. The use of concrete-filled pipes to carry the jacking tracks was particularly impressive.

The project team is commended for the way in which the 6 800 ton bridge was jacked, almost 60m in six weeks without any disruption to train schedules.

The Use of Recycled Building Materials as Aggregate in Concrete

EP Kearsley & HF Mostert, *Department of Civil Engineering, University of Pretoria*

ABSTRACT: In South Africa high quality natural aggregates have always been available at a very low cost in most parts of the country. This has resulted in limited use of recycled aggregates. With the refurbishment of inner cities and the increased awareness of the environmental damage caused by wastage - the use of recycled building materials as aggregate in concrete is becoming an option for an increasing number of developers and clients.

This paper highlights the effect that the quality of building materials used to manufacture the recycled aggregate has on the properties of the concrete made using the recycled aggregate. Results compare the mechanical and physical properties of concrete made using old, discarded railway sleepers as an aggregate source to that of concrete, which is produced using dolomite.

BACKGROUND

The environmental impact of producing concrete can be significantly reduced by not only using waste materials as extenders in cement but also by replacing a fraction of the large volume of natural aggregates used in concrete with waste material.

The scarceness of high quality natural aggregate in some developed countries has resulted in significant research, over a long period of time, followed by the successful use of various types of recycled aggregate in concrete.

In South Africa the low cost of high quality natural aggregates has resulted in very limited use of recycled aggregates. But with the environmental awareness a large number of inner city refurbishments are opting for recycled building materials to use as aggregates.

Little has been published locally on recycled aggregates and results published by international researchers indicate that the quality of concrete can be negatively affected by the use of waste [1][2]. Many researchers suggest that the waste content should be limited [3] [4], or that the fine material should be screened out and only coarse aggregate should be used [5].

The aim of this paper is to establish whether the quality of the building materials used to manufacture the recycled aggregate has a significant effect on the properties of the concrete made using the recycled aggregate.

To optimise the waste usage the coarse aggregate in the concrete were completely replaced with recycled aggregate, while the fines generated during the crushing process was used to partially replace the fine aggregate. Results compare the mechanical and physical properties of concrete which have been made using old, discarded railway sleepers as an aggregate source to that of concrete made using dolomite [6].

In the design of concrete mixes containing recycled aggregates literature indicates that minor modifications to standard mix design procedures will be required [7] such as:

- The water/cement ratio required for a certain compressive strength can be assumed to be the same for recycled concrete as for conventional concrete.
- Target strengths should be calculated using higher standard deviations if the quality of the recycled aggregates varies.
- To maintain constant workability, recycled aggregate concrete requires a free water content 10 ℓ/m^3 higher than for conventional concrete.
- The cement content of recycled aggregate concrete mixes should be adjusted according to the increase in water content, probably resulting in a slight increase in cement content.
- The actual density of recycled aggregate should be measured and used in mix design calculations.

EXPERIMENTAL SETUP

To establish the effect of the quality of recycled aggregate on the concrete properties, five different sets of mixtures were cast. A reference mixture was cast using crushed dolomite as aggregate, while four different streams of construction waste were crushed with a laboratory jaw crusher before being use as recycled aggregate in concrete.

The first three streams of waste were obtained from concrete that was tested after 28 days of water curing. The concrete was divided into three classes, strong (in the region of 100 MPa concrete), medium (in the region of 50 MPa concrete) and weak (less than 20 MPa concrete). The fourth waste stream was building rubble obtained from a clay brick masonry wall that was demolished.

Table 1: Aggregate properties

Mix	A	B	C	D	E
Coarse Aggregate	**Dolomite**	**Strong**	**Medium**	**Weak**	**Rubble**
Moisture absorption (%)	0,3	0,8	1,1	1,5	11,2
Relative Density	2,86	2,7	2,6	2,54	2,29
Sieve Size (% passing)					
19	100,0	100,0	100,0	100,0	91,1
13,2	83,7	77,3	85,6	72,0	73,9
9,5	22,5	63,0	65,4	55,5	60,4
6,7	1,1	48,8	45,7	43,4	52,6
4,75	0,2	36,9	33,9	35,4	46,4

Fine Aggregate	Dolomite	Strong	Medium	Weak	Rubble
Sieve Size (% passing)					
4,75	100,0	100,0	100,0	100,0	100,0
2,36	71,5	65,6	54,7	71,5	79,5
1,18	47,6	48,6	30,5	51,5	64,0
0,6	32,4	34,5	18,8	36,0	51,3
0,3	23,2	25,1	13,1	23,5	34,8
0,15	17,6	19,1	10,2	15,1	20,0
0,075	14,0	15,7	8,8	11,2	11,4

The properties of the aggregate used can be seen in Table 1. As expected the moisture absorption of the recycled aggregates are significantly higher than that of naturally crushed aggregates, with the building rubble absorbing considerably more moisture than the recycled concretes. This increase in moisture absorption would result in a reduction in workability as the free water content would be reduced. To maintain a constant free-water content, the aggregates were left in water overnight and surfaced dried before mixing. As the strength of the concrete that was crushed to manufacture the aggregates decreases, so the relative density of the aggregates produced reduce.

During the crushing process more than a third of the waste was crushed to particle sizes of less than 4,75 mm and any requirement for only using coarse recycled aggregates would not be viable as it would not only result in a new waste stream, but the separation process would add cost, making recycling financially less viable. It was therefore decided to use all the crushed recycled material to completely replace the coarse aggregate while partially replacing the fine aggregate. The intention was to keep the volume of coarse aggregate constant and after adding sufficient recycled material to replace all the coarse aggregate with recycled material - a significant percentage of fines had already been replaced. The fine aggregate in all mixes was supplemented with dolomite sand to keep the total volume constant. The ratio of coarse to fine aggregate for the reference mixes containing only dolomite aggregate was kept at 50:50.

