WCB ENGINEERING BULLETIN

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

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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. To promote fellowship in the engineering profession.

EDITORIAL

Welcome to the latest edition of the Western Cape News Bulletin

At the end of last year, we bid farewell to our long serving Secretary, Mariana Jacobs. Mariana left us to take on a post at another larger Institution.
We wish her all the best for the future.

The Board decided to not appoint a new secretary in full time capacity but have rather asked myself (Chris Schnehage) to fill in the role on a temporary basis.
And so – as a result, members may have noticed that there has been a drop in the activities in the social front. This is directly due to Mariana leaving.

The office at 2 Davidson Street, Benoni, has been closed and the Institution's belongings have been stored in a container at a premises nearby. I took what I needed to Cape Town and am caretaking from there.

It has been noticed that quite a few members have made payment for their subs for 2021 – and we thank each of you. However, there are a number of payments that have been received to which no clear information on who has made the payment – while the invoice clearly states to please use the invoice number as a reference! This is not a good state of affairs as such a payment cannot be credited to whoever made the payment. So, PLEASE let us know should you be aware of your company making a payment and you suspect an incorrect reference has been used. THANK YOU!

In this Bulletin, we have the normal Questions and Answers for Factories and Mining GCC examinations.
We have a note from ECSA together with a quarterly report of the last quarter.
There are also two short articles taken from the ICMEESA Archives – from The Certificated Engineer volume 39 – 1969.

Any contributions to future editions of this Bulletin from members would be welcome.

I trust that you will find the content of this news bulletin interesting enough to pass on to your colleagues and friends.

Chris Schnehage
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LOCAL BRANCH NEWS

Activities of the Western Cape Branch since the last Bulletin were as follows:

We have not had any activity during the first quarter of 2021 due to the continued COVID Pandemic. However, we are planning to hold a Zoom meeting soon.
Will keep members up to speed with this as at present trying to get the logistics right.

We appeal to members who have an interest to please suggest something and assist with arrangements.

Until next time, Ciao for now!

Chris Schnehage
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OHSAct, June 2015 (3) (DMR)

3.1 Define the term "bench saw" as given in the Driven Machinery Regulations, 1988 as amended. **[2]**
Answer: See definitions

3.2 What steps must you take in the following cases of moving or revolving components of machinery which are not in such a position or of such construction that they are as safe as they would be when securely fenced or guarded.

3.2.1 Set screws or keys on revolving shafts. **[1]**
Answer: 2(b)

3.2.2 A square projecting shaft or spindle end projecting more than a quarter of its diameter. **[1]**
Answer: 2(c)

3.2.3 Driving belts or chains **[1]**
Answer: 2(d) & (e)

3.3 Name TWO conditions under which the saw blade of a power-driven circular saw shall not be used. **[2]**
Answer: 3(1)(a)(b)

3.4 What must be guarded on a band knife? **[1]**
Answer: 4

3.5 What steps must you take to make a wood moulding machine safe if work can not be performed when the machine is effectively guarded? **[2]**
Answer: 6

Plant Eng. Fan with Duct

A fan with the inlet open to the atmosphere delivers 12 m^3/s of air through a 750 mm diameter duct against a static pressure of 500 kPa. The barometric pressure is 700 mm mercury and ambient temperature is 20°C.

Calculate the total air power of the fan.
Density of air at 760 mm Hg and 0°C is 1,293 kg/m^3.

