

MARCH 2005

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

EDITORIAL

New draft Electrical Installation Regulations

New proposed Electrical Installation Regulations were published for comment in Government Gazette Notice Number 28293 dated 9 December 2005. These are draft regulations and interested parties have until the 9th of March 2006 to submit comments to the Department of Labour (DOL).

Here are some of the important requirements as per the draft regulations:

1. The format of the Certificate of Compliance has been changed (again). Currently the electrical contractor is required to indicate the measurement results obtained during the inspection and he / she must state that the electrical installation is safe. The proposed certificate is more a declaration in that the electrical contractor is only required to state that the work has been done in accordance with the legal requirements and therefore safe for use. The proposed certificate also makes provision for the signature and declaration on the part of the user / owner of the building;
2. All certificates issued by electrical contractors must contain a unique number and must have been issued by the DOL. This will in all probability mean that electrical contractors will have to buy these certificates from the DOL. As all certificates are numbered the DOL would be able to trace all certificates back to the electrical contractor to whom these certificates were issued. This will hopefully also discourage unauthorized persons from issuing certificates;
3. The proposed regulations make provision for the establishment and registration of Approved Inspection Authorities (AIA) for electrical installations. Although not widely advertised the DOL have some time ago started registering AIA's for electrical installations. Again this provision will merely formalize existing structures. Currently these AIA's for electrical installations are paid by the DOL to investigate electrical complaints. These AIA's for electrical installations will first put some pressure on the electrical contractor to fix non-conformances. Should they be unsuccessful they will report the matter to the DOL who in extreme cases can cancel the contractor's wiremen's license / registration.

These AIA's will not be your normal electrical contractor as the proposed regulations prohibit them from operating as electrical contractors. It could also be assumed that the DOL would require that these organizations are accredited by an external body prior to them being approved as an AIA;

4. The proposed regulations contain requirements, which will result in control similar to that exercised by the Local Authority Electrical Inspectors in the past. These provisions may however result in us having to pay more for work done by electrical contractors, as users are required to employ AIA's to supervise some work done by electrical contractors. The proposed regulations require that:

- a. All installation in excess of 1kV be designed and the construction be supervised by a person who is in possession of the following qualifications:
 - i. An engineering diploma in the mechanical or electro technical (heavy current) qualification of at least a T3 or N5 level;
 - ii. A graduate engineer; or
 - iii. A certificated engineer; and
 - b. The user or lessor appoint an Approved Inspection Authorities for electrical installations or a person who is in possession of the qualifications as mentioned above when installing an electrical installation of 25kVA or above. This will result in the user having to contract the services of an AIA when employing electrical contractors for relatively small jobs;
5. The safety of the electrical installation remains the responsibility of the user or lessor as mentioned previously. The proposed regulations do however allow for the lessor to transfer this responsibility to the lessee should the two parties have agreed to this in writing. I assume this will become a standard clause in all leasing contracts; and
 6. The proposed regulations places more emphasis on the control to be exercised by electrical contractors as the regulations require that all work done be conducted under their "general control" which is defined as "includes the instruction, guidance and supervision by a registered person over electrical installation work that is being carried out".

The above article is an extract from a SafeNet (Africa) publication and copied with permission:

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Chris Schnehage

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During the French Revolution a priest, a lawyer and an engineer are about to be guillotined.

The priest puts his head on the block, they pull the rope and nothing happens -- he declares that he's been saved by divine intervention -- so he's let go.

The lawyer is put on the block, and again the rope doesn't release the blade, he claims he can't be executed twice for the same crime and he is set free too.

They grab the engineer and shove his head into the guillotine, he looks up at the release mechanism and says, "Wait a minute, I see your problem...."

LOCAL BRANCH NEWS

Hello once again everybody.

We are well into the year by now and have just had a torrid time with the recent power failures. We seem to have survived this lot now, and hopefully we don't have similar failures for a long time to come.

We held our AGM on Tuesday 21 February at which the committee members who served last year were re-elected and one new member volunteered to serve. Thus the committee for 2006 is as follows:

Chris Schnehage – Chairman

John Davidson – Treasurer

Mort Lyle

Enrico Anelli

John Moorhouse (newly elected)

We wish them well for the year and may they serve our Institution well!

At the AGM we also had Mr. Ravi Pillay, Chief Air Pollution Officer for the DEAT (Department of Environmental Affairs & Tourism) address us on the new Air Pollution Control Regulations. It was a most interesting discussion and certainly sounds like a step in the right direction.

The next few months events planned are:

Tuesday 14 March (12h30) – visit to the Cape Town Harbour – container depot, etc

Tuesday 11 April @ 14h00 – visit to the Faure Accelerator

May – talk on “Contingency Planning & Emergency Preparedness at Sanlamhof Computer Centres”

June – Talk on shipwrecks along our coast

We look forward to seeing you at one of our functions.

