

R. G. E.

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VERRIGTINGS 1968

Deel 1

Tegniese Vergadering

9de tot 10de MEI 1968

Vanderdijlpark

Die Vereniging van Munisipale Elektrisiteits-  
ondernemings van Suidelike Afrika

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PROCEEDINGS 1968

Volume 1

Technical Meeting

9th to 10th MAY, 1968

Vanderbijlpark

The Association of Municipal Electricity  
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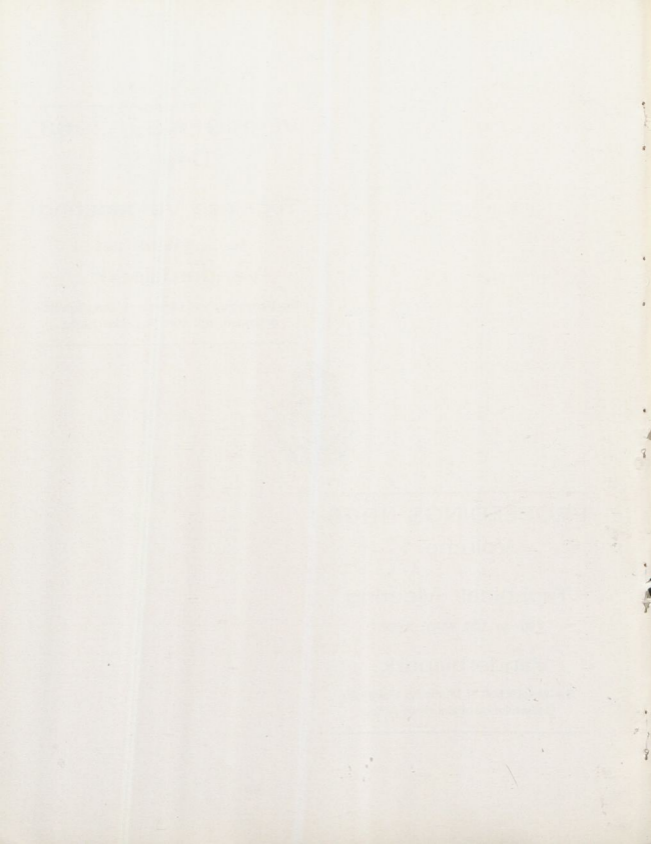
Technical Meeting

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**Vereniging van Munisipale  
Elektrisiteitsondernemings  
van Suidelike Afrika.**

**KENNISGEWING VAN DIE**

**1968- TEGNIESE VERGADERING.**

Ons bevestig hiermee dat die 1968- Tegniese Vergadering van die Vereniging op Donderdag en Vrydag, 9 en 10 Mei 1968 by die Vaal Driehoek Tegniese Kollege, Vanderbijlpark, gehou sal word.

DAVIDSON EN EWING (EDMS.) BPK.  
per : R. G. Ewing,

2 April 1968.

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Sekretarisse.

**SAKELYS EN PROGRAM.**

**DONDERDAG, 9 MEI 1968.**

- 9.00 vm. „Produktiwiteit in Elektrisiteitsondernemings“ :  
(a) Inleiding tot die Tema deur A. C. T. Frantz.  
(b) Gebruik van Half-geskoolde Arbeid, Bystand vir Ambagsmanne en Meganisasie deur C. Lombard.
- 10.30 vm. Pouse vir Verversings.
- 11.00 vm. „Produktiwiteit in Elektrisiteitsondernemings“ vervolg :  
(c) Instandhouding van Substasies deur W. W. Martin en A. S. Bridger.  
(d) Lees van Meters, Boekhouding en Insameling van Gelde deur L. S. Campbell.  
(e) Installasie en Werkverrigting van Aardlek-relé's op Huishoudelike Installasies deur F. J. van der Merwe.
- 12.45 nm. Verdaging vir Middagete. \*(Kyk opmerking onder.)
- 1.30 nm. Elektrifisering van Bantoetuislande deur S. J. Liebenberg.  
Bespreking sal ook Bantoedorpe dek.
- 3.00 nm. Pouse vir Verversings.
- 3.30 nm. Verslae.
- 4.30 nm. Verdaging.

**The Association of Municipal  
Electricity Undertakings  
of Southern Africa.**

**NOTICE OF**

**1968 TECHNICAL MEETING.**

We hereby confirm that the 1968 Technical Meeting of the Association will be held on Thursday and Friday, 9th and 10th May, 1968, at the Vaal Triangle Technical College, Vanderbijlpark.

DAVIDSON & EWING (PTY.) LTD.  
per : R. G. Ewing,

2nd April, 1968.

\_\_\_\_\_  
Secretaries.

**AGENDA AND PROGRAMME.**

**THURSDAY, 9th May, 1968.**

- 9.00 a.m. “Productivity in Electricity Undertakings” :  
(a) Introduction to Theme by A. C. T. Frantz.  
(b) Use of Semi-skilled Labour, Assistance for Artisans and Mechanisation by C. Lombard.
- 10.30 a.m. Refreshment Interval.
- 11.00 a.m. “Productivity in Electricity Undertakings” continued :  
(c) Substation Maintenance by W. W. Martin and A. S. Bridger.  
(d) Meter Reading, Accounting and Collections by L. S. Campbell.  
(e) Installation and Performing of Earth Leakage Relays in Domestic Installations by F. J. van der Merwe.
- 12.45 p.m. Luncheon Adjournment. \*(See note below.)
- 1.30 p.m. Electrification of the Bantu Homelands by S. J. Liebenberg.  
Discussion will also cover Bantu Townships.
- 3.00 p.m. Refreshment Interval.
- 3.30 p.m. Reports.
- 4.30 p.m. Adjournment.

Aand : Die afgevaardigers sal by geleentheid van 'n vleis-braai deur die Stadsraad van Vanderbijlpark onthaal word.

**VRYPDAG, 10 Mei 1968.**

9.00 vm. 'n Oorsig van die Gebruik van Ondergrondse Hoëspanningskabelnetwerk in Johannesburg deur G. Masson.

10.30 vm. Pouse vir Verversings.

11.00 vm. Bespreking van Referaat.

12.45 nm. Verdaging vir Middagete. \*(Kyk opmerking onder.)

1.30 nm. Ledeforum.

3.00 nm. Pouse vir Verversings.

3.30 nm. Ledeforum vervolg.

4.30 nm. Verdaging.

Aand : Die afgevaardigdes word uitgenooi om 'n kort toer van die Vaal Driehoek Tegnieuse Kollege te onderneem onmiddellik na die beëindiging van die verrigtinge. 'n Vergadering van die Uitvoerende Raad sal daarna volg.

Voorsiening vir 'n busdiens tussen die verskillende hotelle en die vergaderplek is gemaak.

\* Die afgevaardigers word versoek om nie die vergaderplek te verlaat nie, aangesien middagete voorsien sal word.

Evening : Delegates will be the guests of the City Council of Vanderbijlpark, at a Braai-vleis.

**FRIDAY, 10th May, 1968.**

9.00 a.m. A Review of High Voltage Underground Cable Reticulation Practice in Johannesburg by G. Masson.

10.30 a.m. Refreshment Interval.

11.00 a.m. Discussion on paper.

12.45 p.m. Luncheon Adjournment. \*(See note below.)

1.30 p.m. Members' Forum.

3.00 p.m. Refreshment Interval.

3.30 p.m. Members' Forum continued.

4.30 p.m. Adjournment.

Evening : Delegates will be invited to tour briefly the Vaal Triangle Technical College, immediately after the conclusion of proceedings. A meeting of the Executive Council will follow.

Bus transport is being provided between the various hotels and the meeting venue.

\* Delegates are requested not to leave the meeting venue as lunch will be provided.

## PRODUKTIWITEIT IN MUNISIPALE ELEKTRISITEITSONDERNEMINGS

### INLEIDING TOT DIE TEMA

deur  
A. C. T. FRANTZ,  
Stads-Elektriëse Ingenieur, Kaapstad

Meneer die President,

Ek bedank u vir die geleentheid wat u my vandag gegun het om die tema van hierdie jaar se tegniese vergadering in te lui — naamlik: "Produktiwiteit in munisipale elektrisiteitsondernemings".

Die belangrikheid daarvan om ons nasionale produktiwiteit te verhoog, is onlangs baie sterk onder die aandag gebring toe die vinnige styging in die lewenskoste geneig het om hand uit te ruk weens die hoogkonjunktuurtoestande wat toe in die land geheers het. Inflasie, wat tot op daardie stadium gemiddeld 2% per jaar was, het vinnig toegeneem tot 'n peil van nagenoeg 3% tot 4% per jaar. Hoewel dit algemeen aanvaar word dat kruipende inflasie van ongeveer 1% tot 2% per jaar noodsaaklik en ook wenslik is om 'n stabiele en lewendige ekonomie met 'n voortdurende verhoging in die lewenstandaard te verseker, is 'n syfer van 3% tot 4% as te hoog beskou. Om hierdie potensieel gevaarlike neiging te bedwing, het die regering vinnig opgetree en die nodige stappe gedoen om die inflasie in die ekonomie teen te werk. Ons is wel deeglik bewus van die stappe wat gedoen is.

Die onderliggende rede vir die opbouing van inflasionêre druk was ongetwyfeld die chroniese en ernstige tekort aan geskoolde arbeid. Hierdie arbeidstekort het natuurlik uitgesloot op sterk mededinging onder werkgewers vir die beperkte beskikbare arbeid en lone is gevolglik tot onrealistiese hoogtes gedwing. Indien die verhoogde lone gepaard gegaan het met proporsionele produktiwiteitsverhogings sou alles in die haak gewees het. Maar dit was oor die algemeen nie die geval nie. Dit is duidelik dat enige lönverhoging gepaard met verhoogde produktiwiteit ten volle geregtig is en nie regstreeks sal bydra tot inflasie nie. Met ander woorde hoër lone vereis meer werk.

Die enigste waarlik permanente teenvoet vir inflasie is dus verhoogde produktiwiteit en doeltreffende gebruikmaking van ons relatief skaars arbeid, materiaal en kapitale bronne. Van hierdie drie faktore is arbeid by verre na die belangrikste en die een wat hom die meeste leen aan produktiwiteitsverhogings. Want sonder die behoorlike eksploitasie van arbeid kan volle en doeltreffende gebruikmaking van materiaal en kapitaal nie verkry word nie.

Arbeid binne munisipale elektrisiteitsondernemings is veral van belang weens die relatief hoë arbeidsintensiwiteit van sulke ondernemings. 'n Studie van die kapitale inkomste- en uitgawesifers van kenmerkende ondernemings bring aan die lig dat, afgesien van kragopwekking, meer as die helfte van alle uitgawes aan salaris en lone bestee word. Selfs met die inrekening van kragopwekking en die gepaardgaande proporsioneel

## PRODUCTIVITY IN MUNICIPAL ELECTRICITY UNDERTAKINGS

### INTRODUCTION TO THEME

by  
A. C. T. FRANTZ  
Town Electrical Engineer, Cape Town

Mr. President,

I thank you for the opportunity you have given me today to introduce the theme of this year's technical meeting, namely, "productivity in municipal electricity undertakings".

The importance of increasing our national productivity was highlighted most forcefully recently when due to the boom conditions then prevailing within the country, the rapid rise in the cost of living tended to get out of hand. Inflation, which until then had been averaging 2% per annum, rapidly increased to around 3% to 4% per annum. While it is generally agreed that creeping inflation of about 1% to 2% per annum is both necessary and desirable to ensure a stable and vigorous economy with a continuing increase in living standards, a figure of 3% to 4% was considered too high. In order to contain this potentially dangerous tendency, the government acted promptly and took the necessary steps, with which we are all only too familiar, to deflate the economy.

The underlying reason for the build-up of inflationary pressures was undoubtedly the chronic and serious shortage of skilled labour which resulted quite naturally in fierce competition amongst employers for the limited labour available, thereby forcing up wages to unrealistic levels. If increased wages had been associated with proportionate increases in productivity, everything would have been fine. But this generally, was not the case. Clearly, any wage rise that matches increased productivity is fully justified and will not contribute directly to inflation. In other words, more pay demands more work.

The only really lasting counter to inflation, therefore, is increased productivity and more effective utilization of our relatively scarce labour, material and capital resources. Of these three factors, labour is by far the most important and the one most amenable to productivity increases. For without the proper exploitation of labour, full and effective utilization of materials and capital cannot be achieved.

Labour within municipal electricity undertakings is of particular importance due to the relatively high labour-intensiveness of such undertakings. A study of the capital and revenue expenditure figures of typical undertakings reveals that, excluding generation, more than half of all expenditure is accounted for by salaries and wages. Even with the inclusion of generation, with its attendant proportionately high capital charges and fuel costs, salaries

hoë kapitale en brandstofkoste, is salarisse en lone nog verantwoordelik vir ongeveer 'n derde van alle uitgawes.

Dit is dus taamlik duidelik dat doeltreffender gebruikmaking van arbeid die sleutel is tot verhoogde produktiwiteit. En dit is in hierdie enkele gebied waar die grootste moontlikheid vir verbetering lê. Maar as hierdie moontlikheid besef wil word, is dit noodsaaklik dat bestuursgesag op hoë vlak meer bewus gemaak moet word van die vraagstuk en van die verskeie tegnieke en metodes wat beskikbaar is om hierdie doel te bereik. Dit is baie duidelik dat die verantwoordelikheid vir verhoogde produktiwiteit op hierdie vlak lê. Dat dit so is, is duidelik bewys deur die Regering se onlangse erkenning van die belangrikheid van hierdie vraagstuk en sy optrede deur 'n produktiwiteitsraad in die lewe te roep om aktief produktiwiteit te bevorder en om aan nywerheid en ander belanghebbende instansies raad te gee en bystand te verleen.

Daar is gesaghebbend verklaar dat 'n produktiwiteitsverhoging van ongeveer 4% per jaar die mikpunt moet wees. Dit is 'n redelike syfer wat nie moeilik bereikbaar behoort te wees nie — veral deur die meer doeltreffende gebruik van arbeid op alle vlakke.

Op hierdie tydstip kan dit miskien geelê wees om die aandag te spits op 'n taamlik ernstige en verontrustende neiging wat ontwikkel binne die munisipale dienste in die algemeen as gevolg van die inherente moeilikheid dat daar nie finansieel so aktief meeding kan word met die nywerheid vir die beperkte beskikbare arbeid nie. As gevolg hiervan het munisipale salarisstrukture gewoonlik agter die van die nywerheid geblu en daardeur die personeeltekort vererger en die gaping tussen die voortdurend toenemende volume werk en die relatief verminderde personeel andersyds vinnig verbreed.

Hierdie breërwordende gaping het natuurlik uitgeloop op 'n gedwonge produktiwiteitsverhoging. Indien hierdie toestand toegelaat word om voort te duur sonder enige gepaardgaande verbetering in organisasie, metodes en saamhangende aktiwiteite om die druk te verminder, moet dit uiteindelik nadelig wees vir die gesondheid van die werknemers en ook op die lang duur vir die produktiwiteit van die onderneming as geheel.

Die behoefte vir die bevordering van verhoogde produktiwiteit is dus bo alles aansienlik dringender binne die munisipale dienste as wat dit is binne die nywerheid, en dit is die plig van almal van ons wat vandag hier teenwoordig is om so aktief moontlik te strewen na hierdie doelwit.

Aangesien verhoogde produktiwiteit primêr die verantwoordelikheid is van die bestuursgesag op hoë vlak, is dit voor die hand liggend dat noukeurige aandag gegee moet word aan die basiese funksies van bestuur, naamlik beplanning, organisasie, personeel, leiding en kontrole. Alle werk moet versigtig beplan en uitgevoer word deur 'n behoorlik beplande organisatoriese struktuur en noukeurige aandag moet bestee word aan personeel om behoorlike arbeidsrangskikking binne die organisasie te verseker. Personeeropvolging en opleiding moet nie oor die hoof gesien word nie. Laastens moet die bedrywighede van die personeel versigtig gerig en

and wages still account for about a third of all expenditure.

Quite clearly, therefore, more effective use of labour is the key to increased productivity and it is in this single area that the greatest potential for improvement lies. But if this potential is to be realised it is essential that top management be made more fully aware of the problem and of the various techniques and methods available to achieve this end. For the responsibility for increasing productivity clearly rests at this level. That this is so, was amply demonstrated by the government's recent recognition of the importance of this problem and the action it has taken in setting up a productivity council to actively promote productivity and to advise and assist industrialists and other interested parties.

It has authoritatively been stated that a productivity increase of around 4% per annum should be aimed at. This is a reasonable figure that should not be difficult to achieve, particularly through the more effective use of labour at all levels.

At this juncture it might be opportune to direct attention to a rather serious and disturbing trend developing within the municipal service generally through the inherent difficulty of not being able to compete as actively financially as industry for the limited labour available. As a consequence, municipal wage structures have usually lagged behind those of industry, thereby further aggravating the staff shortage and rapidly widening the gap between the continually increasing volume of work on the one hand and the relatively reduced staff on the other.

This widening gap has of course resulted in a forced increase in productivity, which condition, if allowed to persist without any associated improvement in organisation, methods and related activities to ease the pressure, must in the end be detrimental to the health of the employees and ultimately the productivity of the undertaking as a whole.

The need to promote increased productivity is, therefore, if anything, considerably more urgent within the municipal service than within industry and it is the duty of us all here today to strive as actively as possible towards this end.

Since increased productivity is primarily the concern of top management it is obvious that close attention must be given to the basic functions of management, namely planning, organising, staffing, directing and controlling. All work must be carefully planned and implemented through a properly designed organisational structure. Close attention must be paid to staff to ensure proper disposition of labour within the organisation and that succession and training are not overlooked. Finally, the

gekoördineer word om vermorsing van tyd en geld tot 'n minimum te beperk, met voldoende beheer wat uitgeoefen word oor alle werksbedrywighede.

Die sleutel tot verhoogde produktiwiteit berus dus op noue koördinasie en beheer oor alle bedrywighede, met die hoogs moontlike ontginning van arbeids-, materiaal- en kapitale bronne.

Arbeid op alle vlakke moet so doeltreffend moontlik ingespan wrd. Nie alleen moet verhoogde produktiwiteit verkry word van die basiese werksmag nie, maar noue-keuring aandag moet ook geskenk word aan die onderskeie toestighoudende en hoër bestuursvlakke. Hierdie hoër vlakke is net so belangrik vir die verkryging van verhoogde produktiwiteit deur meer sistematiese beplanning, koördinasie en beheer wat doeltreffender gebruik van materiaal en kapitaal sal toelaat.

In die strewe na groter produktiwiteit is daar vandag baie tegnieke en metodes beskikbaar. Daar is 'n snel toenemende belangstelling in "organisasie en metode" en "werkstudie"-tegnieke, met inbegrip van vaartbelynde koste-stelsels gebaseer op watsenskaplik vasgestelde standaarde, verfynde klerklike prosedures en die gebruik van rekenoutomate, fynbeplande voorsorgsonderhoudprogramme en die aanwending van verfynde tegnieke soos kritieke-roete-vastellings en lineêre programmering. Daarbenewens kan aansienlike voordeel geput word uit die vervanging van handewerk deur meganisasie waar moontlik, en deur ten volle van vervoer en ander hulpmiddels soos tweerigting-radiokommunikasie vir nouer koördinasie gebruik te maak.

Arbeid is 'n duur item in vergelyking met meganiseerde installasie en wanneer die gepaardgaande hoër produktiwiteitspotensiaal daarby in aanmerking geneem word, is die algehele ekonomiese voordeel wat meganisasie meebring, veelvuldiger.

Daar is beslis ruimte vir meer meganisasie binne munisipale elektrisiteits-ondernemings. Hier is 'n voorbeeld: ons in Kaapstad het die doeltreffendheid van kabellegging verbeter deur gebruik te maak van masjiengraafalaaiers om vore te maak, drukbore om leidings by straat-oorgange te graaf en elektriese aangedrewe kabelrollers om ekstrahoespanningskabels mee te lê. 'n Paar jaar gelede het ons ons distrikonderhoudspanne gemeganiseer. Voorheen het hierdie spanne handwaens van die een werks-punt na die ander gestoot. Nou verkry hulle op spesiaal toegeruste motorvoertuie met draaibare skuifere. Oorweging word tans daaraan geskenk om hierdie handlere met hidroulies beheerde platforms te vervang. Groot-skeeps gebruik word ook gemaak van kragbeheerde hykranes op voertuie vir die op- en afhaal van implemente, voorrade en materiale, en die plant van pale.

'n Behoorlik georganiseerde en instandgehoude vervoerafdeling is noodsaaklik vir hoër produktiwiteit. Vervoer, soos ander meganiese implemente, is nie duur in vergelyking met arbeid nie. As voorbeeld: die jaarlikse kapitale koste vir vyf motorvoertuie bedra minder as die lone van een geskoolde man. Drie sulke voertuie kan verkry word teen dieselfde koste van twee arbeiders. As gevolg van hierdie koste-differensiaal is dit in die algemeen meer lonend om vervoer byderhand te hê wat wag

activities of the staff must be carefully directed and co-ordinated to minimise wastage of time and money with adequate control being exercised over all operations.

The key to increased productivity, therefore, centres on close co-ordination and control of all activities with the maximum possible exploitation of labour, material and capital resources.

Labour at all levels must be employed as efficiently as possible. Not only must increased output be obtained from the basic working force but careful attention must also be given to the various supervisory and higher management levels. These higher levels are equally as important in achieving improved productivity through more systematic planning, co-ordination and control permitting the more effective utilization of materials and capital.

In the quest for increased productivity, numerous techniques and methods are available today. A rapidly increasing interest is being taken in "organisation and methods" and "work study" techniques, including streamlined costing systems based on scientifically established standards, refined clerical procedures and the use of computers, carefully designed preventive maintenance programmes and the employment of sophisticated techniques such as critical path scheduling and linear programming. In addition, considerable advantage can be gained through the mechanisation of manual operations wherever possible and the full utilization of transport and other aids to closer co-ordination such as two-way radio communication.

Labour is an expensive item relative to mechanical plant and, when associated with the attendant higher output possible, the overall economic advantage of mechanisation is multiplied many times over.

There is definite scope for increased mechanisation within municipal electricity undertakings. For instance, we in Cape Town have improved the efficiency of cable laying operations through the use of excavator loaders for trenching, a thrust-borer for ducting road crossings and electrically-driven cable rollers for laying extra high voltage cables. Some years ago we mechanised our district maintenance gangs. Previously these gangs pushed hand-carts from job to job. Now they operate from specially-equipped motor vehicles fitted with turntable extension ladders. Consideration is currently being given to replacing these hand-operated ladders with hydraulically-operated platforms. Extensive use is also made of power operated cranes on vehicles for the loading and off-loading of plant, stores and materials and the planting of poles.

A properly organised and maintained transport fleet is essential to high productivity. Transport, in common with other mechanical plant, is not expensive relative to labour. For example, the annual capital charge on five motor vehicles amounts to less than the wages of one artisan. Three such vehicles can be had for the same cost as two labourers. As a consequence of this cost differential, it generally pays to have transport standing by waiting to move labour rather than to have labour



om arbeid te vervoer as wat dit is om arbeid ledig te laat staan. As voorbeeld van die toepassing van hierdie beginsel kan genoem word dat proefnemings in Engeland bewys het dat dit meer ekonomies is vir kabellassers om hul eie persoonlike vervoer van die een werk na die ander te gebruik as wat dit is om gemeenskaplike vervoer aan hulle te verskaf. Nie alleen word daar bespaar op die kapitale koste van die voertuig nie, maar die salaris van die bestuurder word ook uitgeskakel.

Benevens voller gebruikmaking van arbeid spruit verdere belangrike besparings dikwels uit tegnologiese ontwikkelings. 'n Kenmerkende geval wat aandag verdien is die gebruik van aluminiumkernkabels. Dit wil voorkom asof dit ekonomies voordelig kan wees om hierdie kabels te gebruik en om verdere ondersoek na die aangeleentheid moontlik te maak het my Raad besluit om een van ons ingenieurs na Engeland en Europa te stuur om eerste-rangse inligting oor die jongste ontwikkelinge en tegnieke op hierdie en aansluitende terreine in te win.

Dit bring my by 'n ander punt, naamlik die belangrikheid van gedagtewisseling oor idees, tegnieke en metodes om verhoogde produktiwiteit te bevorder. Dit mag nie altyd moontlik wees om ingenieurs op buitelandse studiereise te stuur nie, maar dit behoort taamlik moontlik te wees om te reël vir soortgelyke kort besoeke binne hierdie land tussen ons verskillende ondernemings, en ek wil dit voorlê as 'n gedagte wat moontlik oorweeg kan word. Ek het kort besoektyperke van 'n paar weke tot 'n maand in gedagte. Ek is seker dat die nou persoonlike kontak wat sal voortspruit uit hierdie gedagtewisselinge net tot ons gemeenskaplike voordeel kan wees en dat dit daadwerklik kan bydra tot die bevordering van verhoogde produktiwiteit.

Terwyl ek die onderwerp behandel, is dit van net soveel nut om u te herinner aan die belangrikheid om personeel op te lei in die moderne tegnieke en metodes wat nou beskikbaar is. Personeel kan bestuur word na toesighouers- en soortgelyke kursusse om by hulle 'n geesdriftiger en aktiewer belangstelling in hierdie aangeleenthede te kweek en om voortdurende koste-oriëntasie van hul gedagtes te verseker. Elke geleentheid om so iets te doen behoort deur rade aangegryp te word.

Ten slotte wil ek weereens die belangrikheid van arbeid beklemtoon in enige program ter verbetering van produktiwiteit. Nie alleen moet maksimum gebruik gemaak word van individuele aanleg nie, maar noue koördinasie en kontrole moet te alle tye uitgeoefen word. In die lig van die relatief hoë en gestadige toenemende arbeidskoste moet alles gedoen word om meganisasie so ver moontlik toe te pas.

Dit is duidelik dat ons vandag te doen het met 'n uitdaging van aansienlike omvang — om ekonomiese behoue te bly moet ons ons produktiwiteit verhoog. Daar is geen praktiese alternatief nie. Ek is vol vertroue dat die munisipale elektrisiteitsondernemings wat op hierdie verhogende verteenwoordig is, hierdie uitdaging sal aanvaar en ywerig en voortdurend na hierdie doel sal streef. Ek is seker dat die referate wat deur die volgende sprekers gelewer gaan word, aansienlike belangstelling en lewendige bespreking sal uitlok.

standing idle. As an instance of the application of this principle, experiments in Great Britain have shown that it is more economical to have cable jointers use their own personal transport to move from job to job, than to use pool transport. Not only is a saving made on the capital cost of the vehicle, but the wages of the driver are also eliminated.

In addition to more fully exploiting labour, further significant savings frequently stem from technological developments. A typical case warranting close attention is the use of aluminium-cored cable. It would appear that worthwhile economies can be obtained using such cable and in order to investigate this matter further my Council has agreed to one of our engineers visiting Great Britain and Europe to obtain first-hand information on the latest developments and techniques in this and allied fields.

This brings me to another point, namely the importance of the interchange of ideas, techniques and methods in fostering increased productivity. It might not always be possible to send engineers on overseas study tours but it should be quite feasible to arrange for similar short visits within this country amongst our various undertakings and I would like to submit this as an idea for possible consideration. I envisage short spells of perhaps several weeks to a month. I am sure that the close personal contacts that will result from such interchanges can only but be to our mutual advantage and should assist materially in the promotion of increased productivity.

While on this subject, it is as well to remind you of the importance of training staff in the modern techniques and methods now available. Staff can be sent on supervisor and similar courses to develop more keenly an active interest in such matters and to ensure continual cost-orientation of their thoughts and every opportunity to do so should be taken by councils.

In conclusion, I would once again stress the importance of labour in any programme to improve productivity. Not only must maximum use be made of individual skills, but close co-ordination and control must be exercised at all times. In view of the relatively high and steadily increasing cost of labour, every endeavour must be made to mechanise operations as far as possible.

Quite clearly, we are faced today with a challenge of considerable magnitude — to survive economically we must increase our productivity — there is no practical alternative. I feel confident that the municipal electricity undertakings represented at this meeting will rise to this challenge and strive strenuously and continuously towards this goal, and I am certain that the papers to be presented by the ensuing speakers will provoke considerable interest and lively discussion.

## HALF-GESKOOLDE ARBEID, BYSTAND VIR AMBAGSMANNE EN MEGANISASIE.

deur

C. LOMBARD,

Stads Elektrotegniese Ingenieur, Germiston.

### 1. INLEIDING :

In 'n verbeter mededingende wêreld, is die toekomstige ekonomiese krag van iedere nasie in 'n groot mate afhanklik van sy sukses met die bevordering van produktiviteitsdoeltreffendheid waar die lewering van goedere en dienste ookal daarby betrokke is. Vanweë die feit dat die opheffing van lewenstandaarde afhanklik is van verhoogde produktiwiteit, moet hierdie bevordering nie slegs voortdurend wees nie maar moet ook teen 'n steeds toenemende tempo geskied.

Een van die noodsaaklike vereistes om hierdie doelstelling te bereik, is dat die nasie se beskikbare mannekragte tot die beste voordeel aangewend moet word.