The particle size distribution and densities as indicated in Table 1 were used to calculate the mix composition for each stream of aggregate. Three different water/cement ratios (0,35; 0,5 and 0,65) were used for each aggregate stream. The free water content was kept constant at 195 l. A commercially available super-plasticiser was used in all the mixes as recommended by the manufacturer to 0,5% of the cement content with a Cem I 42.5N cement.

The concrete properties were determined using the average of a set of three results. All test specimens were cast and then kept in a constant temperature room until de-moulding took place after 24 hours. Samples were cured in water in a constant temperature bath at 25 °C and tested after surface drying. Sets of 100 mm cubes were used for compressive strength testing while 150 mm diameter cylinders were used to determine the Modulus of Elasticity.

RESULTS

Despite the fact that the aggregates were pre-wetted to make provision for the water absorption of the aggregates, the use of recycled aggregates still resulted in a significant loss in workability. The irregular shape of the recycled particles as well as the rough surface would contribute toward the loss in workability. It would have been possible to improve the workability by increasing the water and the cement contents, but to keep results comparable it was decided not to adjust the mix compositions.

Some of the results obtained during this investigation can be seen in the set of graphs in Figure 1. From the first graph it can be seen that the use of recycled aggregates can have a significant effect on the density of the concrete produced. The mixtures containing the building rubble are more than 15% lighter than the mixture containing dolomite as coarse aggregate and with an own weight in the region of 2100 kg/m^3 the effect of recycled aggregate density definitely has to be taken into account even during the design of the structures containing recycled aggregate. From the graph it can be seen that the mixtures containing strong and medium strength recycled concrete with a free water/cement ratio of 0,5 have lower densities indicating a lack of compaction caused by the low workability. All the other mixes seem to be sufficiently compacted.

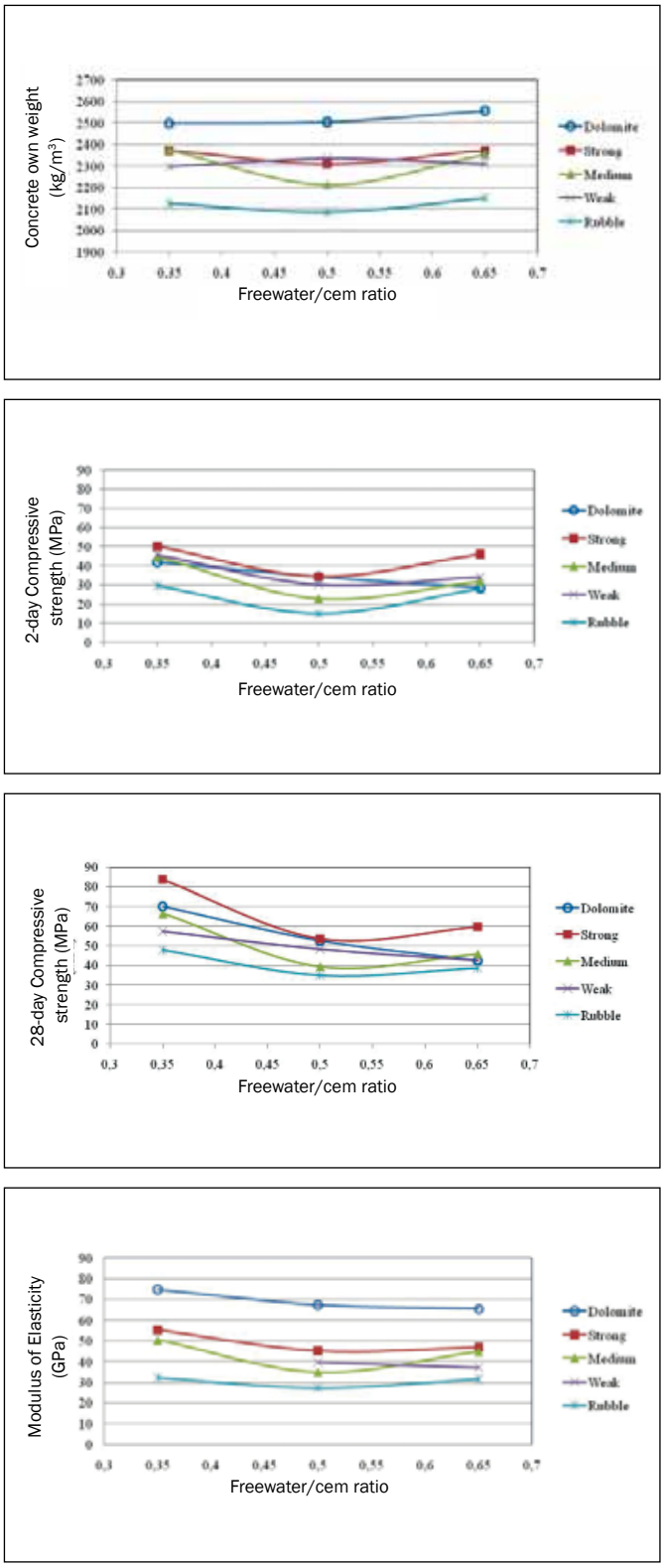

Figure 1: Concrete properties

The second and the third graph in Figure 1 give information on the effect of recycled aggregate quality on the compressive strength development. The early age strength measured two days after casting is, as expected, affected by the free water/cement ratio, with lower water/cement ratios in the normal concrete resulting in higher strengths.

