Engineering Bulletin

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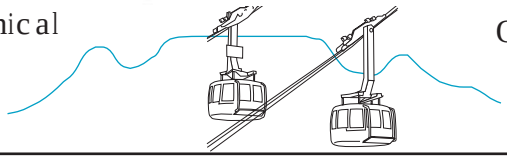

MISSION STATEMENT: 1. To uphold the image & status of the Certified Engineer. 2. To represent the Certified Engineer at ECSA and other decision-making bodies concerning legislation, safety & health standards, the environment and machinery regulations. 3. To promote continued education & training of its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

EDITORIAL

THE ENGINEERING PROFESSION BILL

This bill is before Parliament and will repeal the Engineering Profession Act (No 30) of 1978, the Transkei Act of 1990 and the Engineering Act (No 114) of 1990.

ICMEE Council is considering the draft bill and will comment on it.

The purpose of the bill is to regulate the relationship between the S A Council for the Engineering Profession and the Council for the Built Environment.

The South African Council for the Engineering Profession (SACEP) will consist of 30 registered members: 20 engineering professionals, 10 engineers of whom 6 will be employees of the State, and 10 members of the public.

Appointments will be for 4 years.

The president and vice-president must be engineers.

The Chief Executive Officer will be a paid officer as well as the administative staff.

Levies will be paid by tertiary educational institutions who will be certified every five years.

The SACEP will consult with the Council on Higher Education and the SA Qualifications Authority for competency standards.

The SACEP will liaise with the National Standards Body to establish a Standards Generating Body to set examination standards (including overseas requirements).

The SACEP is responsible to the Council for the Built Environment (CBE)and the new Act will be administered by the Minister of Public Works. The CBE must also approve voluntary engineering institutions.

Registration will be required in the following categories:

A Professional Engineer
Technologist (Eng)
Certificated Engineer
Technician (Eng)

B Candidate for Professional Engineer
for Technologist (Eng)
for Certificated Engineer
for Technician (Eng)

C Specified Categories

AWKWARD PRESSURE VESSELS

There was a time when a user of machinery could get free advice from the Department of Labour and at no additional charge get written permission to have an awkward pressure vessel gas tested (with certain necessary precautions) instead of undergoing a hydraulic test. These awkward vessels are found in the textile and paper industries. They are usually very large vessels which would require tons of water for a hydraulic test, placing an excessive load on bearings and causing possible distortion of the shafting. Provision is also not usually made for venting the gas to ensure complete filling with water.

Under the present Vessels Under Pressure Regulations (Reg 13(4)) this permission must be obtained from an approved inspection authority who would specify the precautions to be taken and may wish to supervise the test or recommend a Registered Competent Person (Pressure Vessels). Prior to such a test an internal inspection must be carried out.

This internal inspection raises a problem where access to the interior is not provided for. Then permission must be obtained for shell thickness testing and/or entroscope inspection both of which may not be satisfactorily executed, depending on the geometry of the vessel and whether it is clad.

Refrigeration pressure vessels also create problems for compliance with inspection and testing, but where it can be shown that the liquids are not corrosive exemption may be granted on application to the Department of Labour.

Editor: J Horne

5 Abingdon Road

Kenilworth 7708

Tel/Fax (021) 7972661

e-mail: jhorne@ilink.nis.za

Local Branch News

Unfortunately we had a problem with putting a talk together as prearranged for August. Sometimes a persons best intentions do go awry. However, let it not be said that we do not keep on trying!

On 28 September we held a very successful and interesting visit to Koeberg Nuclear Power Station. 14 persons attended after 22 said that they would be there. I must say that the visit was of great interest to all of us. What a place! It is in fact mind boggling to see what is being done to keep all systems on the leading edge and safe as well.