Suggested answer:
Density of air at 700 mm Hg and 20°C

$$= 1{,}293 \times \frac{700}{760} \times \frac{273}{293}$$

$$= 1{,}108 \text{ kg/m}^3$$

$$\text{Velocity of air} = \frac{12}{\frac{\pi}{4} \times 0{,}75^2} = 27{,}2 \text{ m/s}$$

From $v^2 = 2gh$

$$\text{Velocity head, } h = \frac{27{,}2^2}{2 \times 9{,}81} = 37{,}71 \text{ m of air}$$

Pressure due to velocity head $= \delta gh$

$$= 1{,}108 \times 9{,}81 \times 37{,}71 = 410 \text{ Pa}$$

Total pressure $= 500 + 410 = 910$ Pa

Air power $= 910 \times 12 =$ **10,92 kW**

Plant Engineering: MINES safety/risk question

Question (June 2010, Question 3)

You are appointed as an engineer on a mine. You are informed during the morning shift that the rock hoist conveyance got stuck in the shaft and the automatic winder paid rope out to the conveyance causing a slack rope condition. The rope formed a corkscrew on top of the conveyance, about the width of the conveyance itself.

What are the steps you would follow to remedy the situation and what do you need to do before putting the winder back into production? [20]

Proposed Solution:

- Stop all winding operations and record instruction in all WED logbooks.
- Give instructions to all to clear all personnel from the shaft barrel and shaft bottom.
- Assess the depth at which the conveyance is stuck. Try to determine how much rope is paid out to slack.
- Convene rescue team:
  - Rigger and assistants
  - Shaft foremen who will also be the person giving and receiving signals from the rescue conveyance to the WEDs.
  - Most experienced, good WEDs available to drive the rescue winder and assist with stuck winder – to be driven on manual.

- Determine which conveyance in the shaft barrel is available to reach the stuck conveyance without jeopadising safety.
- Rig available conveyance for shaft inspection.
- Ensure clear communication systems from rescue conveyance to bank and WEDs.
- Instruct WED of rescue conveyance to lower conveyance with team, slowly < 1,5 m/sec.
- When the team arrives at the stuck conveyance area, they are to stop above the stuck rock hoist and do visual assessment before being lowered to the area.
- After arrival at the conveyance and assessing the situation, the team is to:
    - Secure the conveyance
    - Evaluate the paid out rope for damage
    - It is stated that the cork-screw is the width of the conveyance, hence the conveyance could be lifted with the cork-screw intact if necessary.
    - Take up the instruct the rock-hoist WED to take up the slack rope until only the corkscrew is left.
    - Decide whether the conveyance can be hoisted to safety with the corkscrew intact or not. If it can be hoisted, it should be done at low speed, typically ≤ 1,5 m/sec. If it isn't safe to hoist the conveyance and a new front-end has to be made, the rope must safely be disconnected from the conveyance and hoisted to surface for a new front-end.
- After all has been done and the stuck conveyance recovered to surface, a proper shaft inspection & repairs to be done to the area of the incident eliminating the cause of the incident.
- Trial run all conveyances at least twwice through the shaft barrels
- Inform all managers of the progress.
- When all is safe, return the shaft to production.
- Report the incident to the inspectorate.

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A Legal Knowledge: MINES question

Question (November 2020, Question 2):

What requirements must a mines rescue service provider comply to for the purposes of Regulation 16.5(1) (c) and (d)? [10]

Proposed answer

16.5(2) For the purposes of regulation 16.5(1)(c) and (d), a mines rescue service provider must-

(a) be an organisation/institution which has personnel with specialist knowledge and experience in mines rescue and emergencies and which has access to rescue equipment and training facilities, including facilities for Heat Tolerance Testing, Workload Testing and Simulated Training;

(b) render an emergency rescue service on a co-operative basis;

(c) provide mines rescue services with emphasis on mobilisation of mine rescue teams, quantity or access to rescue teams, emergency communication, additional emergency resources, back up facilities and transport;

(d) ensure that any breathing apparatus that may be used by mine rescue teams continually complies with SANS 50145:1997/EN 145:1997 'Respiratory protective devices - Self-contained closed-circuit breathing apparatus - Compressed oxygen or compressed oxygen-nitrogen type - Requirements, testing, marking';

(e) ensure that their personnel is competent to check and maintain any rescue equipment used by it in accordance with the Original Equipment Manufacturer's specifications;

(f) test and maintain the functional performance of any other rescue equipment used by it in accordance with the Original Equipment Manufacturer's specifications; and

(g) ensure that the rescue team members used by them to provide mines rescue services meet the qualification requirements as prescribed in Chapter 22.

