steel CONSTRUCTION

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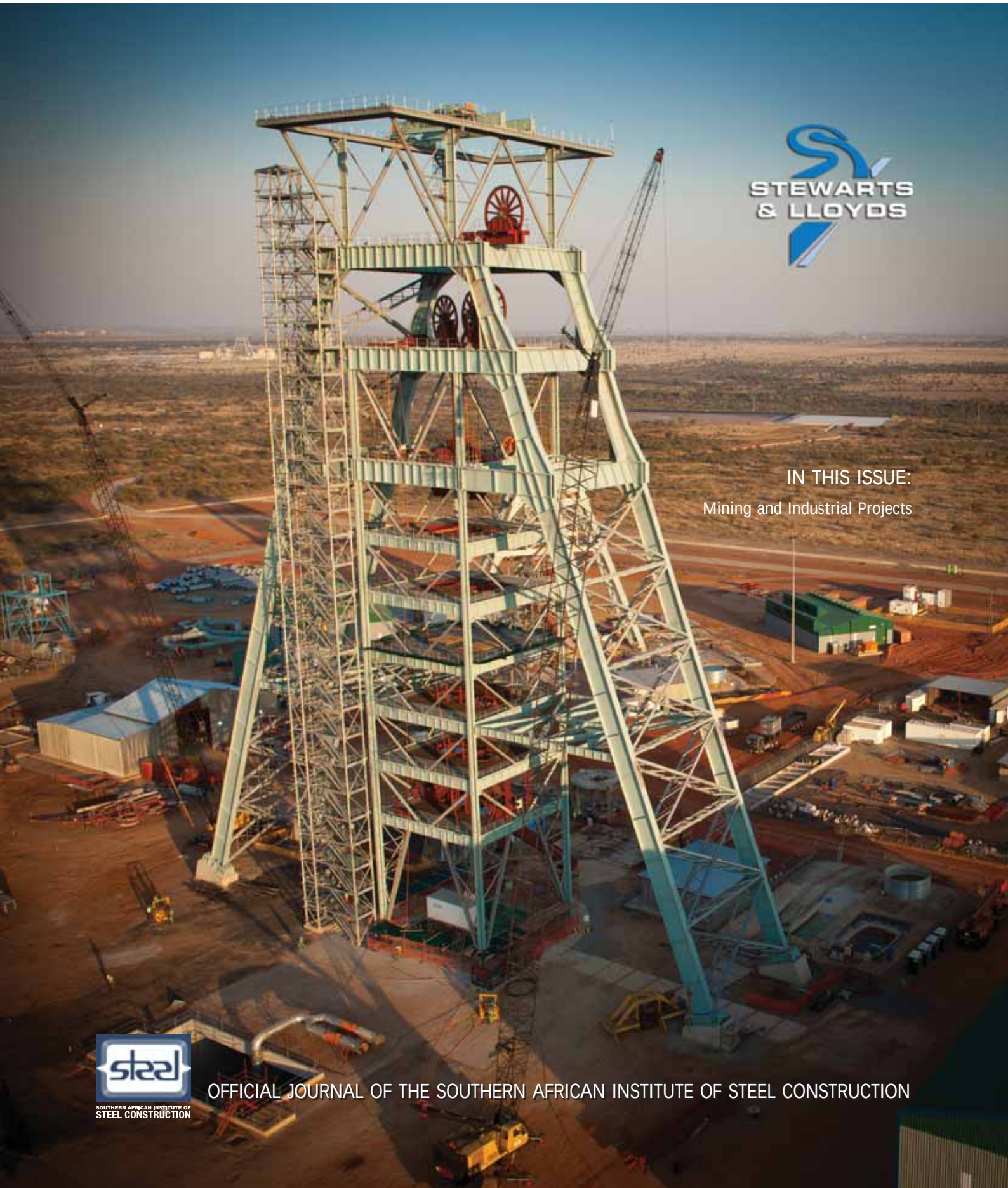

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Mining and Industrial Projects

SOUTHERN AFRICAN INSTITUTE OF STEEL CONSTRUCTION

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Total process optimization

Bob (35) knows the most efficient way to design, detail, and fabricate a steel structure. His company uses Tekla to automate fabrication and project management through interfacing with MIS systems and CNC machinery. What's more important, sharing the Tekla model allows the project team members to stay in the building information loop real-time.

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EDITOR'S NOTE

More than half of the year has passed already and here I am still thinking it's April. Time flies when you are er... having fun. With two major labour strikes behind us the construction and mining industries are not having as much fun as usual, but fortunately they are now behind us and this editor will not speculate on the repercussions of these strikes further ahead.

Despite the struggling economy there are still some good mining and industrial projects out there. In evidence are the really good entries of this nature we received for Steel Awards 2014. This year we are splitting the warehouse and factory entries from the heavy industrial and mining entries to form a new B&T Steel sponsored category for these types of structures. Mining and industrial structures are still seen as the bread and butter projects for the steel construction industry, but to keep it that way we need to protect our industry and keep things local.

Kobus de Beer has been our champion in this regard negotiating with SOEs and setting import duties in place with the Department of Trade and Industry in order to level the playing fields for our local steel construction industry.

The Institute has been working hard to make steel framed multi-storey buildings in South Africa a viable option. One thing everyone in a city desires is enough parking garages. So this is a good start for our initiative. Read Part II on designing parking garages in steel on page 10 and see how easy and effective it actually is.

Don't forget you can now book your seat for Steel Awards 2014 taking place on 18 September in Johannesburg, Cape Town and Durban. Do it today or tomorrow it might be December already!

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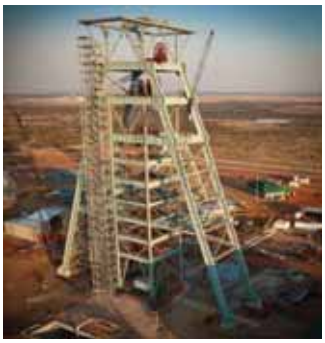

Bakubung Platinum Mine Main Shaft Headgear
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SAISC COMMENT

By Paolo Trinchero,
Chief Executive Officer, SAISC

So as the steel construction industry what are we doing to ensure that we deserve to be on top? Have we been training our next generation and are we putting measures in place that will not only stop the decline of manufacturing but see it grow. Are we planning to take advantage of opportunities in South and Southern Africa?

TEAMWORK

Another World Cup is behind us and we as South Africans can sympathise with Brazil on the effect it has when it is all over and our construction industry returns to a new normal. Germany's triumph secured a fourth World Cup title – their first since the country was reunited 24 years ago. One can't help notice the extraordinary teamwork and professionalism shown by the team.

"We have been together for 55 days but the work started 10 years ago with (former national team manager) Juergen Klinsmann," said Germany coach Joachim Loew. "We did everything to experience this day. The team really deserved it. No one deserved it more than us."

So as the steel construction industry what are we doing to ensure that we deserve to be on top? Have we been training our next generation and are we putting measures in place that will not only stop the decline of manufacturing but see it grow. Are we planning to take advantage of opportunities in South and Southern Africa?

Are we working as a team?

Our recent labour woes indicate that this is clearly not the case. We all need to recognise that to be a winning nation we have to work together.

The SAISC would like to see the industry working to integrate our design capabilities, our detailing systems and modern CNC equipment. It is clear that many of our costs have escalated. These costs can be measured in hours per ton of design time, hours per ton of fabrication and erection time, energy and logistics, not to mention red tape. We need to focus on innovation to radically bring down our costs and work on streamlining our supply chains to improve our competitiveness and our export capability.

With little work around we are told by large clients and SOEs we need to be competitive. Having been to a number of meetings and being guilty of arranging a few we have excellent ideas but need to work harder on implementation.

The SAISC is in the process of launching the SAISC Steel Academy which will cover a range of courses and training opportunities from typical engineering design courses, to competitiveness and contractual issues through to business development. A number of questionnaires have gone out encouraging members to give us feedback on training. Please take the time to fill in your requirements; it is important that we tailor the training to your needs. What we are really looking for are interventions that will have an impact on our competitiveness.

Steel Awards 2014

Despite the difficult financial times, there were 61 entries into the competition this year. As usual there were many in the architectural category, which is usually the biggest category, but this year light steel framed SASFA type entries were the biggest by number. This continues to highlight how this industry has grown in leaps and bounds.

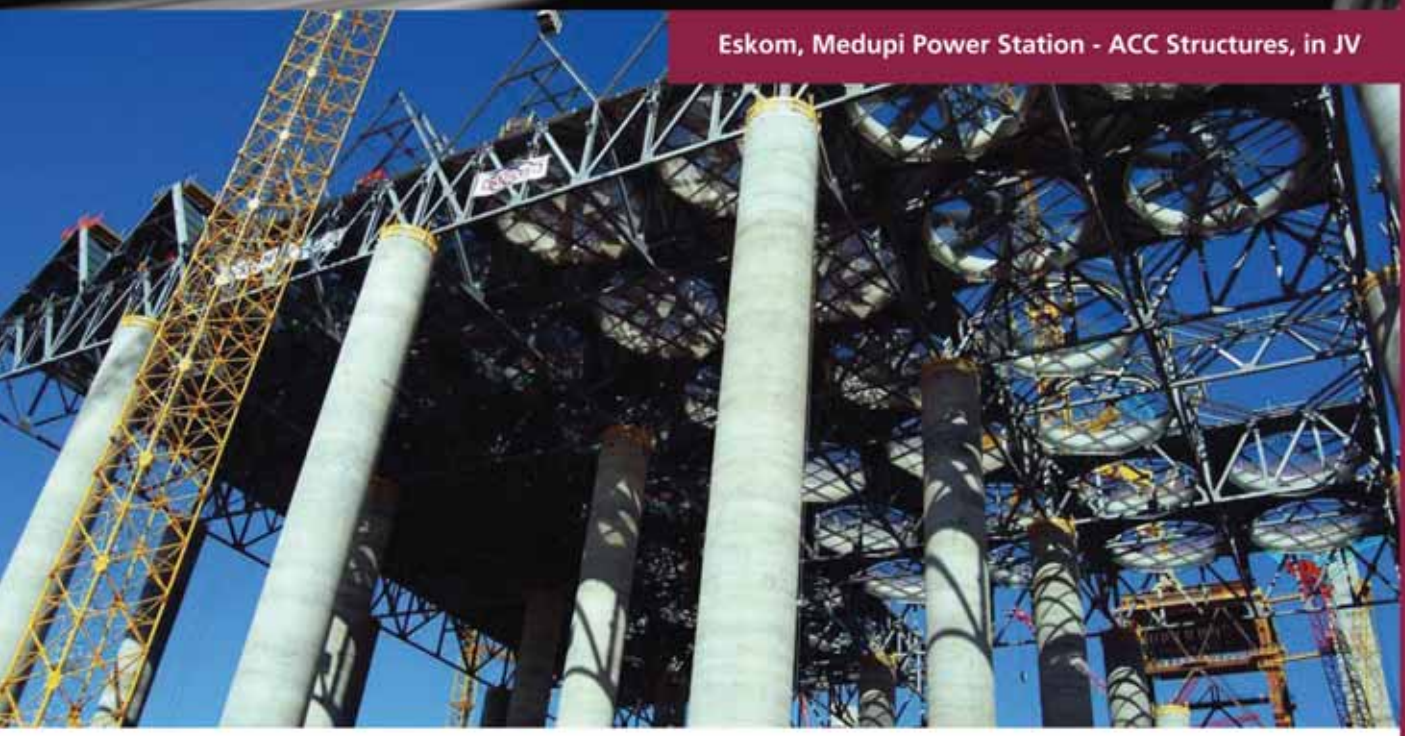
Generally the standard of workmanship has been very high, at the levels we have come to expect from entries. Sadly there was only one export project so no award in that category this year.