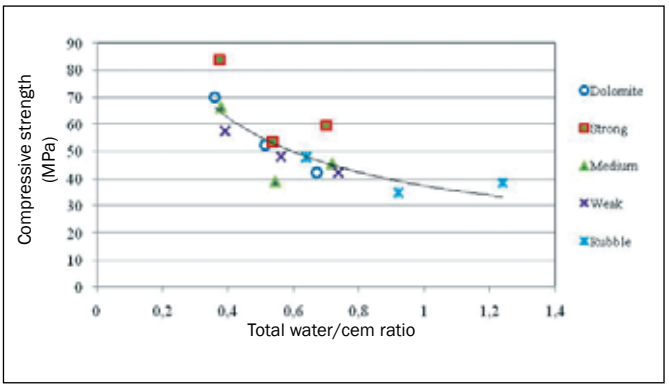

Figure 2: Effect of total water/cement ratio on 28-day compressive strength

It is however interesting to note that the recycled concrete mixes yield early age strengths equivalent to that of the normal concrete at low water/cement ratios and higher strengths than that obtained for normal concrete at high water/cement ratios. The relatively high early age strengths obtained with recycled concrete can be attributed to the un-hydrated cement that would be exposed during the crushing of the recycled concrete and which is now in contact with water and can contribute towards the hydration process.

As expected, the majority of the recycled aggregates yield lower strength concrete than the normal aggregate after 28 days. The only exception is the mixes made with recycled high strength concrete as these mixes yield higher strengths than those obtained from mixes containing dolomite.

The higher than expected strength of these mixes can again be attributed to the un-hydrated cement that would have been present in the relatively young concrete that was used to produce the aggregate. It is worth noting that the effect the recycled aggregates has on the strength of the concrete is more noticeable at the lower water/cement ratios with the concrete containing building rubble only reaching 68% of the strength obtained with normal concrete. As expected, the lack of compaction for the two mixes with a water/cement ratio of 0,5 had a negative effect on the strength of the concrete.

The modulus of rupture of the mixes varied between 15,7% and 11,4% of the compressive strength, which is in the range that is deemed typical for normal concrete. The mixes containing the dolomite did however have the higher ratios and the mixes containing the building rubble the lower ratios.

The fourth graph in Figure 1 gives an indication of the stiffness or modulus of elasticity of the concrete and it is clear the use of recycled aggregates does result in a significant reduction in the modulus of elasticity. In structures where large deflections are expected, the use of recycled aggregates in concrete should be carefully considered, but all the stiffness values recorded for the recycled aggregate concrete fall well within the modulus of elasticity range normally assumed by design engineers.

DISCUSSION

The 28-day strength results as recorded in Figure 1 seem to indicate that it is not possible to predict the strength of concrete containing recycled aggregates. Water/cement ratio graphs are used when a concrete mix composition is designed and it is therefore essential that suitable methods be used to design the mixes. If we add the water that was required to fill the voids in the aggregates during the pre-wetting of the aggregates to the free water content of the mixes the actual total water contents of the mixes can be calculated.

The 28-day strengths of all mixes were plotted as a function of the total water/cement ratio in Figure 2 and it is clear that this ratio holds true –regardless of the type of aggregate used. The strengths obtained from recycled high strength concrete can be seen as the only outliers, and the higher strengths can be explained by the presence of un-hydrated cement in the crushed material. This graph does however prove that it would be possible to design a recycled concrete mix using a standard water/cement: strength graph if the extra water required as a result of the aggregate void content were taken into account.

CASE STUDY

The results of a case study conducted a number of years ago [6] is included in Table 2 to give an indication of a true comparison of the properties of concrete made with good quality recycled aggregate. In this study old railway sleepers that were removed from railway lines were crushed and the crushed material was used to replace 100% of the coarse aggregate in a concrete mixture. A reference mixture was cast using dolomite as aggregate and the mix composition of the two mixes can be seen in Table 2.

The comparison in strength development for the two mixes can be seen in Figure 3 and it is clear that the trend is similar, with the recycled aggregate concrete yielding marginally higher strengths early on, but lower strengths at later ages. The modulus of rupture, split cylinder strength and modulus of elasticity as indicated in Table 2 show only a marginal decline in the recorded properties and the marginal loss in performance is deemed a small price to pay

Table 2: Comparison of concrete properties

	Natural Aggregate Concrete (NAC)	Recycled Aggregate Concrete (RAC)
Mix Composition	**kg/m³**	**kg/m³**
Cement (Cem I 42.5 R)	472,5	472,5
Fly Ash	105	105
Water	10	210
Fine aggregate – dolomite	677	677
Coarse aggregate – dolomite	1015	
Recycled coarse aggregate		1015
Water/cement ratio	0,4	0,4
Slump (mm)	50	10
28-day Compressive Strength (MPa)	71,7	65,9
28-day Modulus of Rupture (MPa)	8,3	7,8
28-day Split cylinder strength MPa)	3,4	3,1
Modulus of Elasticity (GPa)	52,1	50,6
Porosity (%)	12,8	13,9
Sorptivity (%)	0,53	0,61

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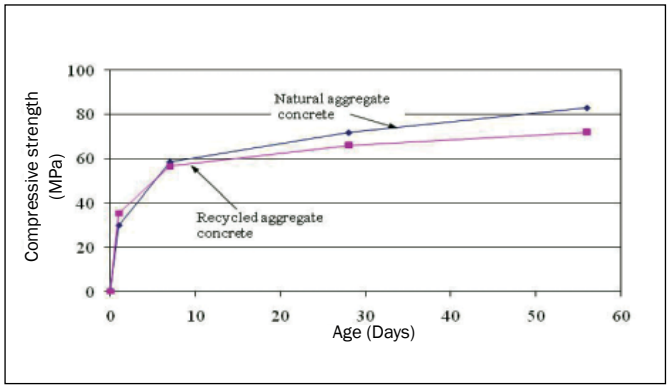

Figure 3: Strength development comparison

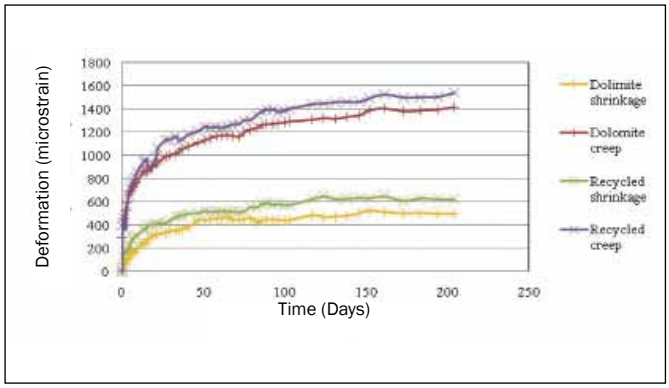

Figure 4: Drying shrinkage and creep comparison

for the total replacement of coarse aggregate with waste material. The porosity and sorptivity values as indicated are indicative of the long term durability properties that were measured and again the insignificant decrease in quality should not have a significant effect on the long-term durability of the concrete.

