steel CONSTRUCTION

EDITOR'S NOTE

Humans need bridges. Here we talk about the tactile ones, but often humans need a bridge of words or a handshake to cross to the other side... Ok let's not get all philosophical and fuzzy.

Simply said:

A bridge is a structure built to span a valley, road, body of water, or other physical obstacle, for the purpose of providing passage over the obstacle. Designs of bridges vary depending on the function of the bridge, the nature of the terrain where the bridge is constructed and the material used to make it.

The first bridges were made by nature itself – as simple as a log fallen across a stream. The first bridges made by humans were probably spans of wooden logs or planks and eventually stones, using a simple support and crossbeam arrangement. *(www.wikipedia.org).*

We received a satisfying number of steel pedestrian bridge entries for Steel Awards this year, maybe symbolising a country still trying to unite a rainbow nation. Not all of them are covered in this Issue, but I am sure they will receive attention in the Steel Awards and future Issues.

Apart from bridges, Steel Awards delivered another record number of entries from big airports and stadiums to residential and refurbishing projects. And the support from our members in terms of sponsorship was once again astounding! See them all on page 37.

Also in this issue:

Tass Engineering has now become one of an elite set of local structural steelwork manufacturers to be certified to ISO 3834 part 3, Quality requirements for fusion welding of metallic materials (see page 15).

Spencer Erling concludes the articles from the Jeff Packer lectures and covers pre-qualified weld procedures for tube to tube welds. (see page 12).

steel CONSTRUCTION

VOL. 34 No. 3 MAY 2010

Contents

OFFICIAL JOURNAL OF THE SOUTHERN AFRICAN INSTITUTE OF STEEL CONSTRUCTION

Orange Farm pedestrian bridge.

Front cover sponsored by NJR Steel (see details on page 37)

PUBLISHED BY
Southern African Institute of Steel Construction
1st Floor, Block C
43 Empire Road, Parktown West
P O Box 291724, Melville 2109
Tel +27 11 726 6111
Fax +27 11 482 9644
E-mail: info@saisc.co.za
Web site: www.saisc.co.za

EDITOR
Reneé Pretorius
renee@saisc.co.za

ART DIRECTOR
Sandra Addinall
Tel +27 11 868 3408
Fax +27 11 900 1922
E-mail: cbtdesign@adcot.co.za

REPRO & PRINT
Camera Press
Tel +27 11 334 3815

ADVERTISING
Viv van Zyl
Tel +27 16 349 6839
Cell 082 492 8603
Fax 086 647 2788
E-mail: viv@lantic.net

SOUTHERN AFRICAN INSTITUTE OF STEEL CONSTRUCTION (SAISC)
Executive Director
Dr Hennie de Clercq, PrEng.
hennie@saisc.co.za

Education Director
Spencer Erling, PrEng.
spencer@saisc.co.za

ISF Director
Neels van Niekerk
neels@isf.co.za

SASFA Director
John Barnard
john.barnard@saol.com

CHANGES TO THE MAILING LIST:
Please notify us of any changes to the mailing list.
Tel.: +27 11 726 6111

SUBSCRIPTIONS:
To take out a subscription please telephone +27 11 726 6111

ANNUAL SUBSCRIPTION:
R100.00 South Africa
R200.00 Other countries
Prices include VAT, packaging and postage.

SAISC COMMENT

By Dr Hennie de Clercq, Executive Director, SAISC

QUALITY ASSURANCE – A COIN WITH TWO SIDES

Sometimes I marvel at the diversity of the steel construction industry in South Africa. There are large companies and very small ones (if you can weld and you can convince your wife or girlfriend to hold the other end of the piece of steel you are in business). There are companies that specialise in various types of steelwork – architectural, power line pylons, platework, very heavy structures, special structures for the mining industry, and many others. Many seem to have no focus at all.

But the weirdest diversity seems to be in the area of quality assurance, where things seem to vary from the ridiculous to the ridiculous, with a little bit of the sublime somewhere in between.

At the top end of the realm of quality lie the structures for which the consequences of failure are too ghastly to contemplate, and where there are international industry norms that have to be applied. Typically, the client bodies are very sophisticated and have international exposure, just like their engineers. Exhaustive contract documents, rules and guidelines determine exactly what has to be done to assure the expected level of quality. Nobody can even think of arguing against very strict quality requirements for these projects, or against the need to develop comprehensive documentary proof that the requisite levels of quality have been achieved.

The 'ridiculous' in this field comes in the first place in the form of requirements that have no bearing on the performance or reliability of the structure but are nevertheless strictly enforced. Endless hours are spent in the industry recording the presence of a few beads of weld splatter, marking their position, grinding them off, inspecting the result, and recording that they are gone. This happens even where the steelwork will not be painted, such as inside a box. Sharpness of edges, lengths of bolts and many other things get such excessive attention from inspectors, most often not because these things affect the quality of the steelwork but rather because they are easy to inspect. The whole inspection process is made more disruptive if the inspectors are just plain difficult, priding themselves in catching out the contractor and prone to walking away from the steelwork the moment they see the first semblance of a problem.

Another problem encountered where high quality standards are applied relates to the requirements for documentation. Our problem is not with the fact that documentary proof of the achievement of quality is required. But it is rather easy to design a system that is very complicated and laborious without providing any more certainty than a simpler system would give, and that's what we see from time to time. Sometimes the volume of paper competes with the volume of steel on a project.

But if we are concerned about the waste of time and money relating to excessive and senseless procedures at the high quality end, things are often really crazy at the bottom end. We find it amazing that some consulting engineers who would not think about letting a spade of concrete be cast without checking the reinforcing and requiring test cubes assume that steelwork will automatically meet minimum quality standards! Some of them don't even know what to look for with steelwork, or what tests to prescribe. They just trust the steelwork contractor, even the one with the girlfriend.

Now I guess we should regard such trust in our industry's standards of workmanship as a compliment, but that's not how things work. We surely see some poor welding, dimensional inaccuracies, holes too close to edges, and many other problems. We also see steelwork that's simply wrong, either because the designer made a mistake or because the contractor did not interpret his drawings correctly. And we see problems that occur because no person with a feel for structural behaviour and strength actually looked at the final structure in some detail and asked whether it will perform as required. Whichever way you think of it, it is an absolute requirement that there must be some solid quality assurance with any size or type of steel structure. In any case, the engineer has a legal obligation to do quality assurance and to ensure that the contractor does it.

I have discussed the problems at the two ends of the quality assurance spectrum, but we don't need to look at extremes. We can just make a general statement: all steelwork needs a decent amount of solid QA, exercised by knowledgeable people, and there must be documentary proof of it. SANS 1921-3 and SANS 2001-CS1 provide as much guidance and information as most people and most projects would need. The course on Best Practice for Structural Steelwork run by the Institute from time to time serves to equip engineers and steelwork contractors alike to implement appropriate quality assurance. We appreciate that there is still a need to train inspectors in QA of steelwork, and this is currently getting our attention.

STEEL AWARDS SPONSORS 2010

MAIN INDUSTRY SPONSOR

The Aveng Group: DSE Structural Engineers and Contractors, Trident Steel, Grinaker-LTA M&E and Steeldale
Contact: Kobus Marais
PO Box 68, Germiston, 1400
Tel: +27 (0) 11 871 4111
Fax: +27 (0) 11 871 4141
Email: kmarais@grinaker-lta.co.za
Website: www.aveng.co.za

T SQUARE SPONSOR (Table Toys/ Trimmings)

ArcelorMittal SA
Contact: Charles Dednam
PO Box 2, Pp 80300, Vanderbijlpark, 1900
Tel: +27 (0) 16 889 4110
Fax: +27 (0) 16 889 3487
Email: charles.dednam@arcelormittal.com
Website: www.arcelormittal.com

TUBULAR CATEGORY AWARD SPONSOR

The Association of Steel Tube and Pipe Manufacturers of South Africa
Contact: Colin Shaw or Margaret Olivier
PO Box 18587, Sunward Park, 1470
Tel: +27 (0) 11 823 2377
Fax: +27 (0) 823 2377
Email: astpm@astpm.com
Website: www.astpm.co.za

LIGHT STEEL FRAME AWARD SPONSOR

NJR Steel
Contact: Chris Kothe
PO Box 58337, Newville, 2114
Tel: +27 (0) 11 477-5515
Fax: +27 (0) 11 477-5550
Email: ckothe@njrsteel.co.za
Website: www.njrsteel.co.za

PARTNER SPONSORS

B&T Steel Construction
Contact: Bryan Wilken
PO Box 690, Delmas, 2210
Tel: +27 (0) 13 665 1914
Fax: +27 (0) 13 665 1881
Email: Marketing@btsteel.co.za
Website: www.btsteel.co.za

Bolt and Engineering Distributors
Contact: Mike Giltrow
PO Box 14190, Wadeville, 1422
Tel: +27 (0) 11 824 7500
Fax: +27 (0) 11 827 2314
Email:mike@bolteng.co.za
Website: www.bolteng.co.za

Cosira Group
Contact: John da Silva
P.O BOX 1390, Dowerglen, 1610
Tel: +27 (0) 11 817 6600 or +27 (0) 861 COSIRA
Fax: +27 (0) 11 817 6850 or +27 (0) 86 537 1730
Email: info@cosiragroup.com
Website: www.cosiragroup.com

Group Five
Contact: Wendy Grainger
PO Box 3951, Rivonia, 2128
Tel: +27 (0) 11 899 4600
Fax: +27 (0) 11 918 2902
Email: wgrainger@groupfive.co.za
Website: www.groupfive.co.za

Kulungile Metals Group
Contact: Vicus Meyburg
PO Box 995, Isando, 1600
Tel: +27 (0) 11 929 5000 or 0860 086 911
Fax: +27 (0) 11 929 5062
Email: Isando@kmg.co.za
Website: www.kmg.co.za

Macsteel Service Centres SA
Contact: Dave Dawkshas
PO Box 7729, Johannesburg, 2000
Tel: +27 (0) 11 871 0000
Fax: +27 (0) 11 827 1580
Email: Dave.Dawkshas@macsteel.co.za
Website: www.macsteel.co.za

Robor
Contact: Franco Mordini
PO Box 263, Isando 1600
Tel: +27 (0) 11 971 1600
Fax: +27 (0) 11 392 4435
Email: francom@robor.co.za
Website: www.robor.co.za