Twee van die positiewe gedragslyne in hierdie verband is die opleiding van werkers om hulle bevoeghede te ontwikkel en die meganisering van werkverrigtings.

### 2. DIE OPLEIDING EN GEBRUIK VAN HALF-GESKOOLDE ARBEID :

Die opleiding van ongeskoolde persone teneinde sekere take te verrig wat normaalweg deur geskoolde persone uitgevoer sou word, kan aanleiding gee tot aansienlike toenames in produktiwiteit. Die opheffing van ongeskoolde arbeid mag egter beperk word deur bestaande wetgewing, Nywerheidsraadooreenkomste en dikwels deur die houding van vakunies. Teneinde hulle lede teen moontlike werkloosheid te beskerm, is laasvermeldes gewoonlik gekant teen enige veranderings waarby die opheffing van ongeskoolde arbeid betrokke is.

Daar is egter aanduidings dat die vakunies begin besef dat die laergradering van sekere take en werkverrigtings, dit vir die geskoolde werker moontlik maak om 'n groter gedeelte van sy tyd en pogings te bestee aan daardie take wat sy verheve bekwaamheid verg en dat alle werkers uiteindelik sal baatvind by 'n algemene verhoging van produktiwiteit.

Dit is betekenisvol dat sommige van die loonooreenkomste wat onlangs in die myn-, bou- en ander nywerhede aangegaan is, voorsiening maak vir die laergradering van sekere werkverrigtinge en die betaling van hoër lone gegrond op die verwagte verhoogde produktiwiteit. In die geval van die Elektrotegniese Kontraknywerheid mag sekere take verbonde aan die elektrisiteitsbedrading van persele maar uitgeslote van die omskrywing van „bedradingswerk” in die Wet op Elektrotegniese Draadwerkers en Kontrakteurs, 1939, nou deur arbeiders uitgevoer word in plaas van deur geslensieerde draadwerkers.

## SKILLED LABOUR, ASSISTANCE FOR ARTISANS AND MECHANISATION.

by

C. LOMBARD,

City Electrical Engineer, Germiston.

### 1. INTRODUCTION :

In a fiercely competitive world, the future economic strength of any nation depends in a large measure on its success in advancing productive efficiency wherever the production of goods and services are concerned. In view of the fact that the raising of living standards depends on increased productivity, this advance should not only be continuous but should take place at an ever increasing pace.

One of the essential requirements to achieve this objective is that the nation's available human resources should be used to the best advantage.

Two of the positive lines of action in this regard are the training of workers to develop their abilities and the mechanisation of operations.

### 2. THE TRAINING AND EMPLOYMENT OF SEMI-SKILLED LABOUR :

The training of unskilled persons to perform certain tasks which would normally be carried out by skilled persons can lead to substantial gains in productivity. The upgrading of unskilled labour may however, be restricted by existing legislation, Industrial Council Agreements and quite often, the attitude of trade unions. In order to protect their members against possible unemployment, the latter are usually opposed to any changes involving the elevation of unskilled labour.

There are, however, indications that the trade unions are beginning to realise that the downgrading of certain tasks and operations makes it possible for the skilled worker to devote a greater proportion of his time and efforts to those tasks which require his superior skill, and that all workers eventually stand to benefit from a general increase in productivity.

It is significant that some of the wage agreements which have recently been negotiated in the mining, building and other industries provide for the downgrading of certain operations and the payment of higher wages based on the expected increase in productivity. In the case of the Electrical Contracting Industry, certain operations connected with the electrical wiring of premises but excluded from the definition of "wiring work" contained in the Electrical Wiremen and Contractors Act, 1939, may now be carried out by labourers instead of licenced wiremen.

Daar kan verwag word dat munisipale elektrisiteits-ondernemings in die toekoms deur hierdie neigings en ontwikkelings geraak sal word, en dat aanpassings gedoen sal moet word om die algemene produktiwiteitspeil en lone te verhoog sodat daar op geslaagde wyse op die ope mark gewedery kan word om die dienste van geskoolde werkers te bekom.

### 3. DIE OPLEIDING EN GEBRUIK VAN BANTOE AS GESKOOLEDE WERKERS IN BANTOEGEBIEDE :

Die voorsiening en instandhouding van elektrisiteits-dienste in Bantoeorpe veroorsaak dikwels ernstige probleme vir plaaslike besture. Een van hierdie probleme is die lae peil van produktiwiteit wat te wyte is aan verskillende oorsake soos die huiwering van Blanke vaklui om in sodanige gebiede te werk, die tydsverlies betrefende die afle van afstande na en van hierdie gebiede, die moeilikheid om toereikende toesig te voorsien, ens.

Daar is in die Wet op Bouwerkers, 1951, voorsiening gemaak vir die indiensneming van Bantoe-draadwerkers en kwekelinge in Bantoeorpe. Sodanige kwekelinge word in die algemene verkry van een van die opleiding-sentrums waar Bantoe-studente 'n sekere mate van basiese opleiding in bedragsingswerk ontvang en ook tegniese klasse bywoon. Nadat hulle verdere praktiese ervaring in een van die Bantoegebiede onder die toesig van gelisensieerde draadwerkers opgedoen het, kwalifiseer hulle vir aanvaarding as kandidate vir die Elektrisiteitsdraadwerkerslisensie-eksamen en nadat hulle hierdie eksamen met sukses afgele het, kan hulle as gelisensieerde draadwerkers in Bantoegebiede indiens geneem word.

Die indiensneming van Bantoe-elektrisiteitsdraadwerkers het die toestand betreffende bedragsingswerk in Bantoeorpe, verlig en die volgende logiese stap sal wees om Bantoeerwers op te lei om sodanige geskoolde werk soos die oprigting en instandhouding van bogronde lyne, substasie-installasies en -instandhoudingswerk, kabellawerk ens., te doen sodat hulle kan kwalifiseer om alle werk in verband met die distribusie van elektrisiteit in Bantoegebiede onder toesig van Blanke toesighouers uit te voer.

Ofskoon daar geen spesiale voorsiening vir die opleiding en indiensneming van Bantoeerwers vir hierdie tipe werk in Bantoegebiede bestaan nie, is sodanige opleiding en indiensname nie strydig met enige wet of Regeringsbeleid nie.

Volgens plaaslike en ander toestande, kan een of meer van die volgende gedragslyne gevolg word om sodanige opleiding aan Bantoeerwers te verskaf :

#### (i) Inskrywing van Vakleerlinge :

Ofskoon daar geen wetlike struikelblokke bestaan ten opsigte van die inskrywing van Bantoe as vakleerlinge kragtens die Wet op Vakleerlinge of volgens enige private kontrak nie, is hierdie gedragslyn klaarbyklik onprakties weens die gebrek aan fasiliteite vir sodanige vakleerlinge om onderrig in tegniese vakke te ontvang.

It can be expected that municipal electricity undertakings will in time be affected by these trends and developments, and that adjustments will have to be made to raise the general productivity level and wages in order to compete successfully in the open market for the services of skilled workers.

### 3. THE TRAINING AND EMPLOYMENT OF BANTU AS SKILLED WORKERS IN BANTU AREAS.

The providing and maintaining of electrical services in Bantu townships often present serious problems to local authorities. One of these is the low level of productivity due to various causes such as the reluctance of European artisans to work in such areas, the time lost in travelling long distances to and from these areas, the difficulty of providing adequate supervision, etc.

Provision has been made in the Building Workers' Act, 1951, for the employment of Bantu wiremen and trainees in Bantu townships. Such trainees are generally drawn from one of the training centres where Bantu students receive a certain amount of basic training in wiring work and also attend technical classes. After obtaining further practical experience in one of the Bantu areas under the supervision of licensed wiremen, they qualify for acceptance as candidates for the Electrical Wiremen's Licence Examination and on passing this examination, they can be employed as licensed wiremen in Bantu areas.

The employment of Bantu electrical wiremen has alleviated the position as regards wiring work in Bantu townships, and the next logical step would be to train Bantu workers to perform such skilled work as the construction and maintenance of overhead lines, substation installation and maintenance work, cable jointing, etc., so that they can qualify to carry out all work in connection with the distribution of electricity in Bantu areas under the direction of European supervisors.

Although there is no special provision for the training and employment of Bantu workers in this type of work in Bantu areas, such training and employment is not in conflict with any law or Government policy.

Depending on local and other conditions, one or more of the following courses could be followed to provide such training for Bantu workers :

#### (i) Indenturing of Apprentices.

Although there are no legal obstacles to indenturing Bantu as apprentices under the Apprenticeship Act or under a private contract, this would appear to be impractical owing to the lack of facilities for such apprentices to receive technical tuition.



(ii) Opleiding van Bevoegde Persone :

Bantowerkers wat oor die nodige aanleg beskik, kan opleiding ontvang deur onder toesig van Blanke vaklui te werk vir 'n tydperk van ses jaar om te kwalifiseer as persone wat bevoegd is om een en ander van die werk hierbo genoem, uit te voer. Kwekelinge in hierdie kategorie kan verkry word uit die geleedere van Bantopersonneel wat saam met Blanke vaklui werk.

Ofskoon sodanige kwekelinge spoedig redelik bedrewe kan raak wat betref sekere tipes werk, beskik hulle gewoonlik oor 'n beperkte potensiaal weens die gebrek aan tegniese onderrig. Hulle normale pligte sal derhalwe beperk wees tot die oprigting van bogronde lyne en instandhoudingswerk, die voorsiening van diensaansluitings, behartiging van sekeringsoproepe ens.

'n Verdere nadeel is die langdurigheid van die opleidingstydperk aler sodanige Bantowerkers bevoegd raak om hierdie tipe werk te doen.

(iii) Opleiding van Distribusie-Elektisiens :

Daar is 'n besliste voordeel verbonde aan die verkryging van kwekelinge uit die geleedere van Bantopersonne wat ingeskryf is en basiese opleiding ontvang het betreffende-elektisiteitsbedringswerk by een van die opleidingsentra waar hulle ook soos voorheen vermeld, die geleentheid het om tegniese klasse by te woon. Baie van hierdie Bantoe is in besit van die N.T.S. II-sertifikaat en hulle kan opgelei word as distribusie-elektisiens wat bevoegd is om alle tipes werk te verrig wat gepaard gaan met die distribusie van elektisiteit in Bantogebiede.

Die duurte van die opleidingstydperk moet sodanig wees om te voldoen aan die vereistes vir hulle om persone te word wat bevoegd is om hierdie tipe werk te verrig. Dit mag ook moontlik wees om hulle gedurende hulle opleidingstydperk die geleentheid te bied om opleiding te ontvang van en verdere ondervinding op te doen aangaande bedringswerk sodat hulle kan kwalifiseer as kandidate vir die Elektisiteitsdraadwerkers-eksamen. Die opleidingstydperk mag moontlik verkort word indien 'n kwekeling sy eksamen met sukses aflê alvorens die gewone opleidingstydperk verstryk het.

(iv) Opleiding van Gekwalifiseerde Draadwerkers as Distribusie-Elektisiens:

Indien die besit van 'n Elektisiteitsdraadwerkers-lisensie aanvaar word as gelykstaande aan voltooiing van 'n vakleerlingskap in 'n ingenieurs-ambag, sal gelisensieerde Bantodraadwerkers na een jaar se verdere opleiding en ondervinding aangaande oprigtings- en instandhoudingswerk ten opsigte van distribusiesistels, kwalifiseer as persone wat bevoegd is om hierdie tipe werk te verrig.

(ii) Training of Competent Persons.

Bantu workers who possess the necessary aptitude can receive training by working under the supervision of European artisans for a six-year period to qualify as persons competent to perform some of the work mentioned above. Trainees in this category can be drawn from the ranks of Bantu personnel attached to European artisans.

Although such trainees can soon become fairly proficient in certain types of work, they usually have a limited potential due to lack of technical education. Their normal duties would therefore be confined to overhead line construction and maintenance work, the provision of service connections, attending to fuse calls, etc.

A further disadvantage in the length of the training period before such Bantu workers can become competent to perform this type of work.

(iii) Training of Distribution Electricians.

There is a decided advantage in drawing trainees from the ranks of Bantu persons who have been enrolled and have received basic training in electrical wiring work at one of the training centres where, as stated earlier, they also have the opportunity of attending technical classes. Many of these Bantu are in possession of the NTC II Certificate and they can be trained as distribution electricians capable of performing all types of work associated with the distribution of electricity in Bantu areas.

The length of the training period must be such as to satisfy the requirements for them to become persons who are competent to perform this type of work. It may also be possible during their training period to provide them with the opportunity to obtain training and further experience in wiring work so that they can qualify as candidates for the Electrical Wiremen's Licence Examination. The training period may possibly be shortened if a trainee passes this examination before the expiry of the normal training period.

(iv) Training of Qualified Wiremen as Distribution Electricians.

If the possession of an Electrical Wiremen's Licence is acceptable as the equivalent of having served an apprenticeship in an engineering trade, Bantu licensed wiremen will, after one year's further training and experience in construction and maintenance work on distribution systems, qualify as persons who are competent to perform this type of work.

Ofskoon dit raadsaam mag wees om in sekere gevalle die opleidingstydperk tot langer as een jaar te verleng, blyk dit dat die opleiding van gekwalifiseerde Bantoe-draadwerkers as distribusie-elektrisiesiens die beste gedragslyn is om te volg vir spoedige resultate.

Skere praktiese probleme is teengekom in verband met die werking en indiensname van Bantoe-kwekelinge in Bantoeedorpe. Daar is by voorbeeld by tye gevind dat dit uiters moeilik is om reëlings te tref vir die oorspring van 'n Bantoe-kwekeling of gelisensieerde draadwerker van een gebied na 'n ander. Daar kan maar net vertrou word dat die owerhede mettertyd maatreëls sal instel om sodanige oorspringe te vergemaklik.

#### 4. MEGANISASIE :

Die fisiese inspanning wat 'n persoon self kan ontwikkel is slegs ongeveer  $\frac{1}{2}$  p.k. Dit is derhalwe in die algemeen hoogs onekonomies uit die oogpunt van produktiwiteit beskou, om 'n persoon enige fisiese werk te laat doen wat redelikerwys op meganiese wyse gedoen kan word. Kragmasjiene kan gebruik word vir baie van die werkverrigtinge wat deur elektrisiteitsondernemings uitgevoer word soos tyds- en arbeidsbesparende meganiese hulptoerusting vir vaklui ens. Hierdie hulptoerusting wissel van klein kraggereedskap tot groot masjiene wat 'n aansienlik kapitale belegging verg.

Die omvang waartoe die meganisering van 'n werkverrigting werklik 'n ekonomiese proposisie is, moet egter noukeurig ondersoek word en vergelyk word met die koste verbonde aan die gebruik van handarbeid en -toerusting aangesien die bedryfskoste van meganiese installasies grootliks afhanglik sal wees van die benutting daarvan. Met 'n lae benutting, mag die masjientarif so hoog wees dat dit raadsaam mag wees om voort te gaan met die gebruik van handarbeid of om gebruik te maak van gehuurde masjinerie.

Die probleem van ongenoegsame benutting kan dikwels die hoof gebied word deur te belê in veeldoelige masjiene wat vir meer as een tipe werkverrigting gebruik kan word.

Munisipale elektrotegniese ingenieurs is reeds bekend met die meeste van die meganiese gereedskap en toerusting wat algemeen by elektrisiteitsvoorsieningsondernemings in gebruik is om vaklui te help en produktiwiteit te verhoog. Onderstaande notas en algemene opmerkinge oor sommige hiervan is derhalwe nie bedoel om volledig te wees nie, maar dien slegs as inleiding tot die onderwerp van meganisasie en om besprekings en die wisseling van gedagtes aan te wakker.

##### (i) Kompressie-gereedskap en Toebehoere :

Die gebruik van meganiese kompressie-toebehoere aangewend deur middel van hand- of kraggereedskap is wydvertak aanvaar en die gebruik daarvan kan aansienlike besparings teweegbring in vergelyking met konvensionele metodes.

Die kompressie-gereedskap wissel van handgereedskap vir kleiner geleiers tot gereedskap met hand- of kraghidrouliese pompe.

Although it may be advisable in certain cases to extend the training period beyond one year, the training of qualified Bantu wiremen as distribution electricians would appear to be the best course to follow to obtain quick results.

Certain practical problems have been encountered in connection with the recruitment and employment of Bantu trainees in Bantu townships. For instance, it has sometimes been found extremely difficult to arrange for a Bantu trainee or licensed wireman to be transferred from one area to another. One can only hope that the authorities will, in due course, introduce measures to facilitate such transfers.

#### 4. MECHANISATION :

The physical effort that a man himself can develop is only about  $\frac{1}{2}$  h.p. It is generally therefore highly uneconomical from a productivity point of view for a man to do any physical work which could reasonably be done by mechanical means. Power machines may be applied to many of the operations carried out by electricity undertakings as time and labour saving mechanical aids for artisans, etc. These range from small power tools to large plant requiring a considerable capital investment.

The extent to which mechanisation of an operation is really an economical proposition should, however, be carefully investigated and weighed against the cost of using hand labour and equipment since the operating cost of mechanical plant will depend to a large extent on its utilization. With a low utilization, the machine rate may be so high that it may be advisable to continue using hand labour or to make use of hired plant.

The problem of insufficient utilization can often be overcome by investing in multi-purpose machines which can be applied to more than one type of operation.

Municipal electrical engineers are already familiar with most of the mechanical tools and plant which are in common use in electricity supply undertakings to aid artisans and increase productivity. The following notes and general remarks on some of these are, accordingly, not intended to be complete but merely to introduce the subject of mechanisation and to initiate discussion and the exchange of ideas.

##### (i) Compression Tools and Fittings :

The use of mechanically compressed fittings applied by means of hand or power operated tools has found wide acceptance and their application can effect considerable savings in cost over more conventional means.

The compression tools range from hand tools for small conductor sizes to tools with hand or power operated hydraulic pumps.

Die las van kopergeleierkabels deur middel van kompressie bied geen besondere probleem nie. Weens die hoë prys van koper, word ondergrondse kabels met aluminium-geleiers nou op 'n redelike uitgebreide skaal geïnstalleer en die moontlikheid om hierdie kabels deur middel van kompressie te las, word deur verskeie munisipale elektrisiteits-ondernemings ondersoek. Dit blyk in hierdie stadium dat die aanwending van hierdie tegniek in verband met die las van aluminium-aarkabels met 'n sekere mate van versigtigheid benader moet word.

(ii) Kragstingerbore :

Hierdie toerusting wissel van liggewig draagbare eenhede tot groot grondboormasjiene wat op vragmotors monteer is, elk volledig met krageneheid, hidrouliese beheerstange, integrale hystoestel en kraambalk vir pale ens., en met 'n vermoë om gate met 'n deursnee van nege duim tot 36 duim tot 10 voet diep te graaf.

Met drie manne kan daar met sodanige masjiene meer as 100 paalgate per werksdag onder gunstige omstandighede geboor word.

Die aankoop van die groot grondboormasjiene waarna hiertevore verwys is, kan natuurlikerwys net geregverdig word deur groot ondernemings terwyl die klein draagbare kragbare met voordeel deur ondernemings van alle groottes gebruik kan word. Met twee manne, kan een sodanige masjiene wat ongeveer R360.00 kos en van 'n 75 cc. enjin voorsien is wat 78 p.k. ontwikkel, 'n gat met 'n deursnee van 10 duim en 5 voet diep in redelike harde oklip boor in net minder as 5 minute.

(iii) Masjiengrawe vir Kabelslote.

Masjinerie vir die uitgraving van kabelslote kan in twee vernaamste tipes ingedeel word, naamlik kettingtipe en skopgraaptipe en hierdie masjinerie is beskikbaar in verskillende groottes en vermoëns van klein tot groot. Masjiene wat 'n kombinasie is van hierdie twee tipes, is ook beskikbaar.

Teneinde groter veelsydigheid in die hand te werk, kan bybehore vir baie van hierdie masjiene voorsien word om bykomende werkverrigtinge uit te voer, soos stootskraapwerk, laaiwerk, boorwerk e.d.m.

(iv) Hystoerusting :

Hierdie toerusting sluit in mobiele en vragmotorgemonteerde hystoestelle en hyskrane vir die hys en ondersteuning van manne wat werk aan bo-grondse lyne, opstapelwerk, laaiwerk en die vervoer van materiale en toerusting e.d.m. doen.

Die meeste van hierdie toestelle is beskikbaar in verskillende groottes en vermoëns met opsionele bybehore om aan te pas by individuele vereistes en omstandighede.

The compression jointing of copper conductor cables does not present any particular problem. Due to the high price of copper, underground cables with aluminium conductors are now being installed on quite an extensive scale, and the possibility of compression jointing these cables is under investigation by several municipal electricity undertakings. It would appear at this stage that the application of this technique to the jointing of aluminium core cables should be treated with a certain amount of caution.

(ii) Power Augers :

These range from light-weight portable units to large truck-mounted earth-boring machines, each complete with power unit, hydraulic controls, integral winch and jib to handle poles, etc., and capable of digging 9-inch to 36-inch diameter holes up to 10 feet deep. With a crew of three, such a machine may drill over 100 pole holes per working day under favourable conditions.

The acquisition of the large earth-boring machines referred to above can obviously only be justified by large undertakings while the small portable power augers can be used to great advantage by undertakings of all sizes. With a crew of two, one such machine costing about R360.00 and powered by a 75cc. engine developing 7.8 h.p. can dig a 10-inch diameter hole 5 feet deep in fairly hard oklip in just under five minutes.

(iii) Cable Trench Excavators :

Plant for excavating cable trenches can be classified into two main types, namely chain type and shovel type and these are available in various sizes and capacities from small to large. Machines which are a combination of these two types are also available.

In order to provide increased versatility, accessories can be supplied for many of these machines to perform additional operations such as bulldozing, loading, boring, etc.

(iv) Hoisting Equipment :

These include mobile and truck-mounted hoists and cranes for hoisting and supporting men performing work on overhead lines, stacking, loading and transporting materials and equipment, etc.

Most of these are available in various sizes and capacities with optional accessories to suit individual requirements and circumstances.

(v) Diverse Toerusting :

Hierdie tipe toerusting sluit in sodanige items soos draagbare kompressors met luggereedskap vir die boor en skoonmaak van metale e.d.m. asook kragstampers, boutskiethamers, e.d.m.

In die geval van groot meganiese toerusting, sal daar baie voordele verbonde wees aan die gesamentlike gebruik daarvan deur twee of meer munisipaliteite wat geografies nie te ver van mekaar as geleë is nie. Sodanige reëling sal natuurlikerwys noukeurige koördinasie deur die betrokke munisipaliteite vir asook omsigtige beplanning, maar dit sal die moeite loon om dit te oorweeg.

(v) Miscellaneous Equipment :

These include such items as portable compressors with air tools for drilling, cleaning metals, etc., as well as power rammers, stud guns, etc.

In the case of large items of mechanical plant there would be many advantages attached to the pooling of resources by two or more municipalities which are geographically not too far apart. Such an arrangement would obviously require close co-ordination between the municipalities involved as well as careful planning but would be worth considering.

## INSTANDHOUDING VAN SUBSTASIES.

deur

W. W. MARTIN en A. S. BRIDGER.

As gevolg van die tekort aan geskoolde arbeid om die toenemende aantal eenhede in 'n substasie namate die stelsel ontwikkel, bied die instandhouding van die uitrusting in substasies 'n probleem aan distribusieingenieurs. Dit geld nie slegs vir Suid-Afrika nie, maar ook in die Verenigde Koninkryk veroorsaak dit heelwat kommer en die ontwerpers van installasies soek steeds na maniere waarop die instandhoudingsvereistes vermindert of vereenvoudig kan word.

### TRANSFORMATORS.

Transformators is waarskynlik die betroubaarste stukke uitrusting en basies is die olie die enigste aspek van 'n transformator wat instandhouding verg. Agteruitgang van die olie laat die suurgehalte daarvan styg sodat slyk gevorm word en dit verkort die leeftyd van die isolering. Die hooforsaak van die agteruitgang van olie is die aanraking daarvan met die atmosfeer, veral waar die humiditeit hoog is. In Suid-Afrika word die toestand erger as gevolg van snelle temperatuurveranderinge, wat aanleiding gee tot groter lug sirkulasie tussen die lugruimte in die transformator en die atmosfeer. Silikajelatesemhalers verminder die voggehalte van die lug, maar dit is noodsaaklik dat sodanige asemhalers behoorlik in stand gehou word; aangesien 'n versadigde asemhaler erger toestande kan veroorsaak as wanneer die transformators regstreeks met die atmosfeer verbind is. As gevolg van wisselende klimaattoestande sal dit nie nodig wees om die asemhaler dwarsdeur die jaar ewe dikwels te versien nie en geen algemene leidraad hiervoor kan vir die hele land gegee word nie.

Olieinstandhouding behoort nie te dikwels nodig te wees nie en ons wil aan die hand doen dat 'n monster van die olie een maal per jaar getoets word en dat die olie slegs gefiltreer word indien die suurgehalte daarvan abnormaal hoog styg.

## SUBSTATION MAINTENANCE.

by

W. W. MARTIN and A. S. BRIDGER.

The maintenance of equipment in substations presents a problem to Distribution Engineers, because of the shortage of skilled labour and the ever-increasing number of units as a system grows. This applies not only in South Africa, but is causing considerable concern in the United Kingdom and plant designers are always looking for means to reduce or to simplify the maintenance requirements.

### TRANSFORMERS :

Transformers are probably the most reliable pieces of equipment and basically the only item on a transformer which requires maintenance is the oil. Deterioration of the oil causes a rise in acidity and the consequent formation of sludge, and where this occurs the life expectancy of the insulation is reduced. The major cause of oil deterioration is the contact between the oil and the atmosphere, particularly where humidities are high, and this is accentuated in South Africa due to the rapid change of temperature which occur, resulting in increased air circulation between the air-space in the transformer and the atmosphere. Silica Gel breathers reduce the moisture content of the air, but it is essential that these breathers be properly maintained as a saturated breather can give rise to conditions which are worse than if the transformers were directly connected to the atmosphere. The frequency of servicing the breather will vary during the year due to varying climatic conditions and no general guide can be given on this for the country as a whole.

Oil maintenance should be comparatively infrequent and a test on a sample of the oil once per year, we would suggest, is adequate and filtering only resorted to when the acidity value shows signs of increasing abnormally.

Roetine-instandhouding van paalgemonteerde transformators is feitlik onmoontlik en die neiging bestaan vandag om hermeties verseelde transformators te gebruik. By hierdie transformators is die lug in die lugruimte vervang deur stikstof of spesiaal gedroogde lug. Daar word beweer dat die toenemende gebruik van verseelde distribusietransformators van tot ongeveer 500 kVA 'n afname in instandhouding tot geveel het. In Amerika word dit in die geval van transformators van tot 2,000 kVA gedoen.

#### SKAKELTUIG.

Ook by die instandhouding van skakeltuig is dit die olie wat in stand gehou moet word en hoewel die ontstaan van suur en slyk gewoonlik nie so opmerklik as by transformators is nie, gebeur dit tog. Wanneer 'n stroom deur olieskakeltuig verbreek word, word koolstof gevorm en die hoeveelheid koolstof wat gevorm word, hang van die stroom af wat verbreek is. Hoe dikwels die olie in stand gehou moet word, hang basies daarvan af hoe dikwels die stroombreker werk sowel as van die stroom wat verbreek word. Indien 'n foutstroom ontstaan, moet die olie so spoedig moontlik gesuiver word. Verholing van die olie sal die breekvermoë van die stroombreker en van die stroom wat verbreek word, normaalweg nie benadeel nie en indien 'n foutstroom ontstaan, moet die olie so spoedig moontlik gesuiver word. Hoewel verholing van die olie die breekvermoë van die stroombreker normaalweg nie sal benadeel nie, bestaan die gevaar dat koolstof op isoleeropervlakke kan neerslaan en die isolering uiteindelik defek sal laat raak. Stroombrekers wat vir die beheer van hoogoende gebruik word, moet met baie kort tussenposes, gewoonlik ongeveer elke twee weke, nuwe olie ontvang. In dié geval werk die stroombrekers egter dikwels en is dit ook dikwels oorlaststrome wat verbreek word. In die geval van substasie-stroombrekers wat nog nie in 'n fouttoestand gewerk het nie, is dit waarskynlik voldoende om die olie een maal per jaar te ondersoek. Indien toets dan toon dat die olie benede die standaard is, hoef dit vir instandhoudingsdoelendes slegs gefiltreer te word.

Werkings in fouttoestande veroorsaak ook dat die stroombrekerkontakte brand en as dit te erg word, kan dit die werking van die stroombreker benadeel. Kontakte kan binne perke opgedoen word, maar moet uiteindelik vervang word. Die nuwe soorte stroombrekers verg minder instandhouding as gevolg van die feit dat wolframkoperboogpunte gebruik word. Dit is een geval waar vervaardigers daarin geslaag het om die werking van stroombrekers te verbeter en die instandhouding daarvan te verminder, maar, soos gewoonlik, teen 'n verhoging in die prys van die kontakte self.