The planned programme for the next few months is as follows:

Continued on Page 3 col 1

Dangerous wor m screw conveyor

On 28 February 1973 at a wine cellar cooperative, during the lunch interval a youth of about 14 years, employed by an outside transport company, apparently climbed over an unguarded worm conveyor and possibly slipped and fell onto the worm screw, receiving fatal injuries. There were no eye-witnesses to the incident. The IP may have been reaching into the conveyor to remove grape pips and skins. Although there had been a guard on the machine on the previous Monday, on the day of the incident Wednesday there was no guard in place. The guard was probably removed for cleaning of the conveyor and not replaced and then moved out of the way when the tractor came in.

The youth's job was to see to the filling of the tankers which came from the transport company for which he worked. The boy's father also worked for the transport company. When the police arrived they found that the body had been drawn into the worm feet first for a distance of about 3 m. The legs were badly mangled and the abdomen torn open. A doctor certified death and the body was removed by the policeman.

The lessons to be learned from this incident are obvious. Supervision with safety in mind would have ensured that the cover over the dangerous worm screw was replaced immediately after cleaning. To allow the conveyor to be operating without its cover was criminal. General Machinery Regulation 2 requires a Competent Person to be appointed in writing to supervise machinery. Such a person must not only have had experience in the operation and maintenance of machinery (preferably an artisan) but also have a responsible attitude towards the safety of persons working in the vicinity of machinery.

The presence of unsupervised youth is a risk where machinery is in use. The use of the services of this person may have been a contravention of the Basic Conditions of Employment Act.

AFFILIATE MEMBER

We welcome Charles Marx as our twenty fifth affiliate. We trust he will benefit from the association with the branch.

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
Drake & Scull (Pty) Ltd	Tel: Fax:	683-7056 683-7088
Circuit Breaker Industries Ltd	Tel: Fax:	931-3125 931-3120
African Products (Pty) Ltd, Bellville	Tel: Fax:	951-2151 951-5627

Legal knowledge

Occupational Health & Safety Act (Act No 85 of 1993)

JUNE 1995 Question 2

(a) Where an employer requires any person to enter any place from or into which solid or particulate material is being discharged and where a danger exists of a person being engulfed by such solid or particulate material , certain precautionary measures have to be taken. Name ALL these measures. (10)

(b) With regard to a structure being demolished, every employer who performs building work shall, with respect to such demolition, ensure that certain steps are taken. Name these steps. (12)

(c) A person working in an elevated postion, may only do so from certain positions. Name these positions. (3)

ANSWER

(a) General Safety Regulation 7

(i) The person is provided with and properly uses a safety belt or rope;
(ii) Another person who is properly instructed must remain in attendance outside to render assistance in case of emergency;
(iii) If dangerous gas, fumes, dust or vapour is present the precautions referred to in Reg 5 must be applied.

(b) General Safety Regulation 13

(i) Not to overload any floor, roof or any other part of the structure;
(ii) Take precautions to avoid the danger of collapse when any part of a framed building is removed or concrete is cut;
(iii) Provide shoring or other means to prevent accidental collapse of any part of the structure or adjacent structure

(c) General Safety Regulation 6

From a ladder or scaffolding or as safe as working from a scaffold.

Occupational Health & Safety Act (No 85 of 1993)

Issue No 20

GENERAL ADMINISTRATIVE REGULATIONS (GAR)

GAR 2: Certificate of Exemption: This is signed by the Chief Inspector or Provincial Director or a delegated person. NB: All exemptions will fall away from 11 December 1999 and fresh exemptions will have to be applied for and motivated. These must not be confused with approvals given by Department of Labour inspectors or approved inspection authorities in terms of certain regulations.

GAR 6: Reporting of incidents & occupational diseases

GAR 6(1): Incidents reportable in terms of Section 24 of the Act must be reported on WCL 1 or WCL2 forms within 7 days of the incident to the provincial director. In the event of death or likely death or permanent disability the provincial director must also be advised forthwith by telephone or facsimile or similar communication.

GAR 6(2): Where death occurs subsequent to reporting the incident the provincial director must be notified forthwith.

GAR 6(3): Incidents affecting visitors at a place of work are also to be reported as above.