Ciao for now!

Chris Schnehage

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EXPLOSION FROM A BOILER BLOW DOWN PIT

An enquiry was held in terms of the Boiler Explosions Act when an explosion occurred at approximately at 00:15 on Monday 13 August 1962 at a rubber manufacturer's premises in London when the lid of a blow down pit and its fastenings was blown from its frame, the threads having failed. A stoker working on the boiler was killed. Two other personnel were severely scalded.

Arising out of the enquiry it was established that the blow down pit, situated just below ground level in the boiler house and some 3 m from the centre line of a multitubular economic type boiler, had dimensions of 1,3 m in length, 1,2 m in breadth and 1,15 m deep. The pit was brick-lined and connected to the boiler blow down valve by a 50 mm steel pipe about 3 m long and over-flowed to a surface drain through a 150 mm pipe and then to a sewer.

The pit was also fitted with a 150 mm open vent pipe which extended about 1,8 m above the floor. The pit was closed at the top by a cast iron lid 750 mm square and 40 mm thick weighing about 63 kg, and secured by 2 x 5/8” brass bolts into a cast iron frame at ground level.

From records it appeared that the blow down pit had never been inspected.

It was further established that while the stoker was on duty blowing down the boiler to reduce the water level, the lid of the blow down pit together with its fastenings was blown from its frame, the threads having failed. This caused the contents of the boiler to be discharged into the boiler house as a result of which the stoker was scalded to death.

From the evidence available at the enquiry the indications were that at the boiler pressure at which the blowing down was being carried out the provisions for release to waste of the contents of the blow-down pit was inadequate with the result that the lid together with its fastenings was blown from its frame owing to overpressure in the pit.

This boiler was installed about eight years prior to the incident as a new boiler. Since its installation it was tended by the stoker who was killed. It was operated by coal firing with chain grate stoking when installed. The stoker would thus have been well acquainted with the operation of the boiler and had over the period of years blown down the boiler on numerous occasions.

In February 1962 the firm approached a contractor with a view to converting the boiler to oil burning. It was stipulated that the work should commence at the beginning of the firm's annual summer holidays in July. The installation was to be completed and the boiler to be available for steaming on the day the firm resumed work on the 7 August 1962, the works having closed on the 20 July 1962.

Unfortunately due to various reasons the installation was not fully completed when work restarted and the boiler was not working as a fully automatic unit during the ensuing week as trouble was being experienced with certain of the switch control gear. The contractor was in attendance during this week. On Thursday 9 August objection was raised in the manner in which the Mobrey controls were operating. A representative of this firm was called and was in attendance together with other personnel associated with the conversion of the boiler to oil burning.

On the evening of Thursday, certain adjustments were made to the Mobrey controls by an outside technician. One of the persons was asked to lower the water level to check the feedwater pump. Having partly opened the valve when the lid of the blow-down pit opened causing hot water to swirl over the floor towards this person scalding both of his feet as well as two other personnel.

The next day, Friday, 10 August, the owners fitted two 5/8” brass Whitworth bolts to secure the lid. At the enquiry it was established that the now-deceased stoker was unaware that bolts had been fitted. It was also ascertained at the enquiry that during the process of carrying out blow-down operations, it was customary to open the valve and allow it to blow down until the blow-down lid fluttered (!!) then to close the valve until the pressure had relieved itself, then open the valve and repeat the procedure intermittently so as to avoid water flowing over the boiler house floor. Thus the blow down lid was used as a guide to indicate when to open and close the valve during blow down operations!

On the evening of Sunday 12 August at 22:10 a service engineer arrived at the premises to carry out some adjustments. The now-deceased stoker was already on duty. The fire was lit at about 22:45. The service then departed.

At 00:15 the security heard an explosion and rushed to the boiler house where he found the lifeless body of the stoker.

At the enquiry it was postulated that the stoker was not informed that studs were fitted on the previous Friday. Consequently, when he had to blow down the boiler by opening the valve very slowly and expecting the lid of the blow down pit to rise, which it did not do. He then continued to open the valve fully believing the blow down pipe to be choked with sediment. Then, without warning the lid blew off due to a sudden rise in pressure resulting in a cascade of hot water and steam enveloping the boiler house. It was also found that a quantity of loose ballast and rotten timber was blown from the pit at the time of the explosion. It was surmised that these items could have blocked proper drainage from the pit. It was also felt that the size of the blow down pit was too small.

M S JAFFÈ

Prof Cert Eng

Plant Eng. 78 (2) Steam Nozzle

Steam entering a nozzle of a turbine, has a saturated vapour value of 2769 kJ/kg. At exit to the nozzle the saturated steam vapour is 2258 kJ/kg and a has also saturated liquid value of 417 kJ/kg. The dryness fraction is 0,885. Determine, the velocity of steam leaving the nozzle assuming a nozzle efficiency of 90%.