Oorverhitting van die skakeltuig word gewoonlik veroorsaak deur die ontstaan van 'n nie-gelëende laag koperoksied waar kontakte van koper op koper gebruik word en wanneer dit gebeur, is dit nodig om die skakeltuig met gereelde tussenposes te laat werk. By moderne skakeltuig word versilwerde kontakte gebruik en dit

It is almost impossible to institute routine maintenance of pole mounting transformers and the trend today is to use hermetically sealed transformers in which the air in the air-space has been replaced by nitrogen or specially dried air. It is suggested that the increasing use of sealed distribution transformers, say up to 500 KVA, would reduce maintenance and in America this practice is being followed up to 2,000 KVA.

#### SWITCHGEAR :

Maintenance of switchgear again involves the maintenance of the oil and while acidity and sludge formation are not normally so pronounced as in transformers they do occur. Whenever a current is broken by oil switchgear, carbon is formed and the quantity of carbon is related to the current broken. The frequency with which the oil has to be maintained is basically a question of the frequency of operation of the circuit breaker and the current broken and, when the current is fault current, then the oil should be reconditioned as soon as possible. Carbonisation of the oil will not normally impair the breaking capacity of the circuit breaker and the current broken but the danger which arises is that carbon particles may deposit on insulating surfaces and ultimately give rise to a breakdown of the insulation. Circuit breakers which are used for arc furnace control have to have the oil changed at very short intervals, usually of the order of two weeks, but here the frequency of operation is high and the currents broken are also very often overload currents. For substation breakers which have not operated on fault the examination of the oil once per year is probably sufficient and oil maintenance can be confined to filtering of the oil where tests show that it is below standard.

Fault operation also results in the burning of the circuit breaker contacts and if this is allowed to become excessive then the operation of the circuit breaker can be affected. Within limits contacts can be dressed up, but ultimately need to be replaced. Contact maintenance has been reduced on the newer circuit breakers by the use of Tungsten copper arcing tips and this is an instance where manufacturers have succeeded in improving the operation of the circuit breaker and reducing its maintenance, but, as usual, at an increased cost for the contacts themselves.

Overheating of switchgear is usually caused by the formation of a non-conducting film of copper oxide where copper to copper contacts are used and, when this occurs, it becomes necessary to operate switchgear at periodic intervals. In the more modern designs of switchgear silver-plated contacts are used and this eliminates the



skakel die ontstaan van nie-geleidende oksied en gevolglike oorverhitting uit.

Stroombreektoestelle funksioneer in die ongewoonste toestand, aangesien hulle bewegende dele is wat 99.9% van hulle leeftyd staties bly, maar onmiddellik moet kan reageer indien dit van hulle verwag word. Die ontwerp van die toestelle bied dus heelwat probleme en ontwerpers soek steeds na maniere om hulle betroubaarder te maak. Daar was 'n tyd toe die ontwerp van die toestelle in 'n mate op profnemings berus het, maar vandag word rekenaars gebruik om toestelle so akkuraat moontlik te ontwerp en daarom behoort hulle betroubaarder te wees en minder instandhouding te verg. Gewoonlik verg skakeltoestelle geen ander sorg as die skoonmaak en olie daarvan op plekke wat in die instandhoudingsaanwysings aangee word nie en dit behoort minstens een maal per jaar te geskied.

Daar word besef dat ernstige probleme ondervind kan word as oliefilteruitrusting na die terrein geneem en voorsiening vir die opdoen van kontakte gemaak moet word by 'n stelsel wat baie stroombreekery bevat en behoorlik in stand gehou wil word. In die Verenigde Koninkryk het dit 'n saak van die allergroutste belang geword en tans is een van die gebiedsrele besig, om, in samewerking met 'n vervaardiger 'n oplossing vir dié probleem te soek. Dit wil voorkom of, indien die werkdele van die skakeltuig tesame met sy stroomtransformator en beveiligingsrele so gemaak kan word dat dit betreklik hanteerbaar is, dit moontlik sal wees om uitrusting na 'n sentrale werkwinkel te neem vir instandhouding. Die uitvoerbaarheid van dié idee hang hoofsaaklik van die vereenvoudiging van stroombaanvereistes en die standaardisasie daarvan af, sodat 'n verwyderbare eenheid verkry kan word wat maklik vervoer en omgeruil kan word vir een wat aandag moet ontvang en wat dan, op sy beurt, volledig in die werkwinkel getoets kan word. Om dit te bewerkstellig, is dit noodsaaklik dat die stroomtransformators klein moet wees en op sy beurt bring dit weer mee dat die lewering daarvan so klein is dat gewone reles nie gebruik kan word nie. Die ontwerp wat tans ondersoek word, maak gebruik van 'n statiese relé met 'n baie klein stroomtransformatorlas. 'n Statische relé met die gewone afhanklike verdragings is moontlik, maar ongelukkig nie eenvoudig nie, en is duur. By die betrokke eenheid wat tans oorweeg word, is daar van 'n definitiewe vertraagde relé gebruik gemaak en is baie kort tydindelingen tussen reles moontlik met die stroom wat gebruik word. Dit wil dus voorkom asof dit moontlik is dat beter koördinasie van beveiligingsapparaatstelling met so 'n relé as met reles met afhanklike verdragings verkry kan word. Soos reeds gesê, is dit noodsaaklik vir 'n maklik verwyderbare en vervoerbare eenheid dat die getal en grootte van die stroomtransformators beperk moet wees en derhalwe kan telstroomtransformators nie aan verwyderbare eenhede aangebring word nie. Hoëspanningmetertelling sal laat vaar moet word en metertelling sal aan die laespanningskant van die transformator moet geskied.

formation of a non-conducting oxide and consequent overheating.

Circuit breaker mechanisms are subject to most unusual conditions in that they are moving parts which spend 99.9% of their lives in a static condition, but must be able to move immediately when called upon to do so. This gives rise to various problems in the design of mechanisms and designers are always looking for means to make mechanisms more reliable.

At one time mechanism design was, to some extent, a case of trial and error but today computers are being used to optimize designs and this should improve reliability and reduce maintenance. Normally the only attention required by switch mechanisms is to clean them and oil where directed in the maintenance instructions and this should be done at least once per year.

It is realised that having to take oil filtering equipment to site and to make provision for the dressing of contacts where there are a large number of circuit breakers on a system, can give rise to serious problems if the switchgear is to receive proper maintenance. In the United Kingdom this has become a matter of major importance and one of the Area Boards, in conjunction with a manufacturer, are looking for a solution to this problem. It would appear that if the operating portion of the switchgear, together with its current transformers and protection relay could be made so that it can be handled comparatively easily, it would then be possible to take equipment to a central workshop for maintenance. The feasibility of this conception is governed largely by simplification of the requirements of the circuit breaker and standardisation thereof, in order to have a removable unit which can be readily transported and exchanged for one requiring attention and which can be completely tested in the workshop. In order to do this it is essential that the current transformers are small and this, in turn, limits their output to an extent which precludes the use of normal relays, and the design being investigated, makes use of a static relay having a very low burden. The provision of a static relay with the common inverse time characteristic is possible but unfortunately is not simple and leads to an expensive relay. As a result in the unit under consideration, use has been made of a definite time lag relay and with circuit employed, very close time grading between relays is permissible and it seems probable that better co-ordination of protective gear settings can be obtained using such a relay rather than inverse time relays. As pointed out, to achieve the objects of a readily removable and transportable unit, limitations and size of CTs are essential and, therefore, metering current transformers cannot be fitted to a removable unit. Any questions of high tension metering would have to be abandoned and metering done on the low voltage side of the transformers.

#### INSTANDHOUDING VAN RELES.

Dit is gewoonlik aan te beveel dat relés elke twaalf maande deur middel van sekondêre injeksie nagegaan word, maar uit statistiek van CEGB blyk dit dat die verkeerde werking van relés meer dikwels aan die instandhouding daarvan toegeskryf kan word. Daar word aanbeveel dat wanneer 'n stroombreker in werking gestel moet word, die relé met die hand in werking gestel word om dit uit te klink ten einde na te gaan of die relé reg werk en of die uitklinkspoel, die uitklinktoevoer en die breekmeganisme in 'n goeie toestand is. Roetineuitklinktoetse is inderdaad onnodig.

#### UITKLINKBATTERYE.

Aangesien die werking van die skakeltoegestel soveel van die uitklinktoevoer afhang, is dit nodig om die toestand van die batterye met tussenposes van hoogstens drie maande na te gaan en kan dit selfs nodig wees om dit meer dikwels te doen waar die batterye in ongunstige toestande werk. In plaas van batterye van tyd tot tyd met gedistilleerde water up te vul, kan batterye met hermeties verseelde selle, wat onlangs verkrygbaar geword het, nou gebruik word. Die gebruik van laasgenoemde sal die tyd wat vir die versiening van uitklinktoestel nodig is, ongetwyfeld verkort.

## LEES VAN METERS, BOEKHOUDING EN INSAMELING VAN GELDE

deur

L. S. CAMPBELL,  
Stadtesourier, Vanderbijlpark.

Voordat ek by die kern van my praatjie kom, meen ek dat dit belangrik is om eers die siening van 'n Stadtesourier oor produktiwiteit te omskryf.

Ek sien dit as die voordele bekom of nadele gely as gevolg van die vervanging van 'n spesifieke sisteem, prosedure, samestelling van arbeid, toerusting, ens. deur 'n ander stelsel. Die bestaande prosedure word as die nulpunt op die skaal beskou en die nuwe idee moet teen die oue gemeet word om die voor en/of nadele te bepaal.

Op soek na die ideale oplossing is 'n mens se kansse in die begin of proefnemingsstadium ewe goed dat die resultate of negatief of positief gaan wees.

Die begrip van produktiwiteit is so oud soos winsbejag en word gekry by enige idee wat groter doeltreffendheid beoog. By plaaslike bestuur is die doel nie so seer om winste te maak nie as om lewens na 'n beter diens teen dieselfde prys, of na dieselfde diens teen 'n laer prys, te streef.

Aangesien die lewensstandaard aanhou styg is dit meer dikwels die eersgenoemde doelwit wat eerste in ons gedagte posvat.

#### RELAY MAINTENANCE:

It is usual to recommend that relays should be checked by secondary injection every twelve months, but CEGB statistics show that more relay mal-operation occurs due to relay maintenance than due to lack of maintenance. It is suggested that whenever a circuit breaker has to be operated, it should be tripped by operating the relay by hand to check that the relay is operating correctly and that the trip coil, trip supply and breaker mechanism are in good condition, but that routine trip testing is not, in fact, necessary.

#### TRIPPING BATTERIES:

As the correct functioning of the switchgear depends so largely on trip supplies, it is necessary to check the condition of the battery at intervals not exceeding three months and it may, in fact, be necessary to do this more often if the battery is operating under adverse conditions. The periodic topping up of tripping batteries with distilled water can now be avoided by using the hermetically sealed cell batteries which have recently become available and their use will, undoubtedly, reduce the time necessary for the servicing of tripping units.

## METER READING, ACCOUNTING AND COLLECTIONS

by

L. S. CAMPBELL,  
Town Treasurer, Vanderbijlpark.

Before getting down to the subject of my talk it is important that I first express the views of a Town Treasurer on productivity. I see productivity as the profit gained or lost by an undertaking from the replacement of a particular system, procedure, labour mix, machine, etc. by a new system. The old system is taken as the zero value and the new one must be measured against it to determine the gain or loss. In endeavouring to find the ideal solution one is just as likely to achieve negative as positive results in the development or experimental stage.

The idea of productivity is as old as the profit motive and is found in any guise which intends to promote greater efficiency. In Local Government the idea is not so much to make profits but to strive for a better service at the same cost, or the same service at a lower cost. With rising living standards it is more often the former idea which is uppermost in our minds.

Alhoewel baie sinici beweer dat dit nie binne die vermoed van die plaaslike bestuur is om sy produktiwiteit te verbeter nie is dit interessant om te verneem dat die verkoopprys van bantoebier konstant gebly het oor die afgelope 33 jaar. Toe ek in 1935 in die diens van plaaslike bestuur getree het, was bier in die kafferpot gebrou en teen 2s. per gelling verkoop, wat geen wins opgelewer het nie, terwyl 'n beter produk teen 'n verkoopprys van 20c. huidige van die hand gesit word en uitstaande winste afwerp.

Aangesien die lede van 'n Tesourie-personeel nie los van mekaar werk nie is die tempo waarteen veranderings plaasvind, uiters stadig en kan slegs stuksgewys toegepas word nadat die vorige stap in werking gestel is, deur die personeel baasgeraak en die doeltreffendheid daarvan bewys is. My eerste ondervinding van 'n onbeplande produktiwiteitsveldtog het in 1935 plaasgevind toe 'n handgeskrewe water- en elektrisiteitsdebiteure register van een vorm na 'n ander oorgeskryf is. Eers na ses maande se bloed, sweet en onbetaalde oortyd kon van al die haakplekke ontslae geraak word en dit in 'n bruikbare stelsel omskep word wat die resultate afgewerp het wat die Stadstoesourier oorspronklik beoog het.

By ons is die opkapping van stelsels 'n voortdurende proses wat onwetend deur die hele personeel toegepas word en wie se idees hoogsaaiklik deur die Interne Ouditeur en sy personeel ondersoek word. Die Interne Ouditeur is 'n ten volle gekwalifiseerde persoon met 'n B.Comm. graad of I.M.T.R. diploma en is dus instaat om die voor- en nadele van 'n idee te bepaal. 'n Posing is aangewend om sy roetine werk tot 'n minimum te beperk om sodanig sy produktiwiteit te verhoog deur meer tyd vir onafhanklike ondersoeke beskikbaar te stel.

Maandag-oggend bring ek en die Interne Ouditeur 'n halfuur saam deur om sy dagboek vir die vorige week deur te werk, kwespunkte wat opgeduik het te bespreek en gedagtes te wissel. Dit is opvallend hoe stelsels verbeter en prosedures opgeknip kan word deur hierdie eenvoudige metode.

Produktiwiteit is 'n relatiewe begrip en dit is gevaarlik om te veralgemeen. Wat vir Vanderbijlpark meer doeltreffendheid in die hand gaan werk of gewerk het, mag etlike jare gelede al in u eie plaaslike bestuur toegepas gewees het en sal ons stelsels vir u dus geen produktiwiteitswaarde hê nie. Die beste waarvoor ek mag hoop is dat u kommentaar of my aanmerkinge 'n nuwe idee gaan aanwakker wit in een of ander onderneming van waarde sal wees. Mag dit verhoed word dat ek u van 'n lat voorsien om u eie Stadstoesourier mee te slaan!

Die opskrif van hierdie referaat is alles behalwe betowerend en verskaf nie die geleentheid om met fantasiese of verbeeldingsryke idees te kom nie. Behalwe dit, is die relatiewe belangrikheid of verhouding van die onderwerp tot die elektrisiteitsonderneming as geheel, belangrik. Ek meen dat die waarde van hierdie posing lê in die oefening en die moontlike toepassing van idees tot alle funksies van plaaslike bestuur wat deur die Tesourie-afdeling bedien word.

While many cynics aver that Local Government is incapable of improving its productivity it is interesting to note that the price of bantu beer has not increased over the last 33 years. When I started in Local Government in 1935 the beer made in a three-legged pot was sold at 2s. per gallon for no profit, and today the price is 20c. for a better product which pays handsome dividends.

As each member of the Treasury staff does not work "in vacuo" the tempo at which change may be effected is very slow and is only effected piecemeal after each previous step has been put into practice, understood, and proved satisfactory. My first experience with an unplanned productivity drive was in 1935 when a manual electricity and water debtors' register of one sort was changed for another. It took six months of blood, sweat and unpaid overtime to find the gremlins and make it a workable system giving the results the Town Treasurer had originally envisaged.

With us, systems improvement is a continuous process applied unconsciously by the whole staff whose ideas are investigated in the main by the Internal Auditor and his staff. The Internal Auditor is a qualified man with a B.Comm. Degree or the I.M.T.A. Diploma and therefore is able to judge the merits and demerits of an idea. An effort is made to reduce his routine work to a minimum and so enhance his productivity by giving him the time to undertake independent investigations.

Every Monday morning the Internal Auditor and I spend half an hour going through his diary for the previous week discussing the points which have cropped up and in exchanging views. It is remarkable how systems are improved and procedures tightened up by this simple expedient.

Productivity is a relative concept and it is dangerous to generalise. What has promoted, or may promote, greater efficiency in Vanderbijlpark may have been in operation for a number of years in your own local authorities and has no "productivity" value for you. The best I may hope for is that my remarks or your comments will generate the germ of an idea which may be used to advantage in some or other undertaking.

Far be it from me to provide you with a stick with which to beat your own Town Treasurer!

The title to this discussion is hardly a glamorous one and gives one little opportunity to indulge in flights of fancy. Besides, its relative importance to the whole electricity undertaking is such that any improvements effected can make little difference to the overall picture of an electricity undertaking. I feel that the value of this effort lies in the exercise and the possible application of ideas to all the functions of local government helped by the Treasury Department.



Huidig, dit wil sê, Februarie 1968, is die posisie in Vanderbijlpark soos volg:—

	Elektrisiteits	
	Bevolking	Verbruikers
Blank	38,000	9,200
Nie-Blank	27,000	1,550
Eenhede aangekoop vir die jaar eindigende Februarie 1968 — 92 miljoen.		
	1967/1968	
	R	
Salarisse: Meterlesers	7,000	
Masjienoperatrises	3,000	
Gedeelte van Tesourie-afdeling rakende meterlesing en debiteur-rekeninge (50% van R20,000)		
	10,000	
Vervoer: Meterlesers	1,000	
Skrifbehoefes	1,000	
	22,000	
Afsluitings en heraanafsluitings	6,500	
Gemiddelde aantal per maand	1,200	

Indien die totale koste van R22,000 met 20% besnoei word, wat beslis 'n noemenswaardige prestasie sal wees, sal die prys per eenheid met slegs .03c. verlaag word wat te min is om tariewe te verminder aangesien dit die gemiddelde rekening met minder as 18c. per maand sal aftekeer.

Om terug te keer na die onderwerp onder bespreking, is die eerste plig van die Stadstoesourier om te verseker dat elke sent wat die Raad toekom ge-in word.

Om seker te maak dat geen inkomste verlore gaan nie, met:—

- alle meters wat geïnstalleer word in 'n meterboek opgeskryf word.
- alle meters moet gelees word.
- geen krag voorsien word alvorens die vereiste deposit betaald is nie.
- debiete ingevolge die voorgeskrewe tarief gehef word.
- berekeninge moet akkuraat wees.
- korrekte bedrae teen debiteur gehef word.
- alle bedrae ingevorder word en ten laaste
- geen bedrae afgeskryf word nie tensy die Raad dit goedkeur.

Dit is maklik om 'n ingewikkelde beheerstelsel in te stel maar niks is moeiliker as om dit te laat werk sonder om nog meer ingewikkelde kontroles te bewerkstellig nie.

Die doeltreffendste beheerstelsel is een wat die personeel verplig is om toe te pas of wat met gegrief saam met 'n ander presedure, wat daaglik uitgevoer moet word, gedoen word. Die tyd het ons geleer dat hoe meer gereed en dikwels 'n taak verrig word, hoe minder kans bestaan daar dat dit oor die hoof gesien sal word.

The position here at this time, February, 1968, is as follows:—

	Electricity	
	Population	Consumers
European	38,000	9,200
Non-European	27,000	1,550
Units purchased to year ended February, 1968 — 92m.		
	1967/1968	
	R	
Salaries: Meter Readers	7,000	
Machine Operators	3,000	
Proportion of rest of Treasury Department affecting meter reading and debtor accounting		
	10,000	
Transport: Meter Readers	1,000	
Stationery	1,000	
	22,000	
Disconnections and Reconnections	6,500	
Average number per month	1,200	

Should the total cost of R22,000 be cut by 20% — certainly no mean achievement — then the cost per unit sold would be reduced by .03c. which is too low to pass on to consumers as it represents less than 18c. per month on the average account.

To return to the subject matter of this talk: The first duty of the Town Treasurer is to ensure that every cent of revenue due to the Council is collected.

To ensure that no revenue from electricity is lost:

- all meters installed must be recorded in a meter book.
- all meters must be read.
- no electricity is supplied before the requisite deposit has been paid.
- the debits raised are in terms of the correct tariff.
- the calculations must be correct.
- the amount is recorded on the debtor's account.
- the money is collected, and lastly no amounts are written off without the sanction of the Council.

The easiest thing to do is to devise an elaborate system of control while the most difficult task is to have checks.

The best system of control is one which the staff is obliged to effect or can be done conveniently with another procedure which is done daily as experience teaches us that the job done with the greatest frequency and regularity is the one which does not get forgotten.

Dikwels bots 'n ongereelde taak met die daaglikse roetine en gevolglik besluit die personeel dat die verlangde werke van minder belang is — hulle besluit meesal self die volgorde van belangrikheid van hulle verskeie take wat, weens gebrekkige kennis van die opset as geheel dikwels verkeerd is.

#### METER-REKORDS.

Nadat verskeie stelsels op die proef gestel was, is die beste resultate tot dusver van die volgende metode verkry :—

By uitreiking van meters in maksimum hoeveelhede van vyftig deur die Magasynafdeling, word 'n lys wat die fabrieksnommers van die meters aantoon in drievoud opgestel. Een afskrif bly in die magasyn, een word aan die meterlesers gestuur en die derde afskrif gaan saam met die meters na die toetsafdeling.

Die toetsafdeling ken aan elke meter 'n munisipale nommer toe en stuur daarna die lys, wat fabrieks- sowel as munisipale nommers aantoon, aan die Hoof Meterleser wat die erfnummers en dorpsgebied teenoor die ooreenstemmende meter op die lys inskryf sodra kennis ontvang word dat 'n meter geplaas is.

Na vervanging van 'n meter word die ou meter se nommer op 'n lys aangebring en na opknapping en sodra dit weer in gebruik geneem is, word die nuwe huis en erfnummer en dorpsgebied op die lys aangeteken. Word die meter eger as onbruikbaar beskou, stel die Superintendent die meterlesers in kennis en word die meter van die lys geskrap.

In elke maand word die voorraad meters by die toetsafdeling geneem en alle foute opgespoor.

#### LEES VAN METERS.

Afgesien van die omruil van meterleesronddes om te verseker dat elke meterleser slegs elke derde maand dieselfde meter lees, is slegs die volgende prosedures aanvaar om produktiwiteit te verbeter :—

1. Meters word slegs soggens gelees. Middae word in die kantoor deurgebring deur afrekkings na te gaan, watermeters wat skoongemaak moet word, te lys, adresplaatjies te slaan, en spesiale, finale- en bevestigende-lesings te neem. Om sy leeskwota af te handel werk die meterleser soggens onder druk en gedurende die namiddig onder toesig.
2. Meterlesers maak nie gebruik van trapfiets nie — hulle word by hulle werkplek afgelaai en tussen 12 en 12.30 nm. word hulle weer opgelaa. Die prosedure is nodig geag nadat 'n paar meterlesers soek geraak het tydens die Hoof Meterleser se inspeksies.
3. 'n Maandelikse leesprogram word opgestel en moet stiptelik nagekom word. Dit verseker dat die verbruiker sy rekening op bykans dieselfde datum — binne 'n dag of twee — van elke maand sal kry. Hierdeur word druktye, en die gebruik van ander personeel om die werk op datum te bring, uitgeskakel. 'n Verdere voordeel is 'n vermindering van brief-

An irregular procedure frequently clashes with the daily routine and consequently the staff decide that it is of minor significance — they tend to decide for themselves the order of importance of their various tasks which they very often incorrectly assess due to their lack of knowledge of the set-up as a whole.

#### RECORDING OF METERS.

After trying several systems we found that the following one has given the best results to date :—

When meters are issued by the Stores Department in batches not exceeding fifty, a list, in triplicate, is made of the factory numbers on the meters. One copy remains at the Stores, one copy is sent to the Meter Readers and the third copy goes with the meters to the Testing Department.

The Testing Department gives each meter a municipal number and then sends its copy of the factory numbers together with the new municipal numbers to the Chief Meter Reader who writes the erf number and township on this list when notice is received that a meter has been placed.

When a meter is replaced, the number of the old meter is entered on a list and after it has been repaired and is re-used the new address, erf number and township is entered against it. If, however, the meter is scrapped the Superintendent notifies the meter readers and the meter is then taken off the list.

Once every month stock is taken of all meters at the Testing Department and any errors located.

#### METER READING.

Apart from the rotation of meter reading rounds so that they read the same meter but once in three months, the only procedures adopted to improve productivity are :—

1. Meters are read in the mornings only, the afternoons being spent in the office checking the abstractions, listing water meters which require cleaning, cutting address stencils, or making check, final or special readings. The meter reader works under a certain amount of pressure in the morning to complete his quota then works under supervision in the afternoon.
2. Meter readers do not use bicycles — they are dropped off at their meter reading points and collected between 12 and 12.30 p.m. This was found necessary as when the Chief Meter Reader went out on inspection a man or two may have temporarily disappeared.
3. A monthly reading programme is drawn up and is strictly adhered to. It ensures that there is no slacking and that consumers receive their accounts on the same date — within a day or two — in each month. This avoids rush periods and the diversion of other staff to this section to bring the work up to date. A further advantage is a reduction in correspondence due to "abnormally" high consumptions

wisseling oor hoë verbruik veroorsaak deur „maande“ wat wissel van 21 na 41 dae.

4. Nume meterboeke word maar eenkeer in vier jaar herskryf. Vir hierdie doel word daar van die dienste van universiteitsstudee gedurende die Desember-vakansie gebruik gemaak.
5. By die toonbank word slegs een boek in viervoud gebruik vir finale lesings en oorplasinge. Die elektrisiën en loodgieter kry een vorm elk terwyl die derde een eers na die meterleser gaan om die finale lesings te neem en daarna gebruik word by die terugbetaling van die verbruikersdeposito. Waar oorplasinge plaasvind word die derde afskrif gebruik om 'n nuwe adresplaatjie te slaan.

'n Verbetering wat ek graag sal wil sien is die af-en heransluiting van die toevoer aan huishoudelike verbruikers deur meterlesers of ander ongeskoolde arbeid, dit wil sê, ongeskoold uit die gesigspunt van die Ingenieur.

Sover my geheue strek is dit nie nodig om van die dienste van 'n elektrisiën gebruik te maak om die toevoer te staak waar bogronde geleidings gebruik word nie, behalwe in gevalle waar die omgekrapte huisvrou die pad na die spens waar die meter toendertyd geïnstalleer was, versper en ons gedwing word om dan die toevoer by die straatpaal af te sluit.

In Vanderbijlpark met sy ondergrondse geleidings is dit waarskynlik nodig om die werk deur 'n elektrisiën gedoen te kry.

Sou dit vir die Elektrotegniese Ingenieur moontlik wees om die gebruik van minder bevoegde arbeid toe te laat om laagspanningtoevoer te staak, kan daar doeltreffender gebruik gemaak word van die elektrisiën wat tans daarmee besig is en daarenkens sal die Onderneming soos volg daarby baat:—

1. Die totale koste van die elektrisiën en sy vervoer word gespaar deurdat die meterleser verplig is om alle meters na afsluiting te gaan lees aangesien die meter normaalweg binne die perseel is, terwyl die toevoer in die verdeelkas op straat afgesluit word.
2. Die publiek word beter bedien aangesien daar vinniger opgetree kan word om die toevoer te herstel of die diens, soos verlang, te staak. Aangesien ons van 'n ander departement afhanklik is, word die werk gedoen wanneer dit vir die Elektrotegniese Ingenieur gerieflik is en nie soos deur die publiek verlang nie. Die elektrisiën kom sy opdragte kort voor die kantoor sluit haal en gevolglik word groot ongerief veroorsaak, in gevalle waar hy die werk nie afgehandel kry nie. Dit is verkieslik dat ons in die posisie gestel word waar ons kan belowe dat die werk gedurende kantoorure gedoen sal word en sodoende die verbruiker die geleentheid bied om ons kans te gee om enige foute reg te stel nog voor die personeel van diens af is.

Om arbeid te bespaar is daar oorgegaan na die kwartaalike lesing van meters. Die stelsel is met welslae vir twee en 'n half jaar al (sedert Julie 1965) in werking.

caused by the spread of a "month" varying from 21 to 41 days.

4. New meter books are re-written but once in four years. For this purpose University students are used during the Christmas vacation.
5. Only one book with forms in quadruplicate is used at the counter for final readings and transfers. One form each for electrician and plumber and one for the meter reader who takes the final readings, and on which refunds of deposits are also made. For transfers the meter reader's copy is used by one of them to cut a new address stencil.

An improvement I would like to see is for the meter readers or other unskilled staff — unskilled from the Engineer's view point — to undertake the disconnection of the electricity supply to domestic consumers.

My own recollection of the old overhead reticulation is that it is not necessary to make use of an electrician to do the dastardly deed except in cases where an irate housewife bars the way to the pantry (where the meter was usually placed) and it was necessary to disconnect at the pole (Street Standard). In Vanderbijlpark, with its underground system it is apparently necessary to have the work done by an electrician.

