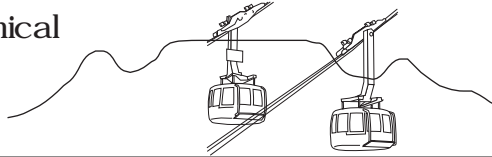


# WCB ENGINEERING BULLETIN

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

P.O. Box 504, Rondebosch 7700



April 2001  
Vol. 7 no. 2



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 horrific incident involving a harmless looking fire extinguisher is described in some detail for two reasons:*

- 1. As a reminder to management and competent persons to check this type of equipment regularly in accordance with laid down standards of safety.*
- 2. As an example of the standard of incident investigation which the Department of Labour, which administers the Occupational Health & Safety Act, should be carrying out.*

*The purpose of health and safety standards is to warn about and prevent industrial health hazards and machinery accidents. The function of the inspectorate is to apply the legislation by visiting factories and informing and warning the employer and user of machinery of their legal obligations, and to investigate incidents which were not prevented.*

*If incidents are not thoroughly investigated and the true causes established, prevention of similar incidents will not be achieved. Incidents involving machinery and construction work require engineering knowledge and experience. Incidents involving hazardous substances require chemical and hygienic knowledge and experience. Inspectors with these expertises should be available in the Labour Department. Can anything be achieved without such?*

*Industrial accidents affect the workers of the nation. This important group should be kept alive and well. Serious incidents are publicised in the Press. Official investigations are not. Findings are kept under wraps for fear of embarrassing someone. We don't hear of a company being sentenced for three people killed in a boiler explosion or eleven people suffocated in a locked room or miners killed in a rockfall. Our daily papers could fill this vacuum.*

*It is heartening to see advertisements in the local papers in which the Department of Labour is advising workplaces that inspectors will be visiting them. A list of questions is included to which the answers Yes or No can be ticked off to query if the company is complying with certain requirements. A warning is added that failure to comply with the relevant Acts constitutes a criminal offence. Bravo Labour! Show mercy to the thoughtless but wrath to the callous.*

Jerome Horne  
10 Whitehall Court  
143 Main Road  
Rondebosch 7700  
Tel/Fax: (021) 686 0015 Cell: 083 769 6377  
e-mail: jhorne@ilink.nis.za

## Local Branch News

Hello once again everybody.

EE Publishers, who publish the Electron and Energize, have recently bought out the Vector magazine and have approached the Council to have this magazine as the Journal of the Institution. After deliberation, Council accepted the offer. The only condition from EE Publishers is that only fully paid up members receive the magazine. Any persons wishing to continue receiving the Energize or Electron, are welcome to subscribe to them in future.

Therefore, once again we have a journal as the mouthpiece of the Institution and we sincerely hope that we are able to keep up with news and papers of interest. The first issue as our journal will reach all paid up members in April.

A further item of interest is the calling for nominations for members of the new ECSA council. The nominations must be in on or before 26 April. Any member who may be interested in nominating himself or herself or a colleague, please contact me for further information.

Programme for next few months is as follows: Unfortunately the planned visit to the SAB did not materialize due to some technical hitch, we will attempt to arrange later in the year.

19 April	Talk on Unicity
17 May	Technical visit to Grand West Casino
21 June	Talk on Occupational Health and Safety

Please diaries these dates!

How about hearing from you? We would love to print a column for letters to the editor, so we look forward to some response from you!

Regards to all and Ciao for now.

**Chris Schnehage**

Tel: 083 326 8023

Email: icmeewc@netactive.co.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

# Dangerous fire extinguisher

A most unusual incident occurred on 10 July 1982 at about 14:35 in a factory when welding caused a small fire and the fitter who was using the welding equipment used a fire extinguisher. He grabbed the nearest fire extinguisher, pressed the plunger and the brass screwed top flew off and struck him in the face with fatal results.

## The occurrence

An engineering company was contracted to carry out modifications to a door press in the production department of the factory. The modifications consisted of removing the four suspension chains of the platens and replacing them with spacer plates. Three men arrived at 08:00 and work commenced immediately. Measurements were first taken and all the pipe work stripped off the machine. At about 11:45 the men started to fit the spacer plates. At about 12:20 worked stopped for a lunch break. The men returned at about 13:15.

The fitter in charge sent his assistants to bring the welding equipment. When they returned they drilled two holes in the press while the fitter tried to remove some broken studs where a bracket was to be fitted in that position. Because he could not remove one of the broken studs he sent the apprentice assistant to the factory workshop to drill a larger hole in the bracket. The labourer assistant excused himself to go the toilet. He was away for about 15 minutes. After ten minutes the apprentice returned. He saw the fitter sitting next to the machine. He noticed a fire burning beside the machine. He walked up to him then ran back to the workshop and shouted: "There's a fire there and someone has got hurt there". He then went to the gate and told the watchman to contact the Police and the ambulance. When the labourer arrived a little later he dragged the fitter away from the fire at the machine and went to the workshop to look for the other assistant. The firm's fire fighting team was at the scene shortly afterwards and extinguished the fire. The police arrived at the scene shortly afterwards followed by the Labour Department inspector. The latter found the scene of the accident covered in a white powder.

