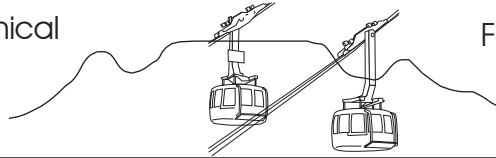


WCB ENGINEERING BULLETIN

The Institution of Certificated Mechanical
and Electrical Engineers
Western Cape Branch (WCB)
P.O. Box 504, Rondebosch 7700



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MISSION STATEMENT: 1. To uphold the image & status of the Certified Engineer. 2. To represent the Certified Engineer at ECSA and other decision-making bodies concerning legislation, safety & health standards, the environment and machinery regulations. 3. To promote continued education & training of its members and future engineers. 4. Promote fellowship in the engineering profession

Editorial

Sasol has been in the news lately for the spate of accidents that have occurred over a period of 6 months - 14 deaths and 360 injuries. The latest accident, an explosion in the polymers ethylene plant at Secunda, closed the plant for 11 weeks. Management has now appointed a US safety consultant, Du Pont, to review its safety procedures.

Why is it necessary to import safety specialists? We have the National Occupational Safety Association, NOSA, who do auditing of safety procedures. It is presumed that Sasol has certificated engineers on its staff. And the Labour Department has safety inspectors. Aren't these the people who maintain safety in industry? Why go abroad when the expertise is here?

Are the OHS inspectors doing their job of routine inspections and incident enquiries? Are offenders of the Occupational Health & Safety Act being taken to court? Is NOSA being effective in its audits and competitions? Are certificated engineers applying their engineering experience and knowledge of the OH&S Act to their environments and looking for trouble before it develops? There are also private firms which specialise in safety whose expertise is available. Are manufacturers using these institutions or are they being niggardly with regard to expenditure that might seem not to have an immediate return?

The power of the law with regard to the safety of persons at work is in the hands of the Labour Department and unless the law is effectively enforced lives will continue to be lost and workers maimed. Incidents should be thoroughly investigated and the tendency to withhold information from the media about details of a serious accident does not help companies with similar equipment to become aware of impending disaster.

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• Drake & Scull (Pty) Ltd	Tel:	(021) 683-7056
• Sappi Cape Craft (Pty) Ltd, Milnerton	Tel:	(021) 552-2127
• Alstom John Thompson (Pty) Ltd	Tel:	(021) 959-8532

Local Branch News

Hello once again everybody.

We are into the new year with great gusto! We trust that you will all have a great year.

Our first meeting of the year will be past when this edition of the Bulletin reaches you. This would be our AGM, with a talk on "Experiences gained and pitfalls to avoid in CMMS implementation", presented by Hannes van Zyl, SAP Solution Centre, Plant Maintenance, City of Cape Town.

Our next scheduled items of interest are as follows: 25 February. We are arranging a visit to the PetroSA plant (ex Mosgas) in Mosselbay for members in the area as a combined visit with members from Eastern Province.

3 March. We are co-hosting a workshop with SAIEE on the "RESERVATION OF WORK FUNCTIONS IN ELECTRICAL ENGINEERING". This workshop follows on the full day workshop held in October 2004 and a recent workshop held in Durban last month.

Late March – visit to a wine farm in the Stellenbosch region.
April – Visit the new plant at SAPPI – Montague Gardens

Programme for the remainder of the year will be put in the next edition of the news bulletin.

We would like to present a seminar later this year and would appreciate any suggestions for our readers. What would you recommend we choose as subject matter? Please email me your thoughts.

Ciao for now!

Chris Schnehage

Chris Schnehage
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Changes to the Electrical Wiring Code

The public enquiry stage in the promulgation of the latest proposed Amendment 4 to the Wiring Code SANS 10142-1 by Standards South Africa (STANSA) has been extended by a further 60 days until 8 April 2005.

While most standards are voluntary, the Wiring Code, on the other hand, is mandatory with the force of law, through being listed as a safety standard in the Electrical Installation Regulations of the Occupational Health and Safety Act.