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QUAL TER HALL TO MAKE MONORAIL SYSTEM

Reproduced from International Mining Equipment (Vol. 16, No.6 - June, 1965)
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The rapid development achieved with modern mining techniques at the face has resulted in the need for a common transport system to convey men, materials and mineral quickly and safely from the face to the shaft side. A common system of transportation eliminates costly off-loading from one system to another and time consumed due to transferring. Furthermore, in view of the increasing cost of labour and the increasing difficulty in recruiting sufficient underground workers, it is essential to improve the efficiency of underground mine transport systems.

One such system manufactured and to be marketed by Qualter Hall, mining engineers, of Barnsley, is a result of collaboration with Wright Anderson of South Africa, who have had a prototype system working satisfactorily for some considerable time. This co-operation between the two companies has resulted in Qualter Hall producing a monorail transport system that will give a more speedy and versatile system of haulage for mineral, supplies and men, although the initial development is concerned primarily with the last two aspects.

Recent Design
In many respects Wright Anderson and Qualter Hall monorail locomotives are similar, but the Qualter Hall locomotive, being of more recent design, incorporates several important developments.

It is in the application of the drive that the Qualter Hall locomotive illustrates its superiority over the conventional locomotive haulage. Gradients far beyond the capabilities of the conventional ground mounted locomotive can be climbed, and tight curves can also be negotiated; furthermore, on level track this monorail locomotive is capable of hauling twice the load of an equivalent conventional locomotive. The prototype locomotive frequently demonstrates its ability to climb a gradient of 1-in-4 with a train of containers on the test circuit. This ability to climb such steep gradients is derived from the unique patented drive assembly. The greater the load to be pulled, the greater the adhesion between the rubber tyred driving roller and the track as the driving wheel automatically moves in closer contact with the track. As the locomotive does not rely on its own weight for grip and hence drawbar traction, it can be made as light as possible therefore allowing for more payload for the same horsepower.

FLP Diesel Engine
Other advantages embodied in the design of the QH. monorail system are the absence of haulage ropes and the elimination of derailment. The single track that this system is suspended from can be either fastened to existing roof arches of the mine roadway or, depending on the strata, directly bolted to the roadway roof without the high cost of track grading.

The prototype locomotive is fitted with a fully flameproof diesel engine, and obtains a maximum speed of 10 mph. Brakes in the best modern practice are hydraulically operated discs with an additional emergency brake designed for automatic operation. In addition to these brakes on the locomotive there is an independent hand-operated emergency brake on each of the man riding carriages.

Each man riding carriage is designed to carry eight occupants seated. Supplies for transportation are suspended beneath trollies which are capable of carrying loads of varying lengths, as extra sections can be added to the trollies to make up the required length. Less bulky supplies can be transported in container units.

Although at present designed for the rugged and exacting requirements of the mining industry, it can be envisaged that a more sophisticated version of the Qualter Hall monorail could be adapted for civic requirements to meet the everyday needs of the traveler.

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BIG EXTRUSIONS FOR A BRIDGE LAUNCHING TRUSS

Reproduced from 'Machinery Lloyd and Electrical Engineering' (Vol. 37, No. 16 - 31st July, 1965)
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The use of a launching truss, in the form of an overhead girder, can often resolve the problem of placing bridge beams into position where there is difficult or no access below the bridge for the usual lifting equipment. A truss of this sort, recently built by Head Wrightson Stockton Ltd, Norton Rd, Stockton on Tees, has a 200 ft span for launching a 180 ton concrete beam 165 ft long. The truss is a lattice girder of triangular cross section 15 ft deep, the horizontal centres of the top booms being also 15 ft.