Tubular Holdings
Contact: Jorge Bonifacio
PO Box 1342, Bedfordview, 2007
Tel: +27 (0) 11 553 2000
Fax: +27 (0) 11 450 2160
Email: jorge@tubular.co.za
Website: www.tubular.co.za

MAIN INDUSTRY SPONSOR

T SQUARE SPONSOR (TABLE TOYS/ TRIMMINGS)

TUBULAR CATEGORY AWARD SPONSOR

LIGHT STEEL FRAME AWARD SPONSOR

PARTNER SPONSORS

CALENDAR OF EVENTS

KZN REGION – COCKTAIL FUNCTION

8 June 2010

The Blue Waters Hotel (Sundeck Room), Marine Parade, Durban

SASFA: COURSE FOR LIGHT STEEL FRAME BUILDERS

28 June 2010 – 7 July 2010

Durban

1ST INTERNATIONAL CONFERENCE ON STRUCTURES AND ARCHITECTURE

21 – 12 July 2010

Guimaraes, Portugal

www.icsa2010.com

SAISC COURSE: LIGHT INDUSTRIAL BUILDINGS

26 & 27 July 2010 – Durban

29 & 30 July 2010 – Cape Town

SAISC BREAKFAST TALK – KALTENBACH 5

5 August 2010

Country Club Johannesburg

SAISC COURSE: CORROSION PROTECTION

16 & 17 August 2010 – Durban

19 & 20 August 2010 – Cape Town

STEEL AWARDS 2010 – DINNER

15 September 2010

Johannesburg – Conference Centre, Emperors Palace, Jones Road, Kempton Park

Durban – Sun Coast Casino, Durban

Cape Town – The Vineyard Hotel, Claremont

STEEL STRUCTURES: CULTURE & SUSTAINABILITY

20 – 22 September 2010

Istanbul, Turkey

www.sscs2010.com

ARCHITECTURE ZA2010

22 – 27 September 2010

Johannesburg

www.saia.org.za

9TH PACIFIC STRUCTURAL STEEL CONFERENCE

October 2010

Beijing

Visit www.pssc2010.com for more info

SAISC KZN GOLF DAY

21 October 2010

Amanzimtoti Golf Club

SAISC, ISF & SASFA AGM

18 November 2010

13TH INTERNATIONAL SYMPOSIUM ON TUBULAR STRUCTURES (ISTS)

15 – 17 December 2010

Hong Kong

www.hku.hk/civil/ISTS13/

FOR MORE INFORMATION ON EVENTS VISIT OUR WEBSITE – www.saisc.co.za

ORANGE FARM PEDESTRIAN BRIDGE

Most South Africans have seen in image, or in real life, bleached bones lying in an African veldt. More specifically, the bones chosen as the iconography of the bridge would be that of the vertebrates – spine and ribs. The image is not unfamiliar in engineering terms as the spine on the bridge still maintains a load bearing function.

The erection of section 2 is in progress and almost complete.

POSITION AND PURPOSE OF THE BRIDGE

The construction of the Orange Farm Pedestrian Bridge project consisted of the construction of two concrete bridge abutments, a steel feature bridge spanning 65m over section 19 of National Route 1 at km 47.59 (±600m North of the Grassmere Toll Plaza) and pedestrian walkways directing the pedestrians towards the bridge.

A pedestrian bridge was required as residential areas had developed rapidly, on either side of the road. The majority of the establishment occurred without proper town planning and infrastructure provision. The result is that specific facilities such as schools, shops, churches and transport are only on one side of the freeway. Significant numbers of people crossed the freeway on a regular basis and a relatively high number of pedestrians were killed in road accidents.

A pedestrian count conducted in July 2005 indicated that 1 085 persons were crossing the road at the bridge site within a 12 hour period.

To enhance the 'spine and rib' effect of the bridge, the top chord and the side struts were painted white and the bottom chord painted grey.

Northern view of completed bridge.

ARCHITECTS' DESIGN OF THE BRIDGE

Given the context of the open veldt and footpaths on either side of the N1, the architect sought an image or idea that would not be foreign, but have some recognisable association to the users of the footpaths. Most South Africans have seen in image, or in real life, bleached bones lying in an African veldt. More specifically, the bones chosen as the iconography of the bridge would be that of the vertebrates – spine and ribs. The image is not unfamiliar in engineering terms as the spine on the bridge still maintains a load bearing function. The architect thought it important for the users of the bridge to believe that the bones are those of a snake – Njoka in African Mythology is a very powerful symbol, and a good omen, uniting the displaced communities of Orange Farm.

project teams

Client:

SANRAL

Architect:

Boogertman and Partners Architects

Project manager:

Kv3 Engineers

Structural engineer:

Kv3 Engineers

Main contractor:

iQNC Imagine Construction (Pty) Ltd

Steelwork contractor:

Omni Struct Nkosi (Pty) Ltd

The bridge is a steel single span feature bridge structure with a clear distance of 65m between abutments. The bridge is slightly curved and comprises of a triangular shaped girder made up of structural steel hollow sections. The curved frame has a large top central circular element (the spine). The V-pattern side struts are tapered from top to bottom (the ribs). The bottom chords consist of two circular elements, but smaller than the large top central circular element, and two channels. To enhance the 'spine and rib' effect of the bridge, the top chord and the side struts were painted white and the side rails and bottom chord of the bridge were painted grey, creating the illusion that, when viewed in the dark or from a distance, the side rails and bottom chord disappear.

The two bottom circular elements are spaced approximately 3.8m apart. Centred within this 3.8m width, two channels are placed at 2.5m for the walkway. The deck consists of 100 to 120mm thick slab cast on QC-deck. The bridge is enclosed with a galvanised steel mesh to a height of 2.4m on the sides. The mesh was galvanised and becomes almost invisible due to the grey colour of the mesh as well as the sensible placement of the laps of the mesh over the side rails.

Handrails, with a stainless steel top rail were supplied for the ramps and over the full length of the bridge. The minimum clearance between the road and the bridge soffit is 6.0m.

Two floodlights at the underside of the bridge, one at each end, together with four scissor masts, two at each end, were installed to illuminate the bridge.

FABRICATION AND CONSTRUCTION

The steel contractor made use of a 3D model, and as a results thereof, a lot of problems were identified before the bridge was actually fabricated and erected.

The structural steelwork was manufactured and epoxy painted in the workshop. The top and bottom chords of the bridge had different radii which made the structure quite complicated. The top and bottom chords were segmented in approximately 4.5 m lengths. The bridge was manufactured in two sections in the workshop (complete with the top and bottom chords, the tapered side struts and the bracing in the bottom chord level). These two sections were then cut into a total of 10 sections and transported to the paint workshop where three coats of paint (epoxy sealer, epoxy blast primer and epoxy undercoat) were applied.

The 10 sections were transported to the site and then assembled in the median. The top and bottom chords, and the side struts, had to be aligned perfectly before these sections were welded together. The segmented side rails were also fixed into position while the sections were assembled in the median. The final paint coat (semi-gloss polyurethane finish) was applied to the structure on site prior to the erection of the bridge.

On 12 and 13 September 2009 the bridge was erected (2 lifts were done) with a partial road closure. Traffic was deviated over the median. The first section lifted was over the N1 South. The section was supported on the bearings at the one end and supported at the other end in the median by a temporary support structure. The second section was then lifted into position and welded to the first. The welding of the top and bottom chords was done at elevated levels and under difficult conditions. The advantage of the use of welded connections was that with the welds properly prepared and ground, the connections seem invisible.

One of the ten sections in the paint shop after application of the first three coats. The final coat was applied to the structure prior to the erection of the bridge.

After the erection of the bridge, the decking plates were placed in position and the concrete deck casted. The works had to be protected to prevent concrete from falling onto the vehicles below.

RICARDO AVELLINI

NEW CHAIRMAN OF THE SAISC KZN REGIONAL COMMITTEE

Ricardo is very excited about his role as chairman and he sees the KZN Committee going from strength to strength. They will be more involved in the arrangements of all courses given by SAISC in Durban, as well as the annual Steel Awards banquet and KZN Golf Day.

Ricardo Avellini joins the exciting influx of young individuals in the steel construction industry. He has been appointed as the new chairman of the SAISC KZN Regional Committee. However, Ricardo is not a new face to the industry.

Ricardo is part of the third generation of the originally Italian Avellini's that settled in South Africa after World War II.

Their association with South Africa starts with Ricardo's grandfather. Aquilino was taken as a prisoner of war during the Second World War and brought to South Africa. In prison he acquired the skill of ironmongery. Once released, he moved to Durban and started a small iron and steel workshop in his garage, where he used scrap material for his projects. He decided that he needed some assistance to establish a business and went back to Italy to bring his other two brothers to South Africa.

Avellini Bros. was established in 1948 and registered as a company in 1952. Each of the original 'Brothers', Aquilino, Domenico and Mario had a son who stepped into their shoes. The second generation Avellini's – 'The Cousins' developed the company to what it is today. Ricardo's uncle, Pietro is managing director while his father, Len and other uncle Renzo are the two directors. They also made sure that their legacy does not end there for three of the cousins' sons chose to join the family business.

Ricardo is currently the contracts manager at the company, but he had to start from the bottom...

He matriculated in 1998 from Glenwood High School and completed his national diploma in Civil Engineering in 2001 at Natal Technikon (today Durban University of Technology). While working on site at Richards Bay, he completed his degree in Civil Engineering in 2005, also at DUT, under Greg Parrot. Since then, he has attended all the SAISC courses including the Design of Structures for Industry course in 2009.

As mentioned, his work experience started on the workshop floor. His grandfather insisted that he was not allowed in the office, before he knew how to do the basic work of a steelwork contractor and knew how a workshop works. He was promoted to the office as their shop detailer where he initially worked on AllyCad, and then in 2004 on AutoCad, the software that is still used today at Avellini Bros. His responsibilities involved shop drawings, site dimensions and the procurement of material.

In 2005 he was assistant to Rob Mylroie on the ICC extensions site, where Avellini was part of a JV with Churchyard & Umpleby, Impact Engineering and Redfab. There he learnt the tricks of the trade on how to manage a site, and in 2006 he was appointed as contract manager. His responsibilities include basic tendering, overseeing the shop detailing, and procurement of material. Furthermore he sees to it that all the paperwork is done correctly for the project, and manages the erection process on site.