In consultation with the Police and the Resident Engineer the Inspector made the following deductions: Shortly after the two assistants left, the fitter wanted to tack-weld a bracket on to the press. Sparks from the welding fell onto the floor where a mixture of oil and sawdust ignited. The fitter rushed outside found a fire extinguisher and rushed inside. While standing over the extinguisher he depressed the plunger. The CO<sub>2</sub> in the gas cylinder was released and filled the outer cylinder. The brass head assembly and the diffuser were propelled out with tremendous force with the side of the head assembly striking the fitter on the right side of the head and possibly killing him instantly. The head assembly was later found by the Police to have signs of human tissue. The

assembly was later found by the Police to have signs of human tissue. The diffuser was found a short distance away. White powder marks were found on a roof beam above where the body was found and a greater concentration on the floor.

## Technical details

The owner of the fire extinguisher contracting company provided the following information:

The fire extinguisher was a 9 kg CO<sub>2</sub> propelled dry powder riveted and soldered extinguisher about 30 years old. It was serviced by his company, which was responsible for the servicing of all fire fighting equipment on the premises. The extinguisher was operated by pressing a plunger assembly in the head, which caused a spike to pierce the CO<sub>2</sub> cylinder releasing the gas through a funnel device into the bottom of the cylinder. The pressure of gas forced the powder out through the hose and nozzle.

The contractor services the equipment every three months. The procedure was as follows: The cap is removed, the CO<sub>2</sub> cylinder is unscrewed from the head cap, the cylinder is then weighed and the weight checked against the minimum weight stamped on the neck of the cylinder. The head cap is then examined, the condition of the rubber washer checked and the plunger assembly checked for correct functioning with the cylinder removed. The cylinder is then replaced in the head cap; plunger assembly is actuated gently to make certain it is making contact with the seal of the cylinder. The powder is then examined for impurities or lumps, the unit is reassembled, greasing head cap if necessary and the safety cap is sealed with wire and lead. The hose and nozzle assembly is removed and checked for clearance. The pressure in the cylinder is 3500 psi (24 MPa) and the pressure in the main unit rises to 350 psi (2400 kPa).

## Departmental Inquiry

Inspectors of the Labour Department conducted a characteristically thorough inquiry.

The contractor's serviceman gave evidence that he had serviced the extinguisher involved in the incident on 19 May 1982. He had opened the cap, removed the cartridge and checked the weight of the cartridge, cleared the hose, checked the powder, checked the plunger assembly and then reassembled everything. He then checked the spike against the cartridge. He then put the lead seal on. To tighten the cap he first used a "C" spanner and then used a hammer to finished tightening it. He then signed and dated the service label. Before putting the lead seal on he lifted the protective device over the plunger so that it could not be operated unless the seal was broken and the protective device removed.

The investigating inspector examined the equipment and took certain measurements:

Cylinder. The external thread diameter on the main cylinder was parallel and round. The outer diameter of the threads he found to vary between 87,1 mm and 87,2 mm, the slight difference being possibly due to wear. The number of threads per inch were 11, conforming to a 3 inch BSP thread, Cap. The internal thread diameter on the head was found to be both tapered and oval. Internal diameter varied between 86,2 mm

*Continued on Page 3*

### PATRON MEMBERS (continued)

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:	52-2127
John Thompson Africa (Pty) Ltd, Bellville	Tel:	951-2271

Cap. The internal thread diameter on the head was found to be both tapered and oval. Internal diameter varied between 86,2 mm and 87,0 mm at the entrance and 86,1 and 86,9 at the end of the thread. The number of threads to the inch was 12. The type of thread form could not be established from various thread tables, which were consulted. The maximum thread interference was only 0,55 mm.

Hydraulic test. The cylinder was filled with water and the cap firmly screwed on and tapped closed slightly more using a hammer. At a pressure of 300 kPa the cap burst off the lower two threads but did not disengage from the cylinder due to the sudden reduction in hydraulic pressure.

### Calculations

CO<sub>2</sub> cartridge: Pressure 24131 kPa Volume 0,00028 m<sup>3</sup>

Main Cylinder: Volume calculated from measurements 0,00836 m<sup>3</sup>

Pressure when cartridge punctured calculated as 844 kPa. But, assuming that the powder takes up half the volume, then the pressure in main cylinder becomes 1688 kPa.