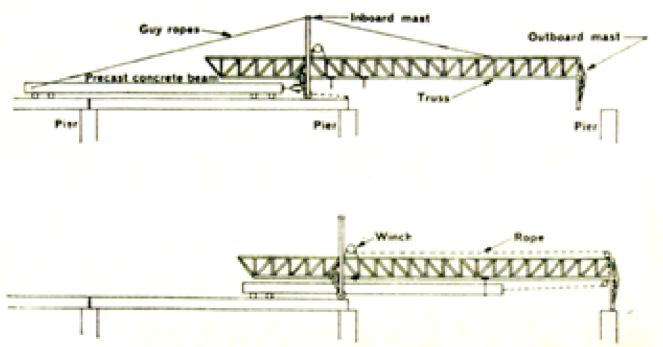

Fig. 1

The diagram (Fig. 1) shows the two stages of the launching of a bridge beam. The launching truss, of aluminium, is first extended by ropes to the next pier, then the beam is run along underneath it. The bottom boom of the truss was produced in two sections as shown in Fig. 2.

It was designed to carry two 90 ton rolling loads at 160 ft minimum centres, each load being distributed to eight pairs of wheels supported on a longitudinal flange incorporated in the bottom boom, as shown in the diagram.

Construction was of aluminium, which offers two great advantages: first, lightness, which is a considerable asset in a cantilevered truss to be launched across the gap between two bridge piers prior to launching the concrete beam; and, secondly, versatility of section shapes. While the truss, including inboard and outboard masts, was constructed almost entirely from standard structural sections, the bottom boom was required to be a 'Y' section, the arms forming the bottom apex of the triangle and the foot providing a running surface for the trolley wheels. Measuring 20 in by 12¼ in, this section was outside the capacity of any extrusion press in the U.K. so it was produced in two halves, one slotting inside the other and bolted through. The two sections, measuring 13 in by 12¼ in and 12 in by $10^3/_4$ in, weighing some 38 and 34 lb/ft respectively, were extruded on the 8 000 ton press at the Rogerstone Works of Alcan Industries Ltd, Aldwych, London WC2, using Alcan GB-B51SWP alloy.

Fig. 2

The truss was completely assembled by Head Wrightson then partly dismantled for export. Jointing throughout was by bolting, using mild steel close tolerance bolts for all main connexions and spun galvanised black bolts for secondary connexions. The two halves of the bottom boom are bolted together on site with the splices in each half staggered.

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Note from ECSA

Dear Valued Stakeholder,

Attached is the ECSA E – Bulletin newsletter for your information. E-BULLETIN

This quarter marks the end of the 2020/2021 financial year. The year under review was masked with great uncertainty presented by the unprecedented impact of the global COVID-19 pandemic. A number of shifts had to take place to align with the environment within which the country as a whole and the Engineering Council of South Africa (ECSA) in particular was operating under.

Within this financial year two key achievements were noted which are profiled in the newsletter. The first is the unqualified audit report from Rakoma Associates and Inc. for the 2019/2020 financial year. Secondly, the new Sixth (6th) Term Council was inaugurated in December 2020. Some of the key changes that are already in implementation phase by the new Council are profiled in this article. An introduction of the President and Vice President of the Council is included in the newsletter.

Moreover, the newsletter covers the Overarching Code of Practice for the Performance of Engineering Work and the revised Guideline Scope of Service and Tariff of Fees for Registered Persons in terms of the Engineering Profession Act, 46 of 2000.

Enjoy the read.

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Design modifications at Medupi and Kusile: progress and problems…

16 March 2021

Much has been written about the cost and time overruns at Eskom's flagship new-build mega-projects – the Medupi and Kusile coal-fired power stations in South Africa. This article focusses on the boiler plant design defects and the status of rectification work currently in progress.

by Chris Yelland, managing director at EE Business Intelligence

The Medupi and Kusile projects involve the construction of two 4800 MW, coal-fired, direct dry-cooled power stations. The Medupi site is close to Eskom's Matimba power station in the Lephalale district of Limpopo Province. The Kusile site is close to Eskom's existing Kendal power station in the Nkangala District of Mpumalanga Province.

To read the full article, click HERE