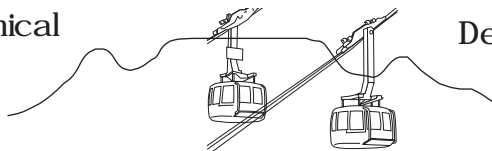


# Engineering Bulletin

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

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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

*A report in the Mining Weekly News on November 16 entitled "Safety law compromised by new provisions" based on a talk by Prof Willem le Roux at a mine health and safety seminar in Johannesburg last month raises some interesting points relating to the vulnerability of the employer in the event of an accident. The report suggests that the amended Mine Health & Safety Act is compromised by provisions which have conflicting consequences. Prof le Roux is quoted as saying: "The employer has, in this context, two interests - one is to achieve the health and safety objectives of the Act and the other is to avoid exposure to civil and criminal liability. These interests are competing, and the Act does not provide any acceptable resolution in this regard."*

*The problem seems to hinge on the requirement of section 11(5) of the Act for the employer to carry out his own investigation of an accident and prepare a report of his investigation. If the report incriminates the employer he might be exposed to civil and criminal liability.*

*The Act also requires the employer to prove that he had either taken reasonable steps to comply, or that his conduct was reasonably practicable and that there was no negligence on his part. The good professor suggested that the Act be amended so as to protect the employer where the employee acts beyond the course and scope of his employment.*

*It appears that this new aspect of the Mine Health & Safety Act is similar to the provisions of the Occupational Health & Safety Act. Section 8 of this Act also requires the employer to act reasonably towards his employee and to be reasonably practicable in his procedures. There is also provision for his own investigation of an incident which must be available to an inspector.*

*The recording and investigation of incidents by the employer is required by General Administration Regulation 8 and the employer is bound by section 39(4) to record true information and not false in the record. This lays him open to self-incrimination. What is he to do? Cover up to protect himself against criminal or civil liability? Would it not be in the best interest of all parties if thorough and accurate investigations were carried out? There may be a case here for the records to be available to investigating inspectors only against indemnity of the persons who have the duty to investigate and record the incidents. ○*

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## Local Branch News

On 19 October, we held a talk on the New Certificate of Compliance. The talk was of much interest and we had a very good turnout. The talk was presented by Colin Pym, who is an Occupational Health and Safety Inspector with the Department of Labour (Colin is the only engineering Inspector in the Western Cape). Unfortunately the talk on the Mega/Uni City did not take place, as there is still a raging difference of opinion between the various parties concerned.

On 28 October we held our Fire Protection and Risk Management Seminar. The attendance was good. Unfortunately we were not so well supported by our own members! I presume that we all have our factories and complexes adequately protected against fire!!

On 16 November a group of us (12) visited Cape Diving and Salvage where we had an introduction to work underwater the Fanie Kruger. An Inspector at the Department of Labour also presented the main points of the Regulations re Diving. This was also a most interesting event.

As the year is drawing to a close, it is appropriate to wish each and every one of you and your families a blessed Christmas and a prosperous New Year for 2000.

Our first item on the agenda will be a talk on Boilers and boiler/pressure vessel failures by someone from John Thompson. The date will probably be 15 February 2000.

Invitations will be sent out as usual. We will publish the rest of our programme for next year early in February 2000.

Best wishes to you all. ○

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## A Boiler Inspector's job is not an easy one!

Whilst inspecting a boiler this inspector had a narrow escape from injury. During the inspection the operator of the boiler moved the front smoke box cover which was hanging on the swinging arm in the open position. The supporting arm suddenly collapsed with the heavy cover onto the floor below. The cause was the collapse of the pipe socket, in which the arm swung, due to severe corrosion. A year before the same inspector had drawn the attention of the user to examine the condition of the support of the other boiler.

*Editor: Good boiler inspector's are an endangered species so need to be preserved at all cost. If only users would act upon good advice without delay they could save themselves trouble and unnecessary expense. o*

## SAQCC Competent Persons for Boiler Inspector

*Adrian Wytje comments as follows:*

The syllabus for Competent Person for Boilers and Pressure Vessels includes the regulations pertaining to boilers and pressure vessels, both under the OHS Act and the Minerals and Energy Act. The regulations under the M & E Act give everything which the regulations under the OHS Act is lacking and which the CP (Boilers) most certainly needs to know.