The most significant difference in behaviour that was recorded was the long term deformation as measured with drying shrinkage and creep specimens. Water cured samples were placed in a climate room set at 65% Relative Humidity and 25°C and allowed to dry naturally. A constant load resulting in a stress of 10 MPa was placed on the creep cylinders. The drying shrinkage and creep deformation recorded can be seen in Figure 4. Both the drying shrinkage and the creep of concrete increases with the use of recycled aggregates and the effect of increased long-term deformation should be taken into account when the decision is made to use recycled aggregates.

CONCLUSION

It is possible to make high quality concrete using large volumes of high quality recycled aggregate. Low strength concrete or building rubble should not be used to manufacture high strength concrete as the high water absorption of the aggregate will result in a significant increase in water content, thus causing an increase in cement content and cost. It is important to ensure that the quality of the recycled aggregate remains relatively constant and therefore it would, in the long run, be sensible to stream the material intended for recycling at source, thus ensuring uniform recycled aggregate quality. If a reliable source of high strength concrete is used as source for recycled aggregate concrete, the coarse aggregate in the concrete can be completely replaced with recycled material without any significant negative effect on the short-and-long-term concrete properties.

The fines produced when the recycled aggregates are manufactured can be used to replace a relatively large percentage (more than a third) of the fine aggregate without unacceptable negative consequences.

By following well established guidelines, South African contractors will be able to successfully use recycled aggregates if the use is not limited by the unnecessary implementation of strict specifications that are not based on performance. It is however essential that not only the effect of every source of recycled aggregate on the properties of the concrete produced should be established before use, but also that the consistency of the waste source and the aggregates produced should be determined before use and assessed on a continual basis.

For further information contact: elsabe.kearsley@up.ac.za

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The work on the recycling of railway sleepers was conducted by Daleen Scholtz, as part of her final year research project while she was studying towards her B Eng (Civil) Degree and the authors would like to thank her for her contribution and for the many hours she spent conducting experimental work on concrete made with recycled aggregate.

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SANS 50450 approval for Ash Resources

Ash Resources pioneered the use of fly ash for the local construction industry and has a unique track record of supplying its customers with consistent world-class quality products.

The recent approval to use the SABS Mark, indicating compliance with the new SANS 50450 specification governing the use of fly ash in concrete, is another significant milestone for the country's leading fly ash supplier.

"The introduction of the SANS 50450 specification reflects South Africa's adoption of the European Standard EN 450 for fly ash, in line with the current local review of all building materials' specifications," advises Ash Resources' Technical Manager, Lehlohonolo Madumo.

"While our plants are noted for their high production quality standards, establishing compliance is a lengthy process. For Ash Resources it started in October 2010 when we launched a continuous conformance evaluation programme of our products, leading up to the audits conducted by South African Bureau of Standards in March 2012. Our first certification has now been received."

SANS 50450 is a more involved and stringent specification for the producer, with the intention of protecting the customer and ensuring the safety and integrity of concrete that incorporates fly ash.

The company has received certification of its Matla plant, and awaits formal confirmation of approval for the Lethabo and Majuba facilities. Matla was Ash Resources' first fly ash production facility and is a key supplier to the readymix concrete and civil construction markets. The plant is currently supplying to projects such as the massive De Hoop Dam in Limpopo and Eskom's Medupi and Kusile power stations.

"We anticipate that major construction tenders will increasingly specify SANS 50450 – compliant fly ash, as SANS 1491:2 is now an obsolete specification," adds Madumo. "Ash Resources will be in a strong position to support its customers in competing for tender awards."

Break times gave companies displaying their goods or services an opportunity to network.

ConCrax 2012 Seminar

ConCrax was a great example of getting these two criteria right. Demand for places at the event was brisk in all centres, except perhaps for Port Elizabeth. Johannesburg recorded the highest number of delegates including ten speakers at 181, followed by Cape Town at 146, Durban, 89, and Port Elizabeth with 55 delegates including speakers.

President, Billy Boshoff set the scene for the seminar in his keynote address which covered the causes of cracking, how to prevent it and understanding the fundamentals of cracking. He followed this with his presentation on Plastic Cracking, Corrosion Cracking, ASR and Sulphate Attack.

Professor Mark Alexander talked on cracking related to drying shrinkage, creep and thermal effects. Mike Otieno presented at the Port Elizabeth and Durban events. Professor Alexander's presentation included the causes and effects of different types of shrinkage - autogenous, carbonation, plastic and drying; factors affecting the onset of creep; various causes of thermal cracking of concrete and a brief overview of the repair options for cracked concrete. In conclusion he stated:

ConCrax - Concrete Cracking Exposed 2012 – showed that the selection of the right topics and speakers are two of the most critical success factors when running a seminar road show.

- The main cause of concrete cracking is presence of restraints – internal or external;
- Creep can be beneficial to structures – tensile relaxation;

Professor Billy Boshoff

- Internal thermal cracking may not be visible but can be very dangerous!
- Cracking can lead to durability problems eg reinforcement corrosion.
- The repair of cracks must be carried out in good time using the correct material and procedure.

