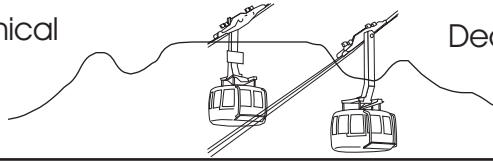


# WCB ENGINEERING BULLETIN

The Institution of Certificated Mechanical  
and Electrical Engineers  
Western Cape Branch (WCB)

P.O. Box 504, Rondebosch 7700



December 2001  
Vol. 7 no. 6



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

*Two recent cases were reported in the local papers of workers overcome by fumes in tanks. On 1 November 2001 two employees of Boschendal Wineries in Groot Drakenstein were overcome by fumes while working on a wine tank. Three men were working on the outside of a wine tank 3 m long by 2 m high. One person climbed into the tank and was overcome. The second worker climbed in and was also overcome. The third man looked inside and saw his two colleagues. He tried to help them but was overcome by the fumes and had to be treated at the local hospital. The first two succumbed.*

*The second case reported on 6 November was of the rescue by Metro Emergency Services of a man working inside a new solvent tank for Plascon Paints in Epping who became disorientated.*

*This issue describes a fatality which occurred in a sewage manhole many years ago and spells out the regulations in the Occupational Health & Safety Act which are intended to prevent just such incidents.*

*If only employers and users of this type of machinery would make themselves familiar with the requirements of the Act they would be guided to do the right thing. If they haven't the will to do the right thing then it is up to the Labour Department to apply the law. The Department has the teeth, they only need the watchdogs to put the teeth into.*

**Jerome Horne**  
10 Whitehall Court  
143 Main Road  
Rondebosch 7700  
Tel/Fax: (021) 686 0015  
e-mail: [jhorne@ilink.nis.za](mailto:jhorne@ilink.nis.za)

### PATRON MEMBERS

Schneider SA (Pty) Ltd	Tel:	464 4240
Globe Engineering Works (Pty) Ltd	Tel:	448-4640
Cape Automation Systems CC	Tel:	511-2382
Improvair (WP) (Pty) Ltd	Tel:	797-9131
Dorbyl Marine (Pty) Ltd Ship Repairs	Tel:	47-5170
Drake & Scull (Pty) Ltd	Tel:	683-7056
Circuit Breaker Industries Ltd	Tel:	931-3125
African Products (Pty) Ltd, Bellville	Tel:	951-2151
Sappi Cape Craft (Pty) Ltd, Milnerton	Tel:	552-2127
John Thompson Africa (Pty) Ltd, Bellville	Tel:	951-2271

## Local Branch News

Hello once again everybody.

We have reached our final news bulletin for the year 2001! Can you believe it?

On 20 September we arranged a visit to the Caltex oil refinery. We had a very good turnout of 27 members. This was a most interesting visit and enjoyed by all.

On 28 September we held our annual dinner dance, with our President in attendance. All who attended enjoyed the function.

On 17 October the WP Technical College held their annual prize giving and we presented a prize to the best student in GCC subjects from N3 to N6 inclusive. This year the prize went to Mr O Anelli.

On 18 October we hosted a talk on electrical controls and type 2 co-ordination. The speaker was Eddie Bennett of Schneider Electrical from Gauteng. It was well attended with 15 attendees. This was a very interesting talk and certainly an eye opener.

On 6 November we hosted a talk on the "Engineering Profession Act 2000" by du Toit Grobler on behalf of ECSA. We invited all our sister institutions and any interested parties. We had an attendance of 37 persons. The make up was as follows.

SAIMechE - 11  
SAIMENA - 5  
SAICE - 1  
ICMEESA - 17  
other - 3 (1 from the WP Technical College)

Programme for the new year is still under discussion and will be available after the AGM in February.

Finally, I would like to wish each and every one of you and your families' seasonal greetings and everything of the best for 2002.

**Chris Schnehage**

Tel: 083 326 8023  
Email: [icmeewc@netactive.co.za](mailto:icmeewc@netactive.co.za)



# CF51: H<sub>2</sub>S fatality

## HAZARDOUS GASES

A factory producing animal food was required to take regular sample of effluent which passed into the municipal sewer system. Waste fish and meat was processed into animal food.

