Fusion

Newsletter of the Southern African Institute of Welding

Nov/Dec 2014

SAIW
Southern African Institute of Welding

CERTIFICATION OF INSPECTORS ... PAGE 6

CERTIFICATION DINNER ... PAGE 8

AWARDS ... PAGE 12

EN 15085 for the Welding of Railway Vehicles and Components – a challenge for S.A. manufacturers and fabricators

SAIW recently hosted seminars on the "Development and Requirements of EN 15085 for the Welding of Railway Vehicles and Components". These seminars, held in Johannesburg and Durban on the 28th and 29th of October, were presented by Albrecht Hans from GSI-SLV, a division of the German Welding Society (DVS). Albrecht is regarded as one of the leading international experts on EN 15085, having 23 years experience with the implementation of EN 15085 as well as DS 952 and DIN 6700, both of which were the forerunners of EN 15085.

South Africa began certifying companies complying to the requirements of ISO 3834 seven years ago as per the IIW Manufacturer Certification Scheme operated by SAIW. EN 15085 has the requirements of ISO 3834 as a basis upon which it builds. EN 15085 is a product standard which in addition to the quality requirements, also defines the design, production, inspection, testing and documentation requirements. As a result of this, many of the generalised requirements of ISO 3834 are replaced with detailed specific requirements.

EN 15085 is presently not a European harmonized standard, i.e. not all European countries need adopt this standard. Conformance and certification of the manufacturer is either voluntary or a requirement of a national safety authority, however this could also be a contract requirement. The German Federal Railway Authority mandates that all railway equipment manufactured for Germany, must be manufactured by an appropriately certified manufacturer. Interestingly this requirement does not apply to Metro railway vehicles, presumably due to the lower speeds these trains travel at. As a result, the number of certified railway manufacturers in Germany is very high as can be seen from the table below. In fact Germany has more companies certified to EN 15085 than ISO 3834. China has also taken the reigns and is following with many Chinese companies being certified. Clearly this is in order for Chinese companies to access the European market and also to break the perception of inferior quality product from China and prove that Chinese companies can produce good quality products. EN 15085 is not only a standard for European based manufacturers, as

can be seen from the information in the table below, it is spreading worldwide with companies outside of Europe opting for certification. It is only a matter of time before this standard will be converted to an international standard similar to EN 729 evolving to ISO 3834.

Continued on page 2

EN15085 for the Welding of Railway Vehicles and Components

– a warning to S.A. manufacturers and fabricators

Continued from page 1

South Africa has all the building blocks in place to meet the requirements of EN 15085. We have the appropriate training and certification programmes in place. We are busy building state of the art power stations, wherein many of the requirements of EN 15085 are already being implemented. The difficulty may well be that for many of the companies that have traditionally manufactured components for railway applications, there is a big jump from their current quality level to that required by the European standard. If South African manufacturers can't meet the required standard, it is doubtful that the international original equipment manufacturers (OEMs) will put their name on inferior quality product and will then source these components from suitable overseas suppliers.

Germany has a strong manufacturing industry of which fabrication and welding are a significant portion. In order to support this, education of welding is of paramount importance in Germany and the welding industry offers attractive career prospects. Germany trains approximately 1000 Welding Engineers each year and has approximately 20 000 qualified welding engineers. Whilst South Africa significantly lags with the training of welding co-ordination personnel, we are making significant headway in training of Welding Engineers, Technologists, Specialists and Practitioners. South Africa has achieved much progress with the training of welding inspectors and the SAIW training programmes have achieved credibility both locally and internationally. Owing to these training programmes, we have many competent and experienced welding personnel that can support the railway re-capitalisation programme.

"EN 15085 REQUIRES THAT SUB-CONTRACTORS ARE CERTIFIED TO AN APPROPRIATE CERTIFICATION LEVEL. IN ADDITION THE RESPONSIBLE MANUFACTURER SHALL VERIFY WITH PERIODIC VISITS THAT THE SUB-CONTRACTOR IS ABLE TO ENSURE THE REQUESTED QUALITY PERFORMANCE OF THE PRODUCT AND THAT CONTRACTUAL REQUIREMENTS HAVE BEEN MET."

During the seminar, Hans covered the requirements of the series of standards in quite some detail. Due to the changing safety relevance of components and sub-assemblies, there are four certification levels (CL1 to CL4) to which manufacturers may opt to conform to EN 15085. The various certification levels are aligned with the three parts of ISO 3834 where comprehensive, standard and elementary quality requirements are described. As with ISO 3834, the welding co-ordination personnel are a key element of the standard. EN 15085 describes three levels of welding co-ordination personnel, namely welding co-ordinators with comprehensive technical knowledge (Level A), welding co-ordinators with specific technical knowledge (Level B) and welding co-ordinators with basic technical knowledge (Level C). The standard also details the level and quantity of welding co-ordinators required. Relevant qualifications for welding co-ordination personnel revolve around the IIW qualifications, namely International Welding Engineer (IWE), International Welding Technologist (IWT), International Welding Specialist (IWS) and International Welding Practitioner (IWP).

In the design requirements of the standard, weld performance classes are defined which are based on the safety and stress category of the weld, these need to be detailed in the fabrication drawings. The weld performance class will then determine the minimum weld inspection classes which detail the required Non-Destructive Testing.

Some of the attendees at the EN 15085 seminar

A key requirement of EN 15085 is the need for production weld tests. A sample sub-assembly is necessary to demonstrate the weldability and practicability of the design, as well as the validation of the welding conditions, skill of welders and to prove the quality of the welds.

Sub-contracts are dealt with quite differently compared to ISO 3834. ISO 3834 requires that the manufacturer appropriately manages the quality from its subcontractors. On the other hand EN 15085 requires that sub-contractors are certified to an appropriate certification level. In addition the responsible manufacturer shall verify with periodic visits that the sub-contractor is able to ensure the requested quality performance of the product and that contractual requirements have been met.

Like ISO 3834, traceability is not a mandatory requirement unless specified in the contract. However material identification and certification is required and it is recommended that state-of-the-art requirements are implemented, therefore traceability is recommended.

The seminar was well supported by South African industry with a good turnout of delegates. There was a good contingent from Transnet Engineering, who is the primary sub-contractor for the locomotives, and also inspection organisations were well represented.

Country – Companies Certified

Country - Europe	Companies Certified	Country – Non European	Companies Certified
Germany	928	China	393
Poland	165	India	18
France	143	United States	11
Czech Republic	135	United Kingdom	6
Switzerland	129	Canada	6
Austria	87	Korea	3
Italy	75	Japan	3
Other European Countries	Approx 400	South Africa	0

Year-end message from Jim Guild

It's hard to believe that this year is almost over. When you are busy time flies. But while being busy is obviously a good thing, there comes a time to take a step back and reflect on the year that has been in order to assess what was good and what could have been better and to learn from these things going forward.

On reflection, there is no doubt that 2014 has been a challenging year in South Africa from a business perspective. This is not only true for the Institute but also for all of business in the country. The root cause of this is the lack of economic growth which has significantly depressed the economy. In such an environment there are no jobs created, no new major contracts, no significant investment and every single aspect of business is affected.