Peter Gage from Jones & Wagener provided an engineer's perspective of concrete cracking, focusing on structural cracking - flexural, shear and detailing. Talking on bending cracking in particular he stated that concrete floors on the ground can be designed without reinforcing. In this instance the bending capacity of concrete is relied on.

"With the advance in materials and design methods over the last half century or so, the capability of the materials is pushed into the realm where cracking is 'normal'."

He talked about the design and the acceptable limits for cracking, as well as detailing for crack limitation, referring to the national design codes, which are currently in use in both South Africa and Europe. Concrete cover of the reinforcement was also dealt with very comprehensively.


Some of the 180 delegates attending in Joburg.

Next to present was Chris Howes from Port Elizabeth. He was able to give the delegates an insight into the contractor's challenges on site with concrete cracking. His practical approach to the issue highlighted many aspects of concrete that have to be considered, by the contractor, in order to reduce or eliminate cracking.

He discussed the concrete specification and mix design; joint layout and design; consistency of concrete supply; protection from the elements and finishing of the surface. In conclusion, he reiterated good planning can minimise or eliminate concrete cracking, thus avoiding a lot of time, cost and aggravation at the end of the day.

Wayne Smithers of Sika in his presentation on causes, remedies and materials, described in some detail the process of repairing cracks in concrete structures using crack injection systems. Although this is not new to the industry, the materials currently available for such processes have advanced considerably. These include: epoxy, polyurethane, polyacrylate or cement microfine-based materials.

Generally speaking, resin-based injection materials offer good adhesion - to concrete, mortar, stone, steel and wood. They are used to fill and seal voids and cracks in structures such as bridges and other civil engineering buildings, industrial and residential buildings, eg columns, beams, foundations, walls, floors and water retaining structures. They not only form an effective barrier against water infiltration and corrosion, but also structurally bond the concrete sections together.

This presentation was followed by a journey with Gordon Mowatt of Spec-con through a short, non-academic, light-hearted presentation. Mowatt shared with delegates some of the experiences, both good and bad, which relate to a specialist contractor's involvement through the diagnostic phase to the final repair of cracked concrete. He said, "As a specialist contractor, when asked to fix concrete cracks, we often find ourselves, tasked with the highly complicated, scientific and technologically challenging procedures in preparing the specialised crack repair materials, for example: adding component A to component B and mixing it up for the allotted time period.


Professor Mark Alexander

This seemingly basic undertaking appears to be beyond the ability of most 'run of the mill general contractors' and has resulted in the emergence of the Specialist Approved Contractor." Of particular interest to delegates was the overview given by the speaker on diagnosing, testing and monitoring of concrete cracks, as well as the available crack repair solutions currently available.

The last speaker at the seminar was George Evans, Concrete Technologist of the Cement & Concrete Institute, who presented, in his own inimitable style, the concrete industry's view of cracking in concrete. He described the definition of cracks, the different types, their significance, assessment, underlying causes and prevention.

Seminar Chair in Johannesburg John Sheath, and coastal Seminar Chair, President Billy Boshoff thanked the speakers, sponsors, Organising Committee and delegates for their support of Concrax 2012.

KZN Branch Chatter

The Annual Cube Competition received 51 entries. Of these 25 were from students at Durban University of Technology, University of KwaZulu Natal and Mangosuthu University of Technology.

This year the students were provided with all the materials necessary in order to achieve the highest strength ratio at seven days. The competition aims to test the students' concrete technology skills and put them to the test.

The materials used were a Cem 11/A-L 32.5R cement, silica fume, 9,5 mm dolerite aggregate, river and crusher sands as well as two types of a super plasticiser. It was interesting to note the high strengths that were achieved. All three student prizes - first, second and third spot went to students from Mangosuthu University of Technology, first prize of R1 500 was won by ZC Msimang, R1 000 prize money for second place was won by M Zungu and R500 for the third placed winner was awarded to IL Dlhamini.

In the Industry category 26 entries were received and two of those achieved a 41 MPa strength at seven days. The Branch noted that a number of entries for the competition were received from not only suppliers and manufacturers, but from their administrative staff as well. The first and second spots were won by NPC Cimpor Concrete and Aggregates staffers. Elvis Nair won the Industry category followed by fellow staff member, Thembeka Gcaba, and third position was won by Henry Sqhiphu from Lafarge. The prizes were presented by Kevin Quayle, General Manager of NPC Cimpor Concrete and Aggregates. The KwaZulu-Natal Branch thanked NPC Cimpor for the prizes, refreshments and snacks.

Egg Protection Device

Students from our three Durban Universities once again competed for the honours in the Best Designed Egg Protection Device.

This year, the build and design standard of Egg Protection Devices were very high. Last year the winning device managed to withstand a respectable 33 blows from the dropped mass piece. This year's winning team managed an incredible 50 blows from the dropped mass piece before the protection device was damaged.

Congratulations must go to the students at Mangosuthu University of Technology, who achieved these winning 50 blows - P Khanyile, MS Ngcobo and MP Ntombela, as well as in second place with 46 blows – K Lesale, KN Morudu and SLT Msani.

The third position was strongly contested between University of KwaZulu-Natal students, who achieved 30 blows with their device and Mangosuthu University of Technology students who clinched the third spot with 32 blows. As always the students and spectators supported all the contestants and there was lots of cheering and shouting as the devices were tested to destruction. Once again this well supported event was sponsored by NPC Cimpor, and Kevin Quayle, General Manager of NPC -Concrete and Aggregates provided the worthy winners with their prizes.

Golf day

The KZN Concrete Society Golf Day took place on September 27th 2012 at the Beachwood Golf Club, in Durban. The new venue has proved to be a far greater challenge for players. But most of the golfers put a smile on their faces and had a really good time even in the bushes at Beachwood.