The future for Ricardo is, hopefully for us, still here in South Africa. When asked if he will be the next MD of Avellini Bros. the answer was a shy maybe.

In 2007 Ricardo married Pauline Rougier-Lagane. He enjoys fishing and golf when not in the office. He is also an avid photographer.

His involvement in the KZN Regional Committee also came along the line of the Avellini connection. Pietro was involved in the committee from its inception but he resigned at the end of 2007. The committee needed a new steelwork contractor representative to replace him, and so Ricardo became a member of the committee in 2008.

During 2008 and 2009 the committee experienced some challenges to keep the ball rolling. All members have full time professions in the steel construction industry and volunteer their time to the SAISC's committee. During these busy construction times, running the committee became quite a difficult task. But Steel Awards 2009 was coming up, and the KZN members have been running their own show since 2003. They had to make a decision to continue with the committee or dissolve it. True to their fighting spirit, it was decided to go on with the show and give Ricardo the opportunity to be chairman. His appointment was announced at the hugely successful Steel Awards 2009 banquet at the Sun Coast Casino.

Ricardo is very excited about his role as chairman and he sees the KZN Committee going from strength to strength. They will be more involved in the arrangements of all courses given by SAISC in Durban, as well as the annual Steel Awards banquet and KZN Golf Day. The SAISC has recently appointed Lisa Smith to assist them on a part time basis with these arrangements.

The KZN committee will also host a cocktail party for existing members and potential members on the 8th of June 2010, to meet the committee and learn more about the benefits of being members of the SAISC.

Ricardo feels strongly about involving the other professions such as the quantity surveyors in the SAISC, to create awareness of the challenges and opportunities within the region's construction industry, and improve it to everyone's benefit.

With young enthusiastic people like Ricardo involved, Avellini Bros. and the SAISC have a fruitful future ahead of them.

John Barnard, SASFA director.

INSTITUTE PRESENTS TWO COURSES ON NEW SANS STANDARDS

By John Barnard, SASFA director

Registrations for the course came in from far and wide – from Gauteng, Durban, Nelspruit, Despatch, Cape Town, Angola, Nigeria and London! The course was oversubscribed – we could only accept 20 registrations - and we had to ask some applicants to wait for the next course.

SOUTHERN AFRICAN LIGHT STEEL FRAME BUILDING ASSOCIATION

The SA institute for Steel Construction and SASFA arranged two training courses to assist designers to come to grips with two new South African standards. Presented during March 2010 in Johannesburg, Durban and Cape Town, the two one-day courses covered the recently published SANS 517:2009 *Light Steel Frame Building*, and the yet to be published revision of SANS 10162:2 *Limit-states design of cold-formed steelwork*. The topics are related as the structural design of light steel frame buildings is carried out according to the cold-formed steel design code. The CPD-approved courses were well attended by especially design engineers in all three centres.

Lectures covering SANS 517 were presented by Anna-Marie Sassenberg (AMS Civil and Structural Consultants), Barend Oosthuizen (By Design) – both Design Consultant members of SASFA – and John Barnard (SASFA). They covered all aspects related to the design and construction of light steel frame buildings (LSFB) – from foundations to roof structures and insulation. Barnard gave attendees an overview of the rapidly growing light steel frame industry in Southern Africa, before introducing them to the typical components of and materials used for LSFB's. SANS 517 covers not only the steel structure, but also the cladding, lining and insulation of LSFB's. It is of interest to note that buildings built to SANS 517 will already comply with the energy efficiency standards laid down in SANS 204.

Barend Oosthuizen covered all the structural design aspects, from design actions through to design considerations for floors, walls and roof structures. Connections and the different types of fasteners were explained, as well as tolerances and structural bracing methodologies. Anna-Marie Sassenberg highlighted design considerations with regard to foundations. Due to the low mass of LSFB's, foundations can be designed for much lower gravity loads, which implies potential cost savings when compared with foundations for heavy masonry building. The engineer must however consider wind uplift in his design calculations!

At the Durban venue, Mr Patrick Swanepoel of Safintra Building Solutions sponsored the cocktail function after the course, and Global Specialised Systems KZN exhibited samples of the products they distribute for use in the light steel frame building industry.

The Institute of Steel Construction was very fortunate to be able to bring the world renowned Australian Emeritus Professor Greg Hancock to South Africa to lecture on the design of cold-formed steel structures to the Australian code AS/NZS 4600:2005.

Discussions at the exhibition table sponsored by Global Specialised Systems, KZN, during the course held in Durban.

This was deemed appropriate as the SA Bureau of Standards is in the process of adopting the Australian standard to replace the outdated SANS 10162:2.

Prof Hancock started off by introducing attendees to cold-formed steel design, and pointing out the changes that were effected in the 2005 revision of the Australian standard. He covered the different mechanisms for buckling of cold-formed steel members, before working through a design example of a simply supported purlin under negative loading conditions (uplift). He then introduced the 'direct strength method for design of cold-formed beams and purlins' which simplifies the cold-formed design methodology through the use of 'signature curves'. This was illustrated by working through another design example, this time of a cold-formed lipped channel column, illustrating the advantage of the use of the direct strength design method. He concluded his fascinating course by discussing various fastening techniques supported by the appropriate design calculations.

Attendees rated both the courses highly in all aspects, and felt that attending was well worth while.

From left to right: Prof. Greg Hancock, Dr Hennie de Clercq (Executive Director SA Institute of Steel Construction) and John Barnard (SASFA), during the courses presented at Emperor's Palace in Kempton Park.

The Institute has since obtained copies of Prof Hancock's handbook 'Design of Cold-Formed Steel Structures (to AS/NZS 4600:2005)' – the handbook as well as copies of the course notes can be ordered from the Institute - please visit www.saisc.co.za or www.sasfa.co.za for order forms, or phone Pamella at 011 726 6111 for additional information.

THE SAXON BOUTIQUE HOTEL SKYWALK SPIRAL BRIDGE

When Rob arrived on site he was met with a mini forest that was to be minimally disturbed while building the elevated walkway. Rob said that in the end it was a good thing he did not inspect the site beforehand – he might have walked away from an opportunity to build such a magnificent bridge.

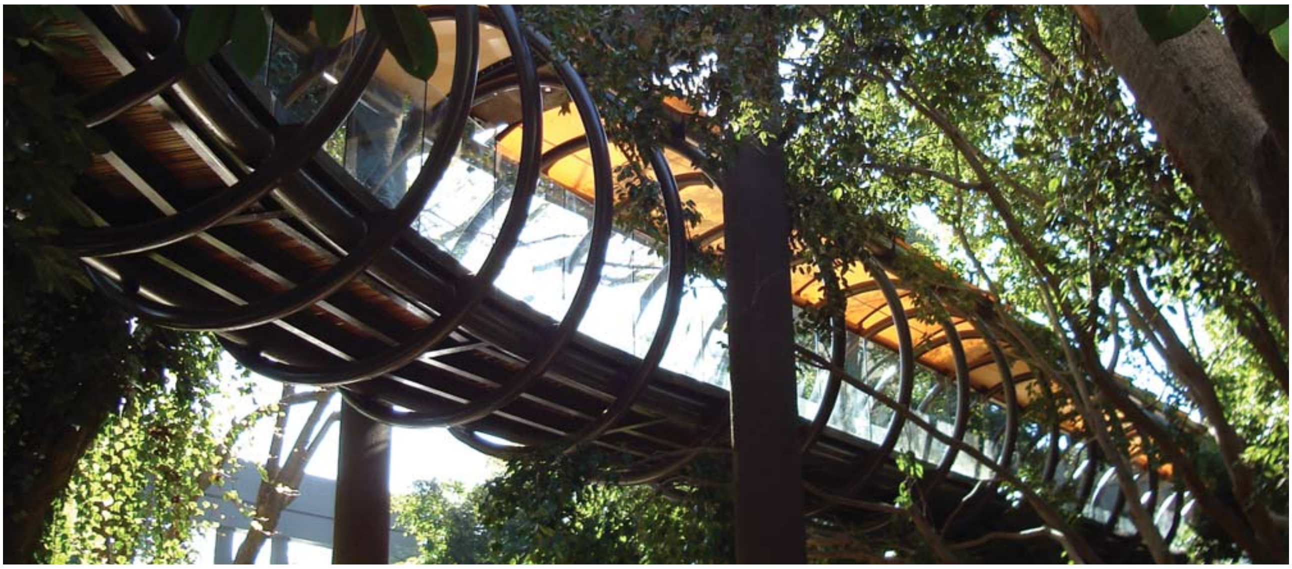
The bridge blends in with the established foliage of the Saxon Hotel gardens.

The Saxon Hotel, located in the leafy suburb of Sandhurst, is known for its exclusivity and elegance. The Soccer World Cup 2010 also inspired the Saxon, like most hotels in South Africa, to expand their facilities to be prepared for occupancy in June 2010.

Three ultra-luxurious villas situated in an indigenous forest were designed to be constructed on top of the basement parking garage at the southern side of the property.

These villas had to be linked to the main hotel and conference facilities and the solution had to be as unobtrusive and elegant as would befit the ambience of The Saxon while ensuring that the indigenous forest garden was not disturbed.

The client envisaged a spiral bridge winding through the foliage. The architect, Len Lategan of Pentagon Architects and the engineer Martin van Wyk put their heads together and designed a tubular spiral bridge spanning 76



The structure curves in various radii to form a snake-like pattern.

metres from the parking garage lift shaft to the lift at the foyer of the main hotel. The three villas are linked to the bridge and lift with timber walkways.

Brian Heineberg and Associates, the Project Quantity Surveyors for the Saxon Hotel firstly approached Rob Mylroie, managing director of Impact Engineering Gauteng to give them an idea of costs for a spiral bridge. The project then went out to open tender and Impact won the project.

After the tender opening one of the other tenderers called Rob Mylroie and asked him if he had had a look at the site before submitting his tender. His answer was no...

When Rob arrived on site he was met with a mini forest that was to be minimally disturbed while building the elevated walkway. Rob said that in the end it was a good thing he did not inspect the site beforehand – he might have walked away from an opportunity to build such a magnificent bridge.