Spencer and Renee really made our judges work very hard with six one-day visits around Gauteng as well as visits to Zululand, Pilanesberg, Durban, Port Elizabeth, Cape Town and Luderitz in Namibia. Thank you to the judges for your commitment to the process. Sorry we made you battle to finalise your decisions (which comment tells you how good the entries were!)

We look forward to seeing many of you on 18 September at the awards function.

CADCON

STEEL CONSTRUCTION AND ENGINEERING



Eskom, Medupi Power Station - ACC Structures, in JV

Established in 1987, Cadcon, as a vibrant and reputable entity, has grown into a leading steel construction, designing and engineering organization involved in major projects in and around Southern Africa and internationally. Cadcon operates from their 15 400 m² workshop and office facilities in Centurion, Pretoria, housing state of the art machinery and latest technology CNC plate, beam, angle, cutting, drill and saw facilities serviced by 20 overhead cranes. Cadcon has also implemented the FabTrol System providing drawing management, material nesting, purchasing, inventory control, production and CNC management, shipping and more.

Eskom, Medupi Ducting Supports, Lephalale

Planning and completion of various significant and complex national and international projects on time, for commercial, industrial, mining and plant sectors, serves as testimony putting Cadcon as a leader at the cutting edge, in a rapidly growing and competitive environment. Cadcon has valuable experience in exports of steel products internationally and strong innovative contributions to the whole of Southern Africa.

Overall Winner SAISC Steel Awards 2011
Sandton City - Protea Court Rooflight, in JV

Furthermore, Cadcon's unique packages include the design and supply of buildings through Mictec, Cadcon's in-house engineering design department. Additional services include crane, truck and trailer hire.

Cadcon operates their full production process from the delivery of raw material, fabrication, abrasive blasting, corrosion protection, erection and finishing to the proud delivery of the final product through their team of graduates and dedicated artisans. Cadcon's methodologies and processes results in their ability to provide their clients with turnkey solutions at optimum efficiency; **STRIVING FOR EXCELLENCE AND PEACE OF MIND IN STEEL CONSTRUCTION**, this being the cornerstone of Cadcon's success and competency.

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BNC PROJECTS (PTY) LTD

By Viv van Zyl, SAISC
Membership Consultant

BNC Projects has a history of favourable results. This was achieved by numerous long serving artisans and other employees who have amassed a wealth of experience in the engineering industry collectively.

The company boasts an extensive portfolio and prestigious client base which verifies their position as an industry leader.

When three aspiring entrepreneurs got together and formed a company in 2000, little did they know that it would grow into one of the foremost engineering services and mechanical contractors in KwaZulu-Natal, as well as South Africa.

Involvement in high profile projects have become a norm for the company. A large part of the company's success is derived through repeat business from a prestigious client base. All of whom consider the company's Level 2 BEE status a bonus in meeting their procurement targets.

In summary the company is able to offer:

Manufacturing which constitutes the machining of various components out of various metals by conventional and CNC turning, milling and drilling. These items and parts can be manufactured and supplied once-off either from drawings and/or samples.

Mechanical contracting; with the use of large capacity guillotines, press brakes, plate rolls and various other modern machines and equipment they can fabricate various large steel structures, pipelines and tanks.

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Fax: +27 31 902 6798
Email: balchunds@bncprojects.co.za
Website: www.bncprojects.co.za

BNC Projects has a history of favourable results. This was achieved by numerous long serving artisans and other employees who have amassed a wealth of experience in the engineering industry collectively.

Their affiliation to CIBD (The Construction Industry Development Board) helps the company to improve the infrastructural sector and enhance the country's economy as a whole. Being affiliated to the CIDB assists with excellent business practices that stimulate sustainable growth and reform, noting that sustainability is always in the forefront of the BNC Projects mindset.

BEE RATING – LEVEL 2 CONTRIBUTOR

BNC Projects is a black owned and controlled enterprise that subscribes to the principles and primary pillars of broad based black economic empowerment. Although their commitment to all aspects of BBBEE is relatively new, their existing stakeholder approach to business, which has been entrenched from inception, has made the achievement of these goals possible.

UNIDO BENCHMARKING

Working within the UNIDO benchmarking framework, BNC Projects are able to achieve maximum scale and impact in the South African manufacturing sector by linking with suppliers and buyer networks who also operate within the UNIDO Benchmarking framework. (SPX Benchmarking assessment is provided to local firms as a service to help them assess their own competitive position and understand their weaknesses and gaps with respect to buyer expectations.)

The company also belongs to a long list of associations which enhance effective networking and communication within various business communities keeping the company abreast of the latest industry trends and thinking.

These are the:

- South African Institute of Steel Construction (SAISC)
- South African Stainless Steel Development Association (SASSDA)
- South African Sugar Technologists Association (SASTA)
- Durban Chamber of Commerce
- Prospecton Business Forum
- Progressive Business Forum

Suntosh Balchund, Managing Director of BNC Projects (Pty) Ltd and Chairman of the SAISC KZN Regional Committee.

The entire organisation operates within an ISO 9001-2008 framework and the interdependence between SBUs affords BNC's clients to enjoy a complete engineering service without compromising the expertise required to carry out each aspect of the required work in a highly professional manner.

MAJOR PROJECTS

- King Shaka International Airport
- Durban Container Terminal Re-Engineering
- Moses Mabhida Stadium
- Msuze River Pedestrian Bridge
- Reserve Bank Perimeter Barrier

Key Corporate Clients:

- Transnet
- Illovo Sugar Limited
- Tongaat Hulett Sugar Limited
- Toyota Manufacturing
- Unilever
- Eskom
- SAPREF Refinery

Key Government Clients:

- eThekwini Municipality
- Department of Transport
- Department of Public Works
- South African National Road Agency
- Transnet Capital Projects
- Transnet Freight Rail
- Eskom

INDUSTRY NEWS IN BRIEF

REGISTRATION WITH PROFESSIONAL BODIES: Are there really any benefits?

After attaining a qualification in any profession, there is often some doubt related to whether an individual needs to register with the professional body regulating and governing that profession. Registration with a professional statutory body invariably involves an initial financial and time investment in putting together a portfolio of evidence but the benefits far outweighs the initial investment.

The assessment process of attaining professional recognition is very important in confirming an individual's competencies benchmarked to international standards.

Many professions, such as engineering is a statutory reserved professional title to individuals who are professionally registered with the primary regulatory body of that profession. Engineers who have completed their three years of candidacy phase training and have been assessed by a panel of their peers are conferred with the Professional Engineer (Pr Eng) title once registered. Under South African legislation impacting on the engineering work environment only professionally registered engineering practitioners are declared competent to act as a 'competent person' as defined in the particular Act, to take engineering responsibility and to sign off on any engineering project where significant risk to the health and safety of the public is at stake.

Renewal of registration is required in five year cycles. Registered engineering professionals are required to obtain 25 CPD (Continuous Professional Development) Credits in five year cycles (minimum 5 credits per year) in the three categories of CPD activities. These categories are: (i) Category 1 Developmental Activities (ii) Category 2 Work-based Activities and (iii) Category 3 Individual Activities.

Getting the most out of professional registration will require a level of personal commitment and involvement in the broader engineering profession and voluntary engineering associations. Most professional bodies are in dire need of professionals with experience in different sectors, to join committees and serve the professional body in addition to being registered professionals.

This level of involvement provides individuals with an opportunity to grow, network and most importantly, influence the direction the profession is taking.

For more information visit www.ecsa.co.za

Edgar Sabela - Acting CEO for ECSA.

CTBUH ANNOUNCES 2014 BEST TALL BUILDINGS REGIONAL WINNERS AND FINALISTS

Four buildings, of which two of them are steel structures, from the United States, Australia, the Netherlands and the United Arab Emirates, have been named the best tall buildings in the world for 2014 by the Council on Tall Buildings and Urban Habitat (CTBUH).

The four regional winners are:

Americas: The Edith Green-Wendell Wyatt Federal Building (steel frame) is a renovation of an existing 1970s office tower, transforming a banal 'energy hog' into a high-performing, attractive building that seems more lightweight by an order of magnitude, yet affords more floor space than the previous version.

Asia & Australasia: One Central Park (steel/concrete) uses two unusual technologies for tall buildings – hydroponics and heliostats – to grow plants around the periphery of the building at all levels. The project presages a future in which biomimicry is no longer a radical concept in architecture, while inverting a perception that tall buildings can only block light and rob the urban environment of natural greenery.

Europe: De Rotterdam is an exercise in formal interpretation that is at once reminiscent of an imported mid-century American skyscraper, but epitomises the off-centre experimentalism of modern Dutch art of the foregoing century. Though it is the largest building in the Netherlands, its mass is broken down into three interconnected mixed-use towers.

Middle East & Africa: The Cayan Tower is a 75-story luxury apartment

INDUSTRY NEWS

The Edith Green-Wendell Wyatt Federal Building (steel frame) is a renovation of an existing 1970s office tower.

building with a striking helical shape, turning 90 degrees over the course of its 304-metre height. Each floor is identical in plan, but is set 1.2 degrees clockwise from the floor below, giving the tower a distinctive form by way of an innovative, efficient, repeatable structure.

An overall winner for the "Best Tall Building Worldwide" will be named from the four regional winners, following presentations from the owners and architects of each building, at the CTBUH 13th Annual Awards Symposium, which will take place at the Illinois Institute of Technology, Chicago, on 6 November 2014.

EXPANDED METALS AID SECURITY IN WAREHOUSES

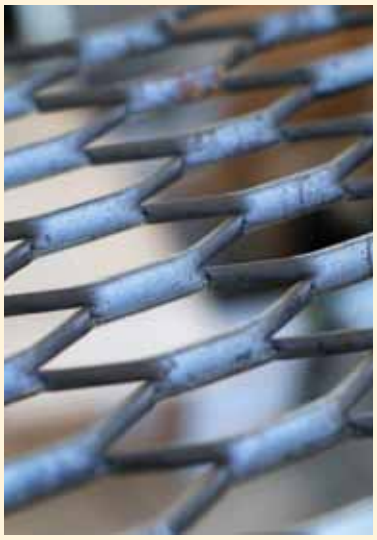
Andrew Mentis is a SAISC Company Member

Expanded metal has fast become a popular material for securing individual areas within all types of facilities. One of the main uses in this particular application is in inventory holding sections of manufacturing plants and warehouses. When compared to conventional fencing, expanded metal offers increased security coupled with unimpaired visibility.

Elaine van Rooyen, marketing manager at Andrew Mentis, says expanded metal offers numerous advantages over ordinary welded or diamond mesh. "Unlike conventional materials, expanded metal is difficult if not impossible to cut. Numerous strands have to be separately cut before an opening can be made," Van Rooyen explains.

Essentially expanded metal is sheet metal that has been slit and expanded into a network of diamond shaped meshes. There are no welds or joints which can be unravelled or worked loose in the expanded metal sheets. Expanded metal sheets are also more impact resistant than other fencing materials. While providing an aesthetically pleasing security barrier, the expanded metal also allows unimpaired vision and free passage of air into enclosed areas.

"The diamond mesh configuration does not offer hand or footholds, and the exposed edge on the top section makes it extremely difficult and dangerous for the intruder to scale."



Essentially expanded metal is sheet metal that has been slit and expanded into a network of diamond shaped meshes.

Expanded metal is normally supplied unpainted, but readily lends itself to any of the normal finishing processes such as painting, stove enamelling, plating and galvanizing. It can also be produced in 3CR12 and stainless steel should the application warrant this type of increased protection.