It is sincerely hoped that the M & E Act will not be rationalised soon so that the information contained in these regulations will remain the standard for inspections of boilers and pressure vessels.

For the information of our readers of the bulletin, it should be noted that these regulations almost literally may be found in the previous Factories, Machinery & Building Work Act of 1941.

*Editor: The Editor will be happy to provide these latter regulations at a nominal cost to interested parties o.*

### PATRON MEMBERS

Schneider SA (Pty) Ltd	Tel: 531-1722
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
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Circuit Breaker Industries Ltd	Tel: 931-3125 Fax: 931-3120
African Products (Pty) Ltd, Bellville	Tel: 951-2151 Fax: 951-5627

## Conveyor Fatality

On 21 May 1975 a tragic accident occurred at a winemaking co-operative due to a number of unsafe procedures.

During the shut-down period a gang of unskilled workers were cleaning and painting a steel drag chain conveyor under supervision of a foreman. The conveyor transfers the grape skins to the outside of the factory. When the workers finish a section they call the foreman George and he switches the machine on (to make a new section available) and then off.

Whilst the three workers and their supervisor were busy on the conveyor it was suddenly and unexpectedly put into motion and just as suddenly brought to a stop. Unfortunately one worker, Daniel, at that moment had his head between a moving part of the conveyor belt and the fixed frame. He suffered severe injuries and died on hour later in hospital.

At the time of the incident George was on top of the conveyor standing on a chain. The conveyor suddenly and without warning moved about a foot and then stopped. All the labourers screamed when the conveyor stopped. Daniel was under the conveyor where he should not have been. He only needed to paint the side of the conveyor. Nathan was outside on a ladder painting the top of the conveyor. When it started suddenly he jumped off and went inside to switch off.

One of the workers, Mathew, a young man of 19, had gone to the switch station with the intention of switching on the screw conveyor in which water had collected from the washing out of the wine tanks, thinking the screw would push out the water. As this was the first time he had operated these switches he did not know which was the right one and most unfortunately chose the wrong one. When he realised his mistake he stopped the conveyor but it was too late.

The personal cause of this accident is considered to be a joint fault on the part of the foreman, the person who set the conveyor in motion and the injured person for the following reasons:

The foreman failed to take adequate precautions to prevent any other person from starting up the conveyor. It is normally standard practice to either remove the fuses or lock the switch in the 'off' position to prevent any person from starting up a machine.

The worker, Mathew, unlawfully started up the machine, although without any criminal intent.

The deceased placed himself in a vulnerable position under the conveyor where he should not have been.

Overall it becomes clear, as one thinks of all the aspects of this very tragic event, that the employer cum user of machinery failed to comply with the provisions of the Factories, Machinery and Building Work Act in force at the time, viz. to set up and enforce safety procedures, to train workers in safe working and to ensure discipline that prevents unauthorised actions by employees. Section 8 of the present Occupational Health & Safety Act of 1993 covers all of these and more, and should be thoroughly studied and applied to prevent such awful consequences. o

# Legal Knowledge : Occupational Health & Safety Act (No 85 of 1993)

JUNE 1999

Question No 1

- (a) Define: (i) Danger  
(ii) Hazard  
(iii) Risk

(3)

ANSWER:

These are part of the main Act

- (i) Causing injury or damage to persons or property  
(ii) Source of or exposure to danger  
(iii) Probablability that injury or damage may occur
- (b) The Act apart from other specific duties, imposes on the employer the duties to inform. State these duties in regard to:
- (i) Every employee on hazards in respect of his health and safety attached to any work he has to perform.  
(ii) Health & safety representatives in respect of inspectoions, investigations, fomal inquiries by inspectors & exemptions the employer had applied for  
(iii) A health and safety representative on incidents that happened in his designated workplace.

(7)

ANSWER:

- (i) Sect 13(a) - Make him conversant with hazards and precautions to be taken and observed.  
(ii) Sect 13(b) - Inform the H & S rep beforehand of such matters.  
(iii) Sect 13(c) - Inform the H & S rep of such an occurrence.
- (c) Whenever an employee commits an offence in terms of the regulations it is presumed that the employer committed the offence unless the employer can prove three requirements.  
State the THREE requirements.