Rowan Chislett, director of PSM (Precise Structural Modelling) was responsible for the detail drawings and there were quite a few challenges involved in the drawings.

His comments on dealing with them:

"In drawing a spiral bridge such as this one - not only are you dealing with the spiral aspect, but the structure curves in various radii to form a snake-like pattern. There is also a slope on a section of the bridge to contend with. The only way to produce accurate shop drawings is by using a 3D detailing package - we used Tekla Structures software.

The engineer's drawings were clear, although there were a lot of discussions between ourselves and Impact Engineering Gauteng to ensure that we could accomplish such a project that would satisfy the professional team from a visual and design aspect as well as the practicality aspect for obvious fabrication reasons.

When detailing complicated projects, communication between the shop detailers, the fabricators and the professional team is extremely important. Although we are located in Durban we still managed to achieve clarity in our communication by submitting numerous proposal drawings and snap shots of connections etc."

Glass handrails, timber treads and a canvas canopy compliment the spiral bridge.

The steel was rolled by General Rolling as partial circular segments and then welded together to make the tubular sections that would form the spiral.

20mm studs (threaded bar) were used to position the spiral connections at each of the four longitudinal main chord members. Sleeves were inserted into the tubular circular sections at these points and the circular sections were then twisted around the sleeve to form the segmented spiral. A jig for each different section of the bridge had to be made in the workshop to facilitate the fabrication process. Full penetration welds with backing sleeves were used at all the spiral and longitudinal tube joints while fillet welds were used on all other connections with stiffening gussets. The bridge sections were primed in the workshop and painted the special Saxon Green once erected on site.

Although the steel structure was fabricated in sections that could be transported as normal loads to the site, some of the longer curved sections could not be maneuvered through the imposing entrance of the Saxon Hotel. The solution was to lift these 13 metre sections with a mobile crane over the wall of the property onto a trolley which was then towed up the winding driveway to their erection location.

The sections were hoisted by crane onto temporary scaffold towers positioned along the bridges route through the trees and site-welded together once they were correctly aligned. Rob said the only way to ensure that the bridge was positioned and welded into place correctly while doing minimal damage to the trees surrounding it, was to use this practical approach.

The bridge has been fitted with timber treads and glass handrails. A canvas canopy is fastened to thin tubular rafters welded across the top chords of the bridge.

The bridge was completed in time for the opening of phase 2 of the project and the final landscaping will be completed in time for the World Cup. Impact Engineering Gauteng also fabricated and erected the two lift shafts at each end of the spiral bridge connecting the hotel lobby with the parking garage and luxury villas.

Rob concluded: "The project was not as difficult as first perceived and it was a great project to be involved in for Impact Engineering Gauteng."

project teams

Client:
The Saxon Hotel

Architect:
Pentagon Architects

Engineers:
MVW Consulting Engineers

Quantity Surveyor:
Brian Heineberg and Associates

Main contractor:
GIP Builders

Steel detailer:
PSM (Precise Structural Modelling)

FACT SHEET

Length of the bridge: 76 metres

Tons of steel: 27 tons

Radii of the spiral: 2.5 metres

SOCIAL SNIPPETS

By Marlé Lötter
Events Manager, SAISC

SAISC GOLF DAY SPONSORS

The winners of the SAISC Golf Challenge 2010, the alliance of Cosira International, received the prestigious trophy from SAISC Chairman, Molefe Kgomo, and brand new golf bags from Kobus Marais of DSE Structural Engineers and Contractors, who sponsored the prize.
From left: Hilton McCaulliffe (Macsteel), Molefe Kgomo (Scaffolding Services & SAISC Chairman), Brian Robertson (Cosira Group & Alliance host); Kobus Marais (Prize sponsor, DSE); Lorne Hayward (Cosira Group).

SAISC GOLF CHALLENGE 2010 – 21 APRIL, KILLARNEY COUNTRY CLUB (JOHANNESBURG)

The big question: *Would Louwill Engineering hold on to this prestigious trophy for a third(!) consecutive year?*

The other question: *Would the weather hold?*
The answer to the latter is, *'Thank goodness for the single sunny April day, amidst rather incessant rain on all the days before and after!*

We applaud our members for once again supporting the golf day with a full field of 30 fourball alliances. With the investment of our sponsors we were also able to succeed a great game with a highly social dinner. Our thanks to

We certainly attract golfers with attitude!

Michael Mamotte of Genrec (also SAISC Board member) for doing service as the Master of Ceremonies and to SAISC Chairman, Molefe Kgomo of Scaffolding Services for handing out all the prizes.

The prizes awarded included the following:

The Winning Alliance *(the answer to the big question above!)* – Louwill put up a tough act, but eventually had to concede the cup to the alliance of Cosira International with host Brian Robertson and team mates, Hilton McCauliffe (Macsteel), Scott Hollywood (Senet Projects) and Lorne Haywood (Cosira). Congratulations guys!

2nd Best Alliance – Louwill Engineering: Martyn Swanepoel (Host), Christoff Kuhn, M Simmonds, Juan Sliep

3rd Best Alliance – Group Five: Roux Terblanche (Host), Werner van der Berg, Donovan Carroll, Zander van der Linge

4th Best Alliance – Bulldog Projects: Mike Book (Host), Armand Labuschagne, Craig Fraser, Grant Boonzaaier

5th Best Alliance – Macsteel Service Centres: Dave Dawkshas (Host), Butch Bouwer, George Brandner, Dirk Steinberg

Michael Mamotte (Genrec, SAISC Board Member) was the Master of Ceremonies at the prize giving function.

6th Best Alliance – Macsteel Coil Processing: Tony Cooke (Host), Grant Leppan, R. White, Dietmar Krupke

7th Best Alliance – Vital Engineering: Johan Claassen (Host), Martin Thomas, Johan van Wyk, Andy Dunn

Nearest-to-pin on 4th – JR Brown

Nearest-to-pin on 14th – Patrick Smith

Longest drive on 7th – Logan Lofstedt

Longest drive on 18th – Juan Sliep

We proudly acknowledge the sponsors of the SAISC Golf Challenge 2010!

Macsteel: Holes 9 & 18

Trident Steel: Holes 1 & 14

PM Piping (division of Project Materials SA): Hole 4

B&T Steel: Golf balls and the prize for nearest-to-pin on the 4th

DSE: Towels, branding the carts and the prizes for the winning alliance

Vital Engineering: Branding the caddies

As ever so often we are also grateful for all the expert assistance of Ping Pong Communications in ensuring a great game for all.

Please visit the SAISC website for a selection of golf day pictures: *www.saisc.co.za – Main menu: News & Events – Events – Recent events - SAISC Golf Day - 21 April 2010 – Read more.*

Note that you could request a high resolution version of any of the pictures from our office – click on the picture and then send the picture title or the identification code you see to pamella@saisc.co.za.

So for next year …

PLEASE DIARISE 13 APRIL 2011, Houghton Golf Club*

* *Date and venue have been reserved, but are subject to final confirmation by end January 2011.*

'Eish, it was such a hard day at the office!'

A TALE OF TWO BRIDGES

HOW PEDESTRIAN BRIDGES TAKE SHAPE

Compiled by Spencer Erling,
Education Director, SAISC

There are two new footbridges, developed by the City of Cape Town, that cross Buitengracht Street which are conceived around two totally different requirements, one for permanent use to separate traffic and pedestrians, one just for occasions when there are events planned for the Cape Town Stadium.

This article summarises the journey bridge designers go through to arrive at a user friendly elegant cost effective solution that pedestrians want to use.

Have you stopped for a minute to consider what goes into the design of a foot bridge?

No it's not just a case of find the location, make the span long enough to clear the roads, do a few 'wl²/8' or similar structural analysis and design check calculations and "*hey presto! Job done!*" I guess bridge designers just wished it was 1/100th as simple as this.

There are two new footbridges, developed by the City of Cape Town, that cross Buitengracht street which are conceived around two totally different requirements, one for permanent use to separate traffic and pedestrians, one just for occasions when there are events planned for the Cape Town Stadium.

This article summarises the journey bridge designers go through to arrive at a user friendly elegant cost effective solution that pedestrians want to use.

BRIDGE 1: BUITENGRACHT STREET AND COEN STEYTLER

Town planning requirements

In the case of the Buitengracht bridge crossing at the Coen Steytler intersection the City of Cape Town found itself having to do a complete 'inner city review' to assess the impact of the Cape Town Stadium in Greenpoint and how to handle traffic and pedestrians expected to throng the area for a full house event. The findings of this study determined that there was a specific need to separate the pedestrian and vehicle traffic on the West side of Coen Steytler for the city bound traffic on a permanent every-day basis.

The human side of bridges

It's a well known fact that many of us (I am chairman of this club!) are very impatient drivers. But spare a thought for the tired pedestrian who has a road to cross... *Why should he climb up that long ramp/staircase just to cross the road? Why not just run for it? To hell with the danger to his life; to hell with the danger to the 'innocent driver' who does not expect to find a pedestrian running across and through the fast flowing traffic!* It is also probably a part of the 'lawless syndrome' that so many of us South Africans have dropped

The high side with glass cladding on the West side provides some protection from the wind and driving rain.

The walking surface is a mastic asphalt surface laid directly on the top plates.

into on the roads. Most of us drive faster than the speed limit, jump the odd red robot, don't stop properly at a stop street and, and, and...

So a critical factor in pedestrian bridge design is how to motivate/coax/force the pedestrian to use the longer, but infinitely safer bridge route. But then add the interests of the physically disabled for who there are only two possibilities of gaining the height to get up to the level of the bridge:

- A long gentle ramp
- An elevator. Of course it is impossible to provide enough elevators for all to use (have you used any of the underground stations in London where you have to use an elevator at peak time? If so, you know what I mean)

But then the young strong and fit person may not want to use a ramp – he wants a 'quick' staircase.

So, we have three choices of gaining the upper level, the decision of which of the three alternatives or combinations we choose to use can 'make or break' how successful a bridge is in terms of pedestrian usage.

The impact of the locality of the bridge

When we are trying to decide on which of the three access methods to choose the location of the bridge and its physical surrounds will often determine the layout of the structure and hence almost force the up/down access methods.