Members who wish to peruse the list of proposed amendments (about 25 of them) can go to www.stansa.co.za or contact STANSA Committee Administrator Puseletso Morajane
Tel: 012 428 6786 Fax: 012 428 6246
E-Mail: morajanp@sabs.co.za

Our thanks again to Chris Yelland of EE News who brought this to our attention.

The hazard of heights

A worker assisting in the lifting up of steel roof purlins apparently lost his balance and fell 6m to the concrete floor below. He was removed to hospital where he succumbed to his injuries about seven weeks later.

The firm who employed him was a sub-contractor to the main builder and was required to supply and erect steel roof trusses. The main part of this sub-contract was completed the previous week under the personal supervision of its director. The remainder of this contract was now being completed. This consisted of fitting purlins to the trusses. The roofing in turn would later be fixed to the purlins. The trusses were at a pitch. Two men were sitting on a truss one behind the other and the more experienced man higher up the truss was in the process of hauling up a purlin by rope. He then heard the man behind him say that he was moving up a bit. A moment later he turned around and saw that the man below him had fallen off the truss and landed on the concrete 5 - 6m below.

The director of the company, which manufactures and erects steel roofing, was informed by the client of the accident at about 11:00 am. He left immediately for the scene. The client had also called an ambulance. On arrival the director found the injured man, whom we will name Piet, lying unconscious on the ground and shaking.

He identified him as his employee, a man of about 35 years of age who had been in his service for about three and a half years, a good worker well experienced in erecting frameworks. About 5 minutes later the ambulance arrived and took Piet to the local hospital. An hour later the director was at hospital and was told there was no room in the hospital and the injured person would be taken to the city hospital.

Next day Saturday the director visited Piet in hospital. He was unconscious. The following day he was operated on. He again visited on Wednesday but Piet was still unconscious. Before leaving for overseas a few days later, he telephoned the hospital and was informed that Piet was much better. When he arrived back about a month later he was informed that Piet had passed away five days before.

The director had personally erected the roof trusses with his staff and the use of a crane hired about a week before the accident. The following week the staff were instructed to put the purlins in position. They were to sit on the trusses and pull the purlins up with a rope. The director admitted: "I did not instruct them to use safety harnesses as they are not in one place all the time. They are constantly moving around."

The other man working with Piet was a welder and he was in charge of the work. We will call him Jan. They had been working for 3 days pulling up purlins and bolting them in position. He was a few paces ahead of Piet. He could not see the man behind him and was about to pull up a purlin when Piet said he would move a little further away. Jan was at that moment pulling up a purlin. He suddenly looked around and saw Piet lying on the ground. He stopped pulling the purlin when Piet said he would move. He climbed down and phoned the client to phone his employer. He was of the opinion that it was not practical to use a safety harness as they move around. "My boss tells me to be careful when we work at a place," he said.

The man working on the ground, whom we will call Fred, had attached the rope to the purlin but was told by Jan aloft to wait before pulling it up while Piet moved a little further down the truss. He said, "My eyes were on Piet all the time. I saw him move a little and then suddenly he lost his balance and fell to the ground about 5m from where I stood."

This accident occurred in November 1976. When the case came to court about a year later the company was fined R75 and each director R15 for the workers not wearing safety belts.

The post mortem revealed that death was due to a head injury causing brain damage and pneumonia.

Comment.

This simple though costly accident reveals the problem of working at heights when it is usually impractical to wear a safety harness. There are however ways of providing for safe working if the employer has the will to explore them. The preferred method is to work from scaffolding. A worker in this type of activity should not have to take risks every day that he is at work when a brief moment of inattention could cost him his life.

To bring us up to modern times the Construction Regulations 2003 Regulation 8 deals with Fall Protection.

This regulation requires:

- a fall protection plan prepared by a competent person
- a risk assessment of elevated work
- evaluation of the physical and psychological fitness of the employee
- programme for training
- maintenance of protection equipment
- elevated work must be performed as if working from a scaffold or ladder
- fall arrest equipment (which is safe) if fall prevention equipment not available
- no elevated work during inclement weather.