Force on the head or top at the latter pressure was found to be 10,74 kN or over 1 tonne.

THE FORCE ON THE MAXIMUM THREAD INTERFERENCE OF 0,55 mm WOULD OVERCOME THE THREAD INTERFERENCE WITH DISASTROUS EFFECT.

### Legal liability

Under the Factories, Machinery and Building Work Act of 1941 a contravention of Regulation C21 was found to have been contravened, which read: "The user shall cause all appliances, machinery and plant to be so selected, arranged, installed, protected, adjusted, worked and maintained as to prevent danger to persons so far as practicable." Read together with Section 40(2) the offence was transferred from the "user" to the "agent".

The fire extinguisher servicing contractor and his employee were therefore charged by the State. In spite of the technical evidence available, the prosecution did not get a conviction.

[The corresponding regulation under the OHSAct of 1983 is General Machinery Regulation 3(1)(a) read with Section 37(2)

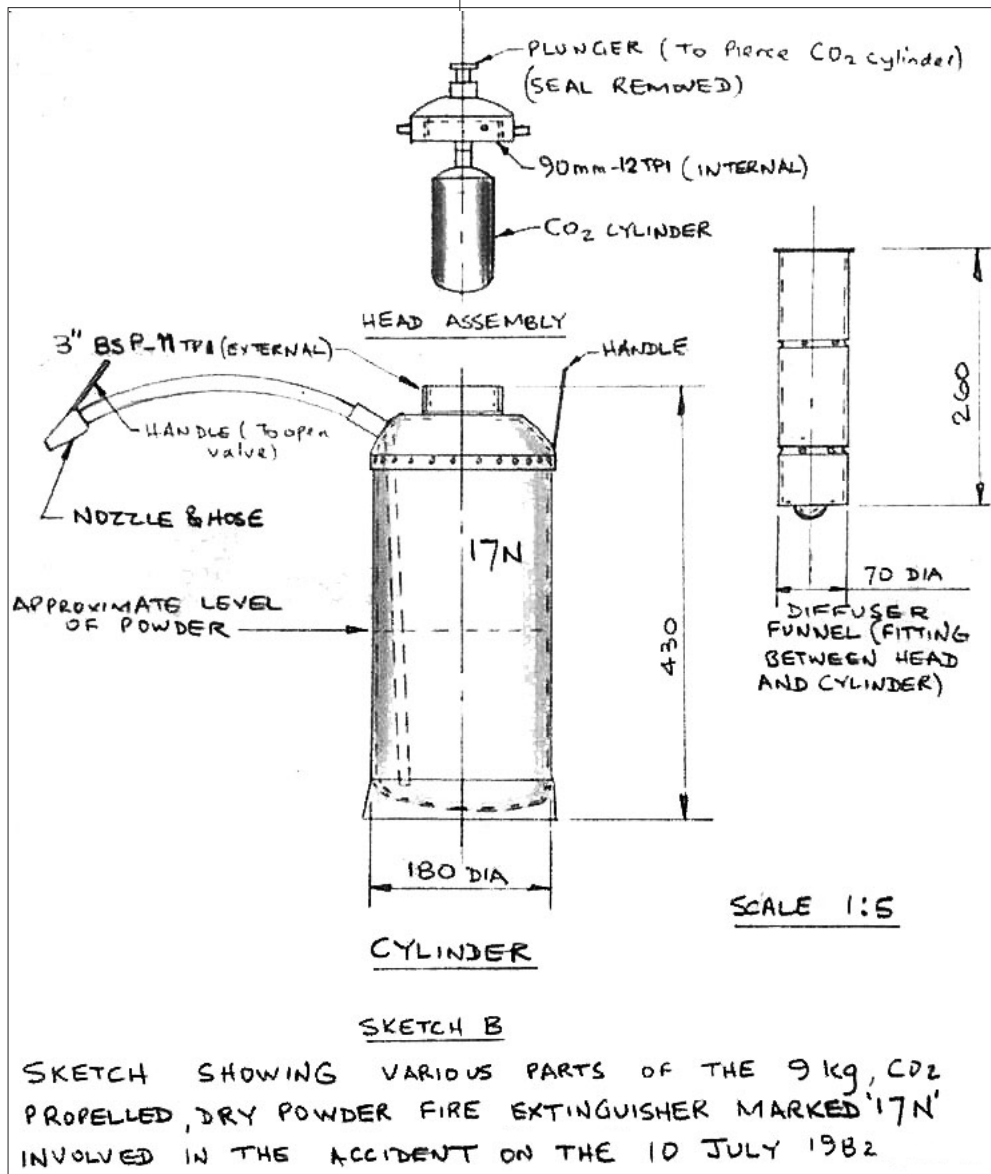
General Machinery Regulation 3(1)(a) read with Section 37(2) and (3)].