Van Rooyen says that expanded metal offers the same level of flexibility as conventional fencing materials and can be tailor made for specific application requirements.

IMPROVING TRANSFORMATION AND EMPOWERMENT IN THE CONSTRUCTION INDUSTRY

The Construction Sector Charter Council's (CSCC) recent Baseline Report, on the State and Progress of Transformation and Empowerment in the Construction Sector, reveals an encouraging improvement in the state of transformation and empowerment in the industry.

The Baseline Report is based on a sample of 3 530 Broad-based Black Economic Empowerment (B-BBEE) certificates and scorecards representing the reporting period (2009 and 2013) and is made up of 1 770 companies that submitted at least one certificate over the reporting period.

The CSCC initiated the report to objectively assess the state of transformation and empowerment in the construction sector and provide clarity and information on the level of compliance with the Construction Sector Code (CSC) as gazetted in 2009. Notwithstanding the above, the CSCC has noted, with concern, the slow pace of progress in some of the critical elements that are key drivers

for empowerment and transformation. These include ownership, enterprise development and procurement, and skills development.

As a result of the report's findings, the CSCC – which is the executive authority responsible for overseeing and monitoring the progress of transformation and empowerment in the construction sector – has invited construction industry role players to fast-track and accelerate improvements in certain aspects of the measurement scorecard.

CSCC CEO, Thabo Masombuka, says: "The results of the Baseline Report highlight areas that require improvement and/or research and development, with certain areas that need to be strengthened as part of ongoing measurement of empowerment in the sector. It forms the basis on which the CSCC will engage with key stakeholders such as industry and the Department of Trade and Industry."

To fast track transformation and empowerment in the construction sector, Masombuka makes the following recommendations:

- Increasing levels of B-BBEE contribution by industry with significant improvement over the years;
- Improve the accuracy of industry classification;
- Improvement of critical knowledge of industry by verification agencies to prevent misrepresentation and fronting;
- Increase industry participation in voluntary surveys and its impact on the industry representative sample;
- Tracking movements from year to year;
- And increase the percentage of black-owned and black woman-owned enterprises amongst large enterprises.

The Military Health Base Depot was selected above 46 other possible winners from the pool of entries.

NEW GREEN MILITARY BASE IS HONOURED WITH SAPOA AWARD OF EXCELLENCE

The newly constructed military base depot for the South African Military Health Service (SAMHS) in Thaba Tshwane was honoured with the National Overall Heritage Award for 2014 at the recent SAPOA Conference.

The Heritage Award was one of only five overall category winners, while there were also ten individual category winners, and for these awards, SAPOA considers and rates projects on all aspects including; engineering, construction, economic viability, sustainability, client and user-client satisfaction and architecture. SAMHS achieved top ratings in all of these criteria, while the Military Health Base Depot was selected above 46 other possible winners from the pool of entries.

The Military Health Base Depot is a formation within the SAMHS, responsible for the acquisition, stockpiling and distribution of medical supplies and pharmaceuticals. The SAMHS needed a modern and secure base facility with increased capacity and one that offered more operational efficiency. The key functions of this base includes; pharmaceutical storage, general storage, vehicle storage, specialist storage (weapons, ammunition and medical containers), and offices.

With this in mind, the existing military property in Thaba Tshwane – covering 64 571m² - was selected as the most suitable site, where a number of the existing building on the site where identified to have significant heritage value and had to be retained in the new design. The requirements for the base depot were met through a campus-type development with twelve buildings of different sizes and functions, including five heritage buildings being restored and innovatively adapted for re-use. The base depot was also independently assessed against the Green Star framework to ensure that the design and construction included the sustainability principles as called for by Green Star, ensuring sustainable building principles were applied despite the fact that no formal Green Star rating tool exists for this type of development.

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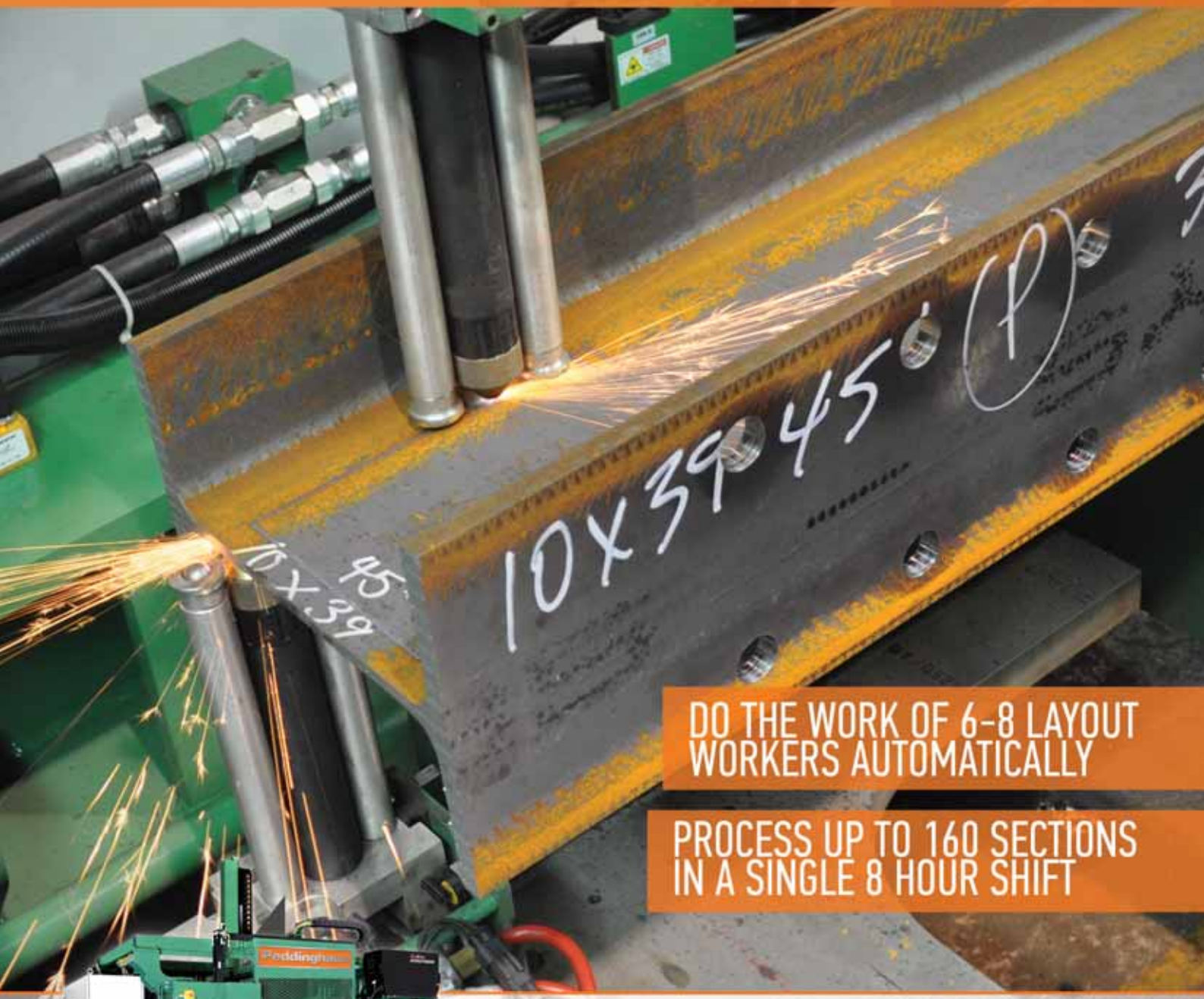

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Recent cladding examples of parking garages include the addition of solar panels, and LED lighting and green walls.

DESIGNING PARKING GARAGES IN STEEL

Part II

Compiled by Paolo Trinchero,
Chief Executive Officer, SAISC

This is the second part of the two part article on designing multi-storey parking garages in steel. In Part 1 the advantages of using steel in the construction of parking garages were discussed as well as the importance of a well thought through lay-out. Read more about deflection, dynamic performance, stability and robustness, fire resistance, waterproofing and aesthetic design in Part II.

DEFLECTION

Where clear span construction and high strength steels are used for the main beams, deflection may govern the design. Beams may therefore be pre-cambered to compensate for dead load deflection and to minimise the risk of ponding, when in-situ concrete solutions are used. An additional pre-camber may be introduced to compensate for a proportion of the live load deflection (usually up to $^1/_3$). This has the advantage that the beams have a slight upward bow, which avoids the optical illusion of a heavily deflected beam when it is, in reality, level. The theoretical deflections, allowed for in pre-cambers, do not always occur and care must be taken to ensure that any permanent set does not impede the efficient drainage of the slab

DYNAMIC PERFORMANCE

The dynamic performance of floors in buildings has become an important issue in recent times, which has led to a review of design practice in this area. In buildings such as car parks, where there is an expectation of disturbance from traffic movement, it is much less important. The human perception of movement in a car park will be less than in other situations because users are either in motion themselves, by walking, or sitting in a car and isolated from external vibration by the suspension.

Traditionally, steel-framed car parks have been designed using a minimum natural frequency as a sole measure of dynamic performance. For vibration, consideration of natural frequency alone can be misleading, as it is the amplitude of vibration that most people feel. In addition to human/car-induced vibration, excitation may be caused by impact from cars running over uneven surfaces or discontinuities, such as expansion joints. Careful detailing and workmanship should ensure that any joints are level and can be traversed smoothly, and that the gaps are no larger than necessary. Regular maintenance should prevent the wearing surface from deteriorating.

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STABILITY AND ROBUSTNESS

The stability and robustness of a structure is a vital structural design consideration. Multi-storey car parks pose a particular problem because they contain few internal walls. This is especially true of demountable structures. There are various methods to ensure structural stability against horizontal forces; two of the most common options are outlined below.

BRACED STRUCTURE

Suitable bays or cores are placed around the building to provide stability in two orthogonal directions. Bracing may take the form of cross members or eccentric type bracing. In car parks the eccentric bracing can be used across the structure because it allows relatively unimpeded circulation throughout the floor area.

UNBRACED STRUCTURE

In this case the frame is designed as 'rigid'. Moments are transferred from beams into columns via moment connections and stability is gained from the stiffness and continuity of the connections. This may result in the need for haunches in clear span construction.

A combination of these methods may be used. For example, use a rigid frame across the structure and brace longitudinally at the outside edge of the building.

Whichever method of achieving stability is chosen, it is important to consider the construction stage of the building as well as the completed structure. The floor slab in most cases is designed to carry the horizontal forces to the braced parts of the structure. Until this plate has gained sufficient strength it may be necessary to provide temporary plan bracing.

FIRE RESISTANCE

For the purposes of fire protection, car parks are generally classified as either open or other. Open car parks have relatively low structural fire resistance requirements whereas the requirements for other car parks are typically consistent with those demanded of commercial buildings of the same height.

The standard structural fire resistance requirement for car parks less than 30m in height is 15 minutes in the UK and in some countries there is no requirement for fire protection. The same practice is used in South Africa although we don't yet have a specific requirement in SANS 10400-T. Most hot

INDUSTRY NEWS

rolled sections are deemed to achieve 15 minutes fire resistance without added fire protection.

The relatively benign requirements for fire resistance in open car parks are based on the results of a global programme of natural fire tests. These tests demonstrated that fires in open car parks do not generate high temperatures and that most unprotected steel in open steel-framed car parks has sufficient inherent resistance to withstand the effects of any fires that are likely to occur.

THE STEEL FRAME

Steel is a durable framing material. It will, if protected correctly, give a long life with minimal maintenance. In most cases all that is required is a repaint at the first maintenance period, which can be 20 to 30 years or more, depending on the initial protection specified.

WATERPROOFING

With all floors it is necessary to provide adequate falls and drainage to prevent the build-up of water on the slabs.