GAR 6(4): A registered medical practitioner who examines or treats a person for a disease as contemplated in Section 25 of the Act must notify the chief inspector and employer within 14 days on WCL 22.

GAR 6(5): A registered nurse or any other person may also give notice of a disease to the employer and chief inspector.

GAR 8: Recording and investigation of incidents

Reportable incidents must be recorded in Annexure 2 as well as other incidents requiring medical attention other than first aid, and the record must be kept for at least 3 years.

A record of an investigation into the incident and the findings must be kept.

The record must be examined by the health and safety committee and endorsed by the chairman of the H & S committee and the employer.

GAR 9: Witnesses at an inquiry

When an inspector is to hold a formal inquiry into an incident he must notify the employer or user of the date, time and place of such inquiry and the employer or user must notify the witnesses.

The inspector may subpoena a witness who refuses to attend.

Continued from Page 1 col 2

19 October - New Certificate of Compliance by Colin Pym an Inspector of Occupational Health and Safety at the Department of Labour.

28 October - Fire protection seminar at Eskom Test and Demonstration Center at Edgemead.

16 November - Visit and talk on underwater construction. Venue still to be announced.

Your support at the functions which we arrange would really be appreciated!!

It is that time of the year when we start looking to changing the guard in terms of the committee and now is the time for anybody who feels that he could contribute to the operation of the branch to stand up and be counted. Please let any one of the committee know should there be anybody out there who is interested. If you do not know who to contact, look on our web site @ http//icmeesa.hypermart.net or phone either Jerome Horne (our editor) or myself.

Finally, there is a lot of information on our web site, so please make a visit. Should you have a problem with the delivery of your Energize or Electron, you can get there directly from within the web page. There are two other sites which you may wish to visit. These are: Should you want any regulation amendments ahead of anyone else, visit and register with HYPERLINK http://www.acts.co.za www.acts.co.za and if you want to read versions of any act before parliament or older, visit HYPERLINK http://www.polity.org.za www.polity.org.za

Please let me have your email address should you have one so that we could save some postage money and correspond electronically.

Cheers for now!

Christopher Schnehage
Tel +27 21 509 3266 (W)
Fax +27 21 509 4170
E-mail: cschnehage@oldmutual.com

Plant Engineering

November 97 (Factories) Exam Paper Page 1

Examination for the Engineer`s Certificate of Competency

Question 7 (c)
A 100 kVA transformer supplied with 2.2 kV has a turns ratio of 400:80. Primary and secondary resistances are 0.3 ohm and 0.01 ohm respectively, and the corresponding leakage reactances are 1.1 ohm and 0.035 ohm respectively.

Determine:

The equivalent impedance referred to the primary circuit

The voltage regulation and the secondary terminal voltage for full load having a power factor of
0.8 lagging
0.8 leading.

To find Ze1 = equivalent impedance referred to the primary

Ze1 = Re1(+ Xe1) and
Re1 = R1 + R2 (K) and
Xe1 = X1 + X2 (K)

Where: K = transformer ratio = N1/N2 = 400 / 80 = 5

Re1 = 0.3 + 0.01(5) = 0.55 ohm and
Xe1 = 1.1 + 0.035 (5) = 1.975

Ze1 = 0.55 (+ 1.975) = 2.05 ohm

(a) To find the Voltage Regulation for cos (= 0.8 lagging = VR

VR = (1 (Re cos (2 + Xe sin (2) / V1

(1 = FL primary current = S / V1 = 100 x 1000 / 2200 = 45.45 A

VR = 45.45 (0.55 x 0.8 + 1.975 x 0.6) / 2200 = 0.0336 p.u. = 3.36%

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ACKNOWLEDGEMENT
The valuable article in the August 1999 Bulletin on Cable Protection was produced by Marcel Buckner of Schneider SA (Pty) Ltd

To find the secondary terminal voltage on no load:

V2 (NL) = V1 (1 / K) = 2200 x (1 / 5) = 440 V

Decrease of secondary voltage between no load and full load :

= V2 (NL) x VR = 440 x 0.0336 = 14.8 V

Secondary terminal voltage on full load = V2 (FL) = 440 @ 14.8 = 425.2 V

(ii) (b) To find the Voltage Regulation for cos (= 0.8 leading = VR

VR = (1 (Re cos (2 - Xe sin (2) / V1

VR = 45.45 (0.55 x 0.8 ñ 1.975 x 0.6) / 2200 = - 0.0154 p.u.