The local municipal health inspector had for several weeks been taking water samples to determine the temperature of the waste water. This operation required descending into a manhole.

At about 08:30 on 30 January 1987 the inspector arrived with his assistant to take samples from the manhole outside the left hand entrance to the factory. The manhole was about 3m deep and about 500mm in diameter. The assistant went down and filled a small tin with water which he handed to the inspector. He went down twice more but on the third occasion smelled something which caused him to climb out to clear his head. He did not go down again.

Just before 12:00 on the same day the company director requested a worker JR to take samples from the same manhole. On his way JR met another worker JA who offered to take the samples because he had done so on previous occasions. JA climbed down into the manhole twice and brought up samples for JR. On coming up after a third descent JR heard him say he could not breathe. JR tried to pull him out but could not because he was too heavy and he fell to the bottom of the manhole. JR climbed down to help him but could not. Another worker MV having just arrived in a vehicle climbed down but because of the size of the opening could not lift the man out. Another worker then climbed down, put a rope around the man and he was then pulled up and taken to a nearby changeroom where MV applied mouth to mouth resuscitation without success.

The director was alerted and phoned for an ambulance. He decided, however, to transport the injured person to a doctor. It was now about 10 minutes after the IP was removed from the manhole. On arrival the doctor declared the person to be dead.

In the course of the official enquiry one of the gases in the manhole was found to be hydrogen sulphide, a poisonous gas. It is also heavier than air and therefore would accumulate in the bottom of the manhole until forced out by a rush of effluent. Subsequent samples of gas taken by the National Institute for Water Research over six separate days and at different times established readings from 8 ppm to 34 ppm. The threshold limit for H<sub>2</sub>S is 10 ppm which if breathed over a period of 8 hours is likely to be fatal. Although a low concentration could be detected by smell, a high concentration strangely is odourless.

### Comment

The employer/user of machinery exposed himself to a number of contraventions of the Occupational Health & Safety Act, which, if adhered to, would have prevented the fatality.

1. General Safety Regulation 5 - Work in Confined Spaces
  - 1.1 GSR 5(1): A competent person must test, evaluate and certify in writing that the air is safe and will remain safe whilst a person is in the area.
  - 1.2 GSR 5(2): If unable to comply with the above, the atmosphere must be purged and ventilated and all sources of potential danger isolated.
  - 1.3 GSR 5(3): Where the atmosphere cannot be purged and ventilated, approved breathing apparatus must be used and a safety harness, rope and attendant must be provided. Also a person trained in resuscitation must be available outside the confined space together with approved breathing and resuscitation apparatus.
2. General Administrative Regulation 6 - Reporting of Incidents

- 2.1 GAR 6(1): An incident referred to in Section 24 (such as a fatality) must be reported in the form of WCL 1 or 2 to the provincial director as well as by telephone.
3. General Administrative Regulation 8 - Recording and Investigation of Incidents
  - 3.1 GAR 8(1): A record in the form of Annexure 2 must be kept on the premises of reportable incidents.
  - 3.2 GAR 8(2): Every reportable incident must be investigated by the employer/user.
  - 3.3 GAR 8(3): The record must be examined by the Health & Safety committee and endorsed.

The company could have been charged for the contravention of the regulations (identical to the above) which were in force under the Machinery & Occupational Safety Act (No 6 of 1983) in addition to the charge of culpable homicide under common law. The company would be charged as a legal persona as well as the chief executive officer.

## Engineering Council of South Africa

On 6 November 2001 this Branch had the privilege of hosting du Toit Grobblers a member of ECSA at the Esckom Demonstration Centre. Other institutions had been invited and a very interested company was present.

The topic was The Engineering Professions Act (No 46) of 1 December 2000 which came into effect on 27 July 2001. The first meeting of the new Council was held on 28 August 2001 and du Toit Grobblers was here to tell us the implications of the new Act.

ECSA consists of 50 members of which 60% are nominated by the professions, 20% nominated by the three levels of government (which must include 7 professionals) and 20% nominated by the public (not requiring qualifications). Nine members of the old council are members of the new council.

All the registered persons are now professionals and can preface their category title with Pr EXCEPT Registered Engineering Technicians who must apply to be registered as professionals.