In simple terms the key to the solution is to get the National Development Plan (NDP) going! This is an excellent overall infrastructural development plan for this country but what is missing is the action of implementing it. And now there is an added constraint - the poor economy itself! Encouraging private industry to spend would help but whilst government policies are not favourable to industry, it will not spend. I think that some sections of the government realise this but it's clear that at the moment there is no attempt to convince the electorate of the need for policy changes.

An economic CODESA, which has been mooted by a number of political commentators may be a useful tool in this process and could certainly be a start in removing the mutual lack of trust between Government and the private sector, each suspicious of the other's motives. For the sake of all South Africans this has to be resolved and I call on both parties to sit together and work things out in a mature and responsible way in order to unleash the enormous potential this country has to become the African powerhouse!

From the Institute's perspective although trading conditions have been tough, I think we can look back on 2014 with great pride. Anyone who was at the Awards and Certification dinners will have an inkling of what this Institute is all about – young vibrant people doing all they can to improve their lives through study and education and older people using improved qualifications to enhance career opportunities.

Jim Guild: SAIW Executive Director

It is always a moving experience to see the hundreds of graduates proudly receiving their certificates and also to be able to honour those who have given a lifetime of service to the Institute and the welding industry. In this regard I would like to single out Lorraine Lerato Montsho who, for a second time, won the honour of the best NDT student and also Robin Williamson, an ex-President of the SAIW who has given 30 years of selfless service to the Institute for which he was awarded the SAIW Gold Medal. Both are wonderful examples of what we are all about!

Finally I wish you all a peaceful and safe festive season and I look forward to another great year for you, the Institute and for South Africa as a whole.

Jim Guild

Young Welder on Track

The Young Welder 2015 competition is on track with more than 10 entries already accepted by the SAIW and about 20 still being assessed.

"We thoroughly scrutinise all the entries to ensure that the candidate will be able to do what is necessary to compete in the competition," says Young Welder project manager Etienne Nell.

He adds that entrants must be skilled in four welding processes – shielded metal arc welding (SMAW), gas tungsten arc welding (GTAW), gas metal arc welding (GMAW) and flux-cored arc welding (FCAW) – across carbon steel, stainless steel, aluminium or in their chosen material.

"We are delighted with the response so far and we will be doing all we can to ensure the highest possible standards within our local competition and, of course, to then prepare the winner for the WorldSkills competition to be held in Sao Paolo in August 2015," says Etienne.

In this regard Etienne says that the winner and runner-up will be trained in both the assembly and the welding of the projects in line with the WorldSkills blue-print and curriculum.

Continued on page 4

Young Welder on Track

Continued from page 3

"Whether South Africa will be successful in Sao Paolo depends a lot on the preparation before the competition and also on the enthusiasm and attitude of the competitor," Etienne says. "Our training will take both these aspects into account."

Meanwhile SAIW GM Operations, Sean Blake, says he is pleased that the welding industry once again rallied behind the Young Welder to ensure its success, particularly the FET colleges and Steinmüller. "The enthusiasm of those who are teaching the youth welding skills was palpable and most encouraging," he said.

He adds that there has also been an increased focus on marketing and promotion for the 2015 competition. "Using the theme 'Creating Employment: Skilling our Youth' our plans for a wide coverage of the competition in a range of media are coming together," he says.
The sponsors for the 2015 competition are: Abicor Binzel, Afrox, AFSA, Air Products, Arcelor Mittal, ESAB, Hulamin, Merseta, SASSDA, Thuthuka Welding and WASA.

For more information please contact Etienne Nell on 011 298 2100

AFNDT Participation at 11th ECNDT in Prague

The 11th European Conference on NDT was held at the Prague Conference Centre in Prague (Czech Republic) during the week of 5 to 10 October 2014. The conference was well attended with 1900 registered participants, 567 technical presentations, 162 international exhibitions as well as numerous ICNDT, ECNDT and ISO TC-135 meetings. Twenty two national and International NDT societies were present.

SAIW's Jim Guild and Harold Jansen represented the SAIW at the conference and participated in the different ICNDT and ISO TC 135 meetings. The ICNDT General Assembly was well attended with more than 30 countries represented. Jansen, also representing the African Federation of NDT (AFNDT) in his capacity as executive secretary, gave feedback to the General Assembly regarding the activities of the AFNDT. He also participated in the Qualification and Certification Workshop that was arranged on the Friday.

Jansen was elected as a member of Working Group 1 on Qualification and Certification and of the Working Group 2 on Education and Research.

SAIW Certification also committed itself, through participation with the SAQCC – Exam Panels, to provide additional questions to be vetted internationally and, if found acceptable, they would be added to the existing ICNDT Question Databank. SAIW Certification acquired this database during 2014 and shall implement it fully during 2015, resulting in all SAQCC examinations being based on the international recognised databank of questions.

Two important and useful documents were issued during the conference viz. ICNDT Guide for Qualification and Certification (Issue date: Oct 2014) as well as the EFNDT Guidelines: Overall NDT Quality System (Issue date Oct 2014), which should be available from the relevant websites.

The SAIW's commitment to global harmonization and service excellence is emphasised by its active participation on the various international (ICNDT), national (SAINT) and regional (AFNDT) non-destructive testing bodies. While the SAQCC-NDT scheme - for which SAIW Certification is the SANAS accredited 17024 certification body (PCB) - is recognised internationally, it is not one of the seven International PCBs currently registered with the ICNDT. However SAIW Certification has committed to registration under the ICNDT MRA agreement of 2013, and we hope that the registration shall be complete by end 2015.

In the SPOTLIGHT

Wiehahn Zylstra

IN OUR SERIES OF PROFILES ON PEOPLE WHO ARE MAKING A DIFFERENCE TO THEIR COMPANIES AND TO THE WELDING INDUSTRY GENERALLY, WE TALK TO WIEHAN ZYLSTRA, TECHNICAL MANAGER OF WELDING ALLOYS SOUTH AFRICA (WASA). WIEHAN MATRICULATED IN VEREENIGING IN 1988 AND WENT ON TO ACHIEVE A B. (ENG) MET FROM NORTH WEST UNIVERSITY AND B. (ENG) MET HONS FROM THE UNIVERSITY OF PRETORIA (UP) AS WELL AS AN MBA FROM NORTH WEST UNIVERSITY. HE IS MARRIED TO HIS "AMAZING WIFE AND BEST FRIEND" CHEREEN AND THEIR FAVOURITE PASTIME IS MOUNTAIN BIKING!

Fusion: How did you get into the welding industry?

WZ: Shortly after I left school I began working in the steel industry – making steel – which I did for 15 years. But, being inspired by an ex Dorbyl Welding Engineer, I developed a deep interest in metallurgy. In 2006 I joined AFROX and went to work at their welding consumables factory in Brits. It was a great advantage for me that this job gave me the opportunity to study Welding Metallurgy at UP and, on the practical level, to learn so much from John du Plessis and Jan Kaljee and the AFROX team about SMAW electrode production.

Fusion: When did you start at WASA?

WZ: I joined WASA in March 2010. Initially I worked in marketing and sales, which afforded me the opportunity to gain experience in business processes while getting to grips with the product and all the practical issues around the full marketing and sales mix from production to distribution and pricing to promotion.

Fusion: What products in particular were you responsible for?