Heat drop at entry to nozzle = $H_1 = \text{Enthalpy} \times \text{mass of steam} / \text{sec.}$
Assume mass steam = 1 kg/sec.
 $H_1 = 2769 \times 1 = 2769 \text{ kJ/sec.}$

Heat drop at exit of nozzle = $H_2 =$
 $= [417 + (0,885 \times 2258)] \times 1 = 2415,33 \text{ kJ/sec.}$

Available Heat Drop = $H_1 - H_2$
 $= 2769 - 2415,33 = 353,67 \text{ kJ/sec.}$

Useful Heat Drop = $(H_1 - H_2) \times \eta$
 $= 353,67 \times 0,9 = 318,3 \text{ kJ/sec.}$

To find the velocity of steam leaving the nozzle:
 $KE = \frac{1}{2} m V^2 = 318,3 \text{ kJ/sec.}$
 $V = \sqrt{318,3 \times 1000 \times 2 / 1} =$
 $= 797,87 \text{ m/sec.}$

OHS Act June 2002 Question (2):

(a) In terms of the General Administrative Regulations, incidents must be reported to the provincial director of the Department of Labour.

- (i) What type of incidents must be reported?
- (ii) When must the incidents be reported?
- (iii) How must the incidents be reported?
- (iv) Who must report it?

Answer:

2(a) (i) to (iv): See GAR 6 (1)

(b) In terms of the General Safety Regulations:

- (i) State THREE safety requirements, numbered 1 to 3, for the safety of wooden ladders.
- (ii) State TWO requirements for the safe use of ladders.

Answer:

2(b) (i) See GSR 13A (4)

2(b)(ii) See GSR 13A (1) & (2)

(c) In terms of the Hazardous Chemical Substances Regulations:

- (i) What actions by persons are prohibited in a respiratory zone?
- (ii) What way of removal of particles of a hazardous chemical substance from any surface or person is prohibited?

Answer:

2(c)(i) See HCSR 8 (c)

2(c)(ii) See HCSR 13 (a)

(d) Where the exposure of employees to hazardous chemical substances in the working environment cannot be prevented and engineering control measures are implemented:

- (i) At what intervals must these measures be examined and tested?
- (ii) Who must carry out these examinations and tests?

Answer:

2(d)(i) See HCSR 12 (b)

2(d)(ii) See HCSR 12 (b)

(e) In terms of the Environmental Regulations for Workplaces, list FIVE requirements, numbered 1 to 5, to expedite the evacuation of a workplace in case of fire.

Answers:

2(e) See ERW 9 (1) (a) to (g)

Jorge Pereira
Cert Eng

The Traveling Engineers

Three engineers and three accountants are traveling by train to a conference. At the station, the three accountants each buy a ticket and watch as the three engineers only buy one ticket.

"How are three people going to travel on only one ticket?" asks an accountant.

"Watch and you'll see," answered an engineer.

They all board the train. The accountants take their respective seats but all three engineers cram into a rest room and close the door behind them.

Shortly after the train has departed, the conductor comes around collecting tickets. He knocks on the restroom door and says, "Tickets, please!" The door opens just a crack and a single arm emerges with a ticket in hand. The conductor takes it and moves on. The accountants see this and agree it is a clever idea. So after the conference, the accountants decide to copy the engineers on the return trip and save some money.

When they get to the station, they buy one ticket for the return trip. To their astonishment, the engineers don't buy a ticket at all.

"How are you going to travel without a ticket?" says one perplexed accountant.

"Watch and you'll see," answered an engineer.

When they board the train all three accountants cram into a restroom and the three engineers cram into another one nearby. The train departs.

Shortly afterward, one of the engineers leaves his restroom and walks over to the restroom where the accountants are hiding. He knocks on the door and says, "Tickets, please!"

Here you go Business Majors!! No competition for the Engineers!!

COMMERCIAL MEMBERS

Globe Engineering Works (PTY) Ltd Tel 021 448-4640

Drake & Scull (PTY) Ltd Tel 021 683-7056

Sappi Cape Kraft (PTY) Ltd Milnerton. Tel 021 552-2127

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From: John Davidson

THE STEENBRAS PROJECT

The introduction of pumped-storage to Cape Town was first considered by Mr C G Downie, the then City Electrical Engineer, who in 1952 suggested to the University of Cape Town that this subject might be considered as a thesis for a BSc degree. Following on this suggestion, a thesis was submitted which proposed the use of existing reservoirs on Table Mountain as an upper water supply source, with a power station of 50 000 kW capacity situated to the south of the mountain in Orange Kloof.