Should it be possible for the Electrical Engineer to permit the use of less skilled labour to disconnect the low tension supply, more efficient use could be made of the electrician presently engaged on the work, and with the following advantages to the Undertaking:—

1. The cost of the electrician and his transport will be saved in total as the meter reader is obliged to read all meters immediately after disconnection for the meter is usually in the house while the service is disconnected in the distribution pillar on the street.
2. The public will be better served as it will be possible to reconnect more quickly and discontinue the service as required. Our difficulty in having to rely on another department is that the work is done at the convenience of the Electrical Engineer and not when required by the public. As the electrician calls for instructions just before the office closes great inconvenience is caused when the work is not done. It is preferable that we be put in a position where we may promise that the work will be done during office hours so that in the event of mistakes the consumer gives us an opportunity to put matters right before the staff goes off duty.

To save labour a quarterly reading of meters has been instituted. The system has been in operation for two and a half years (since July, 1965) and has proved to be a success.

Die prosedure wat ons gevolg het is:—

- (a) Die eerste proefneming van min/meer 10% van die dorp is in 'n goedgevestigde gebied met 'n goeie rekord van betaling gemaak.
- (b) Slegs huise word kwartaaliks gelees — winkels, woonstelle en fabriek word ook steeds maandeliks gelees.
- (c) Die publiek is ingelig dat van hulle verweg word om 'n beraamde rekening vir twee maande te betaal en dat die rekening aan die einde van die derde maand volgens die werklike lesing bereken en aangesuiwer sou word.
- (d) Die gemiddelde rekening, gebaseer op twee jaar se verbruik, is bepaal en word ook gebruik vir enige nuwe verbruikers wat die perseel mag betrek en is afgerond op die hoër rand. Die verbruiker is vooruit in kennis gestel van wat sy gemiddelde rekening gaan wees en indien hy nie tevrede is nie, is hy verwoek om met die belastingaal in verbinding te tree.

Die omvang van die stelsel is mettertyd uitgebrei. Geen moeilikheid is met die publiek ondervind nie en huidige word die stelsel op 50% van die dorp toegepas.

Al nadeel wat ondervind is, is dat die styging in verbruik gedurende die wintermaande 'n hoër rekening tot gevolg het wat die publiek omkrp.

Bevredigende meterlesers word so skaars soos hoerterdande. Jare gelede is geen moeilikheid ondervind om genoegsame aansoeke te ontvang waaruit 'n keuse gemaak kon word nie, maar die dag breek vinnig aan wanneer daar sterk gedink moet word om dames vir die werk aan te stel.

'n Proefneming met vroulike briewestellers is huidige in Vanderbijlpark aan die gang en op die oog af blyk dit 'n sukses te wees. Daar is baie vroue-ambied in Vanderbijlpark beskikbaar wat die Raad in staat behoort te stel om lesers te kry, veral omdat daar slegs voor-middae gelees word.

Sou dit nog nodig wees om watermeters terselfdertyd te lees sal die bantoehandlanger die meters die vorige middag moet skoonmaak indien daar beswaar gemaak word teen die gebruik van 'n jong bantoe om meterkaste oop-, skoon- en toe te maak terwyl die meters gelees word.

#### VERBRUIKERS-DEPOSITO.

'n Jaar gelede was dit nog die gebruik om die verbruikers-deposito op 'n kaart deur die verbruiker onder-teken, aan te bring en daarna word dit alfabeties gelasseer.

Die moeilikheid ondervind was:—

- (a) Waar 'n persoon van een adres trek moet die nuwe erfnummer op die kaart aangebring en die debiteurs-kaart oorgeplaas word na die ooreenstemmende posisie in die kabinet.
- (b) Sou die adresverandering vergete bly kan dit later verwarring skep met ander verbruikers met dieselfde name en vanne.

The procedure followed was:—

- (a) The first area tried, plus minus 10% of the town, was a well-settled one with a good payment record.
- (b) Only domestic dwellings are read on the quarterly basis — shops, flats and factories are still read every month.
- (c) The public were told that they would be required to pay an estimated account for two months and the adjusted actual account at the end of the third month.
- (d) An average was worked out over two year's consumption (also used as the basis for any subsequent consecutive higher rand. The consumer was told in advance sumer occupying the premises) and rounded off to his average and was asked to contact the Rates Hall if dissatisfied with the amount stated.

The system has been expanded as and when necessary. No problems have been experienced with the public and at present 50% of the town is operating under the system.

The only disadvantage yet encountered is the increase in consumption during the winter months when accounts are higher than the average and the public feels it has a grouse.

Satisfactory meter readers are becoming more difficult to find. A few years ago one had no difficulty in obtaining sufficient applications from which to make a choice, but the time is fast approaching when consideration will have to be given to the appointment of women.

Women postmen are under test in Vanderbijlpark and seem to be a success. There is a large pool of female labour in Vanderbijlpark which should enable the Council to find readers— particularly as the work would initially be mornings only.

If water meters are still to be read at the same time, the bantu labourer could clean the meters the previous afternoon, should there be an objection to a juvenile bantu opening, cleaning and then shutting meter boxes when the readings are being taken.

#### CONSUMER DEPOSITS.

Until a year ago we recorded the consumer's deposit on a card signed by him and then filed alphabetically.

The difficulties encountered were:—

- (a) On moving from one address to another the erf number on the deposit card had to be altered as well as transferring the debtor's account card to the relative position in the cabinet corresponding to the new address.
- (b) If the address was not altered there was later confusion over consumers who had the same names and initials.

- (c) Party klerke se spelling en kennis van die alfabet is gebrekkig.
- (d) Aan die einde van die jaar was baie tyd verspil deur foute op te spoor in die poging om die kaarte letter vir letter met die kontrolerekening te ablanseer.

Huidig word die deposito in die dwarste van die debiteurskaart aangebring en kan dus van kabinet na kabinet oorgeplaas word sonder om enige addisionele werk te verrig.

Hierdeur is die gelyste nadele uitgekakel asook die skryfbehoeftes wat nodig was om 'n afsonderlike stel kaarte aan te hou. By afsluiting van die laaste boekjaar is die deposito's binne 'n baie kort tydbestek gebalanseer.

#### REKENINGKUNDIGE PROSEDURES.

Soos in die geval van die meterlesers word 'n maandelikse program vir die boekhoumasjienoperatrisse so opgestel dat die verbruiker sy rekening so ver moontlik op dieselfde datum van elke maand ontvang. Die rekening is binne sewe dae na die versendingsdatum (dit is een dag later as die datum waarop dit gepos word) betaalbaar.

Sou die dames nie die werk gedurende normale werksure kan behartig nie is hulle verplig om oortyd te werk maak, aangesien die program aan hulle bekend is, mag hulle, binne perke werk soos dit hulle pas.

Benewens dat die werk eweredig oor die maand versprei is, word die argument dat die verbruiker nooit weet wanneer om sy rekening te verwag nie, weerlê en word die kassier se werk ook meer egalig oor die maand versprei.

Tydbesparing word ook te weggebring deur tariewe te vereenvoudig wat die moontlikheid van foute vermindert — bv. huisbewoners word almal met dieselfde basiese gelde aangeslaan en alle eenhede verbruik word teen 'n enkele eenheidstarief bereken. Tyd word nie verkwis deur bouplanne deur te soek om oppervlaktes te bepaal en geen langdragtige berekenings volgens 'n wisselende tarief word gedoen nie.

Toe die poswese geweer het om gevoude rekenings te ontvang was ons verplig om die meterlesers se handlangers te gebruik om die rekenings in venster-koeferte te stop. Al voordeel wat ons daaruit getrek het is dat die koert dien as 'n draer vir ander inligting bv. die lys van afsnydatums. Nou wil die Elektrotegniese Ingenieur by die Tesourier se pogings sy nuusbroskies oor nuttige wenke aan verbruikers bysit. Voordat ons die knie voor die posowerhede gebuig het is 'n ondersoek ingestel wat aan die lig gebring het dat dit goedkoep sou wees om die oop rekening, sonder koert of posseel, deur bantoes te laat bestel maar die voorstel was nie vir die Raad aanneembaar nie.

#### VORDERING VAN REKENINGE.

Geen waarskuwing word uitgestuur nie.  
Geen telefoonoproep word gedoen nie.  
Geen uitstel om te betaal word toegestaan nie.  
Geen heraansluitings na ure nie.

- (c) Some clerks' spelling and knowledge of the alphabet was limited.
- (d) At the year end, much time was wasted sorting out errors in an endeavour to balance the cards letter by letter with the control account.

Now the deposit is recorded on the side of the consumer's account card (at right angles to the account) and travels with the card from cabinet to cabinet without any extra work being done.

All the disadvantages listed have been eliminated as well as the stationery required for a separate set of records. At the end of the last financial year the deposits were balanced in a fraction of the time previously taken.

#### ACCOUNTING PROCEDURES.

As in the case of the meter readers a monthly programme is drawn up for the accounting machine operators and is so devised that a consumer is to receive his account as nearly as possible on the same date each month. The account is payable within seven days after the date shown on the form which is the date after posting will take place.

If the girls are unable to complete the work in normal hours overtime must be worked but the operator knows the programme and within limits works to suit herself.

Besides spreading the work over the month the system kills the argument that a consumer never knows when to expect the account. The cashier's work too, is more evenly spread over the month.

Time is saved by streamlining tariffs, thus reducing the possibility of errors, for example, for householders the same basic charge is levied with all units consumed at the same price, no time consumed checking of plans for building alterations to determine room areas is necessary and no lengthy calculations according to a varying scale of charges has to be made.

When the postal authorities refused to accept folded accounts we were obliged to use the meter readers' labourers to place the accounts in window envelopes. The only advantage gained was a vehicle for other notices, e.g. list of disconnection dates. Now the Electrical Engineer wishes to add snippets of information useful to consumers to the Town Treasurer's efforts. Before surrendering to the demands of the Post Office a survey showed that it would be cheaper to use bantu to deliver the accounts without envelopes, but the idea was not acceptable to the Council.

#### COLLECTION OF ACCOUNTS.

No warnings are given.  
No telephone calls are made.  
No extension of time in which to pay is given.  
No reconnections after hours.



Die laaste reël het tot my verbasing geen nagevolge gehad nie en het die kliënte uitgeskakel wat eers tussen 5 nm. en 10 nm. by die huis kom om te verneem dat die toevoer gestaak is. Nou weet hulle dat geen elektrisiteit na-ure beskikbaar is nie en is die oorlas uitgeskakel.

Noodsaaklikheidswyse word daar by tye van die reëls afgewyk maar algemeen gesproke word baie tyd gespaar deur by die reëls te hou aangesien die publiek goed saamwerk nadat hulle geleer is. Slegs waar die uitsondering die reël word, word moeilikheid ondervind.

Die derde reëling is maar onlangs in werking gestel en word bewerkstellig deur elke tweede maand 'n lys van die afsnydatums vir die hele dorp aan die verbruikers te stuur. Die datums is tussen 14 en 21 dae na die rekening uitgestuur is, niteenstaande die bepaling op die rekening dat betaling binne sewe dae moet geskied, soos vermeld.

Die bekendmaking van die vaste afsnydatums het ontstaan uit 'n ondersoek wat ingestel was toe slegteskulde begin toeneem het en dit aan die lig gebring is dat, volgens die ou procedures, sekere verbruikers ses weke gratis gehad het om te betaal of weg te loop.

Nie alleen is die tyd deur die amptenaar in beslag geneem om na die stories te luister, uitstel toe te staan, en 'n nota daarvan te maak vir latere opvolgings besaar nie, maar die slegteskulde het ook afgeneem. Die huidige syfer vir slegteskulde is 22% van debiete gehef (gemiddelde verbruikersdeposito R16.00).

Daar word van Maandag tot Vrydag vanaf die tweede of derde tot die 21ste of 22ste van die maand afgesny.

Tyd is tot die 26/27ste wanneer die uitbetaling van maandelikse salarisse begin nog beskikbaar, maar tot dusver was dit nie nodig om van die addisionele dae gebruik te maak nie.

Om klagtes tot 'n minimum te beperk is die gewone afsnylys tot 40-60 name beperk. 'n Groter getal is te veel werk vir een elektrisien en veroorsaak vertraging wanner heraansluitings later gedoen moet word.

Die staking van die toevoer vind tussen 7.45 vm. en 2.00 uur middag plaas om die wanbetalers die geleentheid te bied om gedurende kantoorure te kom betaal en sy toevoer nog dieselfde dag herstel te kry.

Laaste bly die probleem hoe om agterstallige bedrae te in nadat die verbruiker die dorp verlaat het oor. Oor hierdie netelige vraag word geld nie verwis deur pogings aan te wend om klein bedrae te probeer verhaal nie, aangesien regskoste verbiedend hoog is. Verkielik word daar op groot bedrae wat afgeskryf moet word, ingegaan en procedures word ondersoek om soortgelyke gevalle in die toekoms te vermy, aangesien dit meer vrugte sal afwerp as wat die tydrowende en geldverkwistende invorderingspogings kan doen.

Ingevolge 'n ooreenkoms met die grootste werkgewer in Vanderbijlpark word hierdie kantoor onmiddellik in kennis gestel wanneer 'n werknemer wie geld geleen het om sy diensdeposito te betaal en wie die lening nog nie terugbetaal het nie, wegloop. Dit stel ons in staat om die toevoer te staak op 'n vroeëre tydstip as wat andersins die geval sou wees.

This last innovation has surprisingly enough had no repercussions and has eliminated those customers who come home between 5 p.m. and 10 p.m. to find no current. Now they know there is no electrician available and the nuisance no longer exists.

There are of course the exceptions to every rule but by and large much time is saved by sticking to rules for, once educated, the public co-operates well. It is when the exception becomes the rule that difficulties are encountered.

The third role was only instituted recently and has been achieved by sending out every second month a list of cut-off dates for the whole town — the dates are from 14 to 21 days after the account has been posted although the account reads that it is payable within seven days as has been previously mentioned.

The notification of the fixed cut-off dates resulted from an investigation made when there was an increase in bad debts and it was found that under the old rules some consumers had up to six weeks grace in which to pay or abscond.

Not only is the time of the official who would have to listen to the tale of woe, grant the extension and make a record of it for a later follow up been saved but bad debts have also been reduced. The present bad debt it applied without installing even more elaborate counter figure is 22% of debts raised. (Average consumer's deposit R16.00.)

We disconnect from Monday to Friday from the 2nd or 3rd of the month to the 21st or 22nd. Time is available to the 26/27th, when the paying of monthly salaries begins, but it has not yet become necessary to make use of the extra time.

To reduce complaints to a minimum the normal cut-off list is limited to 40 to 60 names. A larger number is too much work for one electrician and causes delays in later reconections.

The work is done between 7.45 a.m. and noon so as give the defaulter time to pay during office hours and so have the service restored the same day.

Lastly, the question of the collection of outstandings after a person has left the town remains. On this vexed question money is not spent on trying to collect small amounts as legal costs are prohibitive. Rather a check is made on large amounts which have to be written off and procedures investigated so as to prevent similar occurrences in the future as it is a much more fruitful occupation than the time and money consumed in attempting to collect.

In terms of an agreement with the biggest employer in Vanderbijlpark this office is notified immediately an employee, to whom the employer has advanced money for his service deposit, absconds before the loan is repaid. This enables us to disconnect the supply earlier than would otherwise be the case.

# INSTALLASIE EN WERKVERRIGTING VAN AARDLEK-RELÉ'S OP HUISHOUDELIKE INSTALLASIES

deur

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## INHOUD:

1. Inleiding.
2. Eerste relé's in woonstelgeboue.
3. Verpligte installasie op nuwe geboue.
4. Werkverrigting.
5. Toets apparaat.
6. Gevolgtrekkings.

1.1 Toe ek deur ons President genader is om 'n inleidende praatjie te lewer oor huishoudelike aardlek-relébeskerming, was die eerste reaksie om maar 'n verskoning te soek om dit nie te doen nie omdat soveel nog van mening is dat ons reeds genoeg verantwoordelikheid dra, en nie nog aardlek-relé's verbruikers-installasie ook op ons skouers kan neem nie. Ek het egter weer daaroor nagedink en toe wel ingewillig om vir u iets te vertel van wat ons besig is om te doen in Stilfontein, wat betref huishoudelike aardlek-relé's, sodat u kan sien dat dit wel moontlik is om 'n hele huishoudelike installasie, met inbegrip van stoof en water-verhitter, met 'n aardlek-relé te beskerm, sonder om verbruikers onnodige en lastige kragonderbrekings te laat ondervind. Ons moet natuurlik toegee dat daar verbruikers is wat soms maar baie moeilik kan raak en nie rede wil verstaan nie, hierdie soort van verbruiker sal u maar altyd hê, ook op plekke waar daar geen aardlekbeskerming geïnstalleer is nie.

2.1 In Stilfontein was daar die besondere geleentheid om aardlek-relé's op die proef te stel omdat die Myn Maatskappye ook die Dorpseseenaars was, en in samewerking met die Raadgewende Ingenieur van een van die Maatskappye, is 'n blok van 30 woonstelle in 1957/58 met die Kern-balans tipe aardlek-relé's voorsien, die relé's was gestel om op 'n foutstroom van 15 m.A. na aarde, die strombreker uit te klink. Hierdie aardlek-relé's is op elke woonstel se hoofverdeelbord as hoofstroombreker geïnstalleer, met ander woorde, die hele installasie, insluitende stoof en waterverhitter, is daardie beskerm.

2.2 Heelwat groeioppyne is ondervind in hierdie blok woonstelle en op 'n stadium was ons van mening dat hierdie tipe beveiliging nooit sal werk nie as gevolg van die baie lae aardlekstroom. By nadere ondersoek, het dit egter geblyk dat die relé's meer sensitief geword het as gevolg van onstabiele komponente. Hierdie komponente is vervang en die foutstroom is verhoog na 20 m.A. wat die grootste deel van die moelikhede, wat ondervind is, uitgeskakel het. Enige verdere kragonderbrekings as gevolg van aardlekfoute kon opgespoor en herstel word.

# INSTALLATION AND PERFORMING OF EARTH LEAKAGE RELAYS IN DOMESTIC INSTALLATION

by

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## CONTENTS:

1. Introduction.
2. First Relays in Block of Flats.
3. Compulsory installation on new buildings.
4. Performance.
5. Testing apparatus.
6. Conclusions.

1.1 When our President approached me for an introductory talk on domestic earth leakage protection, the first reaction was to find a reason for not doing so, as a large number of Electrical Engineers is of the opinion that we carry enough responsibility and cannot in addition be responsible for earth leakage protection on consumers' installations. I have, however, given the matter a second thought and have decided to tell you something of what we are doing in Stilfontein, as far as domestic earth leakage protection is concerned, so that you can see that it is possible to protect the whole domestic installation, including electric stove and water-heater, without causing inconvenience to consumers by spurious trips. We must of course admit that a consumer can sometimes be very difficult and do not want to understand any reason whatsoever; this type of consumer, however, one will always have, even in towns where no earth leakage protection is installed.

2.1 In Stilfontein there was the special opportunity to test earth leakage relays because the Mining Companies were also the Township Owners and in collaboration with the Consulting Engineer of one of the Companies, a block of 30 flats was fitted with core balance type earth leakage protection relays in the years 1957/58. The relays were set to trip the circuit breaker with a fault current of 15 m.A. to earth. These relays were installed on the main distribution board of each flat as a main switch, in other words, the whole installation including stove and water-heater, was protected.

2.2 Plenty of teething troubles were experienced in this block of flats and at a certain stage we thought that this type of protection will never be a success on account of the very low earth leakage current. On investigation, however, it was determined that the relays have become more sensitive on account of unstable components. These components were replaced and the fault current was increased to 20 m.A. and this solved most of the difficulties encountered. All other trips as a result of earth leakage faults could be determined and repaired.

2.3 Fig. 1 is 'n vergelykende tabel van die relé's soos geïnstalleer in die betrokke woonstelle wat die uitklinkwaardes aangee toe die eenhede oorspronklik geïnstalleer is, en soos blyk uit 'n toets uitgevoer in Desembermaand, 1967:

Figuur 1.

Woonstel	Sensitiviteit in m.A.		Aanmerkings
	9.2.60	10.12.57	
1	20.8	18	
2	21.4	24	
3	19.0	15	
4	21.0	17	
5	21.0	24	
6	19.0	17	
7	19.0	18	
8	19.2	27	
9	19.0	22	
10	20.0	18	
11	20.0	24	
101	19.0	19	
102	21.5	24	
103	19.0	17	
104	19.0	16	
105	23.0	21	
106	20.9	18	
107	20.5	20	
108	21.0	22	
109	21.0	20	Vervang 14/10/1965
110	21.4	17	
111	20.0	19	
112	21.5	22	
113	21.0	20	
114	22.0	24	
115	20.0	24	
201	19.5	18	
202	20.5	20	
203	22.0	24	
204	19.5	18	
Wassery	22.0	18	

2.4 Onmiddelik hierna het die betrokke mynmaatskappy voortgegaan met die installasie van eenhede op die hoofverdeelbord van woonhuise. Weereens is die hele installasie beskerm insluitende die stoof en waterverwarmer. Terselfdertyd is ook pogings aangewend om verbruikers bewus te maak van die voordele van aardlekbeskerming en is hulle gevra om die aantal kere wat die aardlek-relé die hoofstroombreker uitklink aan te teken sowel as die oorsake van die uitklinkings. Verbruikers het ongelukkig in gebreke geblly om die uitklinkings en hul oorsake aan te dui, gevolglik kon ons nie veel gevolg-trekkings maak nie. Dit het egter gebllyk dat weinig werklik probleme gehad het met onnodige uitklinkings, en diegene wat dit wil gehad het kon dit sonder moeite self oplos.

3.1 Dit was kort hierna dat my Raad besluit het op die verpligte installasie van aardlekbeskermingsrelé's op hulle nuwe installasies sedert Maart 1961. Die Elektriese

2.3 Fig. 1 is a comparative table of the relays installed in this block of flats, showing the trip values as installed originally and at a test carried out in December, 1967:

Figure 1

FLAT	Sensitivity in m.A.		REMARKS
	9.2.60	10.12.57	
1	20.8	18	
2	21.4	24	
3	19.0	15	
4	21.0	17	
5	21.0	24	
6	19.0	17	
7	19.0	18	
8	19.2	27	
9	19.0	22	
10	20.0	18	
11	20.0	24	
101	19.0	19	
102	21.5	24	
103	19.0	17	
104	19.0	16	
105	23.0	21	
106	20.9	18	
107	20.5	20	
108	21.0	22	
109	21.0	20	Replaced 14/10/1965
110	21.4	17	
111	20.0	19	
112	21.5	22	
113	21.0	20	
114	22.0	24	
115	20.0	24	
201	19.5	18	
202	20.5	20	
203	22.0	24	
204	19.5	18	
Laundry	22.0	18	

2.4 Immediately hereafter, the Mining Company concerned proceeded with the installation of further units on the main distribution boards of dwelling houses. Again the whole installation was protected including stove and water-heater. Simultaneously it was attempted to bring home to the consumer the advantages of earth leakage protection and they were asked to make a note of the number of trips and their causes. Consumers, however, did not co-operate fully and consequently no real worthwhile conclusions could be arrived at. It was, however, quite clear that few really had difficulty with spurious trips, and those that had problems solved it themselves without any trouble.

3.1 It was shortly after this that my Council resolved to make the installation of earth leakage protection relays compulsory on all new installations since



Verordeninge is diensooreenkomstig gewysig in soverre dat die koste van die aardlekrelé ingesluit word in die aansluitingsfoote, wat normaalweg gehef word wanneer 'n aansoek vir aansluiting ingedien word. Die aardlekrelé tesame met stroombreker dien dan as die verbruiker se hoofstroombreker, en bly as sulks die eiendom van die Raad wat dit dan in stand hou en ook verantwoordelik is om in alle gevalle van uitklinkings (hetsy gedurende gewone of na-ure) ondersoek te gaan instel en die oorsaak van die uitklinking vas te stel. Hierdie besluit van die Raad het tot gevolg dat ons tot op datum 825 installasies het waar aardlekbeskermingsrelé's geïnstalleer is, wat 27% verteenwoordig van die totale aantal verbruikers in Stilfontein.

4.1 Werkverrigting om die eenhede is heeltemal bevredigend want ons huidige die standpunt dat as die aardlekrelé die stroombreker uitklink dan is daar 'n fout op die installasie en dit moet herstel word. Foute kan hoofsaaklik onder een van die volgende groepe gegroepeer word.

1. Foutiewe apparaat wat by muurproppe aangeskakel word.
2. Foute op elektriese stowe as gevolg van foutiewe skoonmaak metodes of foute in die stoof self.
3. Foute op die installasie self.
4. Foutiewe aardlekrelé's self.

4.1.1 By verre veroorsaak foutiewe apparaat wat by muurproppe aangeskakel word die meeste uitklinkings. Een besondere geval het onder ons aandag gekom waar mense 'n nuwe waaierverwarmer by 'n afdelingswinkel aangekoop het. Die verwarmer was voorsien met sy eie skakelaar (slegs enkelpolig), wat dan ook deur die eienaars gebruik is om die verwarmer aan en af te skakel, terwyl die muurpropskakelaar in die „aan“ posisie gelaat is. Op 'n dat het die mense se vierjarige seuntjie gekom en kontak gemaak tussen die element (wat oënskynlik afgeskakel was) en die verwarmer. Die kind het 'n skok opgedoen maar danksy aardlekbeskerming, wa: die kraag onmiddellik af. By ondersoek het dit geblek dat 'n verkeerde aansluiting op 'n aansluitingsklem binne-in die verwarmer self, gemaak was, wat tot gevolg gehad het dat die skakelaar op die verwarmer in die neutrale geleier gekoppel was, in plaase van in die lewende geleier. Hierdie saak is onmiddellik by die S.A.B.S. aangehangig gemaak want die betrokke verwarmer het nie aan die verpligte veiligheidspefsifikasie voldoen nie. Daar is dan ook dadelik stappe geneem deur die S.A.B.S. en die betrokke fabrikante is op hul fout gewys. Ons kan definitief hier die bewering maak dat as die betrokke kind se lewe nie gered is nie, hy definitief gevrywaar is van ernstige liggaamlike letsel: die betrokke kind het absoluut niks oorgekom nie, behalwe dat hy effens geskrik het.

March, 1961. The Electricity By-laws was amended to include the cost of the earth leakage relay in the connection fee, normally payable when an electrical connection is applied for. The relay with associated circuit breaker then serve as the consumers main breaker and remain the property of the Council, who is then responsible for maintenance and also for investigations into trips when called out (during normal or after hours). This Council resolution had the effect that we have up to date a total of 825 earth leakage relays installed, this represents 27% of the total number of consumers in Stilfontein.

4.1 Performance of the units is satisfactory because we are of the opinion that when an earth leakage relay trips the breaker, a fault is present and must be cleared. Faults can mainly be divided under the following groups:

1. Faulty portable appliances plugged into socket outlets.
2. Faulty electric stoves due to faulty cleaning methods or faults in the stove itself.
3. Faults on the installation.
4. Faults on earth leakage relays.

4.1.1 Faulty portable appliances are by far the cause of most trips. One particular instance was brought to our attention, where people bought a new fan heater from a local dealer. The heater had a single pole switch incorporated, which the owner used to switch the heater on and off, leaving the socket outlet switch on the wall in the "on" position. On a day their four-year-old boy came along and made contact between the element (which was apparently switched off) and the heater body, the child received a shock, but thanks to earth leakage protection, the power was immediately switched off. On investigation it appeared that a wrong connection was made on a terminal block inside the heater, resulting in that the switch was connected in the "neutral" conductor instead of in the "live" conductor. This was reported to the S.A.B.S. immediately, as the heater did not comply with the compulsory safety specification. The S.A.B.S. immediately took steps and indicated the fault to the manufacturer concerned. We can definitely state if the child's life in question has not been saved, he was definitely saved from serious bodily injuries. The child, apart from getting a bit of a fright, was absolutely unharmed.

4.1.2 Hierdie soort van foute kom ook heel dikwels voor. Berekende 'n persentasie van die totale aantal aardlekrelê se geïnstalleer en oor 'n tydperk van 3 maande, is dit egter minder as 1% Indien ons uitgeroep word vir 'n aardlekasie fout op 'n stoof, ontkoppel die elektrisiteit die uitklynkspoel van die stroombreker en sit dan die stoof vol aan vir ongeveer 15 minute om vogtigheid uit te dryf. Die uitklynkspoel van die stroombreker word dan teruggeplaas en ons het toe dusver uiters min gevalle teekom waar hierdie metode nie gewerk het nie. Indien dit egter blyk dat daar 'n definitiewe fout op die stoof is, word die verbruiker gevra om die stoof nie te gebruik nie en die so spoedig moontlik te laat herstel.

4.1.3 Aardlekfoute op ander gedeeltes van installasies kom baie selde voor. As dit voorkom word dit gewoonlik gevind op skakelaars in lig en kragpunt stroombane wat lek, of 'n neutrale geleier wat deur 'n ligarmatuur vasgekny is toe dit geïnstalleer is.