WZ: Initially I was responsible for both the INTEGRA products (chrome carbide overlay plate and wear components) and welding consumables. While my responsibilities were classical marketing and sales they also included a deep involvement in quality control. Then, at the beginning of 2011 we split the marketing and sales responsibility into two departments - namely INTEGRA and Welding Consumables. In April 2014 I was given the opportunity to focus more on the technical aspects of our products and I took up the position of Technical Manager. I am still, however, very involved with the marketing and sales of our welding consumable products.

Fusion: What do you feel about the local welding industry?

WZ: In general, while I am very positive about the local welding industry, we need to be aware of the many challenges facing the industry. In my opinion there is no doubt that the main challenge SA is facing is the lack of properly trained or skilled artisans – and of course this includes welders. If we compare the South African welding industry - and, in fact the entire African welding industry – to Europe, for example, it is obvious that we are far behind in terms of the level of skills available. Now, while there is a move to uplift our welding training infrastructure – especially from the SAIW, which is doing a great job - the entire industry needs to do more. And not only the industry! The government has to come to the party in providing the necessary environment, and funds, for more young people to become skilled in welding. In addition we have to continue to fight relentlessly for a world-class level of pride and perfectionism in the work we do as an industry and the product we deliver.

Fusion: What do you feel about the business environment in general in RSA?

WZ: Here, unfortunately, I am a little concerned. I have already spoken about the dangerously low level of skilled personnel, which is applicable to all industries, not only welding. But there are a lot more issues affecting our ability to do business like, for example, labour issues, poor leadership at government level etc. These affect our productivity and cost competitiveness and, in our global economy, where we are competing against the world for work, this has disastrous consequences. BUT, where there are challenges there are also opportunities and we must continuously look out for these and, above all, we must remain positive. I believe that if you do not grow and adapt, you die! And growing with the times in a positive, energetic way is all about attitude. That's the one thing we all can control!

Certification of Welding Inspectors to be introduced from January 2015

As we highlighted in the Fusion issue of December 2013 industry representatives have been advocating the need for a certification programme for welding inspectors. Safety and profit depend on technical control of welding operations. Key staff in all welding related activities need to have an appropriate level of competence in the application of welding technology. This is increasingly a contractual requirement and a trend which is expected to increase even further as new standards come into force and as purchasers incorporate such requirements into specifications. ISO 14731 'Welding Coordination Tasks and Responsibilities' is an example of a standard with requirements for a manufacturer to demonstrate the competence of employees. ISO 14731 is a reference standard for SANS/ISO 3834 – *Quality requirements for fusion welding of metallic materials* which has increasing importance for the welding and fabrication industry. ISO 3834 and ISO 14731 form the basis for product standards such as EN 15085 – Welding of Railway Vehicles and Components and EN 1090 – *Execution of Steel Structures and Aluminium Structures*.

A certification scheme provides a way to assess and recognise job competence. It defines the profile of education, knowledge, experience and responsibility required for a range of welding tasks and provides a professional assessment procedure. Certification is concerned with current competence, rather than historical attainment, so periodical renewal of certification is required.

Personnel certification has three main objectives:

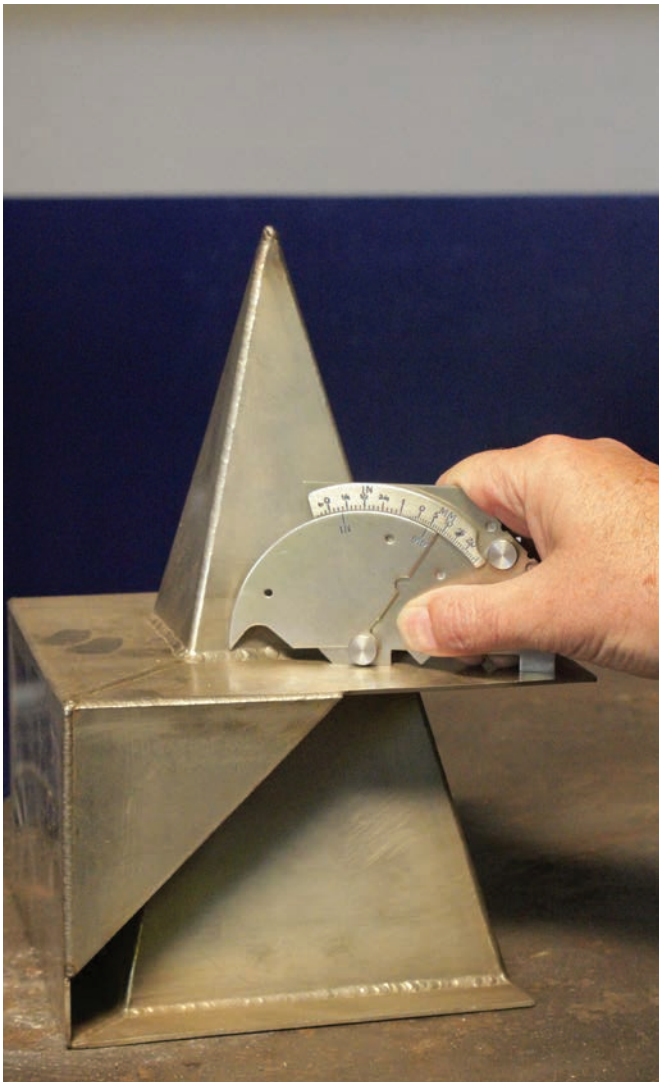
- Testimony that the applicant has demonstrated the appropriate level of knowledge and skill in welding inspection at a point in time.
- Ensuring the applicant has been working satisfactorily on specified welding inspection tasks and has exercised specified responsibilities appropriate to the level of certification over a reasonable period of time prior to certification.
- Verifying that the applicant is keeping up to date with welding and inspection technology and maintaining and developing his or her knowledge base.

In January 2015 SAIW will launch its Welding Inspector Certification Scheme. It is intended to align the scheme with IIW requirements but until such time as IIW introduces an IIW Certification programme for inspectors it will simply follow the current IIW guideline for bodies certifying welding inspectors. The scheme will be incorporated into the scope of SAIW Certification's SANS/ISO 17024 accreditation during the course of next year.

BRIEF DETAILS OF CERTIFICATION REQUIREMENTS

Initially there will be only two categories of certified personnel:

- **Certified Welding Inspector – Comprehensive**
- **Certified Welding Inspector – Standard**



The requirements for certification will be as follows:

Demonstrable Knowledge and Skill

The mandatory qualification requirement is as shown below.

Certification Title	Qualification Required
Certified Welding Inspector – Comprehensive	IIW International Welding Inspector – Comprehensive
Certified Welding Inspector – Standard	IIW International Welding Inspector – Standard

Experience and capability

An applicant for certification is required to have:

- A minimum of two years' experience in the three-year period prior to certification which demonstrates successful application of knowledge and skill in welding inspection at the appropriate level.
- Evidence of scope of experience at the appropriate level. *(a guidance list of the type of activities forming part of an inspectors job will be provided)*

Continued on page 7

Certification of Welding Inspectors to be introduced from January 2015

Continued from page 6

Maintaining and developing knowledge

Applicants and existing certified persons are required to demonstrate that they are maintaining and updating their knowledge relevant to the areas in which they practice i.e. they are practicing continuing professional development. *(Examples of the types of activities which can be included as evidence of CPD will be provided.)*

Comprehensive details of the certification scheme will be published on the SAIW website in the next few weeks. Welding inspectors working as IPEs will already be very familiar with scheme requirements and it is important to appreciate that the information used for renewal of IPE certification will also be suitable for renewal of welding inspector certification so there will be no need for duplication.