There is a growing trend to use a lightweight roof over the top parking deck. This gives added protection to the top floor of the car park allowing users to park in all weathers. The aesthetic appeal of a car park can be significantly enhanced by providing a roof enabling the car park to blend in with the urban environment. The long-term benefits of reduced maintenance can far outweigh the initial cost of this approach.

Innovative cladding for the 'Sugar Cube' Car Park in Sheffield, UK.

REFURBISHMENT

One of the major advantages of steel buildings is the ease with which they can be refurbished and adapted. Car parks in steel are no different in this respect. There are many examples where steel-framed car parks have been refurbished with minimal expense.

COMMERCIAL VIABILITY

The cost of a structural steelwork in real terms has decreased appreciably over the last few years through greater efficiency in steel design and detailing, automated steel manufacturing and fabrication. The shorter construction period made possible through the use of a steel frame and consequently the earlier return on investment increases the commercial viability. The elimination of fire protection has had a major influence in making a steel-framed parking garages one of the most competitive options available in Europe and America and we would like to see more in Southern Africa.

High quality materials have been used for the cladding of the Southern General Hospital's (Glasgow) car park, including; stainless steel mesh panels, ashlar stonework, planar glazing, white render and Siberian larch louvres.

INDUSTRY NEWS

Wire mesh panels have been used for the cladding of this parking garage.

AESTHETIC DESIGN

In addition to aesthetic appeal, the client may require a parking garage to be clad in certain materials to blend in with the urban fabric. Steel car park structures can be designed to accept all types of external cladding from timber to brick work and wide range of metal products including:

- Plastic-coated steel sheets and panels
- Wire mesh panels
- Perforated sheets
- Stainless steel sheets and panels
- Aluminium sheets and panels.

Metallic cladding is often preferred because they are light and open and because of their variety and innovative nature. Recent examples include the addition of solar panels, and LED lighting and green walls. All metallic cladding systems are compatible with steel frames.

The cladding may be designed to be load bearing as well as aesthetic. In particular crash barriers have been designed as an integral part of the cladding system. These may be load resistant (stiff) or energy absorbing (flexible). The steel frame provides an excellent interface for connection of either type.

Links

www.steel-sci.com (Steel Construction Institute UK)

www.aisc.org (American Institute of Steel Construction)

LSFB TRAINING FOR BUILDING CONTRACTORS

WINDHOEK, MAY 2014

By John Barnard, SASFA director

The average rating [of the course] covering all aspects was in excess of 90%, and judging by the students' response, presentation of the course was certainly successful. SASFA has to date issued 228 certificates to attendees for successful completion of the LSFB course for building contractors.

Willem Venter, Lafarge Gypsum, discussing the installation of gypsum board lining.

Andrew de Klerk from Everite explaining detail of fixing external cladding.

SASFA's six-day training course for building contractors was presented at the Safari Conference Centre in Windhoek, Namibia. This was the 15th time we offered the course, but the first time beyond South African borders. We received registrations from 21 attendees: 60% from Namibia, 30% from the Democratic Republic of Congo and the rest from Zambia – indeed an international event!

The candidates were from a range of disciplines –builders, carpenters, technicians, two architects and an accountant. Eight of the attendees were from SASFA member companies.

The four-day section on steel frame manufacturing and erection was presented by John Barnard and Richard Bailey (consulting engineer, previously from MiTek). The one and a half day section on cladding, lining and insulation was presented by Andrew de Klerk (Everite) and Willem Venter (Lafarge Gypsum). As in the past, we asked Speedfit Africa to illustrate their plumbing system. The full range of topics, from foundations and the properties of the materials, to erecting and bracing wall panels, and erecting roof trusses were covered. Not only were students advised on the correct way of doing things, but it was also explained why certain aspects were particularly important.

The whole group of trainees, with Richard Bailey who co-presented the steel frame portion of the course.

SOUTHERN AFRICAN LIGHT STEEL FRAME BUILDING ASSOCIATION

Trainees paying attention to the installation of anchor bolts.

On request from WML Global from Namibia – a recently joined SASFA member – the practical work was done on a structure they wished to erect in an industrial area outside Windhoek. They had prepared a 4.5m x 3m slab on which a light steel frame structure was to be erected by the students, as part of the practical component of the course. Each and every one was encouraged to get their hands dirty with the practical tasks.

Cladding, lining and insulation materials were supplied by Lafarge and Everite for fixing to the steel frame. Marshall Hinds supplied the building wrap and Kare the fasteners for fixing the boards. Joints between the internal lining panels were finished off. Lafarge also illustrated how a damaged gypsum board panel can be repaired.

The students had to write two tests, to assess the level of their knowledge. They were also asked to rate the course on a daily basis, covering aspects such as venue, arrangements, course content, course notes and presentation. The average rating covering all aspects was in excess of 90%, and judging by the students' response, presentation of the course was certainly successful.

SASFA has to date issued 228 certificates to attendees for successful completion of the LSFB course for building contractors.

This six-day course for building contractors was presented in Durban in July and will be presented either in Cape Town or Gauteng in October 2014.

Please visit www.sasfa.co.za for more detail.

LIGHT STEEL FRAME BUILDING IDEAL FOR PENTHOUSE PROJECTS

project team

Developer/Owner:
Dryden Projects

Architect:
Daffonchio and Associates Architects

Structural Engineer:
C Plan Engineers

Project Manager:
Silverline Group

Main Contractor:
Silverline Group

Steelwork Contractor:
Barnet Construction

The light steel frame building (LSFB) method, which has proven itself across the building spectrum, is also ideal for add-on loft units or penthouses. One such example is in Maboneng ("place of light") a high profile development east of Johannesburg city centre. In Maboneng the loft units are built on the tops of various existing multi-storey buildings within the precinct.

Maboneng , the brainchild of Jonathan Liebmann, a young Johannesburg developer, represents a remarkable rejuvenation of a city precinct, which has brought a cosmopolitan flair to a previously neglected part of the city. The neighbourhood now bustles with galleries, art studios, offices, entertainment and retail spaces. The precinct now offers residential complexes with 24-hour security and spectacular city views. Residents share their building with ground floor retail, exhibition space and restaurants.

LSF was the obvious choice for the Maboneng project due to the flexibility of the building method, the low mass of the materials and the speed of construction. It is also convenient to use LSF on rooftops as the apartments can be constructed without the use of cranes which results in significant savings for the developer.

The new building consists of a light steel frame clad with fibre cement boards externally and with glasswool insulation in the wall cavities. The internal lining consists of fire resistant gypsum board to provide the required fire-rating as well as a perfect surface for internal finishes.

LSFB is eminently suitable for vertical extension of existing buildings due to the low mass of the structure. The LSF walls for this development of five apartments have a total mass of only 32 tons – which includes the steel frame, the external cladding, insulation and internal lining. Compare that to the 340 tons had masonry walls been used.

The materials for this project were hoisted up using a manual pulley system – and the additional mass of the new building volume could easily be supported by the existing reinforced concrete structure. There was also no need to strengthen the existing foundations.

Due to the excellent insulation in the walls and roof, LSFB saves electricity required for heating and cooling of the building. The Maboneng project was constructed in only three months and the developer was so pleased with the outcome, that he signed up for a further three LSFB projects.

Mining and industrials projects










Photograph by Gerhard Kapp

KWALE MINERAL SANDS EXPORT FACILITY

The Kwale mine is located some 10km from the coast and approximately 50km south of Mombasa, Kenya. The primary products of the mine are ilmenite, rutile and zircon. Zircon is exported in containers via the Port of Mombasa while ilmenite and rutile are exported in bulk and required a dedicated export facility.

The mine plans to export some 330 000 tons of material per year, through the new port facility. The port facility comprises numerous elements of which the following include structural steel: A storage shed, two breasting dolphins and two mooring dolphins, a load-out platform, access trestles and a shiploader with its associated materials handling equipment

The 7 000m² storage shed has a roof structure supported on a combination of concrete and steel columns. Care was taken to utilise natural light and ventilation.

The marine structures include the access trestle and walkways that connect the facility on land with the load-out platform and then the load-out platform with the breasting dolphins. The access trestles also provide support to the conveyor structures. On either side of the load-out platform one breasting dolphin and one mooring dolphin are located.

The access trestles and dolphins comprised hollow steel tubular piles with steel headstocks. The steel headstocks were fabricated in South Africa and shipped to Kenya. The reinforced concrete superstructures of the conforming design have been replaced by the contractor's alternative design proposal of steel headstock structures to simplify construction over the water. The headstocks for the dolphin structures also functioned as a piling guide for the raker piles of these structures.

The most critical design condition for the access trestles and load-out platform was the deflection limitation due to the conveyors and ship-loader.

A challenge was to combine the mechanical design requirements with the structural design as well as the finite element analysis and modelling, as the dead loads of the various mechanical equipment components and positions changed considerably during the mechanical design stage. Many different load cases and worst case scenarios had to be modelled and analysed in order to ensure the structural integrity of the system.

project team

Developer/Owner:
Base Resources/Titanium Ltd

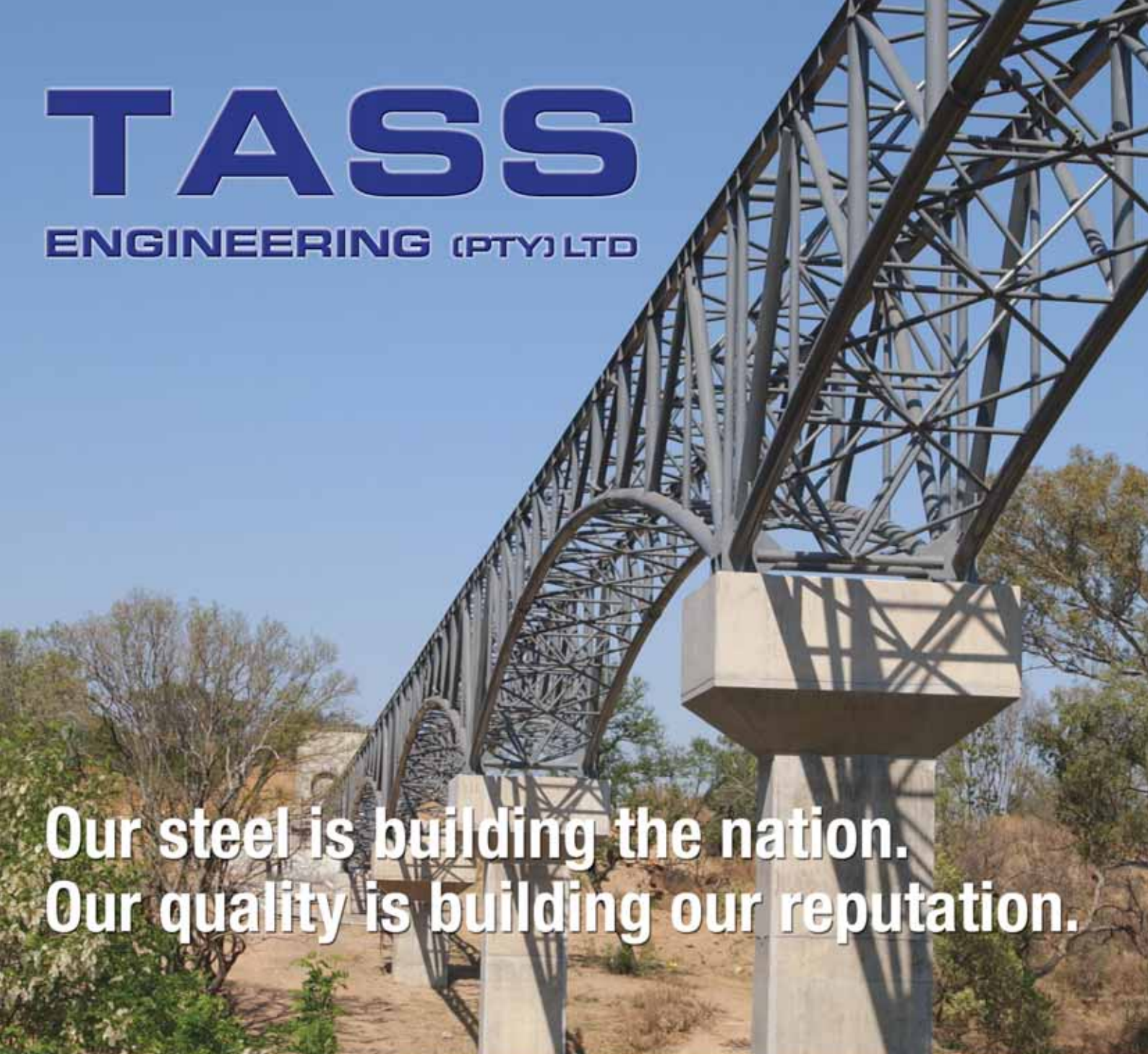
Structural, Electrical & Civil Engineer:
WSP