### Significant features of the new dispensation are:

- Reservation of functions must be re-affirmed and the Council for the Built Environment must be advised of this within 2 years.
- Professional registration will be valid for 5 years. To maintain registration the professional must prove what he has done to stay competent - to keep a lifelong logbook of his professional activities.
- More emphasis is placed on voluntary associations.
- A Presidents Forum of all institutions must meet regularly.

THE AIM OF ALL THIS IS TO PROMOTE PUBLIC HEALTH AND SAFETY.



# Western Province Technical College

Mr Enrico Anneli received the ICMEEWC floating trophy for the most promising student in GCC subjects, N3 through to N6. We extend our hearty congratulations to him and hope that he will set his sights on becoming a Professional Certificated Engineer. This qualification will not only qualify a person to be in charge of the maintenance of industrial production machinery but also brings professional status.

## Letter to the editor

From: AC Mac Lachlan, Saldhana

Ref. "Lived electric pole causes death"  
w.c.b. engineering bulletin august 2001. vol 7, no 4, page 2:

It is assumed that the employer had designated a competent person to comply with Reg 2 of the General Machinery Regulations.

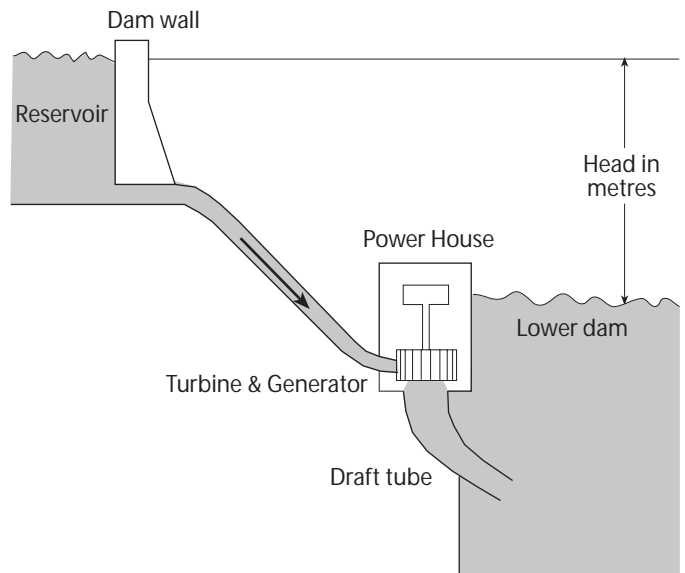
Should this be the case:

- i. then the Municipality was guilty of poor maintenance. The competent person designated should have an inspection schedule on which three monthly inspections should be entered on L.V. Overhead power lines and cables. The defective and loose cable ends would be noticed during these three monthly inspections.
- ii. The armoured cable not being properly clamped to the pole would also be noticed during the above mentioned inspection and rectified.
- iii. Public equipment should at all times be made child safe.
- iv. Reg 13(1)(b) of Electrical Machinery Regulations. The most effective way to earth metal poles is a copper earth mat about 1/2 m diameter buried under the baseplate of the pole. A copper conductor of ample size should be taken from this earth mat up the pole being either strapped or clamped to the pole and taken to the cross-arm where the earthwire should electrically be fixed to the pole. Many of the smaller municipalities did not use this method as they felt the baseplate and the bottom portion of the metal pole was an effective earth. This baseplate many times becomes rusty or covered in calcrete, which forms a layer of insulation between the metal pole and earth and is therefore not effective.
- v. Wooden or concrete poles will solve this problem providing the stays of the wooden or concrete poles have stay insulators fitted more than 2,4 m above ground level.

In addition to the above answers and comments I would like to express my personal opinion on the safety aspects of electrical networks in the rural areas.

"ELECTRICITY NEED NOT BE FEARED BUT SHOULD BE RESPECTED"

The danger of accidental contact with live electrical conductors should be more frequently explained to the general public, in schools, employers to employees in factories, on farms, in offices and to domestic workers.