The airship

(Information obtained from The Daily Telegraph supplement RIGHT NOW 4 September 2004)

The story of the airship started in the 13th century when Roger Bacon, a Franciscan friar, thought about buoyant flight. He suggested that it could be achieved by filling a thin-walled metal sphere with rarefied air or liquid fire. Obviously nothing came of the idea.

In 1670 Francesco Lana di Terzi of Italy calculated that four such spheres could lift a boat. But it was a Frenchman Jean-Baptiste-Marie Meusnier who developed the first practical airship concept in 1784 by devising an elongated balloon driven by airscrews. It never flew but it did inspire Sir George Cayley in Britain in 1816 to create an egg-shaped balloon with steam-powered propellers. But France achieved the first steam-powered airship flight in 1852 when the 3hp hydrogen-filled Aerial Steamer, designed by Henri Giffard flew in Paris at a speed of 7mph. In 1860 the first gas-powered airship flew in Moravia at 9mph. Then came a 60m long airship with a huge propeller at front that could steer the ship called La France.

Finally it was the German aristocrat Ferdinand Adolf August Heinrich Graf von Zeppelin who designed a cigar-shaped aluminium structure with internal gas bags. In 1898 he built his first airship the LZ-1 that was launched from a floating hangar on Lake Constance on 1 July 1900.

During the First World War both Germany and Britain used airships, but being filled with hydrogen they were vulnerable to the enemy.

In 1929 the Graf Zeppelin traveled the 25000 miles around the globe at a speed of 45mph. But in 1937 the Hindenberg disaster stopped further prospects of long distance travel by airship.

Please Be More Reactive

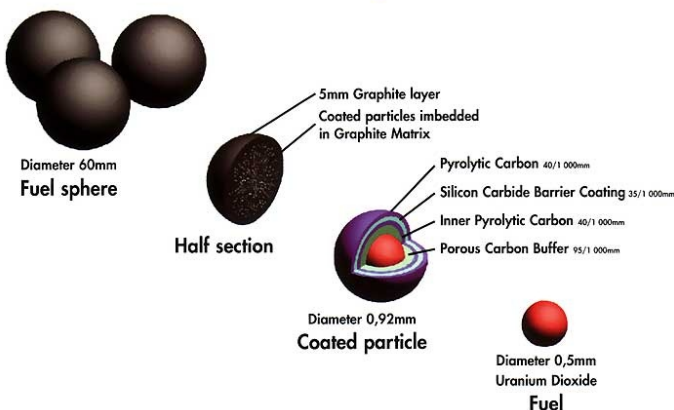
The controversy around the proposed Pebble Bed Modular Reactor at Koeberg Nuclear Power Station rages on. In March 2004 the director-general of Environmental Affairs and Tourism approved the environmental impact report for the PMBR to be built at Koeberg once it had been licensed by the National Nuclear Regulator. The environmental lobby group Earthlife Africa took the department to court on 26 January 2005 to set aside this decision because the department had not allowed Earthlife Africa to make submissions on critical issues such as nuclear safety and the disposal of radioactive waste. The Cape High Court decided that the government must consider the economic feasibility of the R11 billion project and allow Earthlife Africa and others a chance to make submissions on the final report before deciding to approve Eskom's application to build the nuclear power plant.

As reported in the Cape Times of 27 January 2005 Eskom spokesman Fani Zulu said the judgment would not halt the project, but merely reopen the environmental impact assessment process.

The PBMR is a demonstration model to assess its viability to accommodate peak winter loads at economic cost per unit and, if a successful energy generator, to be an export product for the improved wealth of the country. The PMBR project is also tied to the plan to produce hydrogen in large quantities as a fuel in place of fossil fuels. According to the nuclear physicist Phumzile Tshlape reported in the Cape Times of 24 November 2003, the PBMR is uniquely suited to provide the energy needed for the thermo-chemical water splitting processes that could produce large quantities of hydrogen without carbon emissions.