The whole day was extremely successful although the course needed some maintenance work. At the time, however, it was still good to play. We, as the Concrete Society, would like to take this opportunity to give a huge thank you for all the support from the Cement, Ready-mix, Precast, and Admixture and Engineering industries for their support of this event. Without their loyal support every year this would not be possible. We look forward to next year's Golf Day....

From the CEO's desk

With the year-end looming on us fast, the industry is as usual somewhat hectic at this time of year. We too at the Society have had a busy time, in the last quarter, particularly with the ConCrax 2012 seminar road show. Adding to this was the last minute flurry of nominations for the 2013 Fulton Awards and bedding in a new accounting system.

A few weeks ago, I circulated details of our new Memorandum of Incorporation for approval to all our members and I am very pleased to say that this document will now be registered with the Commission for Intellectual Property and Companies (CIPC) for their approval.

In addition, the appointment of our Immediate Past President as a Director of the Society was approved and congratulations go to Nick van den Berg for his ongoing input and support of the organisation. It is sometimes too easy to forget that all the Office Bearers of the Concrete Society are volunteers and give of their time in addition to coping with their day-time careers.

Our third seminar road show this year, ConCrax 2012, proved a great success and attracted close on 500 delegates around the country. Our experience now tells us that the combination of the right topic and the standing and quality of the presenters are critical success factors when running this kind of event. My personal thanks go to all the delegates, speakers and sponsors who have supported us in the past year. The Society is also very grateful to the C&CI for the assistance with, and input for, our technical seminars. They have become an invaluable partner in promoting excellence in concrete

Planning is well under way for the 2013 programme, and of course, the highlight will be the 2013 Fulton Awards for concrete excellence. At the close of nominations, 41 projects had been registered and this is certainly a record in recent years. Adjudication will begin in February next year and the three judges will certainly have their work cut out travelling to all these projects, one of which is across the border in Namibia.

The regions are busy planning their year ahead and members can be assured of some varied and exciting technical events during 2013.

The Society has aligned itself with conference organiser, Hypenica, in Cape Town by becoming an Association Partner for

ConcreteWeek, which forms part of Totally-Concrete Expo. The event will provide three days of keynote sessions, technical demonstrations, interactive panel discussions, workshops and more. This will be followed by two days of site visits, culminating in the Concrete Society's Fulton Awards function on June 8th 2013.

Despite the doom and gloom spoken around the industry for the past few months, I do see light at the end of the tunnel. Our membership has grown by 9% this year in what was certainly a difficult period and as the value proposition of the Society grows I am looking forward to an even more successful 2013.

Finally, I would like to thank the ladies in the office, Natasja Pols and Jeanine Steenkamp for the dedicated hard work they put in on a daily basis, and much of the success this year must be laid firmly at their doorstep. Thank you so much Ladies!

To you our readers and members, if you are going on holiday this summer – travel safely, and for those just 'chilling out', enjoy the break!

John Sheath

CEO

Concrete Society of South Africa


Daniel van der Merwe & John Roxburgh


John Roxburgh - judge


MC Trevor Sawyer


Hanlie Turner


Relay changeover


Winners - Student race


Winners - Industry race


Runners up - Student Race

Float your


and they're off

A strong wind and 8°C weather welcomed visitors to this year's Inland Branch Concrete Boat Race Day at Germiston Lake. Lining the lakeside at the Victoria Lake Club were concrete enthusiasts from industry and academia.

Everyone was wishing that the weather would improve so that the paddling of more than 70 concrete 'craft' would be a more pleasant experience, and improve it did!

By late morning, the wind dropped and temperatures rose to provide, once again, a perfect day on which to test and race the cement-based craft that had been constructed.

Four judges were on hand to adjudicate the Construction Category, which required university students to design and construct cement-based boats of the 'paddle-ski' kind. This was a departure from the traditional 'canoe-like' craft that had been specified in the past, in order to test the students' application of concrete technology and project management. The judges this year were: Andries Marais – Chryso-abe; Hennie van Heerden from Sephaku Cement; John Roxburgh and Daniel van der Merwe both from the Cement & Concrete Institute.

The construction of the boats was carried out to comply with strict criteria, the most important of which was that they must float! The boats had to be made from a freely available commonly-used cement, mortar or concrete. Lightweight aggregate could be used and the binding agent had to be predominantly cementitious in composition.

Limited quantities of other materials were allowed, provided that they did not replace the binding action of the cement. The strength and stiffness of the boat had to be entirely due to the cementing action between hardened concrete or mortar and its reinforcement. Non-concrete parts were not allowed to contribute to the strength or structural integrity of the boat and could be removed at the judges' discretion.


Winners - Construction


Runner-up - Construction


Runners up - Industry race


Quickest Sinkers

boat...

Rhinos can't swim

In the Construction Category in first place was Mzansi Engineering Management from the University of Johannesburg. In second and third spot: Trident, and Go-Bota, from the University of Pretoria. Once the judging was over, the racing began and, as is traditional, the day was driven by 'MC extraordinaire' – Trevor Sawyer. With his quick wit, continual banter and infectious laugh, continuity between races and lunch was truly entertaining.

As usual the racing was manic and competitive, and the relatively choppy water did not deter the paddlers from their 'Dusi-like' spirit.

After all the heats and the finals had been held the winners were announced in each category.

The Student Race was won by Ninette, from the University of Pretoria; in second spot: Varietas from University of Johannesburg; and in third place Indoni, from the University of Johannesburg.

Pro Speed from Ash Resources took the top honour in the Industry Race, followed by Rocla's Raccoon in second spot and Ash Resources' Speed Pro was third. In the Ladies Race, Abe Angels from Chryso-abe took the top honours, in second position Environeers, from the University of Johannesburg, and coming in third place was Ulula, from Ulula Ash.

The most notable and quickest sinker took 90 seconds to go under - Islander from the University of Johannesburg.