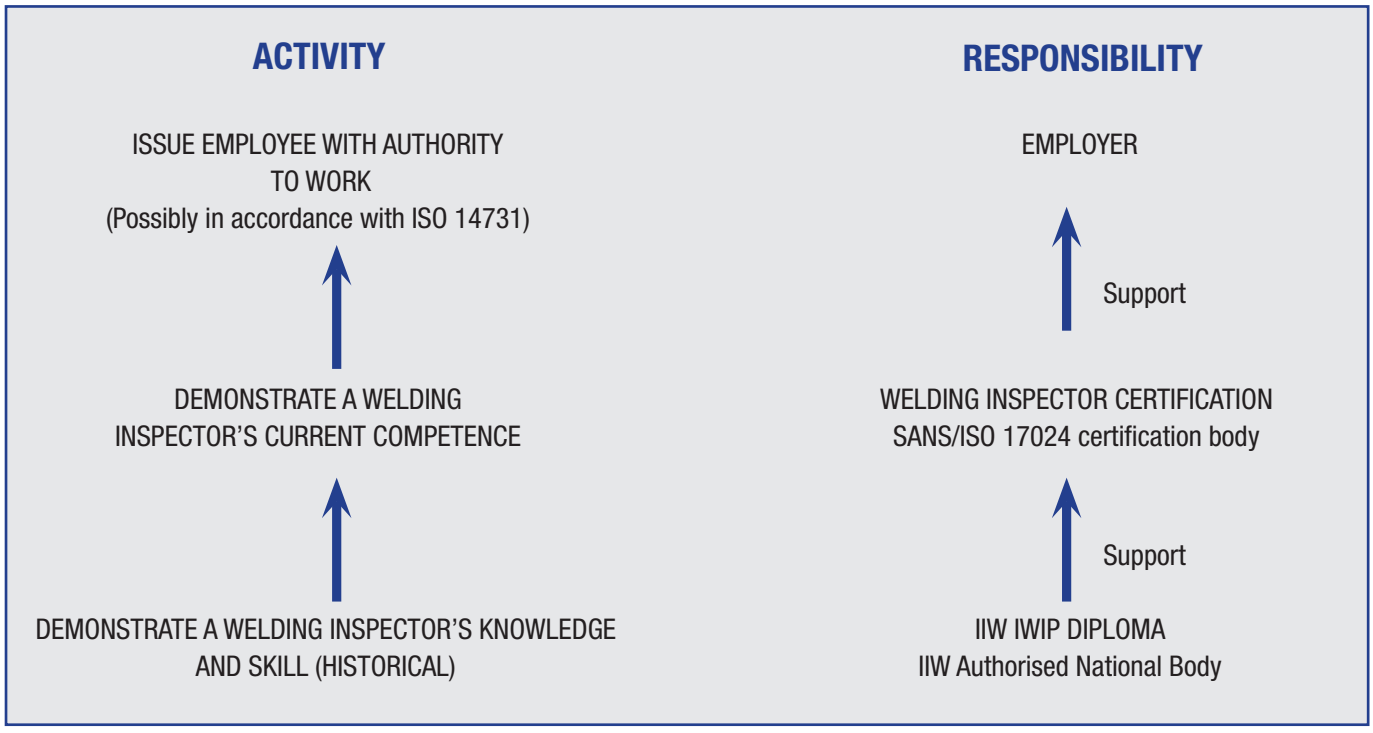
AUTHORISATION TO WORK

It's important to remember that only the employer can authorise an employee to work. This is done on the basis that the employer is convinced about the employee's knowledge, relevant experience, ability to act responsibly and other characteristics. Certification is a useful tool which assists and supports the employer in a way which is convincing to customers and other interested parties. The accompanying figure illustrates how a certification scheme fits into an employer authorisation of a welding inspector.

IN SUMMARY

Industry needs, and uses, a wide variety of welding inspectors. In some cases newly qualified inspectors are perfectly suitable for the job at hand or for working under the supervision of a more experienced inspector but in other cases there can be a need for a more experienced inspector with demonstrable competence for the performance of particular tasks. Inspectors certified at the levels mentioned above will be the cream of the crop.

Figure 1: The Role of Certification in Authorising an Employee to Work



HR NEWS

Welcome Lourens Hand

We welcome Lourens Hand who joined the SAIW as a Welding Technology lecturer in August 2014. Lourens has extensive welder training experience. He started his career as an apprentice welder at ArcelorMittal and worked his way up the corporate ladder ending as head of Steinmuller's Welder Training School – Sebokeng before joining the SAIW. Lourens, who is happily married with a son, says he is looking forward to the challenges of working in the country's largest welding school.

Congratulations!

"Anyone who was at the Certification dinner will have an inkling of what this Institute is all about – young vibrant people doing all they can to improve their lives through study and education and older people using improved qualifications to enhance career opportunities. It is always a moving experience to see the hundreds of graduates proudly receiving their certificates" – Jim Guild.

Inspector Level 1 and 2 (some of the graduates below)












Continued on page 9

Congratulations!

Continued from page 8

Inspector Level 1 with distinction

George Frederick Kruger

Inspector Level 2 with distinction & IIW (S)

Theo Malcolm Francis

International WeldingTechnologist

Aphas Mabunda

Inspector Level 2 with IIW (S) (some of the graduates below)

Brighton Meyiswa Mkhwanazi

Charel van Deventer

Makwande Nyembe

Simon Young

Mamolifi Elizabeth Kwinchi

Mvuseli Advocate Kupula

Peter Mokoana

Phetole Louis Makhurupetji

Phillemon Zwane

JOB KNOWLEDGE 115

Heat treatment of welded joints – Part 2

Part 1 of this series of articles gave definitions of some of the heat treatments that may be applied to a welded joint and dealt with the operation of stress relieving a ferritic steel assembly. The temperature range within which stress relief takes place will also cause tempering of those regions in the HAZ's where hard structures may have formed.

Tempering

Tempering is a heat treatment that is only relevant to steels and is carried out to soften any hard micro-structures that may have formed during previous heat treatments, improving ductility and toughness. Tempering also enables precipitates to form and for the size of these to be controlled to provide the required mechanical properties. This is particularly important for the creep resistant chromium-molybdenum steels. Tempering comprises heating the steel to a temperature below the lower critical temperature; this temperature being affected by any alloying elements that have been added to the steel so that for a carbon-manganese steel, the temperature is around 650°C, for a 2¼CrMo steel, 760°C .

Quenched steels are always tempered. Normalised steels are also usually supplied in the tempered condition although occasionally low carbon carbon-manganese steel may be welded in the normalised condition only, the tempering being achieved during PWHT. Annealed steels are not supplied in the tempered condition.