(6)

ANSWER:

- (i) Sect 37(1)(a) - Employee acted without employer's connivance or permission.  
(ii) Sect 37(1)(b) - Employee acted outside scope of his authority.  
(iii) Sect 37(1)(c) - Employer had taken all preventive measures.
- (d) A mandatary of an employer contravened Driven Machinery Regulation 3(7) by failing to provide his portable power driven saw with a guard. A serious accident occurred, while using the saw on the employer's premises. State in terms of the same section, 'omissions by mandataries' the requirements of the Act on TWO arguments how the employer in question could exonerate himself of the culpability.

ANSWER:

Sect 37(2) - Both parties have agreed in writing to the arrangements and procedures to ensure compliance with the Act. o

## Disabling Injury Caused by Sulphuric Acid

During June this year an operator at a Power Station suffered severe acid burns while operating a valve in the Demineralisation Plant. A PVC pipe broke while a valve was being operated, which resulted in the operator sustaining 20% burns with 98% Sulphuric Acid. He suffered burns on his arms, face and back.

The operator was on his own at the time, and made for the emergency shower where he stayed until help arrived, about 20 minutes later. By the time help came he was suffering from the extremely cold water.

The operator was treated by First Aiders and airlifted to the nearest hospital by helicopter. After skin grafts to his arm and a lengthy stay in hospital he is back at work.

It is planned to install additional pipe supports to the PVC pipework to prevent future incidents of this nature. o

## More on Awkward Pressure Vessels

Further to the editorial on Awkward Pressure Vessels in the October Bulletin, Adrian Wytje has raised the suggestion that Vessels Under Pressure Regulation 13(1)(b) could be widely interpreted to allow an inspector to permit the inspection and testing of a pressure vessel as used in the textile or paper industry to be inspected and tested when it is removed from its bearing bed for maintenance. Furthermore, in terms of this sub-regulation an inspection authority may in writing authorise the user to dispense with an inspection and test if he is satisfied that the vessel is not subject to corrosion. Steam drums in the textile and paper industries in continuous use may indeed fall into this category and as an additional safeguard it must be borne in mind that these vessels are designed to withstand external mechanical pressure as well as internal steam pressure so that their design pressure far exceeds their normal operating pressure.

*Editor: It is hoped that these pointers may encourage users of these types of vessels to take a more pragmatic approach to their problems and enter into discussions with departmental inspectors and inspection authorities about the issues.o*

## Joke

There's a story about how Albert Einstein was travelling to universities in a chauffeur-driven car, delivering lectures on his theory of relativity. One day while on the road, the chauffeur remarked: "Dr Einstein, I've heard you deliver that lecture about thirty times. I know it by heart and bet I could give it myself."

"Well, I'll give you the chance," said Einstein. "They don't know me at the next university, so when we get there I'll put on your cap, and you introduce yourself as me and give the lecture."

The chauffeur delivered Einstein's lecture flawlessly. When he finished, he started to leave, but one of the professors stopped him and asked a complex question filled with mathematical equations and formulas. The chauffeur thought quickly. "The solution to that problem is so simple," he said, "I'm surprised you have to ask me. In fact, to show you just how simple it is, I'm going to ask my chauffeur to come up here and answer your question."

# Occupational Health and Safety Act (No 85 OF 1993)

Issue No 21

## GENERAL ADMINISTRATIVE REGULATIONS (GAR) GAR 10: INTOXICATION

GAR 10(1): Apart from bona fide medicines, the employer/user must not permit a person who appears to be under the influence of intoxicating liquor to enter or remain at a workplace. A shift worker coming on an afternoon shift appeared to his foreman to be rather unsteady, so the foreman decided to observe his performance. Before starting work the employee went to the toilet where he was found after a short while to have slipped on the cement floor and had struck his head on the floor. He was taken to hospital and after treatment discharged and sent home. After two weeks at home he died suddenly, presumably as a result of the fall. The company was exonerated from the contravention because they could show from records that the man had been warned on a previous occasion about intoxication, and on another occasion actually sent home for the same reason.