At the Klerksdorp mine of Aflase there are potentially high grades of uranium which could be mined to meet the requirements of a PBMR. An article published in the Cape Times of 12 November 2003 by Dr Kelvin Kemm, managing director of Silver Protea Nuclear Consortium explains that the uranium fuel to be used in the PBMR consists of grains of uranium smaller than rice embedded in graphite balls as large as cricket balls and cannot melt. Water cooling is not required. These factors make it a very safe use of nuclear fuel.

Fuel element design for PBMR



The subject has caught the interest of the public and a number of letters and articles have appeared in the press. An article by Dr Lennon, Eskom's Managing Director: Resources and Strategy, in the Cape Times of 9 October 2003 takes up the debate by emphasising that energy is essential for prosperity in a modern society. He writes: 'After about 2010, South Africa will need to commission an average of 1000MW capacity every year until at least 2025 – and then accelerate this programme to replace coal plants as they reach the end of their lives.' In addition to the PBMR Eskom is considering other technologies including natural gas, clean coal, imported hydro-power, renewable energy and fuel cells. The right decisions must be made now and not later, he says. By 2025 Eskom would like to have reduced its dependence on coal

by twenty percentage points which means that 18000MW will have to come from non-coal burning sources.

To cater for winter peaks Eskom considered small generating plants near the areas of need. The pebble bed modular reactor idea would fit the bill. It has a short construction lead time, low operating cost and fast load-following features - per Dr Lennon.

An article in the Cape Times of 4 November 2003 by Edward Sproat and Corbin McNeill, both previously associated with Exelon Corporation in the US, urged the SA government to go ahead with building a demonstration model PBMR which like any new technology had its risks but with its design safeguards could put SA in the forefront of the world's energy production technology.

A member of the public in a letter to the Cape Times asks if water will be the coolant and how is the generated heat transferred for steam production. Another reader writes that many countries such as Finland, France and Japan are building nuclear power plants. Another reader is concerned about the proximity of the PBMR to Cape Town and that there is no feasible escape plan for the population. And what if the wind is blowing in the wrong direction?

J Horne

The hovercraft

(Information obtained from The Daily Telegraph supplement RIGHT NOW 4 September 2004)

The British inventor of the hovercraft Christopher Cockerell worked for Marconi during the Second World War and during this time filed 36 patents, without any financial success. In 1950 he set up on his own in an old boatyard in Norfolk and started researching the effect of friction between the hull of a boat and the water. The concept of a cushion of air was not new but he refined it and filed a patent. He could not muster interest from the authorities until in 1957 it was learnt that the Swiss were working on a similar project. He was granted one thousand pounds to develop his patent.

The first passenger-carrying hovercraft, the SRN-1, crossed the channel from Calais to Dover on 25 July 1959, the 50th anniversary of Bleriot's first cross-channel flight. The hovercraft's 'flight' took two hours.

The Channel Tunnel overtook the hovercraft in the 1990's and the hovercraft service stopped.

Cockerell was knighted in 1969 and died in 1999, broke and dependent on his state pension.

Electric wiring in UK

(News item in The Weekly Telegraph of 12 January 2005)

From New Year's Day, amateur DIY devotees in England and Wales have been banned from doing all but the most basic wiring jobs unless they are independently inspected. Under new legislation, only "authorised competent electricians" are allowed to add new circuits or move kitchen sockets and lights without approval from planning officials. However, a poll carried out before Christmas for British Gas found that 61% of people did not know about the latest regulations. They said they would still do major electrical work themselves or enlist an unqualified friend.

Interesting News Flash

On the 1st of February 2005 the Minister of Labour issued a statement in which he announced that the Workmen's Compensation Commissioner, Ms Bongiwe Ncube (Magojo), has been suspended pending an investigation into allegations of "management irregularities and bringing the Department of Labour into disrepute". It would appear from the media statement issued by the Department of Labour that they finally realized that the poor level of service offered by the office of the Compensation Commissioner would always overshadow any good work done by other Department of Labour staff members. The sad thing though is that it took the Minister of Labour such a long time to realize this when considering how often the newspapers reported on the poor level of service delivered by the office of the Workmen's Compensation Commissioners. Well, at least something is happening and one can only hope that improvements implemented after this event will bring about a change in the level of services rendered by the office of the Workmen's Compensation Commissioners, which should be to the benefit of both employers and employees.