4.1.4 Foute op aardlekrelê self kom nog na ons sin heeltemal te dikwels voor, in die geval van Stilfontein is die persentasie foutiewe relê's ook ongeveer 1%, berekende as 'n persentasie van die totale aantal eenhede geïnstalleer, oor 'n tydperk van 3 maande. Op die oomblik is daar dus nog 'n relê beskikbaar wat dieselfde betroubaarheid bied as byvoorbeeld 'n Kilowatt uur meter. Vervaardigers is egter hard besig met verdere ontwikkelings en dit word vertrou dat ons eersdags eenhede sal hê wat heeltemal betroubaar sal wees. Foutiewe relê's word egter maklik opgespoor omdat die meeste relê's wat vandag op die mark beskikbaar is, so ontwerp is, dat in geval die relê foutief raak, die stroombreker onmiddellik uitgeklynk word. 'n „Geen-Lig” klag bereik ons dan waarna die aardlekrelê ondersoek en vervang word in geval dit foutief bevind word.

5.1 Met die verpligte installering van eenhede het sekere toetsapparate ook nodig geword. Daar moet kan vasgestel word of 'n eenheid reg funksioneer en daarom is 'n draagbare apparaat vervaardig wat 'n kunsmatige aardlekfout op die installasie sit. Die apparaat is toegerus met 'n m.A. meter en daar kan dan bepaal word of die sensitiviteit van die aardlekrelê binne die vereiste perke is. Hierdie toets word uitgevoer wanneer eenhede geïnstalleer word en daar word rekord gehou van die meter aflesing. Wanneer klages ontvang word van onnodige uitklynkings word die aardlekrelê weer getoets vir sensitiviteit om seker te maak dat die relê nie te sensitief geword het nie. In ons toetsafdeling is ook so 'n toetsapparaat permanent geïnstalleer waar alle aardlekrelê's getoets word voordat hulle geïnstalleer word, asook foutiewe relê's voordat hulle na die vervaardigers teruggestuur word vir herstelwerk.

5.2 Mettertyd is ook gevind dat daar soms aardlekasie foute opdink wat moeilik is om te vind. Dit het met te gebeur eenhede snags uitklynk vir oënskynlik geen rede nie en dan ondersoek ingestel word, wys die

4.1.2 These type of faults occur fairly occasionally. Calculated as a percentage of the total number of earth leakage relays installed over a three monthly period, it is, however, less than 1%. When we are called out for an earth fault on a stove, the electrician disconnects the shunt trip of the circuit breaker and switches the stove full on for approximately 15 minutes, to drive out moisture. The shunt trip is then reconnected and we have come across a very few instances where this method did not work. If it appears that a definite earth fault exists on the stove, the consumer is asked to refrain from using the stove and to have it repaired as soon as possible.

4.1.3 Earth faults on other portions of installations is very seldom encountered. If they do appear, they can usually be pinned down to switches in light and power circuits, leaking to earth, or else a neutral conductor nipped by a light fitting, when originally installed.

4.1.4 Faults on earth leakage relays themselves are of still a too regular occurrence and in the case of Stilfontein is also of the order of 1%, calculated as a percentage of the total number of units installed, over a three monthly period. There is, therefore, at the moment not yet a relay available from which you can expect the same reliability as from e.g. a KWH meter. Manufacturers, however, are busy with developments and we trust that units will soon be available which will be completely reliable. Faulty relays are easily located, because most relays available have a "fail to safety" feature. A "no light" complaint reaches us, after which the relay is tested and replaced when found faulty.

5.1 With the compulsory installation of earth leakage relays certain testing equipment was also necessary. It must be possible to determine whether a relay functions correctly and for that purpose a portable test set was manufactured which can create a variable artificial earth fault on the installation. The test set is equipped with a m.A. meter and it is possible to determine whether the sensitivity is between the required limits. This test is carried out when a unit has been installed and the meter reading recorded. When complaints of spurious tripping is received, the unit is again tested for sensitivity to satisfy ourselves that the relay sensitivity has not increased. In our test department a similar testing set is permanently installed, where all earth leakage relays are tested before being installed, and also faulty relays before being returned to the manufacturers for repairs.

5.2 Instances have arisen where it was difficult to find an earth fault. It happened at times that units tripped out at night time without any reason whatsoever and when investigated further the fault does not show

fout nie op met die gewone 500 Volt C.S. Isolasietoetsier nie. Ten einde hierdie probleem op te los is oorgegaan tot die aankoop van 'n impuls-toetsapparaat, wat basies bestaan uit 'n ontwikkelaar wat hoë-spanning impulse met spitswaardes van 3, 4 of 5 KV. ontwikkel teen 'n tempo van 1 impuls per sekonde. Die energie inhoud van elke impuls is baie laag: 1.25 Watts teen die hoogste spanning en is derhalwe nie gevaarlik vir personeel of vir die installasie wat getoets word nie. Wanneer 'n impuls toets uitgevoer word op 'n installasie en 'n swak plek sou afbreek as gevolg van die hoë-spanning impuls, word dit aangelui deur 'n defleksie op 'n meter op die instrument, en die kraakgeluid waar die vonk oorsprong, kan duidelik gehoor word. Dis gevolglik betreklik maklik foute met hierdie toetsinstrument op te spoor.

6.1 Aardlekbeskermingsrelé's het gekom om te bly, dit gaan net afhang hoe ons die installasie daarvan gaan doen. Een metode om dit te doen is soos dit in Stilfontein gedoen word, en ons kan bevestig dat dit heeltemal goed werk. 'n Ander manier is om die onus op die elektriese kontrakteur te plaas om aardlekrelé's te installeer, dog ons betwyfel dit sterk dat alle relé's dan sal werk. Hulle is maar te geneig om gou die uitklinkspoel van die stroombreker te ontkoppel want dis tydmors in hulle oë. Gevolglik sal daar ook niemand wees om die aardlekrelé in stand te hou nie.

up with the ordinary 500 Volt D.C. insulation test. To solve this problem an impulse tester was purchased, which consists basically of a generator generating high tension impulses of 3, 4 or 5 KV peak values at a rate of 1 impulse per second. The energy content of each impulse is very low: 1.25 Watts at the highest peak value and therefore constitutes no danger to personnel or the installation being tested. When an impulse test is being conducted on an installation and the weak point should break down as a result of the high tension impulse, this is indicated by the deflection of a meter on the instrument, and the crackle of the sparkover at the faulty point in the insulation can be very clearly heard. It is, therefore, comparatively easy to determine faults with this instrument.

6.1 Earth leakage protection relays have come to stay, it will just depend how we are going to carry out the installation thereof. One method is to do it as is being done in Stilfontein, and we can state that it works quite well. Another method is to place the onus on the electrical contractor to install the earth leakage relay, we doubt, however, if all relays will then work. They consider it as a waste of time and will easily disconnect the shunt trip of the circuit breaker. There will be nobody left also, to maintain earth leakage relays.

## ELEKTRIFISERING VAN DIE BANTOETUISLANDE

deur

S. J. LIEBENBERG.

Toe die President my gevra het om die inleidende toespraak oor hierdie punt op die agenda te lewer, was ek aanvanklik maar huiwerig, maar toe ek terugdink aan die geskiedenis van Vanderbijlpark en die stigter daarvan — daardie groot man en vriend, dr. H. J. van der Byl, wat ook so eng gemoeid was in die ontwikkeling van elektrisiteit in ons land — en aan my ou vriende Charlie Herbst en G. Theron, tans onderskeidelik burgemeester en die president van hierdie Vereniging, het ek besef dat, afgesien daarvan dat ek dit aan my Departement van Bantoe-administrasie en Ontwikkeling — die organisasie by wie die ontwikkeling van die Bantootuislande — verskuldig is, ek dit ook aan die herinnering van die verlede verskuldig is om op hierdie plek en by hierdie geleentheid oor 'n onderwerp te praat wat 'n groot plek in die sake van hierdie volk inneem.

Hoewel hier mense verteenwoordig is wat al met sommige aspekte van die onderwerp te doen gehad het, meen ek dat die meeste nie veel weet van die doelstellings en van die werk wat gedoen is en nog gedoen moet word nie. My toespraak sal dus 'n ongewone wye veld dek om die geheeloorsig te gee wat ek nodig ag.

Hierdie Vereniging het by die verrigtinge van vorige konvensies die probleme van plaaslike en stedelike elektrifisering wat op daardie tydstip bestaan het, afdoende behandel. Laasgenoemde het die elektrisiteitswerk in stedelike lokasies, wat spesiale aandag op sekere konvensies en veral dié wat in 1960 in Durban gehou is, ontvang het, ingesluit en die gedrukte inrigtinge van hierdie konvensies is 'n waardevolle naslaanwerk.

Die elektrifisering van die Bantootuislande is in werklikheid net 'n uitbreiding van die waardevolle en fundamentele werk wat Evkom en die munisipaliteite in die verlede gedoen het. Baie van laasgenoemde is vandag hier deur mense verteenwoordig wat 'n aktiewe aandeel aan die praktiese uitvoering van die werk en aan die opbou van 'n bron van kennis deur middel van die verrigtinge van konvensies tot voordeel van elektrotegniese ingenieurs van vandag en môre, wat dieselfde werk sal verrig, gehad het.

Dit is, sover ek weet, die eerste maal dat die Bantootuislande so by een van hierdie konvensies genoem is en ek meen dat die Vereeniging gelukkigens moet word dat hy onder die verbeeldingryke leiding van die President erkenning aan so 'n fundamenteel belangrike en voldonge feit as die Bantootuislande verleen het. Dit sal ensersyds baie politici onthuts en aan die ander kant steeds groter uitdaging tot uitvoering van hul taak aan die grondleggers daarvan bied.

Die ingenieur se rol is om praktiese uitdrukking te gee aan idees, wat steeds die brug vir die mens is tussen die hede en 'n meer gevorderde toekoms. Hierdie idees

## ELECTRIFICATION OF THE BANTU HOMELANDS

by

S. J. LIEBENBERG.

When the President invited me to give the introductory address to this item of the agenda I was hesitant, but on thinking back on the history of Vanderbijlpark, of its founder — that great man and friend, Dr. H. J. van der Byl, who was also so closely associated with electricity development in this country — of my old friends Charlie Herbst and G. Theron, now the Mayor and President of this Association respectively, I felt that apart from owing it to my Department of Bantu Administration and Development — which is the organisation charged with the development of the Bantu Homelands — I also owed it to the memory of the past to speak in this place on this occasion on a subject occupying a larger stage in the affairs of this nation.

Although some here have had to do with aspects of the subject, I feel that most are not aware to any great degree of the objectives and of the work that has been done and still requires to be done, so this address may be of undue compass in its overall review which is deemed necessary.

This Association has in Proceedings at past Conventions dealt adequately with the then current problems of rural and urban electrification. The latter included electrical work in urban locations which received special attention at certain Conventions, notably that of 1960 in Durban, which provided a valuable work of reference in its printed Proceedings.

The electrification of the Bantu Homelands is in reality nothing more than an extension of the valuable and fundamental work done in the past by Escom and Municipalities, many of which are represented here today by people who played an active role in the practical execution of this work and in building up a fund of knowledge through the Proceedings at Conventions for the benefit of both present and future electrical engineers who will engage in the same work.

This is the first occasion, to my knowledge, that the Bantu Homelands have been named as such at one of these Conventions, and I feel that the Association is to be congratulated that under the imaginative guidance of the President it has given recognition to such a fundamentally important and established fact as the Bantu Homelands, which still agitate many politicians on the one hand, and present an ever-expanding challenge of implementation to its progenitors on the other.

The role of the engineer is to give practical expression to ideas which are ever the bridge by which mankind advances from the present to a more advanced future.

is nie noodwendig dié van ingenieurs of van 'n bepaalde individu nie — soms is dit die vrug van baie geeste wat deur 'n doel en 'n ideaal aangevuur is en getemper is deur ervaring, omstandighede en die uitvloeisel van die tyd. 'n Voorbeeld hiervan is die praktiese skepping van die Bantoeuistlande as 'n tasbare, waarneembare gestalte wat op politieke besluite van die Parlement, waardeur daar in die eerste plek noodsaaklikewys vooriening vir die nodige administratiewe, wetlike en politieke raamwerk gemaak is, gevolg het.

Hierdie taak was oorspronklik in die hande van 'n betreklik klein groepie staatsamptenare, onder andere ingenieurs en persone uit ander professionele kategorieë. Die aspek van elektrisiteit was baie swak verteenwoordig, hoofsaaklik omdat personeel met toepaslike ondervinding nie gevind kon word nie. Tans is die kern van professionele staatsamptenare nog klein, hoewel aansienlik groter as wat dit was. Om dus die geweldige uitbreiding van die program die afgelope ses jaar tred te hou, word daar tans vryelik gebruik gemaak van konsultante van munisipaliteite wat as agente van die Suid-Afrikaanse Bantoeuist, wat deur die Department verteenwoordig word, optree.

Elektrisiteitsdienste in die Tuislande kan min of meer in dorpsontwikkeling aan die een kant en plattelandse ontwikkeling aan die ander kant, ingedeel word. Wat die dorpe betref, is daar twee kategorieë — dié wat sateliete van munisipaliteite is en dié wat dieper in Tuislande in geleë is. Van eersgenoemde is die volgende voorbeelde: Umlazi (Durban), Mdantsane (Oos-Londen) en Garankuwa (Pretoria), voorbeelde van laasgenoemde is Witzieshoek, Selosesho en Nqwelezana.

Plaaslike ontwikkeling sluit elektrisiteitsvoorsiening in aan skole en universiteite soos Turfloop en Nyoja (onder die Department van Bantoe-ondewys), kolleges soos Fort Cox, Cwaka, Taung en Arabie; sendinghospitale soos Holy Cross (Katoliek — Transkei), Shongwe (Sweedse Luthers), Hlabisa (Amerikaans Luthers), Jane Furse (Anglikaans), Donald Frazer (Church of Scotland), Elizabeth Ross (Nederduitshervormd), ens.; teologiese kolleges; besproeiingskemas, ens., bv. dié te Lomati (suiker); sisalskemas en verwerkingsinstallasies, sitruspakhuisse, meubelfabriek en geïsoleerde Blanke gemeenskappe in die Tuislande, soos Sterkspruit, ens.

Die relatiewe voorkeur vir elektrisiteitsvoorsiening hang van plaaslike omstandighede af — die voorkeur geld bv. sterk waar pompinstallasies vir water en/of rioolvuil bestaan en nodig is. Aan die ander kant kan nywerheids-, kommersiële en sosiale dienste sterk voorkeur verg. Waar hierdie oorwegings egter nie geld nie, geld die veiligheidsvereistes nog dat 'n dorp met 'n minimum getal van 1,000 bewoonde huise straatverligting moet hê.

Elektrisiteitswerk word uitgevoer volgens die gebuiklike standaarde en regulasies, soos die Gebruikskode vir Bogronde Bedrading, die Regulasies betreffende die Bedrading van Persele (of Geboue) en die Wet op Fabriek, Masjinerie en Bouwerke van 1946, soos gewysig.

These ideas are not necessarily those of engineers or of any one individual for that matter — sometimes they are the slow distillate of many minds fired with a purpose and an ideal, and tempered by experience, circumstance and the effluxion of time. This is exemplified by the practical creation of the Bantu Homelands in a tangible, visible form following political decisions by Parliament which provided, as a first essential, the administrative, legal and political framework necessary.

This task was originally in the hands of a relatively small group of Civil Servants including engineers and other professional categories. The electrical side was very inadequately represented largely due to an inability to attract suitably experienced personnel. At the present time, the core of professional Civil Servants, although considerably expanded, is still small with the result that to cope with the enormous expansion of the programme in the last six years, free use is now made of consultants or of municipalities acting as agents of the South African Bantu Trust which is represented by the Department.

Electrical services in the Homelands may be divided roughly into town development on the one hand, and rural development on the other. Towns for their part form two categories — those that are satellites of municipalities and those that are more deeply into the Homelands. Examples of the former are Umlazi (Durban), Mdantsane (East London) and Garankuwa (Pretoria); examples of the latter are Witzieshoek, Selosesho, and Nqwelezana.

Rural development includes supply of schools and universities such as Turfloop and Nyoja (under the Department of Bantu Education), colleges such as Fort Cox, Cwaka, Taung and Arabie; mission hospitals such as Holy Cross (Catholic — Transkei), Shongwe (Swedish Lutheran), Hlabisa (American Lutheran), Jane Furse (Anglican), Donald Fraser (Church of Scotland), Elizabeth Ross (Dutch Reformed), etc.; theological colleges; irrigation schemes, e.g. at Lomati (sugar); sisal protects and processing plants; citrus packhouses; furniture factories; isolated white communities in the Homelands such as Sterkspruit, etc.

The relative priority of electrical supply depends on local circumstances — where water and/or sewage have to be pumped the priority is high. Alternatively, industrial, commercial or social services can require a high priority, but where these considerations do not apply, security requires that when a town reaches a minimum number of 1,000 inhabited houses, there shall be street lighting.

The execution of electrical work is in accordance with customary standards and regulations, such as the Code of Practice for Overhead Wiring, the Regulations for the Wiring of Premises (or Buildings), and the Factories, Machinery and Building Work Act of 1946 as amended.



Kragtens die beleid vir die ontwikkeling van die Tuislande, wat dit onder andere ten doel het om 'n toereikende pool van Bantoe-ambagsmanne te skep sodat hulle self die las kan dra van die ontwikkeling en onderhoud van die selfregerende territoriale owerhede wat volgens plan op sekere voorwaardes in die Bantoe-tuislande tot stand sal kom, gebruik die Department Bantoe-werkers met verskillende grade van opleiding om, met 'n mate van Blanke toesig volgens die omstandighede, die werklike take self uit te voer. Sulke Bantoes word gereeld by bogrondse LV- en 11kV-konstruksiewerk sowel as by die bedrading van geboue gebruik. Hulle is egter nie in staat om in hierdie stadium van hulle ondervinding nywerheids-elektrifiseringswerk te verrig nie. Dit is nie maklik om Bantoes met die nodige aanleg, toewyding en karakter vir die werk te vind nie, maar die Departement het reeds verblydende vordering in die opsig gemaak, al kan dieselfde nie van sy agente gesê word nie.

Dit is egter duidelik dat, ten einde die doelstellings te bereik, dit nodig is dat wat die Department betref, die opleiding van Bantoes in dié opsig aansienlik uitgebrei en verander moet word. Daadwerklike aandag word hieraan geskenk en toepaslike veranderings kan verwag word, wat nie die huidige voorafgaande teoretiese opleiding deur die Department van Bantoe-onderwys in die enkele kolleges wat wel in staat is om onderrig in vakke oor elektrisiteit te gee, noodwendig sal afskakel nie, maar dit in 'n mate en vir 'n tydperk wat nog vasgestel sal moet word, met in-diensopleiding sal kombineer. Dit sal belangrik wees om omstandighede te skep waardeur sulke opegeleide Bantoe in die Tuislande gehou sal word waar hulle dienste al hoe meer benodig sal word namate die voortgesette nywerheids- en algemene ontwikkeling van die land 'n steeds toenemende vraag na elektrisiteit in die Tuislande en in die Blanke gebiede sal skep, sodat laasgenoemde ook al hoe minder in staat sal wees om sulke ambagsmanne vir diens in die Tuislande af te staan. Hierdie probleem sal hom nie net in die Tuislande voordoen nie. Groot nywerheidsmunisipaliteite kan met vrug gebruik maak van die diens van Bantoebedradingswerkers in hulle eie Bantoe-dorpe. In dié opsig het Johannesburg reeds ver gevorder en sy verteenwoordigers kan ander wat belang stel moontlik van inligting voorsien. Dit is verblydend dat daar ander referate op hierdie konvensie is wat oor die aspek van die benutting van halfgeskoolde arbeid handel.

Hierdie kwessie van opleiding is hier van die aller-grootste belang, aangesien die ontwikkeling van die mens minstens net so noodsaaklik as die ontwikkeling van materiaal en tegnieke is. Laasgenoemde kan baie van sy waarde verloor indien die mense nie in staat is om die fasiliteite wat aan hulle verskaf word, te benut nie.

Die administrasie van die toevoerstelsels in dorpe is baie dieselfde as dié waaroor daar voorheen by hierdie konvensies verslag gedoen is. Die ondervinding van andere met betrekking tot metertelling en tariefheffing sal egter interessant wees. Tans doen die Department

In accordance with the policy of development of the Homelands, which inter alia has as its objective the creation of an adequate pool of Bantu artisans which will independently bear the burden of development and maintenance in the self-governing Territorial Authorities which are planned to emerge in the Bantu Homelands under certain conditions, the Department uses Bantu workmen of various degrees of training to carry out the actual tasks involved, under a degree of European supervision appropriate to the circumstances. Such Bantu are regularly used on LV and 11KV overhead construction as well as the wiring of buildings, but are unable to handle industrial electrics at this stage of their experience. Bantu with the necessary aptitudes, application and character for this work are not common, but encouraging progress has been made by the Department if not by its agents.

It is clear, however, that in order to achieve the set objectives, the training of Bantu in this branch must be considerably augmented and amended as far as the Department is concerned. This is under active consideration and appropriate changes may be anticipated which will not necessarily abolish present preliminary theoretical training by the Department of Bantu Education in its few colleges capable of giving instruction in electrical subjects, but will combine this with in-service training to a degree and for a period to be determined. It will be important to create conditions which will tend to keep such trained Bantu in the Homelands, where they will be more and more necessary as the continued industrial and general development of the country generates an ever-increasing demand for electricians in the Homelands and in the white areas, which will be increasingly unable to second numbers of such artisans for duty in the Homelands. This difficulty will exist not only in the Homelands, but larger industrialised municipalities could with advantage utilize Bantu wiremen to service their own Bantu townships. Johannesburg is quite far advanced in this direction, and perhaps its representatives could assist others — who show interest — with information. It is gratifying to note that other papers at this Convention are dealing with aspects of the utilisation of semi-skilled labour.

This question of training is of vital importance in this context since human development is at least as essential as material and technical development which could lose much of its value if the people are unable to utilize and exploit the facilities provided them.

The administration of the supply system in towns is very much along the lines previously reported at these Conventions. However, the experience of others in regard to metering and charging will be interesting. The Department at present meters all consumers, but their

nog die metertelling van alle verbruikers, maar die getal verbruikers is nog nie so groot dat dit 'n probleem skep nie.

Dit sal baie interessant wees om van die munisipaliteite wat al die massabedraging van huise onderneem het, inligting oor die werklike benutting van hierdie fasiliteit in die Bantoeedorpe wat daarmee toegerus is en die probleme wat in verband daarmee ondervind is, te bekom.

Die Department het nog nie 'n program van dié aard aangepak nie, aangesien daar weinig tekens was van 'n algemene vraag daarna van moontlik verbruikers wat ook die verpligtinge wat daaruit voortspruit, sal kan nakom. 'n Sekere persentasie van elke gemeenskap kan egter altyd reëlings tref waartoe die gemiddelde persoon in so 'n gemeenskap nie in staat is nie.

Die voorsiening van die hoof-interne distribusiestelsel (ehs) in dorpe skep 'n finansiële probleem. Word dit vir 'n uiteindelige aanvraag ontwerp wat op die geraamde na-verskeidenheidsaanvraag per verbruiker gebaseer is, kan dit maklik gebeur dat aansienlike kapitaal jarelank begrawe bly as gevolg van minimale benutting daarvan. Om so 'n situasie te vermy, het die Departement die standaard vir 'n bogrondse ehs-konstruksie op 11 kVA vasgestel, wat geen ongewone probleme tot gevolg gehad het nie. Kabelwerk het sy voordele; dit is egter nie net duur nie, maar ook moeilik om met Bantoe personeel te versien.

Om die werk van hierdie personeel te vergemaklik, het die Departement die installering daarvan in hoë mate gestandaardiseer sodat rondgaande instandhoudingswerkers die probleme op verskillende plekke maklik herken. Om egter tred te hou met maontlike vordering, het die Departement vrye teuels aan sy agente, nl. Durban en Oos-Londen en 'n konsultant te Hammarsdale, gegee wat hulle ontwerpe betref. Hierdie ontwerpe sal mettertyd met mekaar en met ons standaardgebruik in toekomstige projekte vergelyk en aldus geëvalueer word.

Die Departement se werksaamhede strek oor die hele Republiek, Suidwes-Afrika en die Oostelike Caprivi en al is die taak nog in 'n betreklik vroeë stadium, is die hoeveelheid elektriese werk wat in dié gesamentlike gebied gedoen is en nog gedoen word, indrukwekkend. Op hierdie tydstip is dit nie moontlik om te sê wat die uiteindelige omvang van die hele program sal wees nie.

Die Departement se grootste vennoot in die Tuislande was Evkom, wat deurgaans prysenswaardige samewerking verleen het in verband met die voorsiening van elektrisiteit aan gebiede buite dié wat aan munisipaliteite geliesensier is. Ook op hulle gebied was laasgenoemde altyd gewillig om te help. In baie gevalle is dit wenslik om dieselgenerators te gebruik, meestal in baie verafgeleë gebiede. Die versiening van sulke generators blyk soms 'n ongemaklike saak te wees.

number has not yet reached such proportions that a problem has emerged as a result.

It would be of considerable interest to obtain from those municipalities that have embarked on mass wiring of houses information on the actual utilisation of this facility in the Bantu townships so equipped, and the problems that they have encountered. The Department has not as yet entered upon such a programme since there has been little evidence of a general demand therefor from possible consumers who can be depended upon to meet their resulting obligations. There is always a percentage in every community which can and does make above-average arrangements.

The provision of the main internal distribution system (EHT) in townships poses a financial problem in that if it is designed for an ultimate demand based on an estimated after-diversity-demand per consumer, and installed accordingly, it can easily happen that considerable capital can remain buried for years with minimal utilisation. To avoid this situation, the Department has standardised on overhead EHT construction at 11 KV., which has not resulted in any undue problem. Cabling has certain advantages but is not only costly but is difficult to service with Bantu personnel.

To ease the problems of this personnel, the Department has standardised its installations to a high degree so that itinerant maintenance men have no difficulty with familiarisation at different centres. However, so as to remain abreast with possibly advanced thinking, the Department has allowed free rein to its agents, Durban and East London, and a consultant at Hammarsdale, in their designs which will in due course be evaluated against each other and our standard practice for application in future projects.

The Department's activities cover the Republic, South West Africa and the Eastern Caprivi, in which combined territory the amount of electrical work completed and in hand is impressive even although the whole task is only in a relatively early stage. The dimensions of the ultimate overall programme is obscure at this time.

The Department's principal partner in the Homelands has been Escom, which has throughout co-operated in a most praiseworthy manner in providing power where needed, outside areas licensed to municipalities who have in their turn not been lacking in willingness where they were involved. There are many cases where expediency requires the use of diesel generators, partly in very remote areas. Servicing of generators has at times proved uncomfortable.

Danksy die planne om ons bure se waterbronne te benut — onder andere vir kragontwikkeling — behoort baie gebiede in die Tuislande wat tans ontoeganklik is, die voordele van elektrifisering te geniet. Hiermee kan die ontwikkeling van die mynbou in die Tuislande ook 'n stoot vorentoe kry.

Met dié algemene skets voor oë kan lede nou miskien afsonderlike rigtings onderskei waarin hulle 'n professionele hydrae kan lewer tot die ontwikkeling van dié dele van die land wat gesluimer het terwyl ander dele die vermoë ontwikkel het om die kapitaal en tegniese middele te verskaf wat nou nodig is om die Bantoeuislande tot voordeel van almal aan die gang te sit en te ontwikkel.

## VERSLAE

### A.

#### JAARVERSLAG OOR S.A.B.S.-WERKSAAMHEDE.

##### 1. Algemeen: Elektrotegniese Nomenklatuur.

Die volgende drie groepe is voltooi en deur die Raad goedgekeur:—

- Groep 15 — Skakelborde en Apparaat vir Aansluiting en Regulering.
- Groep 16 — Beveiligingsrelés.
- Groep 25 — Ontwikkeling, Transmissie en Distribusie van Elektriese Energie.

Die volgende twee groepe is in die finale kommentaarstadium:—

- Groep 11 — Statiese Omsetters.
- Groep 12 — Transduktors.

##### 2. Afdeling Fotometrië: Gebruikskode vir Openbare Verligting.

Deel 1 van hierdie kode, wat handel oor die verligting van paale en hoofweë, is reeds 'n jaar gelede voltooi. Goë vordering is gemaak met Deel 2 wat handel oor die verligting van spesiale aspekte van openbare paale en tans word 'n ondersoek na tonnelverligting gesamentlik deur die S.A.B.S. en die W.N.N.R. onderneem.

##### 3. Afdeling Ontploffingsgevaar.

(a) Gebruikskode vir die klassifikasie van gevaarlike gebiede en die keuse van elektriese toerusting vir gebruik in sulke gebiede.

Hierdie kode word tans gesirkuleer vir algemene kommentaar. Sluitingsdatum 19 April 1968.

(b) Nie-vonkende elektriese toerusting vir gebruik in Klas 1 Afdeling 2 plekke.

'n Vergadering is beplan vir 27 Maart 1968 om kommentaar op die konsepdokument te bespreek.

The plans to utilise the water resources of our neighbours — inter alia for power generation — should enable many presently inaccessible areas of the Homelands to enjoy the benefits of electrification, which process could be given added impetus by the development of mining in the Homelands.

With this general picture before them, members may be able to discern individual directions in which to make a professional contribution towards the development of those parts of our country which slumbered whilst others developed the capability of providing the capital and technical means now to activate and develop the Bantu Homelands to the advantage of all.