"PWHT IS A MANDATORY REQUIREMENT IN MANY CODES AND SPECIFICATIONS WHEN CERTAIN CRITERIA ARE MET. IT REDUCES THE RISK OF BRITTLE FRACTURE BY REDUCING THE RESIDUAL STRESS AND IMPROVING TOUGHNESS AND REDUCES THE RISK OF STRESS CORROSION CRACKING. IT HAS, HOWEVER, LITTLE BENEFICIAL EFFECT ON FATIGUE PERFORMANCE UNLESS THE STRESSES ARE MOSTLY COMPRESSIVE."

Tempering of tool steels may be performed at temperatures as low as 150 degrees C, but with the constructional steels that are the concern of the welding engineer the tempering temperature is generally somewhere between 550- 760°C, depending on the composition of the steel.

Post Weld Heat Treatment (PWHT)

As mentioned in Part 1, PWHT is a specific term that encompasses both stress relief and tempering and is not to be confused with heat treatments after welding. Such treatments may comprise ageing of aluminium alloys, solution treatment of austenitic stainless steel, hydrogen release etc. PWHT is a mandatory requirement in many codes and specifications when certain criteria are met. It reduces the risk of brittle fracture by reducing the residual stress and improving toughness and reduces the risk of stress corrosion cracking. It has, however, little beneficial effect on fatigue performance unless the stresses are mostly compressive.

It is an essential variable in all of the welding procedure qualification specifications such as ISO 15614 Part 1 and ASME IX. Addition or deletion of PWHT or heat treatment outside the qualified time and/or temperature ranges require a requalification of the welding procedures. PWHT temperatures for welds made in accordance with the requirements of EN 13445, ASME VIII and BS PD 5500 are given below in Table 1.

Table 1: PWHT Temperatures from Pressure Vessel Specifications

Steel Grade	BS EN 13445	ASME VIII	BS PD 5500
	Temp range °C	Normal holding temp °C	Temp range °C
C Steel	550-600	593	580-620
C 1/2 Mo	550-620	593	630-670
1Cr 1/2 Mo	630-680	593	630-700
2 1/4 Cr/Mo	670-720	677	630-750
5CrMo	700-750	677	710-750
3 1/2 Ni	530-580	593	580-620

Note from Table 1 that ASME VIII specifies a minimum holding temperature and not a temperature range as in the BS and EN specifications.

As mentioned above, PWHT is a mandatory requirement when certain criteria are met, the main one being the thickness. BS EN 13445 and BSPD 5500 require that joints over 35mm thick are PWHT'd, ASME VII above 19mm. If, however, the vessel is to enter service where stress corrosion is a possibility, PWHT is mandatory, irrespective of thickness. The soak time is also dependant on thickness. As a very general rule this is one hour per 25mm of thickness; for accuracy, reference must be made to the relevant specification.

These different requirements within the specifications mean that great care needs to be taken if a procedure qualification test is to be carried out that is intended to comply with more than one specification. A further important point is that the PWHT temperature should not be above that of the original tempering temperature as there is a risk of reducing the strength below the specified minimum for the steel. It is possible to PWHT above the tempering temperature only if mechanical testing is carried out to show that the steel has adequate mechanical properties. The testing should, obviously, be on the actual material in the new heat treatment condition.

Continued on page 11

JOB KNOWLEDGE 115

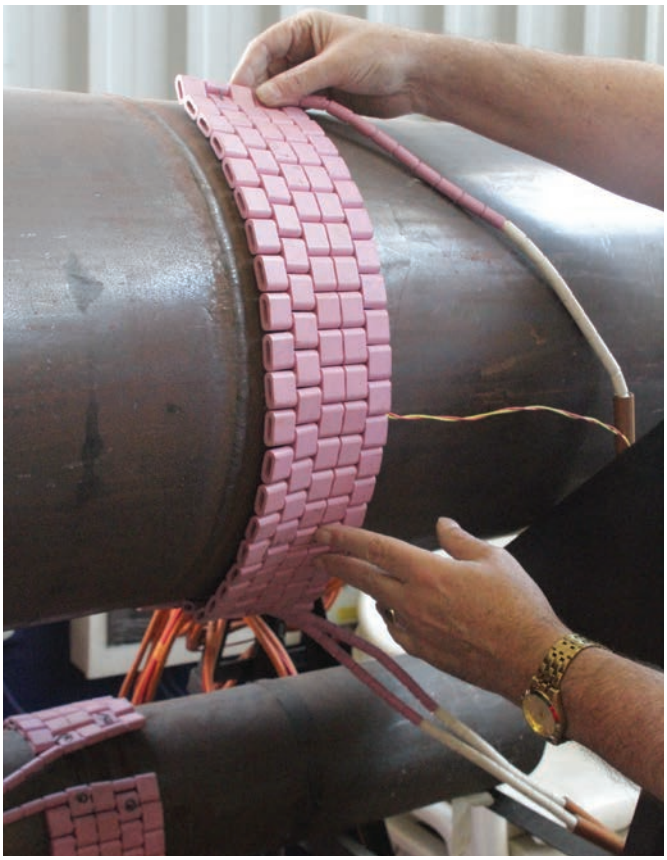
Continued from page 10

Maximum and minimum heating and cooling rates above 350-400°C are also specified in the application codes. Too fast a heating or cooling rate can result in unacceptable distortion due to unequal heating or cooling and, in very highly restrained components, may cause stress cracks to form during heating.

Application of PWHT

The method of PWHT depends on a number of factors; what equipment is available, what is the size and configuration of the component, what soaking temperature needs to be achieved, can the equipment provide uniform heating at the required heating rate? The best method is by using a furnace. This could be a permanent fixed furnace or a temporary furnace erected around the component, this latter being particularly useful for large unwieldy structures or to PWHT a large component on site. Permanent furnaces may be bogie loaded with a wheeled furnace bed on to which the component is placed or a top hat furnace that uses a fixed hearth and a removable cover. Typically, a furnace capable of heat treating a 150tonne pressure vessel would have dimensions of around 20m long, a door 5x5m and would consume around 900cu/metres of gas per hour.

Furnaces can be heated using electricity, either resistance or induction heating, natural gas or oil. If using fossil fuels care should be taken to ensure that the fuel does not contain elements such as sulphur that may cause cracking problems with some alloys, particularly if these are austenitic steels or are nickel based – corrosion resistant cladding for example. Whichever fuel is used the furnace atmosphere should be closely controlled such that there is not excessive oxidation and scaling or carburisation due to unburnt carbon in the furnace atmosphere. If the furnace is gas or oil fired the flame must not be allowed to touch the component or the temperature monitoring thermocouples; this will result in either local overheating or a failure to reach PWHT temperature.



Monitoring the temperature of the component during PWHT is essential. Most modern furnaces use zone control with thermocouples measuring and controlling the temperature of regions within the furnace, control being exercised automatically via computer software. Zone control is particularly useful to control the heating rates when PWHT'ing a component with different thicknesses of steel. It is not, however, recommended to use monitoring of the furnace temperature as proving the correct temperatures have been achieved in the component. Thermocouples are therefore generally attached to the surface of the component at specified intervals and it is these that are used to control the heating and cooling rates and the soak temperature automatically so that a uniform temperature is reached. There are no hard and fast rules concerning the number and disposition of thermocouples, each item needs to be separately assessed.