### Comment

Had a 3 yearly hydraulic test been carried out on the extinguisher the mismatch would have been discovered. There were other extinguishers on the premises with 12 tpi and a mix-up may have occurred due to carelessness on someone's part. There could then have been a second extinguisher waiting to inflict damage. One would expect that a firm specialising in certain equipment would

be aware of the possibilities of error. If the factory staff had been tampering this would reflect on poor management allowing irresponsible activity.

Present regulations for handheld fire extinguishers are found in Vessels under Pressure Regulation 11, which incorporates code of practice SABS 0105, and standard specifications SABS 1475 and SABS 810.



### Important reminder

Certificated Engineers who are in possession of unembossed certificates issued by the Department of Labour should make contact with this department so as to have the certificates replaced by properly embossed certificates. The sooner done the better.

### Qualified engineers at last!

After the November 2000 examinations the following Engineer's Certificates were issued:  
 40 certificates for mines  
 33 certificates for factories.

**QUESTION 2(a)**

The driven machinery regulations prescribe five options for the guarding of a power press. It also provides an additional guarding option known as 'double hand control guarding' and which may be used provided it complies with the prescribed regulations.

State:

- (i) The system criteria mentioned in the regulations which must be complied with before a user may permit the use of 'double hand control' as guarding on a power press.
- (ii) THREE requirements that must be complied with in respect of the operation controls when a double hand control system is used.
- (iii) The additional requirement in the case where a full revolution press fed by hand is used.

[8]

**ANSWER**

- (i) The operating controls must require the simultaneous engagement of both hands of ALL the operators involved in the operation of the press.
- (ii) The controls must be situated at such distance from the point of operation that none of the operators has enough time to reach the danger zone with any part of his body before the working stroke is completed.  
The controls are so designed that the working stroke will be arrested if any one of the operators removes ONE of his hands from the controls.  
The controls must be so arranged that they cannot be bypassed.
- (iii) A full revolution press fed by hand must be provided with an anti-repeat device.

Note: Anti-repeat device is defined as: "A device which incorporates a control system designed to limit the press every time to a single stroke even if the control that is actuating the press is held in the operating position, and which requires the actuating controls to be returned to the neutral position before another stroke can be initiated."

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## Free journal

VECTOR JOURNAL (SA Institute of Technician Engineers) From 1 April 2001 this monthly journal will be sent free of charge to all paid-up members of ICMEESA. Articles from the Western Cape Engineering Bulletin will be included in the content. It will be a great honour for the Western Cape Branch to receive this recognition.

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## Western Cape Engineering Bulletin

The Committee will not send this bulletin to ICMEESA members of the local branch who are not up-to-date in payment of fees to Council. Affiliate Members of the local branch will also not receive their copy of the bulletin if their annual fee has not been paid.

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## Where are the Certificated Engineers lurking?

The Council for the Built Environment Act has been passed in Parliament and will be implemented as time goes on. Changes are likely to be made in the functioning of the Engineering Council of South Africa (ECSA). The work of ECSA has been largely that of setting standards and registering various categories of persons involved in engineering at different levels from professional engineers to lift inspectors. Provision will also be made for disciplinary or penal action against defaulters where poor engineering and other poor professional performances endanger and disadvantage the public.

It would be wise for certificated engineers who have not registered with ECSA to do so. To be entitled to be called a Professional Certificated Engineer not only ensures confidence on the part of one's employer or clientele but also encourages pride in the standard of work expected of a professional.

The Western Cape branch of ICMEE would like to see younger members of the fraternity taking an interest in committee work and offer their services. The present members have worked hard and sacrificially over many years to provide interesting talks and visits and information to members but they are not immortal and youth means young ideas. So who would like to give it a go?

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## Newton's Laws

(Updated for state departments)

1. For every number of officials working, there is an equal and opposite number not working.
2. An official will continue in a state of rest or of stationary motion in a reclining position, unless he forced by the action of external forces (e.g. the job assessment committee), to change that state of motion.
3. The rate of work of an official is proportional to the applied external force and takes place in the direction of the nearest escape route.
4. An official and a job repel each other with a force that is directly proportional to the product of their masses and inversely proportional to the square of the thickness of the files in his in-box.

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## How to be a top manager

Top Managers must learn to cultivate ignorance. The higher you go, the less you actually should know about what is actually going on. Managers must rely on others to know. If they don't they are not managers, they are meddlers. Subordinates will bounce the most trivial decisions up the ladder if that behaviour is reinforced.

Managers don't have to be computer literate... Instant information in the hands of a manager is actually dangerous. Let those as far down in the organisation as possible have the instant information. Let them react and do what must be done and then pass on the results.

(From the Wall Street Journal, Feb 7, 1983)