Ship-loader & Conveyor Systems Engineer:
LNW/Syralco

Project Manager:
WSP

Steelwork Contractors:
- Marine Structures: Stefanutti Stocks Marine
- Shed: Steel Structures
- Shiploader and conveyors: Prodelko, Tass Engineering

Infrastructure Contractor:
Seyani Brothers & Co (K) Ltd



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- Sandton Atrium on 5th Cladding - Liberty Properties
- Razomart Warehouse (350t) - Razomart
- Warehouse Columbia Pharmaceuticals (250t)
- DSTV Head Office, Randburg (100t) - Multichoice
- Sedibeng Brewery Extension (650t) - Heineken
- Frankenwald Warehouse (480t) - Capital Property Fund
- Incubation Hub (240t) - Century Property Developments (Pty) Ltd
- Sandton Office Tower, New Spire - Liberty Properties
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PIPE RACKS AT ISLAND VIEW

project team

Developer/Owner:
Transnet National Ports Authority

Structural Engineer:
Transnet Capital Projects Engineering

Quantity Surveyor:
Transnet Capital Projects Project Services

Project Manager:
Transnet Capital Projects Project Management

Main Contractor:
WBHO

Steelwork Contractor:
Shesha Engineering

Detailers/Detailing Company:
Structech

Galvanizing:
Phoenix Galvanizing

The steel racks are located within the Port of Durban in the Island View complex. The complex is of national strategic importance. The racks currently stand as the only link between the complex and the ocean in order to facilitate the movement of the massive volume of fuel.

The new petrochemical racks stand 13.5 metres above ground level and the steel bridges stand at maximum heights of 15.5 metres. The racking system traverses an approximate length of two kilometres. The 18 steel bridges have spans of between 12 and 44 metres. A total mass of 2 100 tons of steel was used to complete the project. This giant steel system has been designed to withstand the movement of an impressive 7 000 tons of petroleum and other products at any given time.

The geotechnical report revealed that the ground conditions were very poor and serviceability bearing pressures of no more than 50kPa were recommended due to soil scouring, compacted rubble and poor soil conditions. The team decided to use large bases for the 270 steel racks. However due to the long bridge spans this was not a solution for the bridge foundations. The good strength to weight ratio of steel was an extremely critical and determining factor since the foundation foot-prints were at their maximum and could not be increased.

Settlement was very important for this project since settlement problems on a single structure could cause the pipes to span double their designed spans. This could put the pipes at risk of damage and potential failure. Hence, the steel bridges were detailed so that jacks could be placed between the steel piers and the truss. If settlement became problematic, the bridges would be jacked up to compensate for the settlement. This could easily be done with steel and no specialist skill would be required thereafter.

Of the 18 steel bridges, 17 were assembled off-site and only lowered into position. This reduced site congestion and also allowed the processes to run simultaneously.

The challenges were innumerable and complex. The very nature of steel itself provided a resolve for those challenges thereby overcoming them.

MEDUPI UNIT 6 FLUE GAS DUCT

Between the 800MW Medupi Unit 6 boiler and the 213m high chimney is the flue gas duct. This duct consists of four main sections channelling the flue gas through the rotating air heater, filter plant and induction draught fan, a total of 366 metres, before reaching the stack.

The system is submitted to extreme conditions including abrasive ash and temperatures almost reaching 500°C. At the furnace outlet where the temperature is highest, 16Mo3 plate and hot rolled sections are used, while 350WC is utilised in the more moderate sections.

The use of steel also makes the sections stiff and strong enough to bridge significant spans between supports, thus less structural steel is required to support the flue gas ducting which results in better access to the boiler unit.

As might be expected the flue gas ducts will expand significantly during operation. To allow for this the flue gas ducting is supported on glacial bearings or hangers. Since no internal bracing is allowed, expansion also created an interesting challenge when rectangular sections with longer dimensions had to be stiffened. Although the inside of the duct wall will have a very high temperature the outer extremities of the stiffening beams will be significantly cooler. To allow for this heat gradient the duct is placed in a 'cold' outer frame formed by four Buckstays within which the hot inner wall can expand independently. Slotted connections and hinged corners allow for the movement of the duct in the direction of expansion while still stiffening the duct.

The components and mechanical equipment were assembled on site to form assemblies which were rigged into and/or onto the supporting structures.

The largest assembly erected was 58.8m long with a 9m diameter and weighed 220 tons. The assembly was delivered in nine components with a maximum length of 9m. The components were assembled on the ground near the supporting structure and then the assembly was insulated. The assembly was manoeuvred and rigged to its final position at the 29 metre level using two 400T lattice boom cranes in tandem.

The sheer physical size and mass the team had to deal with initially daunted all involved. It required innovative thinking in all stages of the project, and nerves of steel.

project team

Developer/Owner:
Eskom Holdings SOC Limited

Structural Engineer:
Mitsubishi Hitachi Power Systems Europe GmbH

Quantity Surveyor:
Turner and Townsend (Pty) Ltd

Project Manager:
Eskom Holdings SOC Limited

Main Contractor:
Mitsubishi Hitachi Power Systems Africa (Pty) Ltd

Steelwork Contractors:
Murray & Roberts Projects (Pty) Ltd, Medupi Fabrication (Pty) Ltd, MM & G Mining and Engineering Services (Pty) Ltd

Detailers/Detailing Company:
X-Tech, Murray & Roberts Projects (Pty) Ltd, PCP Drafting cc

Cladding Supplier:
Civil and Power Generation Projects (Pty) Ltd

Painter:
ISC Matla (Pty) Ltd, Rand Sand Blasting Projects (Pty) Ltd

GOLDFIELDS VENT SHAFT CONVEYORS

Goldfields commissioned a system of conveyors to link their newly developed vent shaft (the site of the 2010 category award winning headgear), to their plant stock pile. A system of four conveyors starts under the discharge chutes of the vent shaft reef bin, passes through two transfer towers and a silo and ends with a head-end discharge over the stock pile.

The total length of the conveyors is approximately 650m and weighs in at over 600 tons. The system consists of 21 prefabricated gantries of approximately 30m each that were delivered to site complete and ready for lifting.

Made for purpose jigs were fabricated for each gantry to ensure the correct amount of camber was achieved. The sides of the gantries were made from fully welded sections whilst the top and bottom chords were bolted. Steel is the only possible material of construction for these conveyor gantries due to the combination of strength and relatively light weight. The lattice type design provides the box shape gantries with good strength.

All gantries were trial assembled prior to galvanizing to check for fit and dimensions. Once hot dip galvanized, they were reassembled, sheeted and equipped with pipes, cable racks, floor grating, deck plates, handrails and conveyor mechanicals.

The erection methodology was to erect the transfer towers, trestles and take-up towers in advance using reasonably small and inexpensive plant and then, over a relatively short period of time, transport the gantries to site and lift them directly off the truck into position. 25 ton and 140 ton cranes were used for the full duration of the site erection and larger cranes ranging from 300 to 500 tons were used for the heavy lifts.

This was a difficult project with many design challenges. The overall methodology was ambitious but proved to be the winning formula for speed and safety. All secondary tasks like equipping and sheeting the gantries was done on the ground in almost ideal conditions and the risk associated with working at heights was reduced to a minimum. The care taken in fabrication and trial assembly paid off as there were very few lack-of-fit issues during the course of the project.

project team

Developer/Owner:
Goldfields

Structural Engineer:
Logiman

Main Contractor:
Steel Services and Allied Industries

Steelwork Contractor:
Omni Struct Nkosi (Pty) Ltd

Cranes:
Crane Corporation

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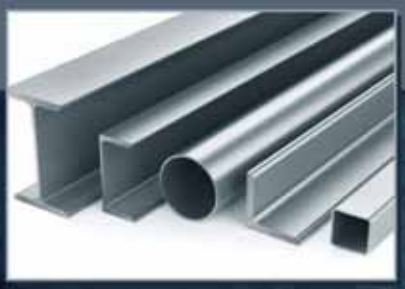

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NAMPAK FURNACE THREE AND SUPPORT INFRASTRUCTURE

project team

Developer/Owner:
Nampak Glass

Architect:
Osmond Lange Architects & Planners

Structural Engineer:
AECOM

Quantity Surveyor:
AECOM

Project Manager:
Mesmeric Projects cc

Main Contractor:
Abbeydale Building & Civils (Pty) Ltd

Steelwork Contractor:
SE Steel Fabrication (Pty) Ltd

Cladding Supplier:
GM Roofing

The steel structure consisted predominantly of tubular steelwork and I-section columns as well as using 3.5mm pre galvanized purlins. Almost 10 tons of steel cap plates for the furnace columns were also used in the fabrication process.

In order to improve energy efficiency, reduce cost and ultimately improve the carbon footprint of the business, Nampak Glass will be using the latest energy efficient technology at their third furnace. The introduction of pre-heater technology into the furnace is projected to reduce energy consumption of the batch melting process. The increased heat content in flue gas from aging furnaces can be recovered by the preheater.

The furnace building itself is 1 700m² and 36m high above ground floor. Budget and speed of construction was critical. Rains delayed the piles and excavation, but specific sectional completion dates still had to be met concerning international contractors whose arrival dates on site were fixed.

The fabrication process was fairly onerous due to the shapes and numerous bevel cuts that were required in order to obtain an accurate fit. Approximately 175 tons of steelwork were required for the main furnace, 35 tons of plate girders for the internal support steelwork, 10 tons of fabricated plate for column caps, 3 tons for pipe bridges and 10 tons of steelwork for lean-to structures.

The installation process for the main steelwork was achieved in a three week period. A 200t mobile crane was established on site and numerous plant was used for the installation (cranes, forklifts and cherry pickers). Due to the tight work area that was available on site, careful co-ordination was required between the contractor and the main contractor in order to meet the timelines as well as to ensure that the steelwork was erected in a safe manner. Due to two tower cranes being on site as well as various other plant and machinery, careful planning was needed to ensure that no bottlenecks were experienced due to the shortage of space for movement of all the required plant.

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TWEEFONTEIN OPTIMISATION PROJECT

The Tweefontein Optimisation Project consists of a new coal washing and materials handling facility located near Ogies, Mpumalanga.

The coal processing plant, or CPP, is a dual module, two-stage, dense medium separation (DMS) coal processing facility, with a capacity to process 13.6 million tons of coal per annum

The CPP structure has an overall footprint of 100 metres by 21 metres. The column lines are at six and seven metre centres. There are six primary maintenance access levels within the structure, supporting platework and equipment, with the upper level at an elevation of 21 metres above the concreted ground level.