‘IT IS ESSENTIAL THAT THE COMPONENT IS ADEQUATELY SUPPORTED DURING HEAT TREATMENT AND TRESTLES SHAPED TO FIT THE COMPONENT SHOULD BE PLACED AT REGULAR INTERVALS.’

As mentioned earlier, the yield strength reduces as the temperature rises and the component may be unable to support its own weight at the PWHT temperature. Excessive distortion is therefore a real possibility. It is essential that the component is adequately supported during heat treatment and trestles shaped to fit the component should be placed at regular intervals. The spacing of these will depend on the shape, diameter and thickness of the item. Internal supports may be required inside a cylinder such as a pressure vessel; if so, the supports should be of a similar material so that the coefficients of thermal expansion are matched.

Whilst heat treating a pressure vessel in one operation in a furnace large enough to accommodate the entire vessel is the preferred method this is not always possible. In this case the pressure vessel application codes permit a completed vessel to be heat treated in sections in the furnace. It is necessary to overlap the heated regions – the width of the overlap is generally related to the vessel thickness. BS EN 13445 for instance specifies an overlap of $5\sqrt{Re}$ where R = inside diameter and e = thickness; ASME VIII specifies an overlap of 1.5 metres. It should be remembered that if this is done there will be a region in the vessel (which may contain welds) that will have experienced two cycles of PWHT and this needs to be taken into account in welding procedure qualification testing. There is also an area of concern, this being the region between the heated area within the furnace and the cold section outside the furnace. The temperature gradient must be controlled by adequately lagging the vessel with thermally insulating blankets and the requirements are given in the application codes.

It is, of course, possible to assemble and PWHT a vessel in sections and then to carry out a local PWHT on the final closure seam. Local PWHT will be discussed in the next part of this series on heat treatment.

The next article will cover further information on other alloys and methods of applying and controlling heat treatment activities.

SAIW and Industry Champions Honoured

At the Awards dinner earlier this year, some 350 people celebrated the outstanding achievements in the welding industry and at the SAIW over the past year/s.

SAIW President Morris Maroga said that the Awards event serves two purposes. “First it recognises and celebrates success in both the local welding industry and in the SAIW. Secondly, it is an opportunity for business networking,” he said.

Maroga said that it would be worthwhile remembering the words of Henry Ford: Coming together is a beginning; keeping together is progress; working together is success. On that note he urged all to network with an open mind so that new opportunities might emerge.

Maroga also paid tribute to all the award winners and to the sponsors of the evening: Air Products, Afrox, Bohler Welding, ESAB, New Age Welding Solutions, Steinmuller, Techtra Engineering, VBV Holdings, VoestAlpine and WASA.

The SAIW Gold Medal Award

Regarded as the highest accolade one can get from the SAIW, the Gold Medal Award, which was first introduced in 1966, can be made to a company or an individual in recognition of outstanding contribution to welding technology in general or to the Institute in particular.

Robin Williamson with wife Janet and daughter Rachael

The 2014 recipient was Robin Williamson who has been involved with the SAIW for more than 30 years. He has been an elected member of Council since 1985 and has played a significant role in the development of the Institute. He was President of the SAIW from 1994-1998 and was awarded Honorary Life Membership in 2003.

Robin has also been a director of SAIW Certification since the company was created in 2005. He has helped in preparing many SAIW course syllabuses and examinations and still finds time to help wherever possible.

SAIW awarded Robin the Gold Medal “in recognition of 30 years of selfless service to the Institute”.

Robin’s wife Janet and daughter Rachael (visiting from Hong Kong) were present at the Awards ceremony.

SAIW President’s Award for NDT

Lorraine Lerato Montsho receiving her award

Petrus Stephanus Rossouw receiving his award

The SAIW President’s Award is made in the name of past Presidents of the SAIW and recognises the best students on the SAIW NDT courses. This year was special because there were two winners: Petrus Stephanus Rossouw and Lorraine Lerato Montsho. This is the second time that Lorriane has won this award!

The Phil Santhilano Memorial Award

The Phil Santhilano Memorial Award is named after the SAIW’s first full-time employee and technical director who was appointed 32 years ago. This award is presented to the best student on one of the SAIW’s Welding Supervision and/or Inspection courses. The winner this year was Duran Naidoo who qualified with distinctions in both Level 1 and Level 2 Inspection courses.

Duran Naidoo receiving his award

The Harvey Shacklock Gold Medal Award

First presented in 1949, this award, which honours the best technical paper presented at an SAIW event, is named after the first President of the SAIW in memory of his contribution to the welding industry. The 2014 winner was Eskom’s Prince Dlamini for his presentation: Dealing with materials and welding quality on Eskom’s new build plant.

Prince Dlamini receiving his award

SA Researchers join in on WTIA's National Welding Capability Project

From 5 to 7 November 2014, as part of its National Welding Capability Project, the Welding Technology Institute of Australia (WTIA) hosted the 4th International Institute of Welding (IIW) Welding Research and Collaboration Colloquium.

Tony Paterson (University of Witwatersrand), Louis von Wielligh (Nelson Mandela Metropolitan University), Riaan Loots (University of Pretoria) joined a group of over 85 speakers and delegates from 12 different countries, including 63 from Australia. The Colloquium was a unique and outstanding forum which brought together representatives from local and global industry and research to exchange ideas and establish cooperative networks for future communication and development.

Such colloquia are the initiative of the IIW Welding Research Strategy and Collaboration Group (SG-RES). Chaired by Prof Americo Scotti from Brazil, SG-RES has the key objective to analyse the growth of welding research around the world. At regular meetings, critical feedback is collected regarding how topics of industrial interest, and support for research in welding and allied techniques, are progressing in the participants' countries, and strategies for future development are generated.

The Colloquium, organised and held in Wollongong by Australian IIW Responsible Member WTIA, was also sponsored by the Australian Nuclear Science and Technology Organisation (ANSTO), BOC Limited and the University of Wollongong. It was delivered through the valuable team effort of the Organising and Technical Committees, respectively chaired by Chris Smallbone, WTIA Industry Advocate and CEO Emeritus, and Americo Scotti, with Emeritus Professor John Norrish and Professor Madeleine du Toit of the University of Wollongong and WTIA's Event Coordinator Cena Josevska as members.

After the opening introduction by Chris Smallbone and Welcome to Country by Chris Cook, Executive Dean of the Faculty of Engineering and Information Sciences at the University of Wollongong, an overview of IIW was given by Dr Cécile Mayer, IIW CEO, and one on SG-RES by Americo Scotti.

Session 1 set the scene for an overview of research capabilities by Prof Heidi Cramer (SLV Munchen, Germany), Prof Madeleine du Toit (University of Wollongong), Dr Lenka Kuzmikova (Post-Doctoral Researcher, University of Wollongong), and Dr Anna Paradowska (Bragg Institute, ANSTO). Nine subsequent sessions, including 35 presentations, focussed on topics such as welding processes, modelling, applications, additive manufacturing, joint manufacture, automation, joining processes, and surface treatment, each chaired by a prominent industrial or research representative.