The day attracted a record number of participating companies and in her closing remarks, the Inland Branch Chairperson, Hanlie Turner, thanked the organising committee, the industry, sponsors, lecturers and students for their continuing support of this now prestigious event on the Inland Branch calendar.

Prizes took the form of medals, this year, which were well-received by all the recipients. A special award was presented to Deon Kruger from the University of Johannesburg for being the lecturer that registered the greatest number of students and boats.

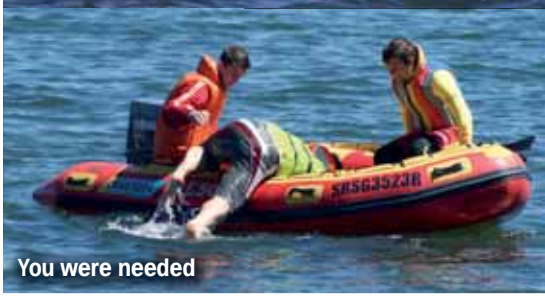
The Inland Branch would like to thank all the Sponsors for their generous contribution to the 2012 Boat Race Day!


Where's the water

Good times


Thank you diving team

Thank you lifesavers


You were needed

Inland Branch Chatter

Inland Branch Chair, Hanlie Turner says that the Inland Branch was proud to host one international, and two South African speakers at its half-day mini seminar 'Cement & Concrete– a commitment to sustainability', in August.

Inland Branch Committee members present back row left to right: Donovan Leach; Michelle Fick; Jannes Bester; Tina Coetzee; Natalie Johnson. In the front row from left to right: Darren Jacobs; Andrew Schmidt; Armand van Vuuren; Colin Kalis; Hanlie Turner.

Professor Arnon Bentur, Head of the International School of Engineering Technion, Israel Institute of Technology, Bryan Perrie, Managing Director of the Cement & Concrete Institute and Dr Dhiraj Rama, Director of the Association of Cementitious Materials Producers shared their expertise and insights with the well over 100 delegates, all keen to learn of the latest developments in the drive towards sustainable concrete.

Prof Arnon Bentur

Sephaku site visit

Sephaku site visit

Sephaku Cement hosted a site visit to the Delmas construction site of their clinker grinding facility. The opportunity to see the unique aspects of this project and in particular the concrete design and placement was appreciated by all who went on this visit. Site visits are very popular, and members are urged to let the committee know of possible sites, which could accommodate visitors.

Egg Protection Device

The Egg Protection Device competition created a real buzz and the enthusiasm of the students was infectious. Assessing the crushed devices and the dish of cracked eggs at the end of the day, the result was unanimous - the true winner was the spirit of concrete!

Concrete Boat Race

The Annual Concrete Boat Race took place on September 29th. To view the action, winners and sinkers go to page 18 in this issue.

Membership

Membership currently stands at 366 paid-up members, comprising material suppliers, consultants, specifiers, contractors, academics and students. The Inland Branch committee remains very enthusiastic and committed to adding value for members and guests at all the events.

Chairman's Breakfast

This year promises to end on a high note with the Chairman's breakfast in November. The inimitable Arthur Goldstuck will be the guest speaker, and the Concrete Achiever of the Year award will be presented to a worthy recipient. Turner says, "The Inland Branch Committee extends a big thank you to all those attending events and especially to our loyal sponsors for their ongoing support. Please get involved in our concrete future!"

Egg protection device

Eastern Cape Branch chatter

This year has been an interesting one with new people joining the local committee and bringing with them renewed enthusiasm and impetus in the Eastern Cape Branch. The Committee aims to continue to encourage members to become more involved in the Branch's activities and to assist us. This will allow committee members a greater opportunity to network with local Society members and keep up to date with the latest trends and developments in the industry.

There have been three national seminar road shows at branch level in Port Elizabeth this year, FloorSem, ConFrex and more recently ConCrax. All of these events have been particularly well attended and our thanks go to all the delegates for their support. In addition to the national events, we held a site visit to the new casino development in Summerstrand with approximately 60 people attending – that is a record for us!

We hope that a further site visit will be held before the end of 2012, the venue and date still having to be confirmed. We hope that our efforts will encourage new membership in the future, together with an increased involvement with the Eastern Cape Committee.

CONCRETE SOCIETY OF SOUTHERN AFRICA INLAND BRANCH PROGRAMME			
DATE	**MEETING/EVENT**	**VENUE**	**CONVENOR**
First Quarter			
13th February 2013	Committee Meeting	C&CI Midrand	Hanlie Turner
28th February 2013	Inland AGM	To Be Advised	Hanlie Turner
12th March 2013	Committee Meeting	C&CI Midrand	Hanlie Turner
14th March 2013	Mini Seminar	Bloemfontein	Armand van Vuuren/Natalie Johnson/ Tina Coetzee
10th April 2013	Committee Meeting	C&CI Midrand	Hanlie Turner
Second Quarter			
8th May 2013	Committee Meeting	C&CI, Midrand	Hanlie Turner
14th May 2013	Mini Seminar	Blue Valley Golf Estate	Jannes Bester/Natalie Johnson/ Tina Coetzee
5th June 2013	Committee Meeting	C&CI, Midrand	Hanlie Turner
13th June 2013	2013 Fulton Awards – Inland Branch	Scarlet Ribbon, Edenvale	Andrew Schmidt/Natalie Johnson/ Tina Coetzee
10th July 2013	Committee Meeting	C&CI, Midrand	Hanlie Turner
16th August 2013	Egg Protection Device – Casting	Not Applicable	Darren Jacobs
20th August 2013	Mini Seminar	Blue Valley Golf Estate	Jannes Bester/Natalie Johnson/ Tina Coetzee
23rd August 2013	Egg Protection Device – 'Crush In'	PPC Jupiter Works	Darren Jacobs/Donovan Leach
Third Quarter			
11th September 2013	Committee Meeting	C&CI, Midrand	Hanlie Turner
14th September 2013	Concrete Boat Race Day	Victoria Lake, Germiston	Michelle Fick/Andrew Schmidt
9th October 2013	Committee Meeting	C&CI, Midrand	Hanlie Turner
13th November 2013	Committee Meeting	C&CI, Midrand	Hanlie Turner
21st November 2013	Chairperson's Breakfast	To Be Advised	Hanlie Turner