The principle of modular design for construction was followed, whereby structural design and engineering concentrated on the facilitation of pre-assembly of structural steel into smaller modular sub-assemblies, allowing for safer, more controlled, and efficient construction. This entailed the design to allow for 7m x 7m or 7m x 6m modules to be pre-assembled and installed as a unit.

The modular design generally dictates a column splice per level, with the floor level at an elevation to suit pre-assembly on the ground. Columns had welded end-plates both sides. Connections were no longer made to the webs of members, but flange plates with web stiffeners were used to simplify the erection bolting process of in-fill beams. Ancillary items such as hand-railing and grating were also designed to be mounted to the pre-assemblies on the ground.

Benefits of the modular design come to full appreciation during construction:

- From a safety perspective, less people are exposed to the risks and hazards associated with steel installation at heights.
- Productivity is increased, as smaller capacity cranes are utilised for pre-assembly purposes, resulting in less cranage costs.
- Safe access is available sooner to follow-on contractors.
- Missing or undelivered items are identified earlier and mitigating action can be planned and implemented sooner.

Modular design is truly a vast improvement from traditional construction methods. No major injuries were reported, and progress was maintained well within plan. Rain delays were reduced as pre-assembly on the ground was always an option to gain progress, even with wet steelwork.

project team

Developer/Owner:
Glencore

Structural Engineer:
DRA Mineral Projects (Pty) Ltd

Project Manager:
DRA Mineral Projects (Pty) Ltd

Main Contractor:
DRA Mineral Projects (Pty) Ltd

Steelwork Contractor:
SMEI Projects Newco (Pty) Ltd

BAKUBUNG PLATINUM MINE MAIN SHAFT HEADGEAR

The headgear is a locally manufactured structural steel A-frame structure supporting three sheave decks and a 14 metre square centre tower from shaft bank to the underside of the lower sheave deck. The height of the headgear is 72 metres to the top sheave deck. The centre tower incorporates six floors. It is anticipated that the total mass for the headgear for the sinking and equipping conditions will be in the order of 1 900 tons.

The headgear has been designed as a multi-purpose headgear to facilitate shaft sinking (currently in this phase) and equipping phases of the project and will finally be converted to the permanent headgear. Conversion to permanent use will be by the removal of the temporary sinking steelwork in the centre tower and replacing it with permanent steelwork and screening with the installation of sheave support beams and permanent sheaves on each of the sheave decks. Each floor level in the centre tower was designed to accommodate the shaft sinking contractor's steelwork and will be replaced with the permanent steelwork at a later date.

Structural steel was the chosen material for this project as it allowed fabrication to be carried out while all the preparation work was done on site to support it. Erection was facilitated by the use of an 1 100 ton crane which allowed portions of the headgear up to as much as 235 tons to be lifted per lift.

Due to the size of the headgear and the loads and forces the headgear will have to sustain, the majority of main members are fabricated sections with hot rolled sections being utilised where possible. All plate girders were painted while hot rolled sections were galvanized.

The erection phase came with a few challenges. Due to the large masses being lifted, especially after the continued rains experienced during the headgear erection, ground conditions deteriorated more than anticipated and the urgent importation of dump rock to stabilise the ground was required. With the assistance of all parties involved, this was overcome and erection was completed one month ahead of schedule.

project team

Developer/Owner:
Wesizwe Platinum Limited - Bakubung Platinum Mine

Structural Engineer:
WorleyParsons

Quantity Surveyor:
WorleyParsons

Project Manager:
WorleyParsons

Main Contractor:
Louwill Bakgoni JV

Steelwork Contractor:
Louwill Engineering

Detailers/Detailing Company:
PCSA Structural Steel Detailers

Cladding Supplier:
Pierrecon Staal

Corrosion Protection:
BLM Corrosion Protection

Cranes:
Sarens SA

WATER RECOVERY GROWTH PLANT PROJECT

project team

Developer/Owner:
Sasol Technologies

Structural Engineer:
Thyssenkrupp PDNA

Quantity Surveyor:
Thyssenkrupp PDNA

Project Manager:
Thyssenkrupp PDNA

Main Contractor:
Thyssenkrupp PDNA

Steelwork Contractor:
Genrec Engineering

Detailers/Detailing Company:
Genrec Engineering

Cladding Supplier:
Bulldog Projects

The water recovery growth plant is for the treatment of effluent water within the Sasol works in Secunda. The project encompassed the supply of fabricated, painted and erected structural steel for pipe racks and supports from the main plant area through to the main building area of the plant.

The pipe racks consist of two and three tier pipe racks of varying heights with support structures for cable racks at the top. Varying type racks such as T-type and goal post structures approximately 3 metres in height were also required.

This was a fast track project in a Greenfield area under a tight erection schedule. In addition, the programme had to be revised so that erection could begin from the middle outwards instead of from the east to west as was originally planned. This of course necessitated a change in scheduling from not only the detailing, but the planned structural steel requirements.

Besides the pipe rack steelwork, support structures were required for the AD tanks that were supplied out of the USA. Due to the fact that this tank had to be assembled prior to the structural steelwork, the accuracy of the tank's support steelwork was critical to match the erection needs. The assembly of the steelwork within the AD tank was challenging due to the access within the tank with only one panel being left open for the steelwork's access. The 154 ton posts and supporting steelwork was installed simultaneously with the spider-like operation piping making the assembly process even more demanding.

Although the site was a Greenfield site, there were many challenges due to limited laydown areas and already built-up structures from the first phase project. This necessitated the continuous monitoring of available steelwork to enable swift erection and in the correct sequence.

All this work had to be carried out under the strict Sasol Technologies' "Safety, health and environmental specification for construction sites". In terms of adherence to these and other safety requirements, the steelwork contractor was awarded best contractor of the quarter on the site for their excellence in housekeeping and an accident free period.

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KUSILE POWER STATION: MATERIAL HANDLING SILOS

This project consisted of the structural steel roof closures to the six fly ash silos and two coal silos, with two staircase towers to the top of the coal silo structures at the Kusile Power Station.

The steel structure consisted of a variety of plate girder sections with continuous fillet welding and full penetration welds to the butt joints of the flanges and webs. Standard hot rolled sections were used for all intermediate beams. Bondeck was then placed on top to receive the concrete roof of the silos. The 262 tons were fabricated and galvanized to specifications and erected on site.

The first challenge was, how does the main contractor slide-cast a 15m round concrete silo to an accurate enough degree with pockets to receive the 1.6m high 18m long plate girder with very little room for error? Site measuring was essential for the large beams to fit exactly into the pockets as any site modifications were out of the question.

A specialised laser survey was done to clearly define the true shape of the inside of the concrete silo and the shape and size of each pocket.

This survey was then placed over the Tekla detailed model to see where modifications needed to be done. The steelwork contractor was very pleased in the end when every beam fitted perfectly as fabricated.

The galvanizing of the large plate girder sections was another challenge. The natural tendency of these girders with thinner webs and thicker flanges is to distort during the galvanizing process. But with the expertise of the galvanizer and the use of thermal blankets, closing the beams immediately after dipping and placing weights on top to allow slow cooling, ensured that the plate girders remained within their allowable distortion tolerances.

The erection of this structure seems basic on plan but when this needs to be done 40 metres in the air across an open silo it is not so simple. Clever use of sky jack cages to the inside of the silos and prefixed life line structures made this achievable for the safest erection procedure possible.

project team

Developer/Owner:
Eskom

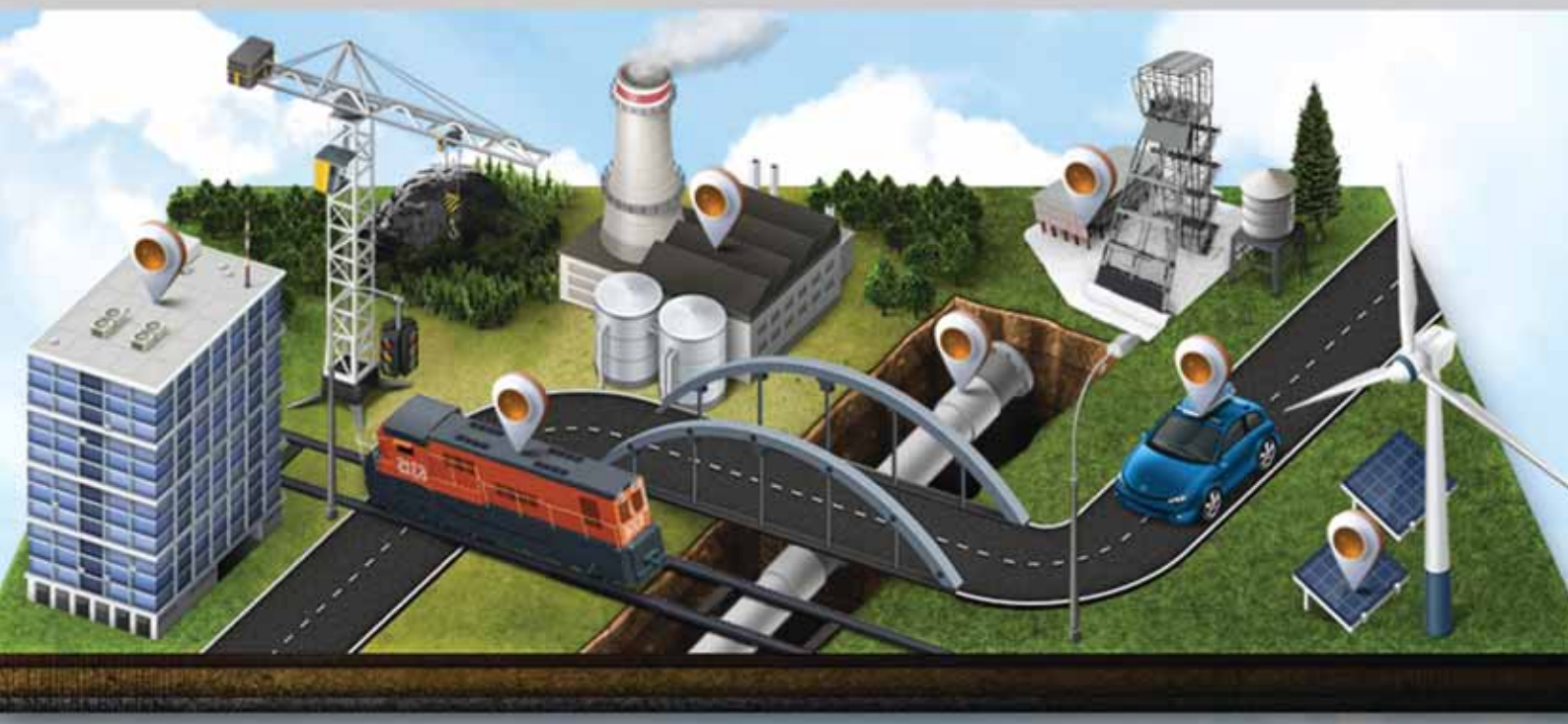
Structural Engineer:
PD Naidoo and Associates

Main Contractor:
Kusile Silos Joint Venture

Steelwork Contractor:
Ferro Eleganza (Pty) Ltd

Detailers/Detailing Company:
Ferro Draughting

Galvanizer:
Robor Galvanizers



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MEDUPI POWER STATION BOILER ISLAND

project team

Developer/Owner:
Eskom South Africa

Structural Engineer:
Hitachi Power Europe

Project Manager:
Hitachi Power Europe

Main Contractor:
Murray and Roberts Projects

Steelwork Contractor:
Genrec Engineering

Detailers/Detailing Company:
Genrec Engineering

Cladding Supplier:
Bulldog Projects

The boiler island consists of three structures, namely the boiler house, the bunker structure, and the air preheater structure, forming a composite structure built around the core of the unit - the main frame.