Prior to the group discussion session for 'The Way Forward', Chris Smallbone presented 'The IIW White Paper – Its significance to creating a National Welding Capability' which stimulated the brainstorming on how the R&D fraternity in Australia, collaborating with the IIW R&D network, could contribute effectively to Australia's future research needs and capabilities.

The Colloquium participants approved a Resolution 'To establish and maintain a WTIA National Welding Capability in Australia with the support of IIW, IIW SG–RES and the research collaborators within the IIW and Australian Networks'.

Networking activities, such as the Colloquium dinner, sponsored by ANSTO and held at the Harbourfront Restaurant on the Wednesday evening, served to cement lasting relationships between Australian and international delegates.

Friday afternoon, more than 50 delegates attended well organised and informative tours either at the University of Wollongong's robotics and welding related facilities or ANSTO, at Lucas Heights, including the Opal Reactor and experimental hall, and neutron engineering instruments. The positive feedback from those who attended the Colloquium was outstanding, reinforcing the WTIA's belief that the Institute's membership of IIW, and opportunities such as the Colloquium, attendance at IIW Annual Assemblies and involvement in the IIW Technical Working Units, provide Australian industry and the community with immense technical, social and economic benefits.

Qualification and Certification

CONGRATULATIONS TO THE PEOPLE BELOW WHO RECENTLY ACHIEVED QUALIFICATION AND CERTIFICATION.

SAQCC-NDT CERTIFICATES

Liquid Penetrant

Mkhwanazi B
Moritz AP
Mothapo MM
Mtsweni VL
Ndlovhu FM

Testing Level One

Lombard B
Matshela KT
Meadows WI
Mhlongo DM
Rehman Z
Willemse SJ

Liquid Penetrant Testing Level Two

Elrix HG
Mbele DS
Mudau DS
Peterson JP
Reed M
Thompson JC
Van der Merwe C

Liquid Penetrant Testing Level Three

Ismail M
Nyaga WG

Magnetic Particle Testing Level One

Daniels CL
Dlodlo TP
Jennings JL
Mhlongo DM
Moritz AP
Nkosi DS
Roos R
Scehrman A
Sinobolo RM
Van der Merwe M
Willemse SJ

Magnetic Particle Testing Level Two

Mbele DS
Mkhize WM
Tyhalithi L

Magnetic Particle Testing Level Three

Ismail M
Nyaga WG

Ultrasonic Testing Level One

Du Toit HL
Keys ER
Letoaba SR
Makua JT
Mokoena TA
Randera S
Sinobolo RM
Willard MW

Ultrasonic Testing Level Two

McMillan S
Smit M
Van der Merwe I

Ultrasonic Testing Level Three

Nyaga WG

Ultrasonic Testing Wall Thickness

Alufayi W
Amir W
Barlow R
Brandon B
Buthelezi GES
Dlamini TD
Els L
Houston MM
Khoza FM
King KF
Mabala VT
Mabula MP
Mapitle SF
Masiso L
Meyer JW
Mkhondo MS
Moloi TD
Mthethwa MB
Nawaz M
Ncongwane PR
Nemushungwa VA
Nkabinde RTN
Ntshangase BJ
Oliver SR
Reddy C
Rehman Z
Stapelfeldt KD
Stoffels CC
Stuyweg DJ
Thubane NS
Tjale EM
Van Niekerk N
Van Rooyen F
Van Rooyen R
Visser R
Woods AE

Radiographic Testing Level One

Heedress N
Pienaar JP
Van Staden PH

Radiographic Testing Level Two

McMillan S

Radiographic Testing Level Three

None

Radiographic Interpreters

Barnard PW
Bartman CJ
Boonzaaier EC
Mankayi V
Mhlongo DM
Neves M

Students that passed the Welding Inspectors Level One & Two

Inspectors Level One

Adams M
Ahmed AS
Allie K
Assani B
Astone DA
Baard H
Baloyi SE
Barends S
Barends S
Bessenger LAF
Biggers SC
Bogdanovic N
Booysen BT
Botha MPS
Bothma DS
Brits E
Brown I
Buys B
Chauke P
Chetty T
Claasen AW
Cooper CL
Davids KA
Dismore KA
Drabble CL
Dunn FLB
Ebrahim ACA
Fariranayi S
Farrington AD
Fisher MV
Fraser MC
Fromme EJ
Froneman JP
Garcia MLDS
Gomez SA
Goosen JJ
Gouws MH
Green I
Grobler E
Grobler GD
Hand L
Herbst P
Hoosen AE
Howard AA
Hudson DR
Isaacs D
Jaceni MS
Jacobs HB
Jacobs J
James EB
Jansen SE
Januarie R
Khongoana T
Khumalo MF
Kola MF
Kruger CC
Kwezela HM
Lazar SJ
Leach van Wyk NW
Lehobo KI
Lepelle SE
Lewis NS
Louw C
Luthuli IZ
Maanda H
Mabala VT
Madia HC
Madonsela DT
Madonsela ZP
Madzhie MP
Mahita KM
Mahlangu FV
Mahlangu S
Mahlangu SP
Mahlangu ZP
Mahlare MKM
Makubu SP
Malatji AB
Mantsoe KP
Maoko TJ
Maome AB
Marais AR
Maroney SP
Masango NB
Masbaso MB
Maseko PP
Maseko SG
Masha KM
Mashilo NC
Masia C
Mathe BM
Matjiu LG
Matlele NJ
Mazibuko NR
Mbele MP
Mbele NI
Mbhele TP
Mbofana P
Mchunu TC
McKnight L
Mcpherson SWL
Metcalfe DT
Methula SN
Meyer JP
Misheck M
Mngomezulu EM
Mnisi ES
Moelich G
Mokoena GM
Mokoena LLJ
Moonsamy L
Motaung JM
Motha L
Mouton A
Mpembe TP
Msibi PE
Mthombeni S
Muchenagumbo D
Mudau BB
Mudzusi EI
Muller D
Mushiane K
Ncubuka SW
Ndaba WG
Neniels J
Ngaleka N
Ngema ES
Ngorima M
Nhantsi T
Nielsen LH
Nkwanyana ZSS
Norris L
Ntiwane NI
Ntungwa MS
Nyalunga ES
Olckers JC
Oliver FA
Oliver JP
Olivier RG
Oosthuizen C
Owusu F
Palmer NC
Palmer RKK
Parker C
Pearson GC
Petersen JW
Petersen PJ
Philander P
Phoseka LT
Pieterse J
Potgieter PC
Pottier ML
Pretorius E
Ramoroka MJ
Randall LR
Rautenbach EM
Razak Z

Continued on page 15

Qualification and Certification

Continued from page 14

Reagan CJ
Resenga MM
Rikhotso NS
Roskrudge BC
Rungwandi C
Sangweni BB
Scharneck JB
Schoeman GJ
Scholtz BS
Sekhu MR
Shabangu JW
Shabangu MP
Shangase NC
Shaw BG
Sibande X
Sibanyone TCM
Sim TH
Simba KG
Simmer AL
Sirayi XA
Snyman AA
Sookrim A
Soule E
Steenkamp S
Steyn GP
Stoop FC
Storm HW
Tshabalala SS
Tsotetsi GR
Van der Linde J
Van der Merwe G
Van der Westhuizen
Van Niekerk C
Van Rooyen F
Van Rooyen M
Van Schalkwyk T
Viljoen A
Visser R
Vlietstra LS
Wasilewski AK
Watson RMC
Weerepas IR
Williams LP
Willoughby CJ
Wulff R
Yende DR
Yende SS
Zeelie JJJ
Zinyana C
Zulu KM
Zwart F