Calculate the power output of the following turbine if the efficiency is 0.8

Head = 500m

Flow =  $100\text{m}^3/\text{sec} = 100\,000\text{kg}/\text{sec}$

$$\begin{aligned} \text{Power output} &= Q \times H \times E \\ &= \frac{100\,000\text{kg}/\text{sec} \times 500\text{m} \times 0.8}{75\text{kg metres}/\text{sec}} \end{aligned}$$

$$\begin{aligned} 1 \text{ metric HP} &= 75\text{kg metres}/\text{sec} = 0.736\text{kW} \\ &= 533\,333 \times 0.736 \\ &= 392\,533\text{MW} \end{aligned}$$

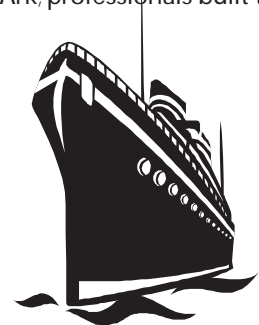
P Retief  
Eng. Tech.  
GCC

## Thanks

We thank Jorge Perreira and Pete Retief for their Plant Engineering answers

## Last Laugh

Never be afraid to try something new.  
Remember, amateurs built the Ark; professionals built the Titanic ...



**PLANT ENGINEERING EXAM**  
**NOVEMBER 2001 FACTORIES**

**QUESTION (5) (b)**

A belt drive consists of two V-belts in parallel, on grooved pulleys of the same size. The groove angle is 30°. The cross-sectional area of each belt is 750 mm<sup>2</sup> and the coefficient of friction is 0.12. The density of the belt material is 1200 Kg/m<sup>3</sup> and the maximum permissible tension in the belt is 5250 N.

(i) Calculate the power that can be transmitted between pulleys 300 mm in diameter rotating at 1500 r/min.

(ii) Find the shaft speed in r/min at which the power transmitted would be a maximum. (10)

(i)  $\theta = \pi \text{ rad}$   
 $v = \pi d n$

$v = \pi \times 0.3 \times 1500/60 = \underline{23.6 \text{ m/s}}$

density = mass / volume

$\therefore \text{mass} = \text{density} \times \ell \times A$   
 $\text{mass} = 1200 \times 1 \times 0.75 / 1000$   
 $\text{mass} = \underline{0.9 \text{ Kg/m}}$

$T_c = mv^2$   
 $T_c = 0.9 \times 23.6^2 = \underline{502 \text{ N}}$

$T_1 = \sigma A = \underline{5250 \text{ N}}$  (given)

$$e^{\mu \theta \operatorname{cosec} \beta}$$

$$e^{0.12 \times \pi \times \operatorname{cosec} 15^\circ} = \underline{4.291}$$

$T_1 - T_c / T_2 - T_c = e^{\mu \theta \operatorname{cosec} \beta}$

$5250 - 502 / T_2 - 502 = 4.291$

$\therefore T_2 = \underline{1610 \text{ N}}$

Power =  $(T_1 - T_2) v \times 2$  (watts)

Power =  $(5250 - 1610) \times 23.6 \times 2$   
 Power = 172 Kw.

**(ii) For maximum Power:**

$T_c = 1/3 T_1$

$T_c = 1/3 \times 5250 = \underline{1750 \text{ N}}$

also:  $T_c = m v^2$  (for max power)

$\therefore v = \sqrt{1750 / 0.9} = \underline{44.1 \text{ m/s}}$

$N_1 / N_2 = v_1 / v_2$

Where:

$N_1 = 1500 \text{ r/min}$

$v_1 = 23.6 \text{ m/s}$

$v_2 = 44.1 \text{ m/s}$

$\therefore N_2 = 1500 \times 44.1 / 23.6$

$N_2 = \underline{2800 \text{ rpm}}$ . At max power.

*Jorge Pereira*  
*Cert. Eng. (Mech. & Elec.)*

**A peculiar question?**

**Plant Eng Exam (Factories)**  
**Nov. 2001 (1) (a) compulsory question**

Among the candidates applying to be trained as Boiler Attendants are the following:

- A man with tunnel vision
- A man who is colour blind
- A man born completely deaf
- A man who has had one hand amputated at the wrist

State, giving reasons, which of the above candidates you would reject and how you would accommodate the others, bearing the requirements for employment equity in mind. (8)

**Readers are challenged to provide a "politically correct" answer.**