For example is there enough room at the end of the bridge to allow for a long gentle straight ramp, or enough width to allow for a curved or switchback ramp? In the case on the South side the answer is no – the gap between the existing hotels prevent a curved or switch-backed ramp and the fact that the popular North Wharf Square users (busy at lunch time) would not look too kindly on a long ramp cluttering their 'picnic spot'. In this case the designers opt for all three.

It must be obvious that the bridge must be high enough to accommodate normal traffic, but also the odd abnormally high vehicle. OK, you say, no real problem there – only if you ignore the possible/probable future completion of the Foreshore highway (remember that highway from Sea Point that just stop in mid air?). Sooner or later that will be continued to join up with... Hey guys, no one knows for sure.

A major exercise in the decision making process for this bridge relates to just where to and how that road will one day progress. The city really do not want to take down an enormously expensive pedestrian bridge because someone forgot to do a 'what if' exercise on that highway. In this case clearance between 5.6 and 5.9 metres has been created.

Even the possibility of an underpass tunnel has to be considered instead of the over pass bridge solution chosen. Just the enormously high capital cost and maintenance service costs, together with a perceived security risk ruled out this solution.

The physical constraints are now determining what solution will work

At last we are now actually able to come up with a structural form since we now know we need a ramp, some staircases, some elevator shafts etc. We also need to seriously consider the aesthetic form of this bridge, which is at a very high profile location and has a height restriction imposed by the future completion of the freeway.

- So no nice deep clad lattice girder or enclosed system for this bridge.
- For the same reason – no cable stayed or suspension solutions.
- Oops, we better look at safety issues... can't have a suicidal person jumping.
- What about lights at night? Another unique solution with LED lights built into the handrails.
- We will have some traffic watchers standing and staring at the vehicles below.
- What about the weather? As you know the wind can blow and the driving rain comes in from the North West.
- The need for a high side with cladding (glass) on the West side will provide some protection. But we do not need this on the East side?
- And then there are those things called foundations – complicated by underground parking between those hotels and reclaimed ground which does not have a great bearing capacity.

  The result is, when the garden material is removed from North Wharf Square, the new load on the existing parking garage columns does not exceed the previous load on those columns. On the reclaimed soil, large spread footings with low pressures were used. These footings were test loaded to determine settlement which was found to be minimal and well within the design expectations.
- Oh and by the way, what about the cost limitation and budget issues somewhere along the line?
- This is the time also to consider 'buildability' and minimum disruption to existing traffic flows.

The structural solution

An 'asymmetric' torsion box with an up-stand beam on one side, (almost an inflated L-shape lying on its side) made up from welded plate construction is the end result. The design has been done to BS5400.

The engineers provided an enormous amount of detail to ensure that the steelwork contractor could check and order each of the plates required to be supplied cut to exact shape. The various spans were then welded into short length boxes to be blasted and painted before delivery to site, where they were welded up into the required spans. In the case of the ramps the assembly process before welding was done on scaffold supports in situ.

The main span was welded up into one length and the correct shape on the island between the two road lanes and then hoisted into position by crane on a Sunday morning when the road was closed. All the curves are in fact a series of facetted straight shapes.

The designers opted for all three access solutions for the bridge – a ramp, elevator and staircase.

The design of this bridge had to be sympathetic to the backdrop of Table Mountain.

The 101m long x 4m wide bridge has a mass of about 120 tons. The stairs and lift shafts add a further 40 tons. The walking surface is a mastic asphalt surface laid directly on the top plates.

The paint specification is a shot blast with inorganic zinc rich primer, followed by two coats of micaceous iron oxide and a final decorative of acrylic polyurethane.

The bridge is expected to be ready for the 2010 World Cup events.

BRIDGE 2: BUITENGRACHT AND WATERKANT INTERSECTION

Town planning requirement

The finding of the inner city investigation mentioned above suggested the concept to convert Waterkant Street into a brick paved mall type road similar to the successful St Georges

Mall model in lower downtown Cape Town. When this plan is incorporated into the stadium requirements and the '1 mile fan route', it becomes obvious that for the event occasions it is important to grade separate traffic and pedestrians routes at Buitengracht Street to keep traffic flowing.

The impact of the locality on the bridge

On the North side of the locality stands the historic St Andrews Square whose ambiance should not be changed. On the South side the access would tail down to the brick paved Waterkant Street.

Because of the relatively few occasions this bridge is planned to be used, it was decided that at all times wheel chair users would be allowed to cross Buitengracht at grade level (i.e. no need for them to use the bridge).

In addition, another feature that makes this bridge different to the Coen Steytler bridge is the very important backdrop of Table Mountain. So any solution to this bridge needs to be sympathetic, and not impact on the backdrop. A slim elegant solution becomes most desirable. To complicate decision making, there is also a possibility that this may at some stage in the future need to be re-located.

project teams

Engineers
Vela VKE

Architects
Gapp Architects in conjunction with COA Architects

Coen Steytler Main Contractor
Vusela

Steelwork Contractor
ADM

Site Welding
SA5

Waterkant Bridge Main Contractor
Civils 2000

Steelwork Contractor
Union Structural

A straight staircase at each end supplies access to the bridge.

The structural solution

Once the need for ramps and elevators is eliminated the way forward is simplified into a two span solution with straight stair access at each end of the bridge. Cable stayed bridges in their very nature result in slim solutions. By the use of two sloping central towers, elegance is added to the bridge. The steel wire ropes have been imported from Germany and are coated with a 'galfan' corrosion resistant coating. Road clearance is 5.6 metres. The bridge is 4 metres wide with a mass of about 31 tons.

The construction method

The contractor opted to deliver the bridge in large units to site and site-welded them together into the structural elements required. This proved to be a relatively quick and efficient method.

The 4 550mm wide bridge consists of two rectangular hollow section edge beams with suitable connections incorporated into them for the sloping cable stay members. For the bottom of the anchors, thick domed plates are used in these connections which help in fatigue issues. Transverse beams join the edge boxes. Deck plates with longitudinal stiffeners, together with a composite concrete deck (to resist lateral service loads), completes the structural form. A macadamized walking surface finishes the bridge off for pedestrian use.

The stairs at the ends are formed from tubular stringers and tread pans bent 4 metres long welded to the stringers. The four pans are filled with asphalt. The ends of the decks were preloaded downwards before connecting to the stringers resulting in a lowering of the design stresses in critical areas so that the plates did not have to be thickened in these areas.

It is expected that this bridge which is an 'event' bridge has very little damping, so the mass of the bridge users will act as the damping and so one will feel some of the excitation of the loads if you stand still on the bridge. However, the movements will never be perceived as being alarming to the bridge user.

Once again this bridge will be ready for use for the World Cup events.

Tim Tasioulas, MD of Tass Engineering.

QUALITY – THE FIRST PRIORITY FOR TASS ENGINEERING

Tass Engineering has now become one of an elite set of local structural steelwork manufacturers to be certified to ISO 3834 part 3, Quality requirements for fusion welding of metallic materials.

This article first appeared in African Fusion March 2010.

Tass Engineering, a privately owned company specialising in the manufacture and installation of general purpose structural steelwork, has grown into one of South Africa's leading structural engineering companies. "From our headquarters in Spartan, our operations cover the entire country and the neighbouring states of Namibia, Botswana, Zimbabwe, Mozambique and the rest of Africa," says managing director Tim Tasioulas.

Initially established to manufacture lattice microwave communication towers for Telkom and Eskom, Tass Engineering now has considerable experience in private sector construction work and a number of leading architects, engineers, quantity surveyors, developers and construction companies are included in its client base. "We are building everything nowadays, in the commercial, mining and industrial sectors. We undertake steelwork to the specific requirements of our clients in factories, bridges, stadiums, warehouses, towers, satellite antennas, shops and shopping centres of any size. If it's made from steel, we make it," Tasioulas claims.

With the workshop area of over 12 000m^2, serviced by 12 overhead cranes, Tass Engineering is capable of handling the manufacture of up to 650 tons per month. "To support this volume of steel and to ensure speedy erection, we have 10 erection crews as well as several exclusive erection subcontractors, a fleet of trucks, trailers and 1 x 30 ton, 1 x 25 ton, 4 x 20 ton, 2 x 8 ton, 1 x 5 ton mobile cranes," he adds.

Key equipment includes: automated saws, a beam and an angle line for the automatic cutting and drilling of sections, a plasma cutting/profiling machine and plate rolls with a capacity of up to 30 mm. "We have a full in-house 3D detailing capability. Detailing is done here and then, after checking, we create CNC programmes and send these, along with a cutting list, to the relevant CNC machine. The saw, beamline, plate cutting machine and the angle lines are all completely automated."

Tass Engineering is currently engaged in a variety of high-profile projects including; Johannesburg's Bus Rapid Transit (BRT) stations, Gautrain stations, the Heineken Brewery, Ambatovy Nickel Mine in Madagascar, Klipspruit Coal Mine, Jwaneng Diamond Mine in Botswana and the road signage gantries for SANRAL.

Submerged-arc welding is used extensively and Tass Engineering is currently looking towards more modern power sources to help monitor and control continuous 24-hour welding to fabricate plate girder blanks for various projects.

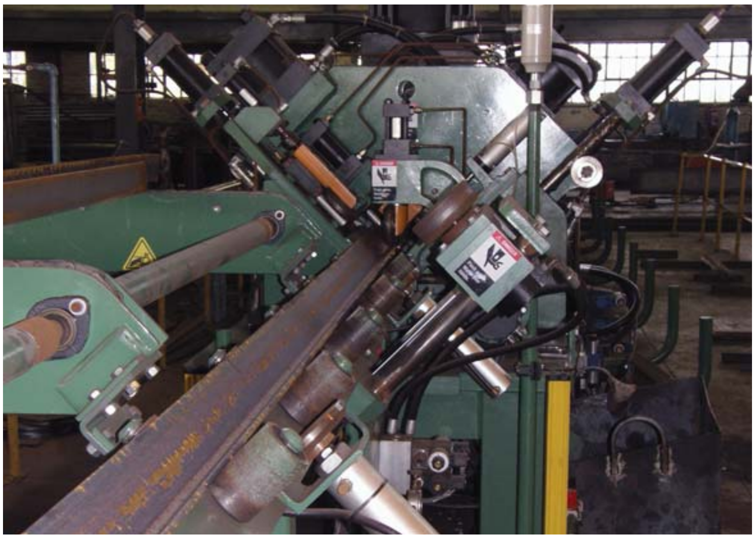
INDUSTRY NEWS

Quality is a first priority and stringent quality control is practised from manufacture through to erection and completion. "98% of our welding is done under the controlled environment of our workshop to minimise site welding requirements," says Tasioulas. Quality management and quality assurance systems are based on SANS/ISO 9000/2008, but, because welding is an absolutely critical part of its business, Tass Engineering has been quick to apply ISO 3834 part 3 to its manufacturing operations. "The reason that we went for ISO 3834 is that, ultimately, I believe it is going to become a given. In terms of weld quality, ISO 3834 will become the standard that everybody is going to have to adopt to win tenders for structural work in the future and we are among the first structural steel companies in South Africa to recognise this and to get certification," he adds.