The newspaper articles that were published after the Department of Labour issued the media statement contained the following interesting information about the Workmen's Compensation Fund and the level of service that could be expected from them:

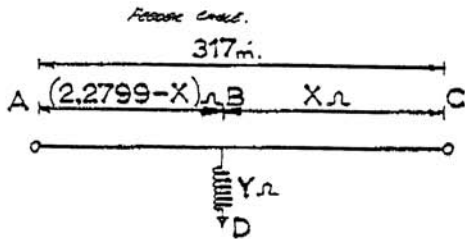
1. The Legal Resources Centre in Pretoria had filed a suit against the Workmen's Compensation Commissioner on behalf of all employees whose claims have not been finalised. Newspapers in the past reported on the attempts made by the Legal Resources Centre to discuss these issues with the Compensation Commissioner without any success. They simply found the office of the Compensation Commissioner to be unhelpful during all their attempts to find solutions to these problems.
2. The records of the Compensation Commissioner suggest that they have a backlog of 50 000 cases. The Legal Resources Centre however claims that up to 250 000 cases have not been finalized;
3. The Legal Resources Centre claims that some of the unresolved cases date back to 1992. This in particular is worrying when considering that this will mean that some employees who sustained serious injuries or families who had lost a bread winner more than 10 years ago are still waiting for compensation to be paid to them; and
4. According to one article the Workmen's Compensation fund has more than R11 billion in reserves.

Information from:
SafeNet Thought for the Day

11 February 2005

3.12. A feeder cable 317 m. long develops a fault to earth on one phase. The fault is localised by the following resistance measurements obtained between one end of the faulty conductor and earth.

Distant end insulated = 7,01 ohm's.
Distant end solidly earthed = 1,85 ohm's.
Conductor resistance is 7,192 ohms/1000 m.
Calculate the distance of the fault from the test end.



$$\text{Total resistance of cable} = 7,192 \times \frac{317}{1000} = 2,2799 \text{ ohms}$$

Referring to Diagram

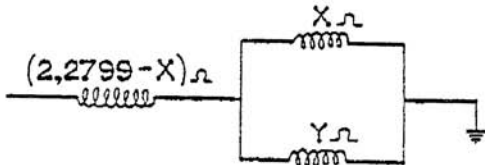
AC = Length of cable with the fault located at B.
The resistance of the fault path ABD is:-

$$(2,2799 - x) + y = 7,01 \text{ ohms}$$

$$y = 7,01 - 2,2799 + x$$

$$y = 4,7302 + x \dots\dots\dots (1)$$

When end C of the cable is also earthed, then the resistance of AB is in series with the joint resistance of the parallel paths x & y.



From the diagram above it can be deduced that:-

$$(2,2799 - x) + \frac{x \times y}{x + y} = 1,85 \text{ ohms} \dots\dots\dots (2)$$

Substituting equation (1) into equation (2) we have:-

$$2,2799 - x + \frac{x \cdot (4,7302 + x)}{x + 4,7302 + x} = 1,85$$

$$2,2799 - x + \frac{4,7302 x + x^2}{2x + 4,7302} = 1,85$$

3.12

$$\frac{4,7302 x + x^2}{2x + 4,7302} = 1,85 - 2,2799 + x$$

$$4,7302 x + x^2 = - 0,8598 x + 2x^2 - 2,0335 + 4,7302 x$$

$$x^2 - 0,8598 x - 2,0335 = 0$$

Solving for x:

$$x = \frac{-b \pm \sqrt{b^2 - 4 x a x c}}{2 x a}$$

$$= \frac{0,8598 \pm \sqrt{(0,8598)^2 + 4 \times 1 \times 2,0335}}{2 \times 1}$$

$$= 1,9193 \text{ ohms}$$

Distance of fault from test end = AB

$$AB = 317 \times \frac{(2,2799 - 1,9193)}{2,2799}$$

$$= 50,14 \text{ m}$$