## REPORTS

### A.

#### ANNUAL REPORT ON THE ACTIVITIES OF THE S.A.B.S.

##### 1. General: Electrotechnical Nomenclature.

The following three groups are complete and have been approved by the Council:—

- Group 15 — Switchboards and apparatus for connecting and regulating.
- Group 16 — Safety Relays.
- Group 25 — Generation, transmission and distribution of electrical energy.

The following two groups are in the final stages for comments:—

- Group 11 — Static Converters.
- Group 12 — Transducers.

##### 2. Division for Photometrics: Code of Practice for Public Lighting.

Part 1 of this Code dealing with the lighting of streets and highways was completed more than a year ago. Good progress is being made with Part 2 dealing with the lighting of special aspects of public roads and an investigation of tunnel lighting is at present being undertaken in conjunction with the C.S.I.R.

##### 3. Division for Explosive Dangers.

(a) Code of practice for the classification of danger areas and the choice of electrical equipment for use in such areas.

This code is now in circulation for general comment. Closing date 19th April, 1968.

(b) Non-sparking electrical equipment for use in Class 1 Division 2 Areas.

A meeting is scheduled for the 27th March, 1968, to consider comments received on the draft document.



- (c) Gebruikskode vir die voorkoming van ontploffings- en elektriese gevare in hospitale.

'n Vergadering is beplan vir 29 Maart 1968 om die kommentaar op die konsepdokument te bespreek.

#### 4. Afdeling Elektriese Kables.

- (a) S.A.B.S. 97 — Elektriese kables met papierisolering vir algemene gebruik.

Die hersiening van hierdie spesifikasie is afgehandel en dit is nou in gedrukte formaat verkrygbaar.

- (b) Standaard toetsmetodes vir elektriese kables en buigbare koorde.

Hierdie dokument is voltooi en daar word geraam dat dit op 22 April deur die Raad goedgekeur sal word.

- (c) Koper produkte vir elektriese geleiers.

Die spesifikasie word tans voorberei vir voorlegging aan die Raad.

#### 5. Afdeling Elektriese Tegnologie.

- (a) Metaalboog — Sweisapparaat.

Hierdie spesifikasie word tans redaksioneel nagesien voordat dit vir algemene kommentaar uitgestuur word.

- (b) Driefasige induksiemotore.

Die kommentaar op hierdie spesifikasie word tans uitgesorteer.

#### 6. Afdeling Elektriese Apparaat.

Meterkabinette.

Die spesifikasie word op 22 April 1968 aan die Raad voorgelê vir goedkeuring.

#### 7. Afdeling Hoogspanningsingenieurswese.

- (a) Hoogspanningslynisolatore van porselein en glas.

'n Finale vergadering vir die hersiening van hierdie spesifikasie voordat dit vir kommentaar uitgestuur word, is beplan vir 7 Maart 1968.

- (b) Lyntoebehore vir bogronde kraglyne — Deel A: Nie-stroomdraende toebehore.

'n Tweede konsepdokument word tans voorberei.

- (c) Beskerming van geboue teen weerliggebruikskode vir die beskerming van huise teen weerlig (S.A.B.S. 03A).

Kommentaar word ingewag.

Daar sal opgemerk word dat die S.A.B.S. en sy komitees in die afgelope jaar besonder aktief was. Die vereniging is hiervoor baie dank verskuldig aan die personeel van buro en die ingenieurs wat so hard saamwerk om standarde daar te stel tot voordeel van die verbruikers en in landsbelang.

- (c) Code of practice for the prevention of explosive and electrical dangers in hospitals.

A meeting is planned for the 29th March, 1968, to discuss comments received on the draft document.

#### 4. Division for electrical cables.

- (a) S.A.B.S. 97 — Electrical cable with paper insulation for general use.

The revision of this specification is complete and it is now available in printed form.

- (b) Standard test methods for electric cables and flexible cords.

This document is complete and is expected to be approved by the Board on the 22nd April.

- (c) Copper products for electrical conductors.

This document is at present being prepared for submission to the Board.

#### 5. Division for electrical technology.

- (a) Metal arc-welding apparatus.

This specification is in the process of being edited before circulation for general comment.

- (b) Three-phase induction motors.

The comments received are now being investigated.

#### 6. Division for electrical apparatus.

Meterboxes.

This specification will be submitted for approval to the Board on the 22nd April, 1968.

#### 7. Division for high tension engineering.

- (a) High tension line insulators of porcelain and glass.

A final meeting for the revision of this specification before it goes out for comments is scheduled for the 7th March, 1968.

- (b) Line fittings for overhead power lines — Part A. Non-current carrying fittings.

A second draft document is now being prepared.

- (c) Protection of buildings against lightning — Code of practice for the protection of houses against lightning (S.A.B.S. 03A).

Comments are awaited.

It will be observed that the S.A.B.S. and its committees have been very active during the past year. For this the association is most grateful to the personnel of the bureau and the engineers who worked so hard to create standards for the benefit of consumers and the country as a whole.

**B.****VASTE KOMITEE VIR ELEKTRIESE VEILIGHEID.**

Op aandrang van die V.M.E.O. het die S.A. Buro vir Standaardse 'n raadgevende komitee waarop u vereniging ook 'n verteenwoordiger het, in die lewe geroep om alle aspekte van veiligheid van elektriese installasies en in besonder die aarding daarvan onder die soeklig te plaas en aan die betrokke liggende aanbevelings te maak.

Die navorsing, versameling van gegewens en ontleding daarvan sal deur die S.A.B.S. onderneem word maar 'n beroep word op ingenieurs gedoen om enige probleme in verband met aarding by die sekretaris van die vereniging aan te meld waarna dit die nodige aandag sal geniet. Ons is vol vertroue dat die werk van die komitee sal lei tot groter veiligheid vir die verbruikers van elektrisiteit sowel as 'n moontlike vereenvoudiging van die menigvuldige regulasies betreffende aarding. Die komitee het sy eerste vergadering op 29 Februarie gehou.

**C.****S.A. NASIONALE KOMITEE OP L.E.K.**

Die werk van hierdie komitee is gewoonlik deur middel van korrespondensie wat dan ook duur vervoer uitgawes uitskakel.

Vir dié rede word ingenieurs wat minder naby Pretoria geplaas is versoek om u vereniging op die komitee te verteenwoordig en hulle bereidwilligheid om te help word hoog op prys gestel.

G. C. THERON,  
Ko-ordinerende Verteenwoordiger.

**B.****STANDING ADVISORY COMMITTEE ON ELECTRICAL SAFETY.**

At the request of the A.M.E.U. the S.A. Bureau for Standards has now established an advisory committee on which your association is also represented, to investigate all aspects of safety of electrical installations and earthing in particular and to make recommendations to the various organisations concerned.

The research and gathering of information and the analysis thereof will be carried out by the S.A.B.S. but a request is made to all engineers to forward any problem on earthing to the secretaries of the association where it will receive the necessary attention.

We are hopeful that the work of the committee will result in greater safety for the consumers of electricity and a possible simplification of the numerous regulations on earthing. The first meeting of the committee took place on the 29th February.

**C.****S.A. NATIONAL COMMITTEE ON THE L.E.C.**

The work of this committee is mostly by correspondence which does not entail costly travel expenditure. For this reason engineers at some distance from Pretoria have been requested to represent your association on this committee and we greatly appreciate their assistance.

G. C. THERON,  
Co-ordinating Representative.

**JAARVERSLAG VAN DIE REGISTRASIERAAD  
VIR ELEKTROTEGNIÛSE DRAADWERKERS.**

Die Raad was soos volg saamgestel gedurende 1967:

Voorsitter: Mnr. J. G. Wannenburg.  
Lede: Mnr. J. M. Fraser.  
Mnr. F. Leemans.  
Mnr. C. Lombard.  
Mnr. A. H. M. Drysdale.  
Mnr. J. J. Gerber.

Daar is elf gewone vergaderings gedurende die jaar gehou en 763 aansoeke om registrasie is oorweeg; daarvan is 692 aangeneem vir die voorgeskrewe eksamens. In vergelyking met 791 gedurende die vorige jaar is 901 voorlopige registrasie-sertifikate toegestaan of hernu.

Van die 738 Kandidate wat vir die skriftelike eksamens ingeskryf het was 123 afwesig.

**ANNUAL REPORT OF THE  
ELECTRICAL WIREMEN'S REGISTRATION BOARD.**

The Board was constituted as follows during 1967:

Chairman: Mr. J. G. Wannenburg.  
Members: Mr. J. M. Fraser.  
Mr. F. Leemans.  
Mr. A. H. M. Drysdale.  
Mr. J. J. Gerber.

Eleven ordinary meetings were held during the year and 763 applications for registration were considered, of which 692 were accepted for the prescribed examinations. The number of provisional registrations certificates granted or renewed totalled 901 in comparison with 791 during the previous year.

Of the 738 candidates who entered for the written examinations, 123 were absent.

Dit is nodig gevind om 24 praktiese eksamens gedurende die jaar te hou. Die praktiese eksamens wat vir die praktiese eksamens ingeskryf het, beloop 719. Van hierdie was 197 suksesvol terwyl 89 afwesig was.

Reëlings is getref vir die aflê van mondelike eksamens deur persone wat, om verskeie redes, nie in staat was om die skriftelike eksamens af te lê nie.

Gedurende die jaar is registrasie-sertifikate aan 252 persone uitgereik en daarmee kom die totaal sedert 1940 nou op 9806 te staan.

Advieskomitees het nou tot stand gekom en funksioneer in Durban, Kaapstad en Bloemfontein.

Die Raad is deur die Transvaalse en Oos-Londense Nywerheidsrade vir die Elektrotegniese-aannemersbedryf versoek om aan te dui of sekere werksaamhede verbonde aan bedradingswerk deur ongeskoolde arbeid verrig kan word.

Na oorweging het die Raad, inter alia, besluit dat die volgende as ongeskoolde werk beskou kan word.

- (a) Buig van buise met 'n buigmasjien.
  - (b) Ruimering van buise.
  - (c) Lê van kables in vore, kanale en rakke mits dit onder die direkte toesig van 'n elektrotegniese draadwerker gedoen word.
  - (d) Klampwerk insluitende die plasing van drade in die klampisolatore mits dit nie gespan word nie.
  - (e) Aanbring van ligte elektriese voerders op tot mediumspanning bevattende medium — en laagspanning stroombane mits geen draadwerk gedoen word nie.
- Met verwysing na (d) en (e) het die Raad ook besluit dat die spesifieke uitsluiting van hierdie werk uit die woordomskrywing van draadwerk oorweeg wrd wanneer die woordomskrywing hersien word.

Ten slotte wil ek graag die Raad bedank vir die beskikbaarstelling van die statistieke wat by hierdie verslag ingesluit is.

C. LOMBARD,  
Sameroeper.

#### JAARVERSLAG VAN DIE KOMITEE BELAS MET AANBEVELINGS OOR NUWE ELEKTRIESE HANDELSWARE

Die Komitee het drie vergaderings gedurende die afgelope jaar gehou en alle aanbevelings is deur middel van die Nuusbrief aan lede bekend gemaak.

Nuwe lede wat nou in die Komitee dien is Mnr. M. Jochelson (Elektrotegniese Aannemersvereniging van Suid-Afrika), Mnr. R. Everatt (Suid-Afrikaanse Vereniging van Raadgewende Ingenieurs) en Mnr. V. Hart (S.A.I.E.E. Bedradingsregulasiekomitee).

In vergelyking met die vorige jaar was daar 'n merkbare toename in die aantal aansoeke wat ontvang en behandel is.

It was necessary to arrange for 24 practical examinations at the 10 principal centres during the year. The number of candidates who entered for the practical examinations totalled 719. Of these 197 were successful while 89 were absent.

Several oral examinations were arranged for persons who, for various reasons, were unable to undergo the written examination.

Registration certificates were issued to 252 persons during the year, bringing the total issued since 1940 to 9806.

Advisory Committees have now been established and are functioning at Durban, Cape Town and Bloemfontein.

The Board has been requested by the Transvaal and East London Industrial Councils for the Electrical Contracting Industry to indicate whether certain operations connected with wiring work could be performed by unskilled labour.

After due consideration, the Board decided, inter alia, that the following could be regarded as unskilled work:

- (a) Bending of conduit with a bending machine.
- (b) Reamering of conduits.
- (c) Laying of cables in trenches, duct and racks, provided that this is done under the direct supervision of an electrical wireman.
- (d) Cleating including the placing of the wires in the cleats, provided that no tensioning is done.
- (e) Fitting of light electrical trunking up to medium voltage containing medium and low voltage circuits, provided that no wiring is done.

With regard to (d) and (e) the Board also resolved that the specific exclusion of this work from the definition of wiring work be considered when the definition is re-

In conclusion, I wish to thank the Board for making the statistics quoted available for inclusion in this report.

C. LOMBARD,  
Convenor.

#### ANNUAL REPORT OF THE RECOMMENDATIONS COMMITTEE FOR NEW ELECTRICAL COMMODITIES.

The Committee met on three occasions during the past year and all recommendations were made known to members through the medium of the News Bulletin.

New members serving on the Committee are Mr. M. Jochelson (Electrical Contractors Association of South Africa), Mr. R. Everatt (South African Association of Consulting Engineers) and Mr. V. Hart (S.A.I.E.E. Wiring Regulations Committee).

In comparison with the previous year, there has during the past year been a marked increase in the number of applications received and considered.

Alhoewel heelwat navrae en aansoeke ten opsigte van draagbare toestelle ontvang is, het die Komitee homself tot ware wat in vaste aanlegte gebruik word, beperk.

Ware word nou en dan as „geskik vir gebruik” aanbeveel met die bepaling dat daar aan sekere voorwaardes voldoen word. Vanweë die feit dat verklarings in advertensies misleidend mag wees as sodanige voorwaardes nie aangehaal word nie, het die Komitee 'n besluit wat in 1959 geneem is, herbevestig dat, nadat die Komitee bevind het dat 'n artikel of 'n sekere klas toerusting geskik is om gebruik te word en die applikant per brief dienooreenkomstig in kennis gestel is, hy daarop geregtig is om die spesifieke bewoording van die brief in publisiteitstof aan te haal, maar dat dit dan beskryf moet word as 'n uittreksel van 'n brief wat van die Aanbevelingskomitee ontvang is en verder, dat dit 'n volle uittreksel daarvan sonder die weglating van enige kwalifiserende klousule moet wees.

Ons bedank al die verteenwoordigers van die verskillende organisasies en liggame wat in die Komitee gedien het vir hulle offervaardige en waardevolle hulp asook die S.A. Buro vir Standaarde vir die samewerking met die toets van artikels waar dit nodig was.

C. LOMBARD,  
Sameroeper.

#### VERSLAG VAN DIE ONDERKOMITEE INSAKE DIE REG VAN TOEVOER EN ONTWIKKELING

Na aanleiding van die verslag wat in Mei 1967 aan die Lourenco Marques-konvensie voorgelê is, het die onderkomitee op 22 Augustus 1967 byeengekom om 'n memorandum te bespreek wat deur die Verenigde Munisipale Bestuur opgestel is. In hierdie memorandum word al nege punte wat in die onderkomitee se verslag aan die Konvensie genoem word, verdedig en dit bevat verdere kommentaar oor punte wat die VMB en sy lidvereniging: en adviseurs geopper het.

Die memorandum het uit 30 paragrawe bestaan, wat soos volg gegroepeer was:—

- (a) Inleiding — wat Paragraaf 1 tot 4 beslaan het.
- (b) Ontwikkeling van Elektrisiteit — Paragraaf 5 tot 9.
- (c) Vergoeding aan plaaslike besture ten opsigte van kragtstasies wat as gevolg van die ontwikkeling van hidro-elektriese skemas verouder kan raak — Paragraaf 10 tot 13.
- (d) Behoeftes aan stabiele Evkom-tariewe (5 jaar) — Paragraaf 14 tot 18.
- (e) Toevoergebiede (uitbreiding van munisipale gebied) — Paragraaf 19 tot 23.
- (f) Bedryfspek van elektrisiteitsvoorsiening (Winstes) — Paragraaf 24 tot 29.
- (g) Verteenwoordiging in Evkom en Elektrisiteitsbeheerraad — Paragraaf 30.

Although many enquiries and applications in respect of portable appliances were received, the Committee confined itself to commodities used in fixed installations.

Commodities are occasionally recommended as "suitable for use" subject to certain conditions being complied with. In view of the fact that statements in advertisements may be misleading if such conditions are not quoted, the Committee reaffirmed a decision taken in 1959 that after the Committee had found an article or class of equipment as suitable for use and notified the applicant accordingly by letter, he was entitled to quote the specific wording of the letter in publicity matter, but that it must be described as an extract from a letter received from the Recommendations Committee and also, that it must be a full extract therefrom without the deletion of any qualifying clause.

We thank all the representatives of the various organisations and bodies who served on the Committee for their generous and valuable assistance and also the S.A. Bureau of Standards for its assistance in carrying out tests on commodities where necessary.

C. LOMBARD,  
Convenor.

#### REPORT OF THE RIGHTS OF SUPPLY AND GENERATION SUB-COMMITTEE.

Following the report to the Lourenco Marques Convention in May, 1967, the sub-committee met on 22nd August, 1967, to consider a memorandum drawn up by the United Municipal Executive. This memorandum contained argument for all nine points mentioned in the sub-committee's report to the Convention and in addition embodied further argument on points raised by the U.M.E. and its constituent associations and advisers.

The memorandum consisted of 30 paragraphs grouped as under:—

- (a) Introduction — covered by paragraphs 1 to 4.
- (b) Generation of Electricity — paragraphs 5 to 9.
- (c) Compensation for local authorities in respect of Power Stations that may become obsolete as a result of development of hydro-electric schemes — paragraphs 10 to 13.
- (d) Need for stability in Escom tariffs (5 years) — paragraphs 14 to 18.
- (e) Areas of supply (extension of municipal area) — paragraphs 19 to 23.
- (f) Business aspect of electricity supply (profits) — paragraphs 24 to 29.
- (g) Representation on Escom and Electricity Control Board — paragraph 30.

Na oorweging het die onderkomitee die VMB-memorandum goedgekeur en saamgestem dat dit die menings van hierdie Vereniging bevat. Die vergadering, waarop die voorlegging van die memorandum aan die Minister met die VMB-afvaardiging bespreek is, is toe voortgesit.

Raadslid J. J. C. Kock, saamroeper van die VMB-komitee, het die vergadering meegedeel dat die Minister (aan wie die VMB 'n afskrif van die memorandum gestuur het) versoek het dat die samespreking tot die hoofpunte van die memorandum beperk moet word en dat daar dan later op die res geantwoord sou word. Die volgende is Raadslid Kock se verslag aan die VMB, waarin die samespreking met die Minister in breë trekke uiteengesit word:

Verslag van Raadslid J. J. C. Kock, Saamroeper, oor die samesprekings op 23.8.1967 met die Minister van Ekonomiese Sake oor Elektriesiteitsvoorsiening en die verhouding tussen plaaslike besture en die Elektriesiteitsvoorsieningskommissie.

Item 50:

Die samesprekings met die Minister van Ekonomiese Sake, mnr. J. W. F. Haak, het gister plaasgevind.

Die volgende persone het die samesprekings bygewoon: Die President, mev. M. Maytom, Raadslid de Lange, Oos-Londen, Raadslid Druursema, Kroonstad, ekself, mnr. Giles en Leishman, verteenwoordigers van die Vereniging van Munisipale Elektriese Ondernemings, mnr. Rode, Stadsklerk van Pretoria, mnr. Gorven, Stadsessourier van Durban, lede van die onderkomitee en ses lede van die Vereniging van Munisipale Elektriesiteitsondernemings, nl. mnr. Theron, Frantz, Simpson, Barton, McWilliam en Stoffberg.

Die Minister van Ekonomiese Sake, mnr. J. W. F. Haak, is vergesel deur mnr. Kotzenberg, Sekretaris van Handel en Nywerheid en mnr. Kitchoff, Voorsitter van die Raad, dr. Strasacker, Voorsitter van Evkom, mnr. Theron, Voorsitter van die Elektriesiteitsbeheerraad en mnr. Theron en Truter, lede van die Raad.

Ons het slegs een uur vir die samesprekings gehad en moes slegs die hoofpunte van die memorandum bespreek. Ek het my op paragraaf 5, 6 en 30 van die memorandum toegespit en —

Eerstens ge vra dat die Wet gewysig moet word sodat aan plaaslike besture die reg verleen word dat die betrokke plaaslike bestuur insae in die Evkomverslag aan die Administrateur kan verkry ten einde hom in staat te stel om daarop te antwoord.

Die Minister het die versoek toegestaan, waarop Evkom egter 'n versoek gerig het dat hulle ook toegelaat moet word om 'n verslag oor die antwoord van die plaaslike besture voor te lê.

Tweedens het ons ge vra dat verteenwoordiging in Evkom en die Elektriesiteitsbeheerraad aan ons toegestaan word. Die Minister, Handel en Nywerheid en Evkom was nie geneë om aan die versoek te voldoen nie en het daarop gewys dat indien hulle sou toestem, ander instansies miskien op dieselfde reg kan aandring en dat die

After consideration, the sub-committee approved of the terms of the U.M.E. memorandum as embodying the views of this Association and then proceeded to meet the U.M.E. delegation to discuss the presentation of the memorandum to the Minister.

Councillor J. J. C. Kock, convener of the U.M.E. Committee, advised that the Minister (to whom a copy of the memorandum had been sent by the U.M.E.) had requested that discussion should be limited to the salient points of the memorandum, leaving the balance for reply later. Councillor Kock's report to the U.M.E., which sets out substantially the discussion which ensued with the Minister, is given hereunder.

Report by Councillor J. J. C. Kock, Convener on the discussion with the Minister of Economic Affairs on 23.8.1967 on Electricity Supply and the relationship between Local Authorities and the Electricity Supply Commission.

Item 50.

The discussion with the Minister of Economic Affairs, Mr. J. W. F. Haak, took place yesterday.

Present at the discussion were the President, Mrs. M. Maytom, Councillor De Lange, East London, Councillor Druursema, Kroonstad, myself, Messrs. Giles and Leishman, representatives of the Association of Municipal Electrical Undertakings, Mr. Rode, Town Clerk of Pretoria, Mr. Gorven, City Treasurer of Durban, members of the sub-committee and six members of the Association of Municipal Electrical Undertakings, being Messrs. Theron, Frantz, Simpson, Barton, McWilliam and Stoffberg.

The Minister of Economic Affairs, Mr. J. W. F. Haak, was accompanied by Mr. Kotzenberg, Secretary of Commerce and Industry and Mr. Kitchoff, Chairman of the Board, Dr. Strasacker, Chairman of Escom, Mr. Theron, Chairman of the Electricity Control Board and Messrs. Theron and Truter, members of the Board.

We had only about one hour for the discussion, consequently had to discuss only the main points of the memorandum. I took paragraphs 5, 6 and 30 of the memorandum and asked —

Firstly: for amendment of the Act to provide, as a matter of right, for submission to the local authority concerned of the report by Escom to the Administrator to enable the local authority concerned to reply.

The Minister agreed to the request but then Escom came forward with a request that they also be permitted to report on the reply of the local authorities.

Secondly: we asked for representation on Escom and the Electricity Control Board but the Minister, Commerce and Industry and Escom are not inclined to accede to the request and pointed out that if they should agree other instances might claim the same right and that at present



lede tans op grond van hulle kennis en nie as verteenwoordigers van bepaalde belange nie, aangestel word.

Ons het geen finale antwoord ontvang nie en het slegs daarop ge wys dat Evkom en plaaslike besture die enigste owerhede in die land is wat elektriese krag ontwikkel.

**Derdens** is 'n versoek gerig dat die Elektrisiteits-beheerraad as 'n onpartydige Raad, aan administrateurs in plaas van Evkom, soos die geval tans is, verslag moet doen. 'n Mens kan nie anders as om tot die gevolgtrekking te kom dat die verteenwoordigers van Evkom hulle uiterste doen om hulle eie bedryf te beskerm nie, en dat hulle wil ontken dat hulle, wanneer hulle verslag doen, tegelykertyd as raadgewers, mededingers en 'n belanghebbende party optree.

**Mnr. Leishman**, Algemene Bestuurder van die Afdeling Elektrisiteit, Johannesburg, het die reg van plaaslike besture om hulle eie krag te ontwikkel, soos in paragraaf 7 tot 9 van die memorandum uiteengesit, bespreek.

Mnr. Leishman het sy saak baie goed gestel en het bewys dat dit in die meeste gevalle moontlik is om elektrisiteit baie goedkoper as Evkom te ontwikkel. Hy het die geval van Kaapstad genoem wat dit teen 29% van die koste minder kon doen, sodat Evkom verplig was om sy eie koste met 29% te besnoei. Hy het ook die feit benadruk dat plaaslike besture wat hulle eie krag ontwikkel, rioolwater gebruik, wat 80% uitmaak van die suiwere water wat gebruik word, terwyl Evkom net suiwere water gebruik.

Gedurende verdere besprekking het mnr. Rode reguit gevra of plaaslike besture in die toekoms verbied gaan word om hulle eie krag te ontwikkel en of hulle die reg gaan behou.

Die Minister het ingestem dat plaaslike besture die reg om krag te ontwikkel kan behou, mits hulle kan bewys dat hulle dit goedkoper as Evkom kan doen.

Mnr. Kotzenberg het probeer om die voorbehoudsbepaling dat die verlies gely op spoorwegvervoer van steenkool ook by die berekening van die koste van plaaslike besture in ag geneem moet word, by die mening van die Minister te voeg.

Mnr. Leishman het verder daarop ge wys dat R650 miljoen in die geval van Evkom belê is en dat nog R400 miljoen binnekort belê sal word en dat die gevaar van onvoorspelbare koste in die toekoms dus werklik bestaan. Ook om hierdie rede moet plaaslike besture die reg om hulle eie krag te ontwikkel tot minstens 1980 behou. Mnr. Leishman het daarop ge wys dat indien die verlies gely op spoorvervoer van steenkool in aanmerking geneem gaan word, die koste van transmissielynne ook in aanmerking geneem moet word.

**Mnr. P. A. Giles**, Bestuurder van die Oos-Londense Afdeling Elektrisiteit het die distribusieregte van plaaslike besture in toevolgegebiede, soos in paragraaf 19 tot 23 van die memorandum uiteengesit, bespreek. Met betrekking tot die reg om krag in aangrensende ingelyfde gebiede te versprei, het hy die noodsaaklikheid van een-vormige munisipale dienste dwarsdeur die hele gebied

the members are appointed for their knowledge and not as representatives of particular interests.

We did not get a final reply on this point and merely pointed out that Escom and Local Authorities are the only authorities in the country who generate electricity.

**Thirdly**: a request was made that the Electricity Control Board as an impartial board should report to administrators instead of Escom as at present. One could not avoid the conclusion that Escom representatives were doing their utmost to protect their own industry and that they want to deny that in reporting they act as consultants, competitors and as an interested party at the same time.

**Mr. Leishman**, General Manager of the Electricity Department, Johannesburg, discussed the rights of local authorities to generate their own requirements as stated in paragraphs 7 to 9 of the memorandum.

Mr. Leishman made out a very good case and not only proved that it is possible in most cases to generate electricity far cheaper than Escom and he quoted the case of the City of Cape Town who could do so 29% lower so that Escom had to reduce their own cost by 29%. He also stressed the fact that where local authorities generate their own requirements they use sewerage water which is 80% of the new water used, whereas Escom used new water only.

In further discussions Mr. Rode asked the direct question whether local authorities are to be prohibited from generating their own requirements in future or whether they are to retain that right.

The Minister agreed that local authorities retain their right to generate provided they prove that they can do so cheaper than Escom.

To this view of the Minister, Mr. Kotzenberg endeavoured to add the proviso that in calculating the cost of local authorities the loss on railway transport of coal must be taken into account.

In the case of Escom, Mr. Leishman pointed out that R650 million had been invested and that a further R400 million will be invested in the near future so that there is a real danger of unpredictable costs in future and that for that reason too local authorities should retain the right to generate until at least 1980. Mr. Leishman pointed out that if the loss on coal transport by the railways is to be taken into account, the costs of transmission lines must also be taken into account.

**Mr. P. A. Giles**, Manager of the East London Electricity Department, discussed local authorities rights of distribution under areas of supply as stated in the memorandum in paragraphs 19 to 23. In regard to the right in contiguous incorporated areas he stressed the need of uniformity of municipal services in the whole area served by that local authority and the undesirability of



wat deur 'n plaaslike bestuur bedien word en die ongewenstheid van kragttoevoer enerjys deur die plaaslike bestuur in 'n deel van sy eie gebied en andersyds deur Evkom in 'n ander deel daarvan, beklemtoon. Hy het om 'n beslissing gevra dat plaaslike besture op die ingelyfde gebiede geregtig moet wees en dit nie vir hulle nodig moet wees om die gebiede deur onderhandeling met Evkom te verkry nie, soos die geval tans is.