"ISO 3834 will give our clients peace of mind and, as a consequence, the complexity of work that they can confidently contract to us will increase. It will definitely give us an advantage over those who haven't been certified," believes Tasioulas.

When asked about the impact on employees. "At first they were definitely negative, but once they saw the overall impact on product quality, it became a competition to see who was doing the best. It is important to note that, because of the traceability elements in ISO 3834, welders cannot afford to make mistakes, and so they are all taking much more care. They know that it will become much more obvious who is responsible for bad welds," he responds.

Due to the variety of work undertaken, the company has not chosen a highly automated welding route. Most of the welders use the GMAW process with solid wire and Argon/CO2 gas mixtures.



The automated angle line for the CNC cutting and drilling of detailed structural angle section.

"All employees are now more committed to producing quality work," he adds. "Every single weld done in this factory gets hard stamped, so if there is a problem, at any time or anywhere, the information on the stamp can be used to trace every detail of the weld; the welder, the wire used and its supplier, the base plate, etc, so we can always trace back to exactly why a weld went wrong," he explains.

This has resulted in much higher levels of responsibility and a significant increase in product quality. "Since the start of the process, we have appointed our own welding quality manager, a level II welding inspector, whose job is to manage all of the ISO 3834 processes. While we have always had an overall quality manager, we are now focussing specifically on weld quality, a critical process for the manufacture of structures."

In achieving certification, Tass Engineering found most of the basic systems for ISO 3834 to be identical to its ISO 9000 systems that were already in place. "We didn't have to implement a brand new system," Tasioulas confirms. "We simply had to add the additional welding focus, to make a quality system specifically suited to welding. All of the welding procedure specifications were upgraded, mostly because of the industry's material change from 300 WA to 350 WA. All the procedures had to be changed to allow for welding across the material spectrum; 300 WA to 300 WA, 300 WA to 350 WA and 350 WA to 350 WA, and all the welders were also retested accordingly," he says.

ISO 3834 improved the organisation, responsibilities and the understanding of tasks. "It is an all day every day quality system. There is a lot more buy-in now because welders understand the process better and they have a new sense of the importance of what they are doing."

Due to the variety of work undertaken, the company has not chosen a highly automated welding route. "We do a lot of submerged-arc welding, using Esab and Lincoln machines, and we are in the process of selecting a new high-tech sub-arc system. We are looking for a system that can store welding procedures and lock them away so that the welder can't adjust them. Also, we are looking to do much more continuous welding – plate girder welding for example, which will require

24-hour welding to fabricate the blanks – so we are going to be running night shifts and we want to monitor the welding continuously to enable us to determine productivity levels. A monitoring system will also enable us to see exactly what the welder has done in terms of welding procedures," he explains.

Most of the welders use the GMAW process with solid wire and argon/CO_2 gas mixtures. "We routinely weld 8.0mm and 50mm thicknesses and we no longer do any stick welding. All of our boilermakers are now coded to do tack-welding with GMAW. Since the change, we have found that the tack welding is much stronger and, as a result, fewer tacks are required," says Tasioulas.

The future? "We have experienced rapid growth, ever since 2000. We are about to embark on the Jwaneng mining project and we are probably going to be looking at producing around 6 000 tons this year. The economy won't be fantastic this year but we are expecting it to be better than 2009," he predicts.

In the longer term, Tasioulas expects infrastructural developments to continue, both in South Africa and Africa as a whole, long after the Fifa World Cup is over. "Africa's heyday will be upon us in the next 10 years. The world, led by China, is going to cluster around Africa in the next decade and we intend to be well placed to participate.

"Our company is on a permanent improvement drive. We improve one major aspect of our company every year, ISO 3834 being last year's project. We look to continually improve our processes, our outputs, the quality of our products and our delivery times," he concludes.

A Uni-bug III system is used to weld the seams of a box section.

Hence, the healthy order book and the very positive outlook.

ERRATA

RECENTLY LAUNCHED GRADE 355 TUBES – A COMPELLING ENGINEERING SOLUTION FOR MANY APPLICATIONS

By Franco P. Mordini – Chairman of the Technical Committee of the Association of Steel Tube and Pipe Manufacturers of South Africa

Some errors appeared in the tables in the article published in the March Issue *(Vol. 34 No. 2)* of Steel Construction on page 38. Steel Construction apologises for the oversight – please use the corrected tables below.

RELATIVE MASSES OF STRUTS

C_r = 800 kN		kL 3.0m			
	Profile	Radius of Gyration min (mm)	Mass Kg/m	Resistance C_f (kN)	Mass ratio
○	CHS 177.8 x 6.0	60.8	25.4	836	1.00
□	SHS 150.0 x 6.0	58.4	27.2	850	1.07
∟	200 x 200 x 16 Angle	39.4	48.5	1140	1.91
I	152 x 152 x 37 Universal Column	38.7	37.0	860	1.46
┼	100 x 100 x 10 Star Angles Strut	45.0	35.6	810	1.40
╨	150 x 90 x 12 Back-to-back Angles	36.9	43.2	833	1.70

Table 1: Relative masses of struts.

RELATIVE TORSIONAL STRENGTH

	Profile	J (10^6 mm^4)	Mass	Mass ratio
○	CHS 88.9 x 4.0	1.93	8.38	1.0
□	SHS 75 x 5.0	1.77	11.1	1.3
∟	200 x 200 x 24 Angle	1.80	71.1	8.5
I	533 x 210 x 122 I-Section	1.81	122.0	14.6
H	254 x 254 x 107 H-Section	1.75	107.0	12.8

Table 2: Relative torsional strength.

RELATIVE PAINT AREAS

		mm^2/m	Area ratio
○	CHS 177.8 x 6.0	559	1.00
□	SHS 150.0 x 6.0	600	1.07
∟	200 x 200 x 16 Angle	800	1.43
I	152 x 152 x 37 Universal Column	912	1.63
┘	100 x 100 x 10 Star Angles Strut	800	1.43
╨	150 x 90 x 12 Back-to-back Angles	960	1.72

Table 3: Relative paint areas.

RELATIVE WIND RESISTANCE

		C_f*		C_f x b	Wind resistance ratio
→○ (1)	CHS 177.8 x 6.0	1	1.20	213	1.00
→□ (1, 2)	SHS 150.0 x 6.0	1 2	1.65 1.60	248 339	1.16 1.59
→∟ (1, 2)	200 x 200 x 16 Angle	1 2	2.00 1.80	240 509	1.12 2.39
→I (1, 2)	152 x 152 x 37 Universal Column	1 2	2.10 1.80	319 273	1.50 1.28
→┼ (1, 2)	100 x 100 x 10 Star Angles Strut	1 2	1.75 1.62	420 275	1.64 1.07
→╨ (1, 2)	150 x 90 x 12 Back-to-back Angles	1 2	1.50 1.60	180 384	1.05 1.35

* Based on Tables 15 and 22 of the SABS 0160-1989.

Table 4: Relative wind resistance.

TUBE TO TUBE WELDS

PREQUALIFIED WELDS TO AWS D1.1.08

By Spencer Erling,
Education Director, SAISC

This is the second article on the tubular steel design course, Jeff Packer presented to some 175 candidates in February 2010. In this article Spencer covers pre-qualified weld procedures for tube to tube welds.

It may come as a surprise to engineers and fabricators alike that tube to tube welds are not just a simple 'all welds 6mm continuous fillet weld' that we so often see on drawings.

The fact of the matter is that when we weld a 'branch member' (a truss internal lacing) to a 'main member' (a truss chord), then depending upon where you are on the connection i.e. toe, heel or sides you will have different weld requirements and sizes to conform with an AWS prequalified weld *(see figures 1 and 2).*

This is also strongly influence by the angle between the branch member and the chord. For instance, consider a weld required in the toe region. For an angle in excess of 120° it will not be possible to do a fillet weld at all. It therefore becomes necessary to cut away the tip of the steel and to do a prepared weld *(see figure 3).*

Along the sides of such a weld, this is the simple part of the weld, and then it is usually possible to do a fillet weld of the given leg size.

However, in the heel area, AWS assumes that for small (acute) angles that it will not be possible to get a welding torch or rod right into the root of the weld and so it ignores the first 3mm (called the Z zone). It also specifies that to achieve the equivalent of a given leg length's weld strength, the weld needs to be 1.5 x the given size.

	Min L for		
	E = 0.7t	E = t	E = 1.07t
Heel < 60°	1.5t	1.5t	Larger of 1.5t or 1.4t + Z
Side ≤ 100°	t	1.4t	1.5t
Side 100 - 110°	1.1t	1.6t	1.75t
Side 110 - 120°	1.2t	1.8t	2.0t
Toe > 120°	t bevel	1.4t bevel	Full bevel 60 - 90° groove

Notes:
1. t = thickness of thinner part
2. L = minimum size (see AWSD 1.1 section 2.24.1.3 which may require increased weld size for combinations other than 36 ksi [250 MPa] base metal and 70 ksi [485 MPa] electrodes).
3. Root opening 0 in to 3/16 in [5mm] (see AWSD 1.1 section 5.22).
4. Not prequalified for $\phi < 30°$. For $\phi < 60°$, the Z loss dimensions in AWSD 1.1 Table 2.9 apply. See AWSD 1.1 Table 4.10 for welder qualification position requirements.
5. See AWSD 1.1 section 2.23.1.2 for limitations on $\beta = d/D$.
6. Ψ = dihedral angle.