Increase of secondary terminal voltage between no load and full load :

= 440 x 0.0154 = 6.78 V

Secondary terminal voltage on full load
= 440 + 6.78
= 446.8 V

MOTORCAR JOKES

(Gleaned from The Treasury of Clean Jokes - Tal D Bonham - Broadman Press 1981)

An Englishman, Irishman and an American were flying over the Sahara Desert.
The Englishman observed, "A beastly place."
The Irishman exclaimed, "The devil's home."
The American exulted, "What a parking lot!"

Petrol attendant: "Your oil is OK, but your engine needs changing."

Most cities have only two types of pedestrians - the quick and the dead.

After knocking down a woman pedestrian who was jaywalking, the taxi driver stopped and helped the irate lady.
Refusing his assistance, she shrieked, "You stupid, reckless creature! You must be blind."
"What do you mean, blind?" snapped the driver. "I hit you, didn't I?"

Car sickness is that feeling you get every month when the payment falls due.

One cold nighta man with reputedly poor eyesight was driving a friend home. The frost was thick on the windows. After a couple of near accidents, The friend tactfully suggested that it might help if they cleaned of the windscreen.
"What's the use," the driver replied. "I left my glasses at home."

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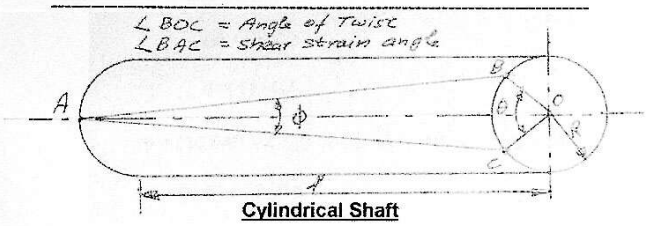
Nov 96 **Question 4 (b)** **Plant Engineering (Factories)**

A torque of 10 840 Nm is applied to the ends of a 4.3 m long cylindrical shaft with outside diameter 127 mm and inside diameter 76.2 mm. The modulus of rigidity of the shaft is 4.1 x 10^4 Mpa.
Determine:
(i) The maximum shearing stress
(ii) The angle of twist in the shaft

$J = (\pi/32)\ (D^4 - d^4)$



Cylindrical Shaft

From: $T/J = G\theta/\ell = \Im/R$

Where:

T = torque	(Nm)	
J = polar moment of inertia = $\pi/32\ (D^4 - d^4)$		(m^4)
G = shear modulus	(GPa)	
θ = angle of twist	(radians)	
ℓ = length of shaft	(met)	
ℑ = shear stress	(MPa)	
R = shaft radius = Dia./2	(m)	

(i) To find ($\Im max$):

$T/J = \Im max/R$

$\Im = TR/J$

and: $J = \pi/32\ (D^4 - d^4) = \pi/32\ (0.127^4 - 0.0762^4)$
$J = 22.23 \times 10^{-6}$ (m^4)

and: $R = D/2 = 0.127/2 = 0.0635$ m

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$\therefore \quad \Im max = 10\ 840 \times 0.0635 / 22.23 \times 10^{-6}$

$\Im max = 30.96$ MPa

(ii) To find : Angle of twist: (θ):

$G\theta / \ell = T/J$

$\theta = T\ell / GJ$

$\theta = (10\ 840 \times 4.3) / (4.1 \times 10^4 \times 10^6 \times 22.23 \times 10^{-6})$

$\theta = 46\ 612 / 0.9114$

$\theta = 0.0511$ radians

$\therefore \quad \theta = 0.0511 \times 180^o/\pi = 2.93^o$

Jorge Pereira 99/08/03