INTERNATIONAL EVENTS			
DATE	**MEETING/EVENT**	**VENUE**	**CONVENOR**
6th – 8th May 2013	International IABSE Spring Conference	Rotterdam, Netherlands	The Korean Group of IABSE
27th – 29th May 2013	International Conference on Concrete Sustainability	Tokyo, Japan	Japan Concrete Institute

CONCRETE SOCIETY OF SOUTHERN AFRICA NATIONAL OFFICE PROGRAMME			
DATE	**MEETING/EVENT**	**VENUE**	**CONVENOR**
First Quarter			
28th February 2013	Closing date for inclusion in Source Book 2013/2014	Attention all CSSA Members	CSSA Administration
March 2013	Concrete Beton	Posted to all CSSA Members	Crown Publications
25th – 28th March 2013	Self Compacting Concrete Seminar Road Show	Johannesburg, Cape Town, Port Elizabeth, Durban	John Sheath
March 2013	Annual General Meeting	To Be Advised	Prof Billy Boshoff
March 2013	Council Meeting	To Be Advised	Prof Billy Boshoff
April 2013	Source Book 2013/2014	Posted to all CSSA Members	Crown Publications
Second Quarter			
7th – 9th June 2013	2013 Fulton Awards Weekend	Champagne Sports Resort, Drakensburg, Natal	Fulton Awards Organising Committee
June 2013	Concrete Beton	Posted to all CSSA Members	Crown Publications
June 2013	Council Meeting	To Be Advised	Prof Billy Boshoff
August 2013	Concrete Beton	Posted to all CSSA Members	Crown Publications
Third Quarter			
30th September – 3rd October 2013	Concrete Testing Seminar Road Show	Johannesburg, Cape Town, Port Elizabeth, Durban	John Sheath
October 2013	Council Meeting	To Be Advised	Prof Billy Boshoff
31st October 2013	Membership Renewal Notices	Not Applicable	CSSA Administration
November 2013	Concrete Beton	Posted to all CSSA Members	Crown Publications

KZN BRANCH PROGRAMME			
DATE	**MEETING/EVENT**	**VENUE**	**CONVENOR**
19th February 2013	MTM	Room 124, Centenary Building, UKZN Campus	Raj Naidoo
19th March 2013	AGM & Concrete Achiever Award	To Be Advised	Raj Naidoo
16th April 2013	MTM	Room 124, Centenary Building, UKZN Campus	Theresa du Plessis
21st May 2013	MTM	Room 124, Centenary Building, UKZN Campus	Craig Handler
25th June 2013	Site Visit	To Be Advised	Raj Naidoo

Company Membership Details

Platinum	Principal Member	Address	Tel No	Email
AfriSam SA (Pty) Ltd	Mr Mike McDonald	PO Box 15 Roodepoort 1725 Gauteng	011-758-6000	mike.mcdonald@za.afrisam.com
Lafarge Industries South Africa (Pty) Ltd	Mr Hennis Van Zyl	Private Bag X26 Gallo Manor 2052 Gauteng	011-657-0000	hennis.van.zyl@lafarge.com
Pretoria Portland Cement Company Ltd	Mr Donovan Leach	PO Box 40073 Cleveland 2022 Gauteng	011-626-3150	donovan.leach@ppc.co.za

Gold	Principal Member	Address	Tel No	Email
BKS (Pty) Ltd	Ms Siyanda Ngebulana	PO Box 3173 Pretoria 0001 Gauteng	012-421-3681	siyandan@bks.co.za
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Silver	Principal Member	Address	Tel No	Email
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Twintec Limited	Mr Martin Kerrigan	Unit 409, The Cliffs Niagara Way, Tyger Falls 7530 Bellville Western Cape	021-914-7752	m.kerrigan@twintec.co.za
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BAMR (Pty) Ltd	Mr Graham Duk	PO Box 23973 Claremont 7735 Western Cape	021-683-2100	sales@bamr.co.za
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Baseline Civil Contractors (Pty) Ltd	Mr Petrus Geldenhuys	PO Box 491 Somerset West Western Cape 7129	021-905-2545	petrus@baseline.co.za
Cementitious Inorganic Products CC	Mr Freddie Mc Lennan	PO Box 12386 Mill Street Cape Town 8010 Western Cape	021-551-2142	freddiem@iafrica.com
CLF Concrete Laser Flooring (Pty) Ltd	Mr Peter Norton	PO Box 8241 Elandsfontein 1406 Gauteng	011-323-2900	peter@concreteflooring.co.za

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Crete Colors SA	Mr Richard Beer	PO Box 13105 Woodstock 7915 Western Cape	083-226-7638	richard@cretecolors.co.za
Dick King Lab Supplies (Pty) Ltd	Mr Dick King	PO Box 82138 Southdale Gauteng 2135	011-499-9400	lanserac@iafrica.com
Doka South Africa (Pty) Ltd	Mr David King	PO Box 305 Kuils River 7579 Western Cape	021-905-3295	David.King@doka.com
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Group Five Coastal (Pty) Ltd	Mr Gareth Chambers	PO Box 201219 Durban North 4016 KwaZulu Natal	031-569-0300	gchambers@groupfive.co.za
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Hindle Mason Projects (Pty) Ltd	Mr Benjamin De Bruin	PO Box 2051 Witkoppen 2068 Gauteng	082-602-7871	ben.hmp@iafrica.com
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