Table 1. Fillet welded prequalified tubular joints made by SMAW, GMAW and FCAW.

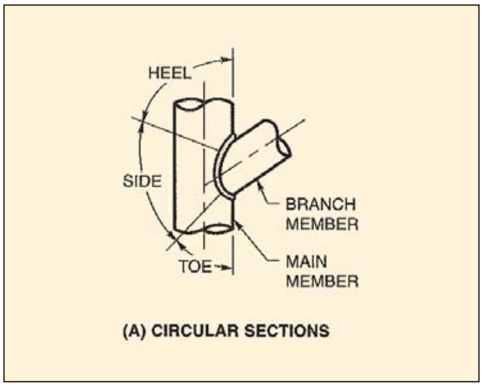


Figure 1.

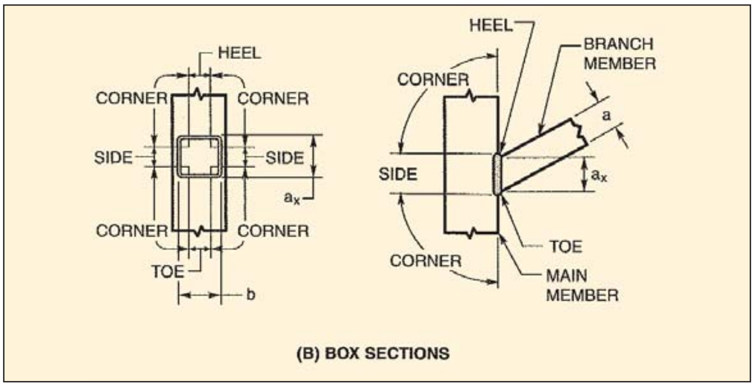


Figure 2.

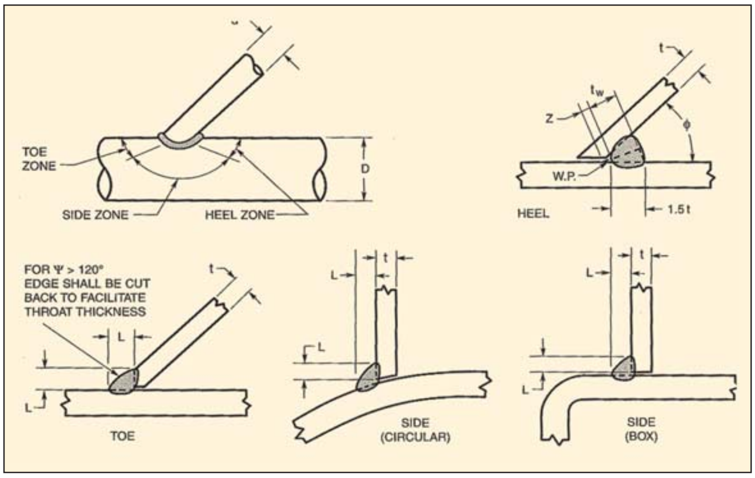


Figure 3.

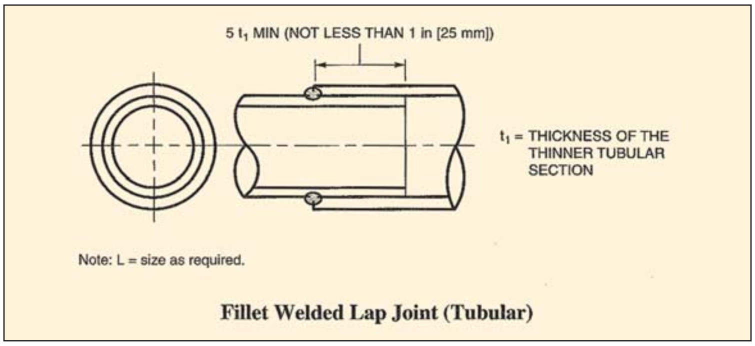


Figure 6.

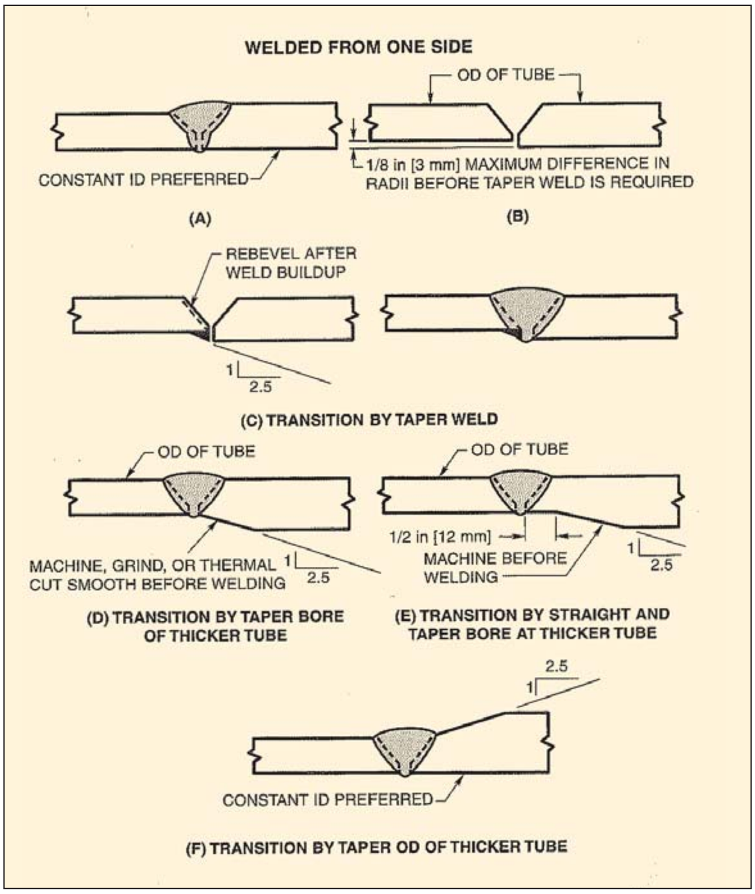


Figure 7.

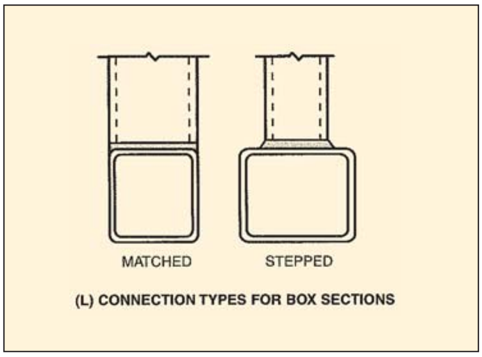


Figure 4.

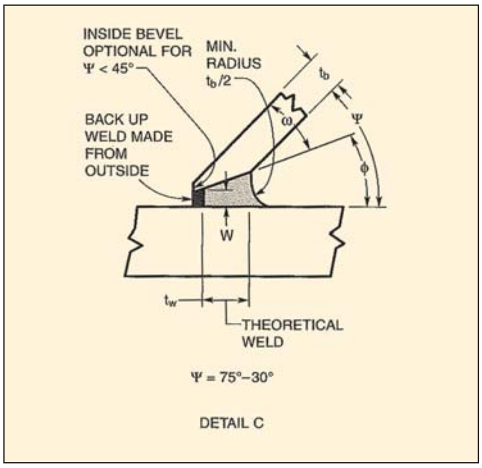


Figure 5.

As mentioned in the article about Jeff Packer's design course, as clearly depicted in the 'side (box)' sketch in *figure 3*, it is very important to land a rectangular lacing on the square portion of the chord box so that the welds do not get caught up in a radiused area and hence become a 'flared groove weld' which also has special requirements. But on the other hand, to eliminate secondary bending effects we would like the lacings to be as big as possible, but not to get close to the radius.

A matched set up *(figure 4)* would only be used for Vierendeel trusses (moment frames).

Table 1 summarises the requirements by AWS, by the size of the angle, for the increased leg length of welds to ensure the correct effective weld sizes are achieved. E is the effective weld size.

AWS does cover the requirements for complete joint penetration (full penetration) welds as well. In this instance, the weld in the heel area will always be a large fillet weld, as it is physically impossible to do a complete joint penetration weld.

AWS has specific requirements for fatigue related welds which emphasize the need for concave 'flowing surface' welds *(figure 5)*.

There are of course going to be transition zones between the sizes and the toe or heel areas. The requirements for these are well detailed in AWS.

WHAT ABOUT OVERLAP WELDS FOR TELESCOPIC TYPE CONNECTIONS?

I have only once in my career seen this called up on a drawing. It was a German design which provided for close tolerance fit between the smaller and the larger tubes, which turned out to be seriously problematic with our South African range of profiles.

But if you are ever faced with such a situation, AWS has been there before…*(figure 6)*.

JOINING TUBES OF DIFFERING WALL THICKNESSES TOGETHER

This is most likely to happen in long members where a change in wall thickness makes sense *(figure 7)*. This should not occur more frequently than at 6.0 metre centres (standard tube lengths) but can go out to 9 metre centres (usually also available).

So now all you engineers and contractors out there, unless you can get a welding engineer to produce a more user friendly (qualified) weld procedure, if you joining highly stressed members together, please consult AWS to ensure that you achieve your effective weld size.

You have been warned!