During 1958, investigations were initiated jointly by the City Electrical Engineer and City Engineer into the feasibility of a pumped-storage installation on Table Mountain, in conjunction with a water supply augmentation scheme. The scheme envisaged a new upper reservoir in Disa Gorge or Echo Valley and a lower reservoir in Orange Kloof. This proposal was subsequently followed up by the Council's consulting engineers but, as Table Mountain was a proclaimed national monument, its implementation proved difficult at the time and the proposal was dropped.

In 1963 the subject of pumped storage was again revived and the possibility of employing either the existing Steenbras dam or Wemmershoek dam as a site for a pumped-storage scheme was considered. However, with Athlone power station being under-utilized at the time, this proposal was not deemed economically viable.

In 1969 the Council's consulting engineers recommended that a 180 000 kW pumped-storage scheme be considered on Paarl mountain after other schemes using fresh water at Steenbras and sea water at Chapman's Peak and Witsands had also been investigated and abandoned as being uneconomic. Because of planning and amenity difficulties, the Paarl site was also dropped.

About this time the City Electrical Engineer and City Engineer had joint discussions on the possibility of combining a pumped-storage installation with a water supply scheme employing a second dam upstream of the then existing Steenbras dam. Following on these discussions, the Council resolved to construct this second dam to augment the City's water supply. It then became logical to combine this new dam with a pumped-storage scheme.

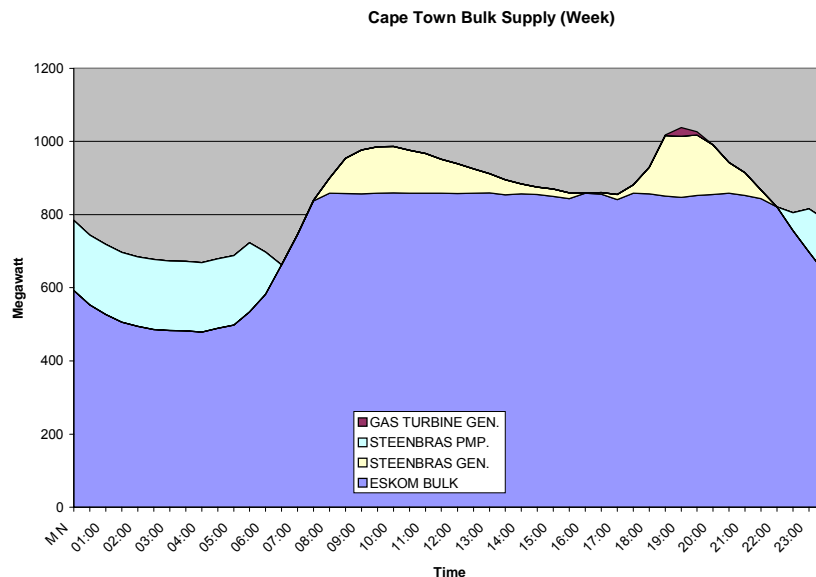
Exploratory drilling on site was commenced in 1971. After the invitation of tenders for the main items of plant and a further economic reappraisal of the scheme, the approval of all authorities was ultimately obtained. Steenbras pumped-storage scheme became a reality with the issue of the first contract acceptance letters in March 1975. Soon afterwards the civil engineering contractors moved onto site. The Steenbras pumped-storage installation is located 50 km from Cape Town on the lower slopes of the Hottentots-Holland mountain range near Gordon's Bay.

ECONOMIC CONSIDERATIONS

The final original cost of the Steenbras pumped-storage scheme, including the overhead line connecting the power station to the City's transmission system at Mitchell's Plain, was estimated at around R65 million at the time. This was equivalent to an installed cost of R361 per kilowatt.

The economic justification for this large capital investment by the City was based on the escaping of correspondingly high ESKOM demand charges, then about R57 per kW per annum. Because of inflationary trends, the annual value of the ESKOM demand charges that were escaped with the generating capacity of Steenbras, increased steadily year-by-year in step with the inevitable increases in ESKOM's tariff. By originally making conservative assumptions in respect of the rate of escalation in ESKOM's tariff and the interest rate, it was calculated that the cumulative present value of the annual savings in ESKOM demand charges, less all operating costs of the pumped-storage scheme, would equal the full capital outlay on the scheme within a decade of commissioning the station.

The dual tariff structure applied in the Cape Town Electricity Undertaking then, is still in use today namely, ESKOM's Night save tariff. A charge is levied for energy consumed in cents/kWh and the charge levied for maximum demand (as attained in any given calendar month in R/kW). These were 7.26 cents/kWh and R46.17/kW respectively for 2001 excluding various surcharges and discounts.



A typical winter day Cape Town Peninsula area System Load 29 June 2005