GAR 10(2): This subclause places a legal duty on the employee or any person not to be under the influence of liquor or drugs at a workplace. So see that the office party is not held at a workplace!

## GAR 11: ADMITTANCE OF PERSONS

Persons may only be allowed at a workplace with the permission of the employer/user. Posting up a "No Admittance" notice or sign is optional. Civil servants on official business are not affected by this regulation.

## GAR 14: CONSTRUCTION WORK

The provincial director of Labour must be advised of construction work which will take more than 3 months and will entail excavations exceeding 1,5m and volume exceeding 3m<sup>3</sup> and heights exceeding 6m. ○

## More jokes

Judge: I'm going to give your wife R300 a month for alimony and child support."

Husband: "That's very nice of you, Your Honour. From time to time, I'll try to give her a little myself."

*Leo Aikman : Readers Digest September 1978*

Husband: "I've found this great job. Good salary, free medical aid and accident insurance, paid holidays and coffee breaks."

Wife; "That's wonderful, dear!"

Husband: "I knew you'd be pleased. You start on Monday."

*Mary Waldrip : Reader's Digest September 1978*

# Maintenance management

Note: The Editor is indebted to Ian Noble-Jack and the Cape Technikon for permission to publish questions and answers from previous examinations in Maintenance Management. It is hoped that Certificated Engineers in training will find these of value.

A sum of R250 000 000 is to be raised to purchase an asset for the maintenance department of a company. One option is a fixed-balance loan, at a fixed interest rate of 17% pa, over a period of 5 years. A second option is to raise the money as a diminishing balance annuity over a period of 4 years with monthly repayments.

- (a) Determine for the diminishing balance annuity the interest rates that will result in the same
- (i) total sum of money being repaid
  - and (ii) same monthly repayments.
- (b) Determine for the diminishing balance annuity, for the interest rates found above, the differences in outstanding balance after
- (i) one year and six months
  - (ii) two years
  - (iii) three years.

## Answer

- (a)  $P = 250 \times 103$ ;  $r = 17\% \text{ pa}$ ;  $n_1 = 5 \text{ yrs}$   
Interest per year = R42 500  
Total interest = R212 500  
Total sum to repay =  $(250 + 212,5) \times 103 = \text{R}462\,500,00$   
Monthly payment over  $5 \times 12$  months = R7708,33 pm

(i) For  $n_2 = 4 \text{ yrs}$   $A_1 = \frac{462\,500}{4 \times 12} = \text{R}9635,42 \text{ pm}$

$$A = P \times r(1+r)^n / [(1+r)^n - 1]$$

A graph of this function is then drawn plotting monthly amounts against a range of interest percentages between say 18% and 36%.

From the graph it is found that

(i)  $r_1 = 34,3\% \text{ pa}$  (0,028583 pm) for the amount R9635,42

(ii)  $r_2 = 20,66\% \text{ pa}$  (0,017216 pm) for the amount R7708,33

- (b) From  $P = \frac{A [(1+r)^n - 1]}{r(1+r)^n}$  with  $n_1^1 = 30 \text{ months}$   
 $n_2^1 = 24 \text{ months}$   
 $n_3^1 = 12 \text{ months}$

Equal total sums

$$P = \frac{9635,42 [(1,028583)^n - 1]}{0,028583(1,028583)^n}$$

$P(1\frac{1}{2} \text{ yrs}) = \text{R}192\,364,34$

$P(2 \text{ yrs}) = \text{R}165\,699,51$

$P(3 \text{ yrs}) = \text{R}96\,727,18$

Equal monthly payments

$$P = \frac{7708,33 [(1,017216)^n - 1]}{0,017216(1,017216)^n}$$

$P(1\frac{1}{2} \text{ yrs}) = \text{R}179\,433,21$

$P(2 \text{ yrs}) = \text{R}150\,498,06$

$P(3 \text{ yrs}) = \text{R}82\,929,26$

Differences after:

$1\frac{1}{2} \text{ yrs}$  R12 931,13

2 yrs R15 201,45

3 yrs R13 797,92 between the balances.