SASFA MEMBERSHIP

MAJOR MATERIAL SUPPLIERS

ArcelorMittal South Africa
Producer of steel
Hannes Basson
Tel 016 889 3189
hannes.basson@arcelormittal.com
www.arcelormittal.com

Brits Nonwoven
Producer of insulation products
Albert Hoenck
Tel 082 453 7977
alberth@brits.co.za
www.isotherm.co.za

Group Five Manufacturing (Everite)
Producer of fibre cement board
Annemarie Robertson
Tel 011 903 8049
arobertson@g5.co.za
www.everite.co.za

Saint-Gobain Gyproc SA (Pty) Ltd
Producer of gypsum board
Andre Schlunz
Tel 011 345 5300
andre.schlunz@za.bpb.com
www.bpbsa.com

Saint Gobain – Isover
Producer of insulation products
Andrew Scott
Tel 011 360 8200
Andrew.Scott@isover.co.za
www.owenscorning.co.za

OTHER MATERIAL AND COMPONENT SUPPLIERS

Avlock International
Fastener and equipment supplier
Mohamed Khan
Tel 011 917 2110
mohamed@avlock.co.za
www.avlock.co.za

Du Pont de Nemours
Manufacturer of weatherproofing membranes
Langa Nxumalo
Tel 012 683-5607
langalakhe.nxumalo@zaf.dupont.com
www.tyvek.com

Kare Industrial Suppliers
Distributor of fasteners
Reitze Hylkema
Tel 011 941 3170
reitze@kare.co.za
www.kare.co.za

United Fibre Cement Co (UFCC)
Distributer of fibre cement products
Leon Bekker
Tel 021 933 0052
leon@ufcc.co.za
www.ufcc.co.za

LARGE MANUFACTURERS

Circle Capital Developments
Profiler and assembler
Nokwazi Mlambo
Tel 011 463 5795
ncm@cicapglobal.co.za
www. icapglobal.co.za

Dezzo Roofing
Profiler and assembler
Brandon Harding
Tel 031 713 6571
brandon@dezzo.co.za
www.dezzoroofing.co.za

Stedone Hazycrest Projects (Pty) Ltd
Construction and profiler
Patrick Swanepoel
Tel 031 713 0737
patrick@stedonehazycrest.co.za
www.stedonehazycrest.co.za

Kwikspace Modular Buildings Ltd
Profiler and assembler
Cole Slabbert
Tel 011 617 8000
cole@kwikspace.co.za
www.kwikspace.co.za

Light Frame Homes cc
Profiler, assembler and builder
Schalk van der Westhuizen
Tel 021 982 6077
schalk@dicksonprojects.co.za
www.steelhomes.co.za

MiTek Industries SA (Pty) Ltd
LSF roof trusses
Richard Bailey
Tel 011 237 8700
richard@mitek.co.za
www.mii.com/southafrica

SA Steelframe Systems
Profiler and assembler of LSF & trusses
Johan Marais
Tel 082 450 0086
johan@steelframe.co.za
www.steelframe.co.za

Silver Falcon Trading 487 (Pty) Ltd
Manufacture LSF & brick force
Vernon Van Der Westhuizen
Tel 011 908 5250
vernon@silver-falcon.co.za

Siteform Framing
Profiler and assembler
Hendrik Fourie
Tel 051 446 0218
info@siteform.co.za

Vela Steel Building Systems
Profiler and assembler
Brent Harris
Tel 011 397 8742
brent@velasbs.co.za
www.velasbs.co.za

MANUFACTURERS

Inno Steel
Profiler and assembler
Len Lategan
Tel 011 794 5436
info@innosteel.co.za

InProfile 2000 P/L
Profiler and assembler
Wolfgang Neumann
Tel 011 908 1903
wolfien@mweb.co.za
www.inprofile2000.co.za

Mystic Blue Trading 334 (Pty) Ltd
Profiler, assembler and builder
Gordon Tidboald
Tel 031 461 8224
sfdrum@iafrica.com

Plusko 169 (Pty) Ltd
Profiler, assembler and builder
Frede Van Zyl
Tel 044 695 0237
info@steelframemosbay.co.za
www.steelframemosbay.co.za

Steeltek Systems
Profiler and assembler
Graham Smith
Tel 082 801 5346
graham@steelteksystems.co.za
www.steelteksystems.co.za

SERVICE CENTRES AND DISTRIBUTORS

Arcelormittal Construction South Africa
Technical solution for cladding, roofing and flooring
Thierry Poitel
Tel 011 268 2561
Thierry.poitel@arcelormittal.com
www.arval-construction.com

Bluescope Steel Southern Africa (Pty) Ltd
Manufacture TruecoreTM Steel
Wayne Miller
Tel 021 442 5420
Wayne.miller@bluescopesteel.com
www.bluescopesteel.com

Clotan
Steel service centre
Danie Joubert
Tel 016 986 8000
daniej@clotansteel.co.za
www.clotansteel.co.za

Clyde Steel
Steel service centre
Previn Thambi
Tel 011 363 1960
previn@clydesteel.co.za
www.clydesteel.com

Global Innovative Building Systems
Distributor of cladding and insulation materials
Tammy Bywater
Tel 011 903 7080
tammy@gissa.co.za
www.gissa.co.za

Global Specialised Systems KZN (Pty) Ltd
Distribute and manufacture insulations products and ducted air cons
Carole Tomkinson
Tel 031 468 1234
carole@globaldbn.co.za
www.globalsystems.co.za

Howick Ltd
Distribute and manufacture specialized roll forming machine
Craige During
Tel +64 09 534 5569/ 072 137 7865/ 083 547 9930
info@howickltd.com
www.howickltd.com

Metal Rollforming SA
Distributor of LSFB equipment
Dirk Moolman
Tel 028 316 1291
sales@metalrollformingsa.com
www.metalrollformingsa.com

Proroof Steel Merchants
Steel service centre
Charles Domingo
Tel 016 450 5800
charles@proroof.co.za
www.proroof.co.za

Scottsdale
Distributor of LSFB equipment
Steve Cullender
Tel 011 486 4195
scottsdale_sa@global.co.za
www.scottsdale.co.nz

DESIGN CONSULTANTS

AMS Civil & Structural Consultants
Structural design engineer
Anna-Marie Sassenberg
Tel 058 303 7223
ams@isat.co.za

By Design
Structural engineer
Barend Oosthuizen
Tel 021 883 3280
barend@bydesign.org.za

CG Structural Design Services
Structural engineer
Cassie Grobler
Tel 011 472 4476
cassie@cgsds.co.za

Entity Engineering
Structural engineer
Andrew Bull
Tel 011 462 8564
entity1@mweb.co.za

Hull Consulting Engineers
Structural engineer
Mike Hull
Tel 011 468 3447
hull@iafrica.com

Martin & Associates
Structural design engineer
Ian Upton
Tel 031 266 0755
ibu@martinjw.co.za

Molapo Projects
Structural engineer
Gert Visser
Tel 016 933 0195
gert@molapo.biz
www.molapo.biz

ASSOCIATE MEMBERS

AAAMSA Group
Promotion of fenestration, insulation and ceiling systems
Hans Schefferlie
Tel 011 805 5002
aaamsa@iafrica.com

CSIR (Built Environment)
National building research institute
Llewellyn Van Wyk
Tel 012 841 2677
lvwyk@csir.co.za
www.csir.co.za

FrameCAD Solutions Limited
Develop and supply end to end LSF
Matthew Day
Tel 00 649 307 0411
md@framecadsolutions.com
www.framecadsolutions.com

HDGASA
Promotion of hot dip galvanized steel sheet
Terry Smith
Tel 011 456 7960
terry@hdgasa.org.za
www. hdgasa.org.za

IZASA
Promotion of the use of zinc
Rob White
Tel 083 456 4989
robwhite@icon.co.za
www.izasa.org

European Light Steel Construction Association (LSK)
www.easysteel.info

National Association for Steel Framed Housing Australia
Ken Watson
kwatson@nash.asn.au
www.nash.asn.au

Pretoria Institute for Architecture
Institute for architects
Maureen Van Wyk
Tel 012 341 3204
admin.pia@saia.org.za
www.saia.org.za

Standard Bank
Provider of home loans
Johann Strydom
Tel 011 631 5977
Johanjj.strydom@standardbank.co.za

University of the Witwatersrand School of Mechanical Engineering
Educational
Kamil Midor
Tel 011 717 7358
Kamil.midor@wits.ac.za

BUILDING INDUSTRY

AC Group Holdings (Pty) Ltd
LSFB construction, ceilings & partitions
Johan Stoltz
Tel 082 411 0247
0825683011@vodamail.co.za

AMC Land Developments
Developer and builder
Trevor Abrahams
Tel 021 761 6943
trevora@amcld.co.za
www.amcld.co.za

Big Rigging Crew
LSF building
Henry Robinson
Tel 082 898 7693
henryr1@telkomsa.net

Blue Sands Trading 437 CC
Construction and manufacture wooden roof trusses, timber decks and solid doors
Pieter Scheepers
Tel 014 717 3600
pieter@foreverwood.co.za
www.foreverwood.co.za

Blue Water Property Investments
Developer and builder
Gert Engelbrecht
Tel 015 295 2018
bluewater@mweb.co.za

Castle Projects & Consultants
Builder of LSFB and project management
Rob Castle
Tel 032 946 2787
rob@castleprojects.co.za
www.castleprojects.co.za

Chad Construction
Builder of LSFB
Anton Coetzee
Tel 082 715 9411
Anton@chadcon.co.za
www.chadcon.co.za

Gecko Development Services
Developer and builder
Ryan Hesketh
Tel 083 324 5059
geckodevelopment@telkomsa.net
www.dirasteelhouses.com

Group Five Housing
Developer and builder
Paul Thiel
Tel 011 253 8833
pthiel@g5.co.za

Overberg Lite Steel Projects
Erector and builder
Basie Oelofsen
Tel 028 312 3047
henjac@telkomsa.net

SAFINTRA Building Solutions (Pty) Ltd
Construction/production of LSFB
Patrick Swanepoel
Tel 031 702 9683
patricks@safintra.co.za
www.safintra-buildingsolutions.co.za

Shospec (Pty) Ltd
Shopfitting ceilings, partitions and shop fronts
Bjorn Kahler
Tel 033 386 0100
bjorn@shospec.co.za
www.shospec.co.za

Silverline Group
Developer and construction
Charl Van Zyl
Tel 0861 001 177
charles@silverlinegroup.co.za
www.silverlinegroup.co.za

Steel Frame Projects
Builder of steel frame homes and trusses
Johan Venter
Tel 074 128 1840
johan@steelframeprojects.co.za
www.steelframeprojects.co.za

Steelworx Homes (Pty) Ltd
Residential builder
Keith van der Linde
Tel 011 465 2612
keithr@accoladepg.co.za

Tec Homes Construction (Pty) Ltd
Building/supply of LSFB
Schalk VD Walt
Tel 021 852 4237
schalk@techomes.co.za
www.techomes.co.za

Velocity Developments cc
Developer and builder
Stuart Grant
Tel 082 553 0987
stuartgrant@mweb.co.za