Ons kon nie daarin slaag om op hierdie punt 'n besliste antwoord van die Minister te verkry nie en hy het onderneem om skriftelik op al die punte wat in die memorandum geopper is en wat bespreek is, te antwoord. Ons het inderdaad slegs twee beloftes ontvang—

**Eerstens:** dat Evkom-verslae aan die Administrateur aan plaaslike besture beskikbaar gestel sal word ten einde hulle in staat te stel om op stellings wat in die Evkom-verslae gemaak word, te antwoord.

**Tweedens:** dat ons die reg behou om elektrisiteit vir ons eie gebruik te ontwikkel mits ons kan bewys dat ons dit goedkoper as Evkom kan doen.

Tot die huidige het die Minister nog nie skriftelik op die VMB-memorandum geantwoord nie.

P. A. GILES,  
Saamroeper.

#### VERSLAG VAN ONDERKOMITEE INSAKE WARMDOMPSEL (GEGALVANISEERDE) SINKDEKLAE.

Na die vergadering wat op 21 Februarie 1967 gehou is, het die Suid-Afrikaanse Buro vir Standaarde op 26 Januarie 1968 'n konspesifikasie vir warmdompel (gegaltaniseerde) sinkdeklae op staaldraad, staalplaat en stroke uitgereik waarin swaarder sinkdeklae as wat vooreen voorgestel is, aangegee word. Kommentaar oor die konspesifikasie sluit op 20 April 1968 en nog 'n vergadering sal gehou word om die spesifikasie te finaliseer.

Intussen het die Buro vir Standaarde SABS 763 — 1966 vir warmdompel- (gegaltaniseerde) sinkdeklae (behalwe op plaat en draad) gepubliseer en uitgegee. Hierdie spesifikasie dek sinkdeklae wat deur warmdompelgalvanisering op struktuurstaalwerk, buise, draadgesnyde artikels, gietstukke en smeesstukke en op holware, spoelbakke, tenks en silinders wat na vervaardiging gegaltaniseer word, aangebring word.

P. A. GILES,  
Verteenwoordiger.

#### VERSLAG VAN ONDERKOMITEE INSAKE STRATEGIESE MATERIAAL.

'n Omsendbrief is aan alle lede gestuur waarin inligting gevra word oor die opslagberging van noodsaaklike goedere, ingevoerde noodonderdele en genoeg materiaal vir die onderhoud van elektriese uitrusting vir 'n tydperk van twaalf maande. Die antwoorde word tans vergelyk.

P. A. GILES,  
Saamroeper.

having a supply by the local authority in one part of its area and Escom in another part. He asked for a ruling that local authorities must get the incorporated areas as a right and not, as at present, by negotiation with Escom.

On this point we could not get a firm reply from the Minister and he undertook to send a written reply on all points raised in the memorandum and as discussed.

In effect, we got only two promises —

**Firstly:** that Escom reports to the administrator be made available to local authorities to enable them to reply to points made in the Escom reports.

**Secondly:** that we retain our right to generate electricity for our own requirements provided we can prove that we can do it cheaper than Escom.

The Minister has not, as yet, provided a written reply to the U.M.E. memorandum.

P. A. GILES,  
Convener.

#### REPORT OF THE HOT DIP (GALVANISED) ZINC COATINGS SUB-COMMITTEE.

Following the meeting held on the 21st February, 1967, the South African Bureau of Standards on 26th January, 1968, issued a draft specification for hot dip (galvanised) zinc coatings on steel wire, steel sheet and strip showing heavier zinc coatings than previously proposed. Comments on the draft specification close on 20th April, 1968, and a further meeting to finalise the specification will be held.

In the meantime, the Bureau of Standards have published and issued S.A.B.S. 763:1966 for hot dip (galvanised) zinc coatings (other than on sheet and wire). This specification covers zinc coatings applied by hot dip galvanising to structural steel work, tubes, threaded articles, castings and forgings and to hollow-ware cisterns, tanks and cylinders galvanised after fabrication.

P. A. GILES,  
Representative

#### REPORT OF SUB-COMMITTEE ON STRATEGIC MATERIALS

A circular has been sent to all members requesting information regarding the stockpiling of essential goods, imported critical spares and materials for the maintenance of electrical equipment sufficient for twelve months consumption. The replies are being collated.

P. A. GILES,  
Convener.

## VERSLAG OOR DIE 1967-KONGRES VAN SANVR.

Die veertiende algemene jaarvergadering van die Suid-Afrikaanse Nasionale Verligtingsraad is van 10 tot 12 Mei 1967 te Benoni gehou.

Die kongres is deur sestig persone bygewoon, bestaande o.a. uit 17 munisipale afgevaardigdes, verteenwoordigers van die S.A.S. & H., W.N.N.R., S.A.B.S. en vervaardigers van straat- en binnenshuise verligtings-uitrusting.

Aan die einde van die vergadering is ampsdraers aangestel en is twee lede van die V.M.E.O. nl. mnr. P. A. Giles en R. M. O. Simpson in die uitvoerende komitee benoem.

Op die kongres is sewe referate gelewer:

### 1. Sonlig en Geboue, deur mnr. S. J. Richards (verkose President).

In die vyftigste jare het ontwikkeling op die gebied van tegniek en materiaal tot gevolg gehad dat geboue met groot glasvensters opperig is. Dit het die probleem van skerp skynsel en sonwarmte laat ontstaan. Direkte sonlig behoort nie in werksplekke in te dring nie en in Suid-Afrika behoort sonlig in die somermaande uitgesluit te word. Son-hoeke is bespreek en die gebruik van sonkaarte, berekenars en kantelmodelle is beskryf. Buite-afskerming is as doeltreffende metode vir die beheer van sonwarmte bepleit, angesien vensters toegang aan sonwarmte tot geboue verleen. Die moontlikheid van geboue sonder vensters is bespreek.

### 2. Verligting en Lugversorging deur mnr. J. Bessant en R. Borgars.

Die referaat het oor die geslaagde vervanging van die natuurlik verslugomgewing gehandel met die klem op gerief wat temperatuur en humiditeit betref. 'n Opname het getoon dat stilte en sindelike verky word maar met bedompigheid, gebrek aan beweging van die lug, foutiewe werking en die gevoel dat 'n mens in 'n ingemaakte atmosfeer leef, tot gevolg. Die twee funksies van verligting, werkverligting en die verligting van geboue, is ondersoek met betrekking tot die algemene toename in verligtingspeile en die aanwending van kleure by die dekoratiewe gebruik van fluoresseerbuis. 'n Beskrywing is gegee van die inlaatstelsel van lugversorging waarvolgens 'n aantal klein eenhede om die geboue aangebring word, sowel as van die stelsel van dubbele kanale waar die een kanaal vir koue en die ander vir warm lug aangebring word. 'n Bespreking is gehou oor die aanbring van afsonderlike ligtoebehoere en lugtoevoerpunte in dieselfde plafonruimte, die saak vir geïntegreerde toebehoere, en veral die probleem van die benutting van hitte wat van ballaste en sonwarmte afkomstig is, is gestel.

### 3. Verligting en Estetiek, deur mnr. R. S. Browne.

Hierdie referaat, wat met behulp van skyfies toegelig is, het die estetiek van lig by argitekture beskryf. Daar is drie aspekte: die voorwerp (of taak) wat verlig word, die waarnemer en die ruimte wat die argitektuur bied.

## REPORT ON S.A.N.C.I. CONGRESS, 1967.

The fourteenth Annual General Meeting of the South African National Committee on Illumination was held at Benoni from 10th to 12th May, 1967.

Sixty persons attended, including 17 Municipal delegates, together with representatives from S.A.R. & H., C.S.L.R., S.A.B.S. and manufacturers of street lighting and interior lighting equipment.

At the conclusion of the meeting, office bearers were appointed and two members of the A.M.E.U. were elected to the Executive, i.e. Messrs. P. A. Giles and R. M. O. Simpson.

Seven papers were read at the Congress:—

### 1. Sunlight and Buildings by Mr. S. J. Richards (elected President).

In the 1950's, development in techniques and materials resulted in large glass windows in buildings and introduced problems of glare and solar heat. Direct sunlight should not reach working areas and in South Africa sunlight should be excluded in summer months. Sun angles were discussed, the use of solar charts, calculators and tilting models were described. External shading was advocated as an effective method of controlling solar heat, as windows permit solar heat gains in the buildings. The possibility of windowless buildings was discussed.

### 2. Lighting and Air Conditioning by Messrs. J. Bessant and R. Borgars.

The paper dealt with the successful replacement of the natural environment of fresh air, stressing comfort in relation to temperature and humidity. A survey indicated that quietness and cleanliness was offset by stuffiness, lack of air movement, faulty operation and the feeling of living in a canned atmosphere. The two functions of lighting, work lighting and building lighting were examined in respect of the general increase in lighting levels, colours in decoration use of the fluorescent tube. The induction unit system of air conditioning using a number of small units positioned around the building and the dual duct system, one duct for cold air and the other for warm air, were described. The accommodation of separate lighting fittings and air supply points in the same ceiling space was discussed, and the case for integrated fittings was given, particularly the problem of the utilisation of heat gain from ballasts and solar heat.

### 3. Lighting and Aesthetics by Mr. R. S. Browne.

This paper, presented with slides, described the aesthetics of light in architecture which has three aspects: The object (or task) lit, the observer and the architectural space. Where exacting conditions of task lighting

Waar die taakverligting of die gerief van die waarnemer baie streng eise stel, is die ruimte vir artistieke aanwending van verligting beperk. In ander toestande, soos die wat deur die skyfies geïllustreer word, bestaan daar aansienlike ruimte vir die ontwerper, wat die aard, rigting en hoogte van die verligting betref. Die referaat het ook natuurlike dagligverligting van kerke en katedrale behandel.

**4. Verligting en Produktiwiteit deur mnr. J. T. Grundy en L. O. Foster.**

Die referaat het gehandel oor verligting in 'n omgewing met algehele elektriese verligting en die ontwikkeling van die doeltreffende en ekonomiese aanwending van natuurlike hulpbronne — m.a.w. produktiwiteit. 'n Vergelyking tussen natuurlike daglig en verligting afkomstig van moderne lampbronne, natrium, kwik, fluoressensie, xenon, ens., is getref en 'n pleidooi is gelewer vir groter samewerking en minder individualisme by die ontwerp van toebereide. Openbare straatverligting is bespreek en 'n vergelyking tussen Britse en Suid-Afrikaanse gebruike is getref. Melding is gemaak van verligting by lughawens en opstelwerke en van nywerheidsverligting. Die noodsaaklikheid dat 'n studie van die volgende gemaak moet word, is beklemtoon: menslike omgewing, ligbronne, eenderse standaarde vir straatverligting, verligting vir lugvervoerdoelendes en nywerheidsverligting.

**5. Hoe Verligting die veiligheid, gesondheid en welsyn raak deur mnr. J. Hein Kieser.**

Nywerheidswerksaamhede hang van die werknemer se vermoë om te kan sien. Fabrieksoekpouers behoort voorligting oor die verligting van die binnekant van fabriek te ontvang. Die Wet op Fabriekse kryf minimum standaarde voor wat glad nie aan moderne vereistes voldoen nie. Swak verligting veroorsaak gesigs-oorspanning, terwyl handaardheid verbeter na gelang van beter verligtingstoestande. Vermelding is gemaak van die feit dat statistiek 'n noue verband tussen persoonlike beserings en verligting toon. In 50% van alle ongelukke het swak verligting 'n bydraende faktor gebyk te wees. Samedrommings op looppaai en vuilgoedhope is gevaarlik.

**6. Verligting en Skerp Skynsel deur mnr. P. Harris.**  
Die referaat het oor die probleem van skerp skynsel, wat afbreuk aan die waarde van 'n verligtingstelsel doen, gehandel en aandag is veral daarin geskenk aan die aspek van skerp skynsel, wat ongerief in handels-, nywerheids- en openbare geboue veroorsaak.

Die beheer van skerp skynsel deur middel van verstrooiing en versperring met behulp van hortjieskerms, is genoem.

'n Beskrywing van die Britse Sonemetode (BL) vir die berekening van die benutting van 'n verligtingsinstallasie is gegee.

**7. Praktiese aspekte van Veiligheidsverligting deur mnr. D. W. Young.**

Mr. Young het die verskil beklemtoon wat daar bestaan tussen noodverligting, wat nodig word wanneer die gewone bronne defek raak en veiligheidverligting wat

of observer comfort are required, the scope for artistic employment for lighting is limited. In other conditions such as illustrated in the slides, considerable scope exists for the designer, as to the character, direction and level of lighting. Natural daylighting of churches and cathedrals was a feature in this paper.

**4. Lighting and Productivity by Messrs. J. T. Grundy and L. O. Foster.**

The paper dealt with lighting in an all-electric environment, in the development of the use of natural resources efficiently and economically, i.e. productivity. Comparison of natural daylight with lighting from modern lamp sources, sodium, mercury, fluorescent, Xenon, etc. was made, and a plea was made for more co-operation and less individualism in design fittings. Public lighting of streets and comparison of British and South African practice was listed. Airfield lighting, marshalling yard lighting and industrial lighting was mentioned. The need for studies of the following, was stressed: Human environment, light sources, even standards of street lighting, air transport and industrial lighting.

**5. The influence of Lighting on Safety, Health and Welfare by Mr. J. Hein Kieser.**

Industrial operations are dependent on an employee's ability to see. Information on lighting of factory interiors should be provided to factory occupiers. The Factories Act prescribes minimum standards which are out of step with modern standards. Poor lighting causes eyestrain, manual performance improves with better lighting. A close relation between personal injury rates and illumination is mentioned. 50% of accidents showed poor lighting was a contributory cause. Congested walkways and rubbish piles are hazardous.

**6. Lighting and Glare by Mr. P. Harris.**

The paper dealt with the problem of glare, which reduces the full value of a lighting system, and concentrated on the aspect of direct glare causing discomfort in commercial, industrial and public buildings.

Mention was made of the control of glare by diffusion and cut-off by shielding using louvres.

The British Zonal (BZ) method of calculation for utilisation of a lighting installation was described.

**7. Practical aspects of Security Lighting by Mr. D. W. Young.**

Mr. Young stressed the difference between emergency lighting which is necessary when the regular source fails, and security lighting which relates to anti-

met anti-sabotasiebedrywighede in verband staan. Die hoofdoel van veiligheidsverligting is om veiligheids wagte in staat te stel om indringers in verbode gebiede te kan gewaar. Afgesien daarvan dat veiligheidsverligting van so 'n aard moet wees dat die bewegings van wagte en nagwagte nie waarneembaar is nie, is dit die funksie daarvan om indringers af te skrik, hulle aanwesigheid te openbaar en te help met hul aanhouding. Die voordele van die alarmstelsel, waar die veiligheidsligte afgeskakel word totdat die alarm afgaan, en die permanente stelsel, waar die veiligheidsligte van skemer tot dagbreek brand, is bespreek. Daar is nadruk geleë op die gebruik van sterk ligtoebehore wat nie maklik stukkend gegooi kan word nie. Die hoogte waarop ligte aangebring moet word, die gebruik van donker klere vir nagwagte, ondergrondse kables vir distribusielyste en die gesigsverreistes vir wagte is bespreek.

P. A. GILES,  
Verteenwoordiger.

#### VERSLAG VAN DIE ONDERKOMITEE INSAKE GELYKE PRYS-AANBIEDINGS.

Die saamroeper het 'n vergadering bygewoon wat op 5 April 1967 in die kantoor van die Raad van Handel gehou is en is meegedeel dat in gevalle waar daar blyke van prysbinding of gelyke prys-aanbiedings is, dit nodig is om getuenis op te stel en inligting aan die Raad voor te lê oor elke besondere geval.

'n Verslag deur die Raad van Handel en Nywerheid oor Prysbinding is op 21 Februarie in die Parlement ter Tafel geleë.

P. A. GILES,  
Saamroeper.

#### VERSLAG VAN DIE KOÖRDINERENDE KOMITEE VIR HOESPANNINGSFASILITEITE.

Die voorgestelde simposium waaroor daar verlede jaar verslag gedoen is, is op 26 en 27 Oktober 1967 in Pretoria gehou.

Die volgende is 'n oorsig van die referate wat op die simposium gelewer is; die volledige referate is verkrygbaar van die Suid-Afrikaanse Instituut van Elektriese Ingenieurs.

Uitgesonderd die vergadering van die drie onderkomiteede is geen ander vergaderings gedurende die jaar gehou nie:—

##### 1. Hoëspanningstoets ter Bevordering van Standaardisasie deur J. C. van Alphen van die S.A.B.S.

Hierdie referaat handel oor die nuwe E.H.S.-toetslaboratorium van die S.A.B.S. wat die 3.2 MV-impuls-generator vir die toets van blits-afleiers, die berekening van ontladingparameters op 150 myl transmissielyste van 132 kV., impuls-toetsing van transformators en die toets van isolators op 'n hoogte van 6,000 vt. met betrekking tot korreksie vir seespieël-oorslagtoestande, ens., huisves.

sabotage activity. The prime purpose of the security lighting is to reveal to the security guards the presence of intruders in a prohibited area. The function of security lighting is to deter, reveal and assist in the arrest of intruders, apart from cloaking the movements of guards and watchmen. The merits of the alarm system where the security lightings are switched off until the alarm is raised, and the permanent system in which the security lighting is switched on from dusk to dawn, were discussed. The necessity for the use of robust lighting fittings to withstand missile impact, was stressed. Lighting levels, the use of dark clothing for watchmen, underground cables for distribution lines and the visual requirements of the guards, were discussed.

P. A. GILES,  
Representative.

#### REPORT OF THE LEVEL PRICE TENDERING SUB-COMMITTEE.

The convenor attended a meeting held at the Board of Trade offices on 5th April, 1967, and was advised that where resale price maintenance or level price tendering was evident it would be necessary for evidence to be drawn up and information given to the Board in respect of each incident.

A report by the Board of Trade and Industries on resale price maintenance was tabled in Parliament on 21st February, 1968.

P. A. GILES,  
Convenor.

#### REPORT OF THE CO-ORDINATION COMMITTEE FOR HIGH VOLTAGE FACILITIES.

The proposed symposium, reported last year, was held in Pretoria on the 26th and 27th October, 1967.

The following are brief details of the papers read at the symposium. These are available in full from the South African Institute of Electrical Engineers.

No other meetings were held during the year under review excepting those of the three sub-committees members.

##### 1. High Voltage Testing in the Promotion of Standardisation by J. C. van Alphen of the S.A.B.S.

This paper deals with the new S.A.B.S. E.H.V. Testing Laboratory to accommodate their 3.2 MV impulse generator for testing lightning arrestors, calculation of discharge para-meters on 150 mile, 132 kV transmission lines, impulse testing of transformers and testing insulators at 6,000 ft. with reference to correction for sea level flashover conditions, etc.

2. Hoëspanningsnavorsing en toetse in die Suid-Afrikaanse Elektriese Vervaardigingsnywerheid deur P. S. Harvey van die Eerste Elektriese Korporasie.

Dit is 'n oorsig van toetsprosedures in die vervaardigingsnywerheid met betrekking tot aanvaarbare standaarde en standaardisasie.

3. Die Nuwe Hoëspanningslaboratoriumfasiliteite aan die Universiteit Kaapstad deur G. H. Webster.

Dit is 'n beskrywing van die aanleg-plan van die Universiteit van Kaapstad se nuwe E.H.S.-laboratorium.

4. Hoëspanningsopleiding aan die Universiteit van Natal deur R. A. Hallawell.

Dit handel oor die E.H.S.-laboratorium van die Natalse Universiteit.

5. Deurslag van Isolasië as gevolg van Inwendige Ontlading deur J. P. Reynders (Witwatersrand Universiteit).

Dit bevat 'n beskrywing van meganismes en die teorie van inwendige wegsterwing en isolasiëdeurslag op verskillende spanningsterktepeile, asook metodes om dit vas te stel.

6. Toets van Hoëspanningstoerusting en -stelsels in Suid-Afrika deur P. W. Candy van E.V.K.

Dit gee in hooftrekke E.V.K. se toerusting- en standaardtoetse voordat die installasie in gebruik geneem word, en waardeur foute opgespoor en ontwerpdata nagegaan word, veral E.H.S.-instrumenttransformators, en 'n beskrywing van 'n corona-detektor.

7. Radiosteuring Verorsaak deur Hoëspanningsrade deur Prof. F. G. Heyman.

Dit handel oor faktore wat radiogeruis verorsaak en die meting daarvan, asook die invloed van die weer.

8. Weerlig en die Uitwerking daarvan op Hoë Strukture deur P. J. Malan (Bernard Price-instituut).

Die uitwerking wat hoë torings, soos die 746 vt. Hertzog-radiouitsaatoring, op weerlig in omliggende gebiede het.

9. Die Meting van Blitsgrondstraaldigtheid deur R. B. Anderson van die W.N.N.R.

Dit beskryf blitsstraaltellers en hul beperkings, asook die teorie van heen- en terugslaglofvorms.

R. W. LEISHMAN.  
Verteenwoordiger.

2. High Voltage Research and Testing in the South African Electrical Manufacturing Industry by P. S. Harvey of First Electric Corporation.

A review of test procedure in the manufacturing industry with reference to acceptable standards and standardisation.

3. The New H.V. Laboratory Facilities at the University of Cape Town by G. H. Webster.

A description of the layout of Cape Town University's new E.H.V. Laboratory.

4. High Voltage Training at the University of Natal by R. A. Hallawell.

Describes Natal University's E.H.V. Laboratory.

5. Breakdown of Insulation caused by Internal Discharges by J. P. Reynders (Witwatersrand University).

Describes mechanisms and theory of internal decay and failure of insulation at various levels of voltage stress and methods of detection.

6. Testing of H.V. Equipment and Systems in South Africa by P. W. Candy of E.S.C.

Gives outline of E.S.C.'s equipment and standard tests for commissioning plant, locating faults and checking design data, particularly E.H.V. instrument transformers and describes a corona detector.

7. Radio Interference caused by High Voltage Lines by Prof. F. G. Heyman.

Factors causing radio noise and their measurements and affects of weather.

8. Lightning and its effect on High Structures by D. J. Malan (Bernard Price Institute).

Effect of high towers such as 746 ft. Hertzog transmission tower on lightning in surrounding areas.

9. The Measurement of Lightning Ground Flash Density by R. B. Anderson of C.S.I.R.

Describes lightning flash counters and their limitations. Also gives theory of leader and return stroke wave-forms.

R. W. LEISHMAN,  
Representative.

#### VERSLAG VAN DIE STANDAARD BEDRADINGSREGULASIES VAN DIE S.A.I.E.I.

Sedert die publikasie van die „1966-wysigings” aan die begin van 1967 is daar, ten spyte van die stygende verkoopstempo van eksemplare, feitlik geen reaksie hierop of op die regulasies in die algemeen ondervind nie. Die onder-komitees van Natal en Wes-Kaapland, wat die hoof-komitee bestaan, was veral baie stil.

#### REPORT OF THE STANDARD WIRING REGULATIONS OF THE S.A.I.E.E.

Since the issue of the “1966 Amendments” at the beginning of 1967, there has been practically no reaction to these nor the regulations generally, despite soaring sales of copies. In particular the Natal and Cape Western sub-committees, which assist the main committee, have been particularly quiet.



Daar heers klaarblyklik algemene tevredenheid oor die praktiese toepassing van die regulasies in hul huidige vorm en dit is duidelik dat radikale wysigings slegs op dringende aandrang moet gesiek, ten einde herhaalde wysigings, wat verwarring meebring, te vermy. Dit word beklemtoon deur die mate waarin die regulasies in die Republiek posgevat het en ook vir eksamendeoelendes gebruik word.

Dit wil voorkom van die brandpunt van die hoof- en onder-komitee se werksaamhede gedurende 1968 sal voortspuit uit 'n studie van die grootliks gewysigde regulasies van die Londense I.E.E., waarvan die 14e uitgawe op 1 Oktober 1966 in werking getree het. Daarbenewens sal nuwe probleme waarskynlik ontstaan in verband met die bedradingsinstallasies van die nuwe „wolkekrabbers” wat besig is om die eerste keer in die Republiek hul verskyning maak en tans in aanbou is en waarvan die vereiste aanvaar tussen 4 en 22 MW wissel.

Ek doen 'n beroep op almal wat kritiek of positiewe voorstelle in verband met hierdie regulasies wil aanbied, om te sorg dat dié die sekretarisse van die S.A.L.E.I., Postbus 5907, Johannesburg, wil bereik.

R. W. LEISHMAN,  
Voorsitter.

#### OPLEIDING VAN INGENIEURS EN TEGNICI.

Ek vra die lede van my onder-komitee en van die V.M.E.O. om verskoning dat dit nie moontlik was om aktiewe samewerking gedurende die afgelope jaar te bewerkstellig nie. Dit is te wyte aan die feit dat die tyd wat ek wel aan hierdie saak kon afstaan, ten volle in beslag geneem is deur die ontwikkeling van fasiliteite in hierdie verband binne die Johannesburgse Elektriese-onderneming. Ek het gemeen dat indien die toepassing van nuwe idees as prakties uitvoerbaar bewys kan word, ons ondervinding in hierdie stadium meer vir die lede van die Vereniging sou beteken as „konsepsievoorstelle.”

Die Stadsraad van Johannesburg het die volgende goedgekeur vir toepassing gedurende 1967:

- (1) Indiensneming van matriculante as „tegniese klerke” met 'n beginsalaris van R1,200 per jaar, wat vir elke jaar waarin hulle in die tegnikusdiplomavakke van 'n jaarlikse kursus van vier maande aan die Tegniese Kollege, wat hulle voltyds en teen volle besoldiging by woon, seslaag het, erkenning in rang ontvang. Gelde word elke jaar terugbetaal nadat eksamens suksesvol afgelê is.

'n Superintendent met uitgebreide ondervinding is na uitdruing in diens gehou om voltydse aandag te bestee aan die ontwikkeling van die onderrig en in situ-opleiding van hierdie leerlinge (in ooreenstemming met die Basiese Opleidingsentrum vir Vak-leerlinge). Klem is gelê op stelselbediende, tegniese en tekenkantoorfunksies, verbruikerswerk van enige aard deur middel van „in situ-opleiding” by wyse

There is apparently a general satisfaction with the practical application of the Regulations as they stand and it will be clear that the motivation of radical alterations must stem from clamant demand in order to avoid too-frequent alterations which introduce confusion. This is emphasised by the extent to which the Regulations permeate the Republic and are used for examination purposes.

It appears that the main focus of activity by the Main and Sub-committees during 1968 will arise from a study of the considerably amended regulations of the London I.E.E., the 14th Edition of which became effective from 1st October, 1966. In addition new problems seem likely to arise in the wiring installations of the new “skyscraper” buildings appearing for the first time in the Republic and now under construction with notified demands ranging between 4 and 22 MW.

I appeal to all who have criticisms or constructive proposals regarding the Regulations to ensure that these reach the Secretaries of the S.A.L.E.E., P.O. Box 5907, Johannesburg.

R. LEISHMAN,  
Chairman.

#### TRAINING OF ENGINEERS AND TECHNICIANS.

I apologise to members of my sub-committee and the A.M.E.U. that it has not been possible to activate joint effort during the past year. This has been because such time as I have been able to devote to this field has been fully occupied developing facilities in this context within Johannesburg Electricity Undertaking. I have felt that if it can be shewn to be practicable to implement innovations, our experience will be more valuable to members of the Association than “draft proposals” at this stage.

Johannesburg City Council has approved for implementation during 1967 the following:—

- (1) Employment as “Technical Clerks” starting at R1,200 per annum, matriculants whose progress in grading is accelerated for each year of passing Technician's Diploma subjects via four months per annum full-time full-pay attendance at Technical College. Fees are refunded for each year on passing examinations.

A Superintendent of wide experience has been retained after retirement to devote full-time to developing teaching and site instruction for these trainees (paralleling the Apprentice Basic Training Centre). Emphasis is placed upon System Operating, Technical and Drawing Office functions, Consumer work of all kinds by “on the job instruction”



van besoeke en onderrig in alle aspekte van die Departement se werksaamhede, uitgesonderde geskoolde ambagwerk.

Spesiale personeelsalarisskale vir gekwalifiseerde „Senior Ingenieursassistent“ met 'n maksimum van R4,224 per jaar is ingestel. Volle digmatskap van die Vakkundige Inrigtings verleen aan hulle toelating tot die hoër ingenieursposte.

Die onderliggende doel hiervan is om 'n nuwe opnemingsveld vir matrikulante oop te stel wat nóg 'n vakleerlingskap nóg 'n universiteitskursus wil aanpak — die enigste twee toelatingskanale wat tot nog toe bestaan het. Dit verklaar ook die basiese rede vir die moeilikheid wat ondervind word met die werwing van beginners vir tegniese rigtings in mededinging met die handel, alhoewel 'n aansienlike persentasie matrikulante vandag tegniese rigtings wil inslaan.

- (2) Die uitbreiding van die geslaagde tweejaar-loodsplan vir „Personeelambagsmanne“ in die Elektrisiteitsafdeling na alle stadsraadafdelings. Vyftig persent van alle ambagsmanne word nog volgens die huidige uurtariewe betaal. Werkwaardeerdes het bepaal — nie op 'n persoonlike basis nie, maar op grond van werksverantwoordelikheid en vaardigheid — onder watter een van twee personeel ambagsmannedelings die res ressorteer.