Inspectors Level Two

Abbas MN
Admire N
Alberts J
Anderson EA
Azaad W
Bowie RZ
Brierly S
Butaza T
Carneiro MF
De Vries RM
Du Plessis PE
Du Plooy HJ
Finlay R
Fransman WC
Fraser RR
Frost DM
Gomera G
Griebenauw D
Henues CS
Herbert WS
Khoza J
Makaya G
Malcolm T
McMillan J
Meiring P
Mokoena TS
Niewoudt D
Nyembe M
Oosthuizen M
Potgieter GP
Ricardo AF
Sissing C
Snyman J
Stoop JHH
Tatchell BT
Tatchell GWA
Temoore A
Van der Nest A
Van Kraayenburg S
Visser R
Wagenaar GM
Waleed M
Walters MAA
Warren AVP

ASME Codes of Manufacture

Edwards SE
Eksteen KR
Govender SL
Hamid R
Jina BJ
Khoza TR
Marungwana KR
Mashilwane TJ
Morrow W
Oosthuyzen P
Pinto B
Ryan DR
Selling NJ
Sikhakhane TP
Swart JB
Van Niekerk M

Painting Inspectors

Akwanwi J
Goevnder N
Masole MG
Mkonde VE
Murulani MC
Njingang JA
Seefane M
Sloan CT
Takaidza D
Vawda ZI

Certified Students

Boilers

None

Pressure Vessels

De Jager D
Maas A
Razack MS

IPE

Bosch J
Bosch WM
Bruwer P
Coetzee M
Hattingh W
Moodley D
Mostert R
Rheeder MNL
Strydom M
Van Niekerk M

Branch NEWS

Johannesburg

During the past quarter there was much activity in the Johannesburg branch with a number of interesting presentations.

On the 27th of August 2014, Dr Tony Paterson from Wits University, presented the evening meeting entitled "Welded Fabrication – gaps and challenges facing hygienic fabrication".

He discussed the use of austenitic stainless steel that has been the material of choice for hygienic process plants since the early 1980"s. Developing issues facing these plants, include tighter health legislation, water quality and shortages, maintenance of existing plant and new build parameters.

The talk provided a background to the health issues involved and concentrated on the difficulties encountered in achieving effective welding of thin wall pipes as a result of manufacturing tolerances. Some fabrication proposals to enhance health compliance were presented.

On the 17th of September 2014, Tafadzwa Mushove (SAIW Lecturer) presented the evening meeting entitled "Total Quality Management (TQM) in the Fabrication Industry"

The presentation discussed quality and its management, in the fabrication industry. Quality management is crucial for the fabrication business in this current era, where modern technology, enhanced communication and transportation systems have rendered the world a global village. Competition at the global level is intense, constant and unrelenting. Only those businesses that are able to produce world class quality can compete at this level. Local fabrication industries, more often than not, find themselves competing with global concerns for business. Winning businesses provide superior value to customers, in the way of superior quality, superior cost and superior service.

On the 29th of October 2014, Jan Cowan (SAIW NDT Examiner) presented the evening meeting entitled "Examination of Radiographs with reference to ASME Section 8 Division 1 UW 51 as Acceptance Criteria".

He spoke about the quality of radiographic interpretation and evaluation and dealt with some of the pitfalls, concerns and misconceptions in radiography and the interpretation and evaluation of radiographs.

New Corporate Members:
H Kampman CC, Rowmoor Investments 982 (Pty) Ltd T/A Matla Steel, Metamorphic Engineering

New Members:
Bergoër RM, Hand L, Lukusa Kabongo PL, Machochoane AD, Makaya G, Mokoana P, Musiyiwa A, Naidoo S, Rungwandi C, Shaikh ZK, Sharpe DB, Wickens SP

Continued on page 16

Branch NEWS

Continued from page 15

Cape Town

In August, the Non-Destructive Academy of SA (NASA) hosted an evening meeting at which Ben Buys presented on "Round Indications to ASME VIII Part 4 Division 1".

In keeping with the RT interpretation theme, in September, Hugo Vaughan of the SAIW presented "Examination of Radiographs with reference to BS EN ISO Part 1 as Procedure and BE EN ISO 5817 as Acceptance Criteria" at the Cape Town branch.

In October, SAIW Certification & Qualification Manager, Herman Potgieter, gave a presentation on ISO 15085 for Railway Equipment & the Influence of ISO3834, which was very informative.

Our final meeting for the year will take place in November – details to follow in next Fusion.

The final Welding Inspector (SAIW Level 1) training for the year started on the 20th October at almost full capacity & will run until the end of the year. Other courses still scheduled for the year are:

- Competent Persons – Pressure Vessels - 24th – 28th November
- Competent Persons – Steam Generators - 1st – 12th December

The 2015 training brochure will be released shortly and we look forward to welcoming many new students in the new year.

Wishing all our members & friends a joyous Festive Season and a prosperous 2015!

Should there be any suggestions for evening meetings, for further information on forthcoming events or to be added to the Cape Town SAIW mailing list, please contact Liz Berry (berryl@saiw.co.za).

Certification Function

With Table Mountain serving as a backdrop, the Cape Town Certification Dinner on the 6th November was a most memorable occasion.

Surrounded by an appreciative audience of family and friends, successful graduates from the Welding Inspector (SAIW Level 1), Senior Inspector (SAIW Level 2) & IIW Welding Practitioner courses were presented with their certificates by Jim Guild.

Congratulations to all those who received their qualifications – and we look forward to being there for your future in the welding & fabrication industry.

Durban

We are pleased to report that attendance at KZN's meetings is picking up significantly. In October Ettiene Nell presented about "determining pre-heat temperature using EN1011-1 & 1011-2".

In November Sean Blake spoke about the "importance of heat treatment after welding ".

While there will be no further meetings this year, please note that our first QC Course - Level 1 for 2015 is nearly fully booked and we are looking forward to a busy year with extra courses being planned for Durban.

We are still urgently looking for premises for KZN – anybody out there with a spare 400m² and a minimum of 20 parking bays?

JOHANNESBURG (HEAD OFFICE)
Membership Services Secretary: Rencia Grundlingh
Southern African Institute of Welding
52 Western Boulevard off Main Reef Road
City West, Johannesburg
P O Box 527, Crown Mines, 2025
Tel: +27 (0)11 298 2100
Fax: +27 (0)11 836 4132
E-mail: grundlinghr@saiw.co.za

CAPE TOWN
Western Cape Representative: Liz Berry
P O Box 179, Table View, 7439
Mobile: +27 (0)84 446 0629
Fax: +27 (0)86 566 7421
E-mail: berryl@saiw.co.za

DURBAN
Kwa-Zulu Natal Representative: Ann Meyer
Mobile: +27 (0)83 787 5624
E-mail: meyera@saiw.co.za

Chairman: Tullio Monté
Mobile: +27 (0)82 577 6158
E-mail: tulliomonte@gmail.com