The boiler house structure measures approximately 46.5m x 46.5m and is constructed around the main frame. There are 24 floor levels starting at the 6m level rising to the 105m level. The mass of the boiler house steelwork is 7 435 tons. It is clad on its four perimeters and braced on all four sides with fabricated plate girders and box girders. Due to the large forces involved, many of the connections between bracing, floor beam and column necessitated intricate analysis. These connections required the use of grade 10.9 bolts and welding of the highest standard which was subject to stringent testing and inspection. The main columns are a variety of cruciform columns and box columns.

Attached to one side of the boiler house is the bunker structure which measures 15m x 50m and rises to a height of 63m to the top of the roof and weighs 1 455 tons. At the 48.75m level there are openings for five storage hoppers. These hoppers are supported on fabricated box girders all of which in turn are supported on welded cruciform columns which eventually transpose into welded box columns. The bunker structure is clad on three sides which are also braced vertically.

Attached to another side of the boiler house and at 90 degrees to the bunker structure is the air preheater structure. Measuring 25.5m x 46.5m with a height of 70.58m up to the roof and having a mass of 2 360 tons it was no less challenging than the boiler house and bunker structure. Similar to the boiler house there were floor levels starting at 6m and ending at 63m level. It is also clad and braced on three sides with substantial bracing systems. Rising from the roof is a large duct measuring approximately 13.3m x 15.5m which turns through 90 degrees and passes through the side of the boiler house before reaching the roof. This duct feeds the air to the boiler contained within the main frame.

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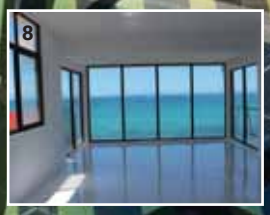


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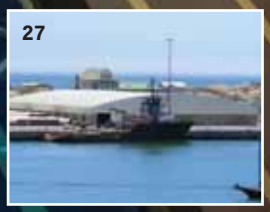
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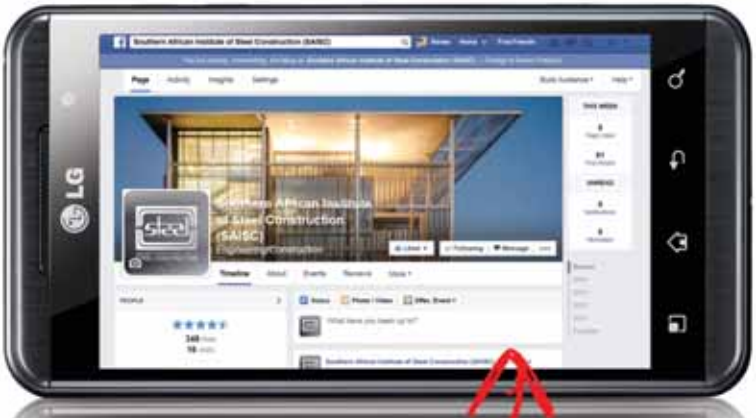

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INNOVATION IN THE SAISC

THE eTOOLKIT

By Amanuel Gebremeskel,
Development Engineer, SAISC

And so we explored the concept of writing a book that focusses on standards – arrived at from years of experience – and yet is versatile. The SAISC Connections eTOOLKIT is one such attempt. It bears all the versatile hallmarks of software but unlike structural programs is in fact a book that acts as a vessel for tacit knowledge.

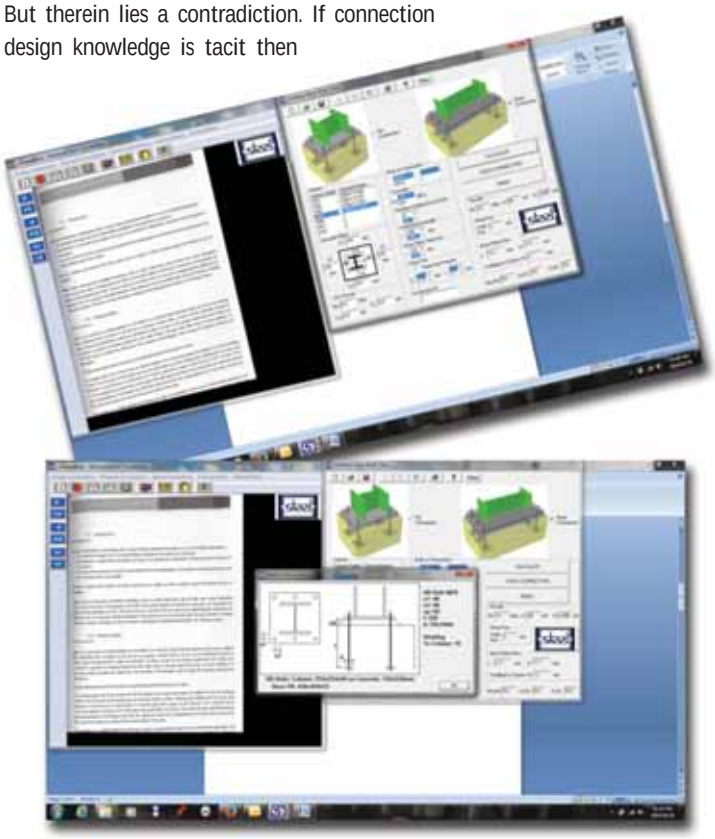
Every once in a while a product or service that people simply do not understand shows up on the market. If the people selling it have a good brand – one measure of credibility – then customers buy the item and hope for the best. A recent example of this is the iPad. It was never clear which market gap it was meant to fill, or how it was to be used. It confounded business school professors and marketing experts. And yet customers stood in line for hours waiting for its arrival.

Such products and services are examples of disruptive innovations. The term disruptive innovations "describes innovations that improve a product or service in ways that the market does not expect, typically first by designing for a different set of consumers in a new market and later by lowering prices in the existing market". A disruptive innovation can be contrasted with a sustaining innovation which "does not create new markets or value networks but rather only evolves existing ones with better value, allowing the firms within to compete against each other's sustaining improvements".

Within our industry one can think of the electric arc furnace as a disruptive innovation. Initially a low capital cost substitute for large steel mills in war ravaged Europe it is now a major source of structural steel products in the largest markets in the world. Light steel framing in South Africa is another more recent example of a disruptive innovation. It has revolutionised the housing market and is now poised to challenge larger structures.

It was clear to us that there was a gap in the market for good structural steel connection design resources. Structural engineering computer programs are very good at carrying out analysis and designing members utilising well established methods and equations presented in literature, codes and specifications. However they fail when it comes to designing systems that require unwritten tacit knowledge. That's why we went ahead and wrote a comprehensive Green Book.

But therein lies a contradiction. If connection design knowledge is tacit then



how is it possible to write about it successfully? One approach is to focus on developing standards based on the tacit knowledge rather than attempting to communicate the knowledge directly. But as is evident in the Green Book tabulated standardised connections can be very limiting for those who seek versatility.

And so we explored the concept of writing a book that focusses on standards – arrived at from years of experience – and yet is versatile. The SAISC Connections eTOOLKIT is one such attempt. It bears all the versatile hallmarks of software but unlike structural programs is in fact a book that acts as a vessel for tacit knowledge. It contains standardised connections that cannot possibly be presented in book format.

We believe the eTOOLKIT is a novel way of writing books. What we do not know is if it is a disruptive innovation – only time will tell. If our traditional industry absorbs it then it will have helped to evolve connection design to a higher level and we can consider it a sustaining innovation. On the other hand if it finds a home on the computers of technical professionals outside our traditional industry and then makes its way back to students, engineers and technicians in our industry then it will have been a disruptive innovation.

One day soon we hope a bright 'oke' will define what it is and it will be obvious that it should always have been defined as such. Either way it will have been an innovation indeed!

You can read more about and buy the SAISC Connections eTOOLKIT at saisc.co.za

CALENDAR OF EVENTS

SASFA INDUSTRY MEETINGS
Durban – 21 August
Cape Town – 30 October

VISITING ENGINEER PROFESSOR ROBERT DRIVER
University of Stellenbosch: 11 - 15 August
University of Pretoria: 18 - 22 August
Afternoon lectures to practicing engineers:
Cape Town: 12 August
Johannesburg: 19 August

WORKSHOP WITH ARCHITECTS
Johannesburg: 20 August, NASREC
Pretoria: 3 September, Pretoria Country Club

STEEL AWARDS 2014
18 September
Johannesburg – Emperors Palace
Durban – The Docklands Hotel
Cape Town – Kelvin Grove Club

POLASA – ESKOM WORKSHOP
22 September
Country Club Johannesburg

STEEL DAY
16 October

SAISC AND SUBSIDIARY AGMS
13 November
Country Club Johannesburg, Auckland Park

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STAINLESS STEELS IN STRUCTURAL APPLICATIONS

By John Tarboton,
Manager: Fabrication, Welding and Technical, Southern Africa Stainless Steel Development Association

Steel Construction decided to publish an article on that 'other' steel – stainless steel - since it would be of interest to our readers who are in the business of structural material. Our thanks to SASSDA for supplying the article.

Stainless steels have traditionally been specified in applications where the primary requirement is for corrosion resistance. However, since their invention over 100 years ago, stainless steels have also been recognised for other attributes such as durability, versatility, quality, sustainability, hygiene and aesthetic appeal. It is this combination of properties that has seen stainless steels become the material of choice in a wide variety of uses, from the utensils and kitchenware used to prepare food; in a range of applications in the transport industry; as process equipment in the food and beverage industry; for the manufacture of pharmaceutical products; in the medical field; through to very demanding applications in the chemical processing and power generation industries.

Widely accepted and being used to an increasing extent in architectural applications, stainless steels are now becoming more widely utilised in traditional structural applications, such utilisation often being driven by other features of stainless steel such as high strength, improved fire resistance properties and good impact resistance. Evidence of this trend can be seen with the introduction of stainless steels in structural design codes in South Africa, the United States, Australia/New Zealand, and Europe.

As a material group, stainless steels are made up of some 200 different primary grades with variants within individual grades adding to the mix. However, for structural usage in South Africa, there are three groups of stainless steel grades that would cover the vast majority of applications. These are the utility ferritic stainless steels, the austenitic stainless steels and the duplex stainless steels.

UTILITY FERRITIC STAINLESS STEELS

There are a number of utility ferritic stainless steels, but perhaps the most well-known and specified grade is 3CR12. 3CR12 was invented by Columbus Stainless in 1977. This steel is now certifiable to ASTM A240, UNS types S41003, S40977 or S40975. It is a 12% chromium steel, with the full chemical composition shown in Table 1. It has an atmospheric corrosion resistance of 150 times that of carbon steel and 30 times that of the zinc coating of galvanized steel. Even though the corrosion rate is extremely low (<2mm/yr), even in the most severe marine environments, it can form a brown patina. Thus, if aesthetics are important, consideration should be

One of the first big projects using 3CR12 was the railway electrification masts in Port Elizabeth, which went into service in 1982, and are still operating, at zero maintenance cost, some 30+ years later.

Grade	%C max	%Mn max	%P max	%S max	%Si max	%Cr	%Ni	%Mo	%N	Other
3CR12	0.030	1.00	0.040	0.030	1.00	10.5–12.5	0.30–1.50			Ti: 4x(C+N) to 0.6
304	0.07	2.00	0.045	0.030	0.75	17.5–19.5	8.0–10.5		0.10	
316	0.08	2.00	0.045	0.030	0.75	16.0–18.0	10.0–14.0	2.00–3.00	0.10	
2001	0.030	4.00–6.00	0.040	0.030	1.00	19.5–21.5	1.00–3.00	0.60	0.05–0.17	Cu: 1.00 max
2101	0.040	4.00–6.00	0.040	0.030	1.00	21.0–22.0	1.35–1.70	0.10–0.80	0.20–0.25	Cu: 0.10–0.80
2205	0.030	2.00	0.030	0.020	1.00	22.0–23.0	4.5–6.5	3.0–3.5	0.14–0.20	

Table 1: Chemical Compositional Requirements (ASTM A240M-12a)

given to coating 3CR12 or to using one of the higher alloyed stainless steels, as detailed below. In marine applications, some light pitting of 3CR12 is also possible, but in the CSIR atmospheric exposure programme, the maximum pit depth that was ever observed was 0.25mm. The main conclusion from this programme was that, from a corrosion resistance point of view, 3CR12 is suitable for use in any atmospheric environment in South Africa.

3CR12 has a minimum 0.2% Proof Stress of 300MPa, a minimum elongation of 20%, as shown in Table 2, and is tough even after welding and at sub-zero temperatures, down to about -30°C. Although not yet a commercial option, recent trial developments for structural applications, based on earlier laboratory research with this grade, has resulted in an enhanced minimum 0.2% Proof Stress of 460MPa being obtained while still retaining the minimum elongation requirement of 20%.

AUSTENITIC STAINLESS STEELS

There are two main grades of austenitic stainless steels that are important for structural applications, namely AISI 304 and 316, and the choice is dependent on the corrosion resistance required. These two steels have a minimum 0.2% Proof Stress of 205MPa, as shown in Table 2, but they have outstanding ductility with a minimum elongation of 40%. They are also exceptionally tough, even when

welded and remain tough, down to liquid nitrogen temperatures (-197°C) or lower.

AISI 304 stainless steel (UNS type S30400) is the most widely used stainless steel, commonly referred to as 18/8 or 18/10, both referring to the same nominal composition of 18% chromium and 8% nickel, as shown in Table 1. It retains its aesthetic appearance in most atmospheres, except those within 20km of the coastline or in severely polluted environments. If aesthetics are important in these environments, then 316 (UNS S31600) should be specified. This grade is similar to 304, except that it has a 2% molybdenum addition. This molybdenum increases the pitting resistance and the steel is thus suitable for marine and severely polluted atmospheric environments.

DUPLEX STAINLESS STEELS

Duplex stainless steels are roughly half austenitic and half ferritic in their microstructures. They have a minimum 0.2% Proof Stress of at least double that of austenitic stainless steels, such as 304 or 316, while maintaining good ductility with a minimum elongation of 25%, as shown in Table 2. They are tough, even when welded and this toughness is retained down to at least -50°C.

There are three types of duplex stainless steels that are relevant to the structural industry. Firstly, there are the lean duplex stainless steels. 'Lean' refers to the alloy composition, with these steels being designed to maximise cost competitiveness compared to the traditional duplex grades. The lean duplex stainless steels are still able to achieve a corrosion resistance similar to 304, with grades such as 2001 and LDX 2101®. 2001 (UNS type S32001) has a nominal composition of 20% chromium and 1% nickel, while LDX 2101® (UNS type S32101) has a nominal composition of 21% chromium and 1% nickel, as shown in Table 1.

Then there is 2304 (UNS S32304), also a lean duplex stainless steel, which has a nominal composition of 23% chromium and 4% nickel. It has general corrosion resistance and pitting resistance that is even better than 316 and is thus suitable for marine atmospheric environments.

Finally, 2205 (UNS32205) has a nominal composition of 22% chromium, 5% nickel and 3% molybdenum. It is a standard duplex stainless steel with very good general and pitting corrosion resistance. 2205 is suitable for even the most aggressive marine environment, except for seawater immersion applications.

Grade	Gauge (mm)	Rp0.2 min (MPa)	Rm min (MPa)	Elongation min (%)	Young's Modulus of Elasticity (GPa)
3CR12	t <3mm t ≥ 3mm	280 300	460	18 20	200
304	All	205	515	40	193
316	All	205	515	40	193
2001	All	450	620	25	200
2101	t ≤ 5mm t ≥ 5mm	530 450	700 650	30	200
2205	All	450	655	25	200

Table 2: Mechanical Test Requirements (ASTM A240M-12a).

Structural applications can take advantage of the high strength of duplex stainless steels and down-gauging becomes possible, depending on buckling and deflection constraints. In practice, this means that the cost of a structure made from duplex stainless steel can be significantly lower than if the structure had been made from an austenitic stainless steel of equivalent corrosion resistance.

Figure 1 shows which stainless steels would be selected for structural applications, depending on the environment, assuming aesthetics are important and no staining is acceptable. If aesthetics are not important, 3CR12 is suitable for all environments, from a corrosion resistance point of view. An indicative pricing is given, per ton, relative to galvanized steel.

CONCLUSION

3CR12 is suitable for any atmospheric environments, from a corrosion resistance point of view, provided that aesthetics are not important. For inland atmospheres, 304, 2001 or LDX® 2101 can be specified. Although the cost per ton of these two lean duplexes is more than 304, the down-gauging that is possible due to their high strength means that the cost of the structure can be lower. For marine applications, 316 or 2304 can be specified, with 2304 having significant cost benefits. If there is any danger of sea spray or splashing, then 2205 can be specified.

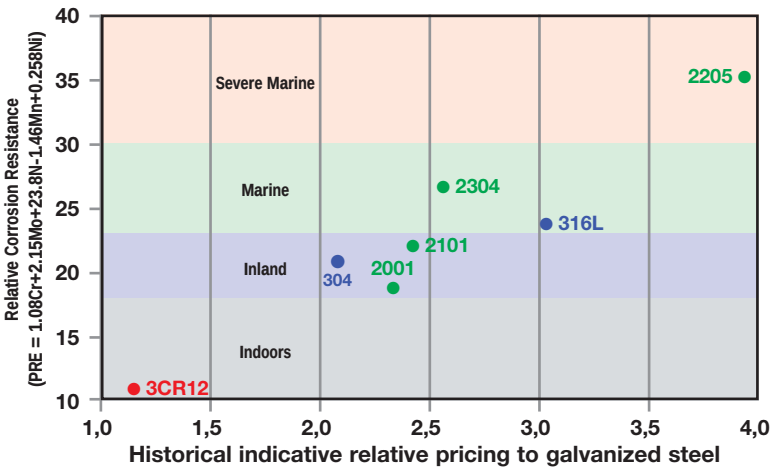

Figure 1: Selection of stainless steels where aesthetics are important.

SOCIAL SNIPPETS

By Marlé Lötter, Events Manager, SAISC

GOLF DAY (JHB)

21 May 2014 – The Royal Johannesburg and Kensington Golf Club (West Course)

Fine weather, great course, brilliant sportsmanship!

Competition results:

Winning team: Louwill Engineering – Manie Fourie (Host), Roland Brink, Juan Sliep and Ruhan Myburgh (Score: 100) *Prize sponsored by Babcock*

2nd place: Augusta Steel – Nico Erasmus (Host), Kevin Crossman, Trevor Marsh, Ruben Chinniah (Score: 94) *Prize sponsored by AVENG Steel*

3rd place: Macsteel Trading – Granville Rolfe (Host), Dennis Dedwith, Peter Smith, Dawie Vos (Score: 94) *Prize sponsored by Afrox*

4th place: Afrox – Hennie van Rhyn (Host), Pierre Boutel, Percy Jackson, Mervin Brandt (Score: 92) *Prize sponsored by SSAB*

5th place: Macsteel Services – Dave Dawkshas (Host), Nigel Provis, Ivor Galaun, Ric Snowden (Score: 91)

Best individual player: Dave Dawkshas, Team Macsteel – Score: 43 points

Nearest-to-pin on 5th: Roger Hammond, Team Macsteel Special Steels

Nearest-to-pin on 16th: Charles Emslie, Team Macsteel Coil Processing

Longest drive on 7th: Denli Struwig

Longest drive on 18th: Michael Spear, Team Tubular Holdings Prize sponsored by Macsteel

The SAISC proudly acknowledges all the event sponsors:

Macsteel – main sponsor / Absolute Gifts / Afrox / ArcelorMittal / AVENG Steel / Babcock / Genrec / Robor / SA Roofing / SSAB / Vital Engineering.

Event pictures and scores: All team scores and some pictures are available at www.siasc.co.za under Recent Events (or send an enquiry to marle@saisc.co.za).

Diary notice: SAISC Golf Day 2015 is provisionally booked for 6 May 2015 – same club and course!

ABOVE: The 2014 SAISC Golf Day champions of team Louwill Engineering receive the trophy at Royal Johannesburg as Braam Beukes of Tudor Engineering bows out on behalf of the 2013 winning team. Prizes for the winning team were sponsored by Babcock and presented by Gary Whally (not in the picture).

TOP LEFT: Dave Dawkshas of one of the eight teams of Macsteel receives the prize for the highest individual score from SAISC CEO, Paolo Trinchero. Incidentally, many years ago Dave was a key initiator of this event hosted annually by SAISC.

BELOW LEFT: The team of SCAW Metals included the only two lady players on the day. Here are Riana Viljoen (left) with colleague, Agaath Hazenberg and Paolo Trinchero of SAISC.

RIGHT: The team of Augusta Steel receives prizes for the 2nd best team on the day with a score of 94 from Hercu Aucamp (far left), on behalf of the prize sponsor AVENG Steel.

ABOVE LEFT AND RIGHT: Macsteel – main event sponsor of SAISC Golf Day 2014.

LEFT: Genrec and Vital Engineering took the opportunity of branding the carts and caddies respectively – utilising marketing platforms that pass every single green!

ABOVE: Action Bolt - The winning team of SAISC Golf Day 2014 in KZN, scoring 73 on the day.

RIGHT (TOP): 3rd place – Team Impact Engineering.

RIGHT (BOTTOM): 4th place – Team Churchyard & Umpleby.

BELOW LEFT: 2nd place – Team Avellini

BELOW RIGHT: 5th place – Team Rebcon Engineering.

SAISC GOLF DAY (KZN)

14 March 2014 – The Royal Durban Golf Club

The regional committee of SAISC in KZN has arranged and hosted another great golf day in Durban on behalf of the Institute. SAISC Head Office thanks the KZN Chairman, Sunthosh Balchund, also Alet Momberg, Don McLean, Paul Simpson and the rest of this energetic team.

Thank you also to the event sponsors who made this a very special day:

Action Bolt / Churchyard & Umpleby / Avellini Bros / Macsteel.

Congratulations to all the winning teams:

1st Place: Action Bolt – Donald Gasa, Anesh Pitamber, Jeffrey Komarsamy, Alex (Score: 73)

2nd Place: Avellini Bros – R Avellini, A Battaglia, R Avellini, S Avellini (Score: 72)

3rd Place: Impact Engineering – Mike, Pete, Fred, Shane (Score: 69)

4th Place: Churchyard & Umpleby – Mark Ferreira, Ryan Tully, Jimmy Villesariou, Louis Gontier (Score: 67)

5th Place: Rebcon Engineering – Warren Butler, Dough Stephenson, Michael Lynch, Craig Hampson (Score: 64)

BELOW: A small celebration was held at SAISC in June to wish Jenny Claassens, administrator of the SAISC School of Draughting, all of the best with the birth of her second little boy, who was born on 16 July. Jenny is supported here by two other 'Institute mommies', Renee Pretorius (left) and Tiana Ferreira (right).

ABOVE: SAISC School of Draughting students were fortunate to attend an Acid Mine Drainage site of Group Five in Germiston on 7 April 2014. This was a very educational site visit and the students learned a lot about the industry.

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