Minder as 10% het die potensiaal vir Graad A met die vooruitsig om 'n superintendant te word en die orige 40% in Graad B, wat ongeveer 15% meer as die uurtarief verdien, plus volle „personeelvoorregte.“ Die poste word op die gewone manier geadvertiseer met die oog op mededingende aansoeke.

Ten spyte van 'n betjie opskudding is hierdie skemas nou suksesvol geloods.

- (3) Wat gekwalifiseerde Ingenieurs betref is die Raad daarvan oortuig dat die land se mannekrag heeltemal ontoereikend is en dat die aanwas wat daar wel is, te jonk is om hoogs verantwoordelike poste in die kragvoorsieningsnywerheid te beklee en sodende te vergoed in die uitdienstreding van die „ou garde“ binne die volgende dekade.

Vertoë word tot die verantwoordelike owerhede gerig om die tekort aan te vul d.m.v. werwing in die buiteland en die opeffing van taal- en burgerskapvereistes wat hul indienstreding vir 'n aanpassings tydperk van 7 jaar kan verhinder.

Die Universiteit is oorerred om nagraadse kursusse aan te bied bo en behalwe die van 'n suiwer tegniese aard om ingenieurs in staat te stel om hul studies op 'n latere leeftyd uit te brei. Die Raad verleen sy steun hieraan kragtens sy „Skema vir Gesubsidieerde Onderwys.“

R. W. LEISHMAN,  
Saamroeper.

by visits and instruction of every aspect of the Department's activities short of intruding upon artisan skills.

Special staff salary grades for qualified "Senior Engineering Assistants" have been established rising to R4,224 per annum. Admission to the Professional Institutions as Corporate Members admits them to higher engineering posts.

The underlying objective is to open a new induction field for matriculants who neither wish to undertake apprenticeship nor university courses — the only two admission avenues hitherto existing, this explaining a basic cause of difficulty in recruitment into technical spheres in competition with commerce although a considerable percentage of matriculants is today technically inclined.

- (2) Approval of the extension of the successful two-year pilot scheme for "Staff Artisans" in the Electricity Department to all Council Departments. Fifty per cent of all artisans remain on current hourly pay rates. Job evaluators have determined under which of two Staff Artisan Grades the remainder fall — not personally but by job responsibility and skill.

Less than 10% are Grade A leading towards Superintendant prospects and the remaining 40% Grade B earning about 15% more than hourly rates plus full "Staff Privileges." The posts are advertised in the normal way for competitive application.

Despite a modicum of agitation these schemes are now successfully launched.

- (3) Regarding qualified Engineers the Council is convinced that the country's output is totally inadequate and any increment too young to assume highly responsible posts in the power supply industry to make good retirement of the "old school" over the next decade.

Representations are being made to the responsible authorities to meet the shortfall by overseas recruitment and suspension of language and citizenship bars to their employment for a seven year acclimatization period.

The university has been persuaded to provide post-graduate courses even outside sheerly technical fields for Engineers to broaden their studies in later life. The Council supports these under its "Subsidised Education Scheme."

R. W. LEISHMAN,  
Convener.

VERSLAG VAN DIE SUID-AFRIKAANSE  
ELEKTROLITIESE KORROSIEKOMITEE.

Die hoofkomitee het sy tweede vergadering op 2 Augustus 1967 gehou en daar is berig dat streekveldkomitees toe reeds in werking was in Kaapstad, Durban en Johannesburg, terwyl stappe gedoen is om 'n vierde in Kimberley te stig, wat as die „Noordkaaplantse Streekveldkomitee insake Elektrolitiese Korrosie” bekend sal staan.

Daar is besluit dat elektrolitiese probleme wat in ander sentrums ontstaan, in die eerste instansie na die Elektrotegniese Ingenieur van die Suid-Afrikaanse Spoorweë en Hawens verwys moet word.

'n „Gebruikskode vir Kables en Pypleidinge wat onder Treinspore deurloop” is goedgekeur vir uitreiking aan belangstellendes. Onderkomitees is aangestel om verdere kodes op te stel wat die volgende onderwerpe dek :—

„Maatreëls teen elektrisiteit vir ondergrondse dienste wat pypleidinge kruis” en

„Katodeskerming vir ondergrondse strukture.”

Daar was geen verdere vergaderings tot Maart 1968 nie.

R. W. LEISHMAN,  
V.M.E.O.-verteenwoordiger.

REPORT OF THE  
SOUTH AFRICAN ELECTROLYTIC CORROSION  
COMMITTEE.

The Main Committee held its second meeting on 3rd August, 1967, and it was reported that Regional Field Committees were by then functioning at Cape Town, Durban and Johannesburg, while steps were being taken to establish a fourth at Kimberley styled as "The Cape Northern Electrolytic Corrosion Regional Field Committee."

It was decided that electrolysis problems which arise at other centres should be referred to the Electrical Engineer of the South African Railways and Harbours in the first instance.

A "Code of Practice for Cables and Pipelines Crossing beneath Railway Tracks" has been approved for issue to interested parties. Sub-committees have been appointed to draft further codes covering :—

"Anti-electrolysis measures for underground services crossing pipelines" and

"Cathodic protection of buried structures."

There have been no further meetings up to March, 1968.

R. LEISHMAN,  
A.M.E.U. Representative.



Foto 1 — Photograph 1



Foto 2 — Photograph 2

## 'N OORSIG VAN DIE GEBRUIK VAN ONDERGRONDSE HOËSPANNINGS- KABELNETWERK IN JOHANNESBURG

deur

G. MASSON,

Distribusiebedryfsingenieur.

### (1) INLEIDING:

Die fereraat wat mnr. W. Barnard by geleentheid van die 33ste Konvensie gelewer het, het geblyk eerder twyfel te laat ontstaan as kritiek uit te lok. Dit is dus van belang om die resultate wat uit hierdie ontwikkeling verkry is, in oënskou te neem, om wysigings in latere skemas aan te teken en om enkele gedagtes oor moontlike toekomstige ontwerpkenmerke uit te spreek.

### (2) WAT DAAR MET HOËSPANNINGSNETWERK BEOOG WORD:

Die hoofredes vir die ontwikkeling van hoëspanningsnetwerk kan kortliks soos volg opgesom word:—

## A REVIEW OF HIGH VOLTAGE UNDERGROUND CABLE RETICULATION PRACTICE IN JOHANNESBURG

by

G. MASSON

Distribution Engineer (Operating).

### (1) INTRODUCTION:

The paper presented to the 33rd Convention by Mr. W. Barnard appeared to arouse more misgiving than criticism. It is therefore of interest to consider the results obtained from this development, to record modifications in subsequent schemes and to express thoughts on possible future design features.

### (2) OBJECTS OF THE HIGH VOLTAGE RETICULATION:

The primary reasons for the development of the high voltage reticulation can briefly be summarised as follows:—



Foto 3 — Photograph 3



Foto 4 — Photograph 4

- (a) Die eerste en belangrikste rede was die uit-skakeling van swak spanningsregulering by die aansluitingspunte van verbruikers; dit is onvermydelik in die geval van 'n netwerk van ondergrondse of bogronde laespanningshoofleidings.
- (b) Estetiese verbeterings en laer instandhoudings-koste.
- (c) Verlaging in die netwerk-koste.
- (d) Die gerieflikheid wat gegroepde meters vir die voorsieningsowerheid meebring.

Daar kan die volgende oor hierdie punte in die volgorde waarin hulle voorkom, gesê word:

- (i) Waar daar geen laespanningsdistribusiekrag-net is nie en die hoëspanningstoever uit 'n transformator met aan-laspanningskontrolle en lynspannings-alkompensasie aangebring word, is die spanningsregulering feitlik perfek. Goë regulering het 'n toename in lasverbruik tot gevolg en die las baat op sy beurt by die hoër spanning.
- (ii) Foto's 1 — 4 hieronder illustreer die estetiese verbetering van die ondergrondse netwerk in vergelyking met 'n bo-grondse skema. Dit is foto's van straatonele in nuwe dorpsaanleggings wat op 'n hoëspanningsgrondslag van netwerk voorsien is.

**Foto 1:** Kensington: Blik op Langermanrylaan, voor die installering van mini-kiosks.

**Foto 2:** Kensington: Blik op Langermanrylaan na die bogronde krag-net afgetakel is.

**Foto 3:** Tipiese straatoneel by Montgomery Park.

**Foto 4:** Tipiese straatoneel by Triomf.

- (iii) Daar word gemeen dat die voordele wat hierdie soort netwerk inhou, 'n koste van tot 10% meer as die koste van 'n konvensionele bogronde laespanningsdistribusieskema regverdig.
  - (iv) Meters wat by die toevospunt saamgegroepeer is, het 'n besparing in die meterlesertyd tot gevolg, en roetine-meteromruiling word ook heelwat vereenvoudig.
- (3) MONTGOMERY PARK: BEDRYFSONDERVINDING EN FINALE KOSTE:**
- Dit kan dalk van belang wees om die bedryfsonder-vinding ten opsigte van sommige van die twyfel-punte wat geopper is toe die referaat oor hierdie skema die eerste keer gelewer is, op te som.

**(a) Verbruikersaanvraag:**

In die geval van verbruikers wie se voor-ver-skedenheidsaanvraag 12 kVA was, is die na-verskedenheidsaanvraag op 5 kVA geskat. Die mening is gelug dat, hoewel daar in die geval van 'n groep van 100 verbruikers 'n m.n.v.a. van die aard vermag kan word, 'n baie hoër syfer

- (a) First and foremost was the elimination of the bad voltage regulation at the consumers terminals which is inevitable on a network of underground or overhead low voltage mains.
- (b) Aesthetic improvements and reduced main-tenance costs.
- (c) Reduction in the cost of reticulation.
- (d) The convenience to the supply authority in having meters grouped.

Dealing with these points seriatim it can be said:

- (i) Where there are no low voltage distribution mains and the high voltage supply is fed from a transformer with on-load voltage control and line drop compensation the voltage regulation is well high perfect. Good regulation does result in increased consumption from load which benefits from the higher voltage.
- (ii) The Photographs 1-4 below illustrate the aesthetic improvement of the underground reticulation as compared to an overhead scheme and show street scenes in new townships reticulated on a high voltage basis.

**Photograph 1:** Kensington: View before the installation of Mini-Kiosks, Langerman Drive.

**Photograph 2:** Kensington: View after the overhead mains were dismantled, Langerman Drive.

**Photograph 3:** Typical street scene at Montgomery Park.

**Photograph 4:** Typical street scene at Triomf.

- (iii) It is considered that the advantages of this type of reticulation justify an increase of up to 10% over the cost of a conventional low voltage overhead distribution scheme.
  - (iv) Meters grouped at the supply point result in a saving in meter readers' time and routine meter changing is very much simplified.
- (3) MONTGOMERY PARK: OPERATING EXPERIENCE AND FINAL COST:**
- It may be of interest to summarise the operating experience in respect of some of the misgivings expressed when the paper on this scheme was first presented.

**(a) Consumer Demand:**

An after diversity demand of 5 kVA was estimated for the consumers whose before diversity demand would be 12 kVA. The opinion was expressed that whilst such an s.d.m.d. may be expected for a group of 100 consumers, a much higher figure should be expected for groups of

verwag moet word in die geval van groepe van twaalf. Toetse het bewys dat, hoewel 'n verbruikersaanvraag van 12 kVA algemeen is, die n.v.a.-syfer, soos dit in die mini-kiosks van die dorpsaanleg gemeet is, nie hoër as 4 kVA is nie. 'n Interessante punt is dat die maksimum aanvraag-lesings in die geval van drie kiosks wat 9, 10 en 11 verbruikers voer, onderskeidelik 'n m.n.v.a. van 3.85, 3.65 en 3.5 aangegee het.

(b) **Toevoerkontinuiteit:**

Die mening is gelug dat 'n standaard ondergrondse netwerkskema wat by 11 kV werk en van ringhoofisolators, ens. voorsien is waar die laespanningsdistribusie onderling tussen die substasies verbind is, 'n baie veiliger toevoer as die hoëspanningsdistribusieskema tot gevolg sal hê. Agt jaar is natuurlik 'n kort tydperk in die lewensduur van 'n ondergrondse netwerkskema, maar bedryfsondervinding wat tot nog toe baie bevredigend en het goed vergelyk met die standaard van ondergrondse laespanningsnetwerkskemas elders in die Stad.

Toe die skema oorspronklik beplan is, was die voorname om isolators by elke diens kabel aan te bring en hierdie voorstel is met reg gekritiseer op grond daarvan dat 'n fout by 'n verbruiker se diens kabel 'n onderbreking by 12 verbruikers tot gevolg sal hê. Teen 'n ietwat hoër koste is die isolators vervang deur miniatuurstroombrekers wat op so 'n wyse volgens 'n lasuitkinkkromme gestel is dat hulle kon diskrimineer en die miniatuurstroombreker is op die verbruiker se perseel geïnstalleer.

(c) **Meters:**

Daar is van verbruikers vereis om 'n meterhouer by die ingangspunt van hul perseel te verskaf, en die miniatuurstroombreker, wat bedoel is om die diens kabel teen oorbelasting te beskerm, word hierin gehuisves. Daarbenewens is beplan dat hierdie houer ook nog 'n meter kan hou in gevalle waar 'n verbruiker daarop aandring dat hy toegang tot sy eie meter wil verkry om sy verbruik te kan lees. Tot dusver het ons nog geen versoeke gehad van verbruikers wat toegang tot hul meters wil hê nie, en dit wil voorkom asof weinig huishoudelike verbruikers enigiens daarin belang stel om hul eie meters te lees.

Daar dien op gelet te word dat die bewering bemaak is dat groepering van verbruikers se meters in die kiosk aansienlike besparing in meterlesertyd tot gevolg het. Dit is beslis die geval waar verbruikers se elektrisiteitsmeters so ver as 150' van die voorste grenslyn van die standplaas geplaas kan word. Die meterleser moet egter dan nog by elke standplaas aangaan ten einde die watermeter te lees en indien 'n regulasie gemaak sou word wat die verbruiker verplig om 'n elektrisiteitsmeter by die voorste grens van sy eiendom te voorsien, verkieslik naby die watermeter, dan sou hierdie aanspraak op

twelve. Tests have shown that whilst consumer demands of 12 kVA are common, the after diversity figure is not more than 4 kVA as measured in the township mini-kiosks. It is interesting to note that the maximum demand readings on three kiosks feeding 9, 10 and 11 consumers gave an a.d.m.d. of 3.85, 3.65 and 3.5 kVA respectively.

(b) **Continuity of Supply:**

The opinion was expressed that a standard underground reticulation scheme operating at 11 kV with ring main isolators etc. and with the low tension distribution interconnected between substations, would result in a very much safer supply than the high voltage distribution scheme. Eight years is of course a short period in the life of an underground reticulation scheme but the operating experience to date has been very satisfactory and quite up to the standard of underground low tension reticulation schemes elsewhere in the city.

When the scheme was originally planned it was proposed to instal isolators on each service cable and this proposal was justly criticised on the basis that a consumer's service cable fault would isolate 12 consumers. At a slightly higher cost the isolators were replaced with miniature circuit breakers set to a load tripping curve to provide discrimination with the miniature circuit breaker installed at the consumer's premises.

(c) **Meters:**

Consumers have been required to provide a meter receptacle at the point of entry to their premises and this houses the miniature circuit breaker which functions to protect the service cable against overload. It was planned that this receptacle could house in addition, a meter in cases where a consumer demands access to his meter for consumption reading purposes. To date we have had no requests for access to the consumer's meter and it would seem that few domestic consumers are interested in reading their own meters.

It should be noted that the claim was made that grouping of consumers' meters in the kiosk results in considerable saving in meter readers' time and this is definitely the case where consumers' electricity meters can be located as far as 150' from their front stand boundary. There is however still the necessity for the meter reader to call at every stand in order to read the water meter and if a regulation were to be introduced making it compulsory for the consumer to provide an electricity meter receptacle on the front boundary of his property and preferably near to the water meter, then the claim of



tydsbesparing nie meer geld nie. Hierdie voorstel sal nie veel byval by verbruikers vind nie, en om voorsiening te maak vir die enkele verbruiker wat toegang tot sy meter vereis, word nie aanbeveel nie.

(d) **Onderhoud:**

Vanuit hierdie oogpunt beskou, was die skema baie bevredigend. Daar was nog geen foute by die enkelfasehoëspanningskabels, die lugdigver-seelde transformators of die laespanningsdiens-kabels van die verbruikers nie. Weens die tekort aan pvc-kabelvoorrade is 'n sekere hoeveelheid papiergeïsoleerde kabel gebruik om straatverligting te verskaf; hoewel daar by die pvc-geïsoleerde kabels geen foute ontstaan het nie, het 'n aantal papiergeïsoleerde kabelte by die mik binne-in die voetstukke van straatverligtings pale geraak. Hierdie kabels is met droë ente afgeheg en blykbaar was aansweling aan die voetstuk van die paal die oorsaak van die defek. Die probleem is deur middel van ventilasie opgelos. Die algehele afwesigheid van dienskabelfoute soos die wat soms deur weerlig by 'n bogronde netwerk veroorsaak word, het bygedra tot 'n verbetering in die kontinuiteit van die toevoer aan verbruikers.

(e) **Enkel-teenoor Driefaseaansluiting:**

Die mening is gelug dat die afwesigheid van 3-fase-toevoer ongerief aan verbruikers sou veroorsaak. Dit was nie die geval nie en die standaard 80-ampere-enkelfaseaansluiting het voldoende en heeltemal bevredigend vir verbruikers geblyk te wees, selfs vir diegene wat gewone huistipe swembaddens geïnstalleer het.

Verbruikers ontvang hulle toevoer via 'n 2-aar-kabel van 0.0225 vk dm oor 'n afstand van tot en met 240'; 'n 2-aar-kabel van 0.04 vk dm oor afstande van meer as 240', maar hoogstens 440'; en 'n 2-aar-kabel van 0.06 vk dm oor afstande van meer as 440', maar hoogstens 600'. Dit is die maksimum lengte kabel wat van 'n mini-kiosk af verskaf word.

(f) **Finale koste:**

Die finale koste van die skema het altesame R93,100 beloop en bestaan uit die volgende:—

Enkelfasehoëspanningsverdelers	...	R26,800
*Bykomende koste van diensaansluitings	...	R5,800
Kiosks en skakeltuig	...	R36,100
Straatverligting	...	R15,100
Kioskfondamente en skakelhuis	...	R3,600
Grootmaattoevoer na dorp 0.25 x 3-aar	...	R5,700
		<hr/>
		R93,100

\*Verbruikers betaal gewoonlik die koste van 'n 2-aar-diens-kabel van 0.0225 vk dm en waar dit nodig was om 'n lang kabel met 'n deursnee van 0.04 vk dm te lê, het die netwerkskema die bykomende verskil in die koste betaal.

time-saving may fall away. This suggestion would not find much favour with consumers and to cater for the odd consumer who requires access to his meter is not recommended.

(d) **Maintenance:**

The scheme has been very satisfactory from this aspect. There have been no faults on the single phase high voltage cables, the hermetically sealed transformers or the consumers' low voltage service cables. Due to shortage of stocks of P.V.C. cable a certain amount of paper insulated cable was used to supply street lighting and whilst no faults developed on the P.V.C. insulated cables, a number of paper insulated cable ends failed at the crutch inside street lighting pole bases. These cables were made off with dry ends and it seems that sweating at the base of the pole has been responsible for the failures. This has been overcome by the provision of ventilation. The complete absence of service cable faults such as are caused by lightning on an overhead network has contributed to improved continuity of supply to consumers.

(e) **Single Versus Three Phase Connections:**

The opinion was expressed that the non-availability of 3-phase supply would cause inconvenience to consumers. This has not proved to be the case and the standard 80 ampere single phase connection has proved adequate and quite satisfactory for consumers even for those who have installed the usual domestic type of swimming pool. Consumers are supplied via an 0.0225 sq. in. x 2-core cable for distance up to and including 240', 0.04 sq. in. x 2-core cable for distance over 240' but not exceeding 440' and 0.06 sq. in. x 2-core cable for distances exceeding 440' but not more than 600' which is the maximum length supplied from a mini-kiosk.

(f) **Final Cost:**

The final cost of the scheme amounted to R93,100 and is made up as follows:—

Single phase H.V. distributors	...	R26,800
*Additional cost of service connections	...	R5,800
Kiosks and switchgear	...	R36,100
Street lighting	...	R15,100
Kiosk foundations and switch-house building	...	R3,600
Bulk supply to township 0.25 x 3-core	...	R5,700
		<hr/>
		R93,100

\* Consumers are normally charged with the cost of an 0.0225 sq. in. x 2-core service cable and where it was necessary to lay a long cable of 0.04 sq. in. section the extra cost difference was charged to the reticulation scheme.

**(4) HOESPANNINGSNETWERKSKEMAS WAT LATER TOT STAND GEKOM HET:**

Ingevolg die Stadsraad se standaardvoorwaardes, word daar van die ontwikkelaars van nuwe dorpe verwag om die koste van die werk wat in vrband met die netwerk gedoen moet word, te deponeer en die bedrag is terugbetaalbaar sodra die skema betaalbaar word ingeval die Raad se standaard betaalbaarheidsformule. Dit was egter tot nog toe die beleid van die Raad om die elnaar te versoek om slegs genoeg te deponeer om die tempo van die dorp se uitbreiding die hoof te bied. Dit bring mee dat die werk stuksgewys uitgevoer word en wel in so 'n mate dat gedeeltes en stukke van gedeeltes van 'n dorp van 'n netwerk voorsien word en die dorp hom dan nie maklik tot die aanvaarding van hoëspannings-distribusie leen in. Daarbenewens is dorpe wat in die jongste jare van netwerke voorsien is op rotsagtige terrein aangelê en kon ons nie soveel dorpe op 'n hoëspanningsgrondslag voorsien as wat ons graag sou wou nie.

**(a) Kensington: Langermanrylaan/Robertslaan:**

Die laespanningsnetwerkatelstel in dele van Kensington is ouer as 40 jaar en sommige dele daarvan het 3-aar- ondergrondse kables waar gebruik gemaak word van twee fases en 'n nulgeleier van die driefase-vierdraadstelsel. Die spanningsregulering in die omgewing van Langermanrylaan tussen die munisipale grens en Marathonstraat was baie swak en om die toestand ietwat te verbeter, is besluit om 'n hoëspanningsdistribusiestelsel met mini-kiosks te installeer. Omdat dit 'n klas "A"-pad en 'n hoofverkeersweg na en van Jan Smuts-lughawe is, is daar gemeen dat Langermanrylaan om estetiese redes geen onooglike bo-grondse kragnet, bestaande uit laespanningsverdelers, oortollige traksie en straatlighoofveldings, soos in foto no. 1 aangetoon, met beval nie. Daar is reeds begin en 'n moderne stelsel van straatverligting soos in foto no. 2 aangetoon, is in die deel van die munisipale grens af tot by Marathonstraat aangebring.

Om voorsiening vir besigheidpersele en woonstelle op 'n baie klein deeltjie van die roete te maak, is spesiale laespanningskables van 'n lasentrum daar naby af aangelê; dit sal in die behoeftes van hierdie verbruikers, wat meer as net die standaard 80-ampère-enkelfaseverbinding vereis, voorsien. Mini-kiosks is geïnstalleer om in huishoudelike verbruikers se behoeftes te voorsien.

Dit was nodig om eers verbruikers se samewerking te bekom vir die verkryging van persele vir die mini-kiosks en om goedkeuring te verkry vir die verskuiving van die meters van die huise af na die mini-kiosk. Die ekonomiese en estetiese voordele is per brief aan die inwoners verduidelik en die hele skema is sonder veel probleme gereël. Die kiosk is in drie dele ingedeel; elke deel is

**(4) SUBSEQUENT HIGH VOLTAGE RETICULATION SCHEMES:**

In terms of the City Council's standard conditions, new township developers are called upon to deposit the cost of the reticulation work to be done and this amount is refundable when the scheme becomes payable in terms of the Council's standard pay-ability formula. It has however been the Council's policy to call upon the owner to deposit only sufficient funds to meet the requirements of the tempo of township development. This results in piecemeal work to the extent that townships are reticulated in sections and portions of a section and does not readily lend itself to the adoption of high voltage distribution. In addition townships reticulated over recent years have been developed in areas where the terrain is rocky and we have not therefore reticulated as many townships on the high voltage basis as we would have liked to have done.

**(a) Kensington: Langerman Drive/Roberts Avenue:**

The low voltage reticulation system in portions of Kensington is more than 40 years old and consists in some parts of underground 3-core cables utilising 2-phases and neutral of the 3-phase, 4-wire system. The voltage regulation in the vicinity of Langerman Drive between the Municipal boundary and Marathon Street was very bad and to give relief it was decided to instal a high voltage distribution system with mini-kiosks. Being a Class "A" road and an arterial roadway for traffic to and from the Jan Smuts Airport it was felt that for aesthetic reasons, Langerman Drive should be cleared of unsightly overhead mains consisting of low voltage distributors, redundant traction and street lighting mains which are illustrated in Photograph 1. A start has been made and the section from the Municipal boundary to Marathon Street has been completed with a modern system of street lighting as shown in Photograph 2.

To cater for business premises and flats on a very short section of the route, special low voltage cables were laid from a nearby load centre to supply these consumers whose demand was in excess of the standard 80 ampere single phase connection and mini-kiosks have been installed to cater for the domestic consumers. It was necessary to seek the co-operation of consumers firstly to obtain sites for the mini-kiosks and to obtain agreement to the meters being transferred from the house to the mini-kiosk. The economic and aesthetic advantages were explained to the residents by letter and the whole scheme was arranged without undue difficulty. The kiosk layout is divided into three sections, each section being supplied with single phase and controlled by an oil circuit breaker. This

van enkelfasetoever voorsien en word deur 'n oliestroombreker beheer. Hierdie indeling maak 'n redelike lasbalans moontlik en die drie stroombane is in 'n ring verbind sodat 'n alternatiewe toevoerbron beskikbaar is in geval 'n kabel defek raak. Die enkelfasekiosk beskik oor 'n transformator met 'n kapasiteit van 65 kVA en het plek vir 12 verbruikermeters.

Die hoë koste per standplaas kan toegeskryf word aan moeilike uitgrawingswerk, die insluiting van die koste van laespanningskabels van die kiosk af tot op die plek waar die bestaande dienskabels na die nuwe lessentrum weggelei is, plus 'n bedrag van R8,623 wat aan die herstel van teersypaadjies en padoorgange bestee is.

(b) **Triomf:**

Hierdie ekonomiese behuiskema is deur die Departement van Gemeenskapbou ingestel en huise vir verkoop aan gesinne met 'n totale inkomste van hoogstens R180 per maand in die geval van 'n gesin met twee kinders, is opgerig. Omdat dit 'n betreklik lae inkomstegroep is, is daar besluit om 'n na-verskeidenheidsaanvraag van 3 kVA per klient te voorsien, ten spyte daarvan dat 'n 2-kW-waterververmer en 'n 3-plaatstof in elke huis geïnstalleer is.

Nege-en-sestig mini-kiosks met 'n kapasiteit van 65 kVA elk is aangebring om in die behoeftes van 1,172 standplase te voorsien en elke kiosk kan 20 verbruikermeters huisves. Die indeling is sodanig dat dit teen redelike koste versterk kan word indien bykomende transformator-kapasiteit later nodig blyk te wees. Die eerste van hierdie lessentrums is in November 1963 in gebruik geneem en die skema is in Julie 1966 voltooi.

Gedurende die strawwe winter van 1966 was die maksimum na-verskeidenheidsaanvraag vir kiosks wat toevoer na 20 verbruikers voorsien het 3.2 kVA. Kritiek teen die skema kan daarop gegrond word dat die reserwetransformator-kapasiteit klein is, maar daar word gemeen dat as gevolg van die korte duur van die winterspitstyd die oorbelasvermoë van die transformators op 'n winter-nag wanneer die omringende temperatuur laag is, voordelig gebruik kan word.

(c) **Victory Park-Uitbreiding No. 18:**

Hierdie dorpsaanleg bestaan uit 62 standplase van ½-acre elk en word van een skakelstasie van baksteen af deur ses mini-kiosks bedien. Die maksimum getal standplase wat hulle toevoer van een kiosk af ontvang, is elf en die maksimum na-verskeidenheidsaanvraag per verbruiker is 5 kVA.

Die standplase in hierdie dorpsaanleg is duur en 'n verdere toename in die las kan verwag word. Indien nodig, kan die kapasiteit van die netwerk maklik versterk word.

layout enables a reasonable loading balance to be maintained and the three circuits are ringed to give an alternative source of supply in the event of a cable failure.

The single phase kiosk has a transformer of 65 kVA capacity and housing is provided for 12 consumers' meters.

The high cost per stand can be attributed to hard digging, the inclusion of low voltage cable costs from kiosk to the points where the existing service cables were diverted to the new load centre, plus an amount of R8,623 spent on the reinstatement of tarmac pavements and road crossings.

(b) **Triomf:**

This economic housing scheme was established by the Department of Community Development and houses were built for sale to families whose total income had to be not more than R180 per month for a family with two children.

Because of the relatively low income group it was decided to cater for an after diversity demand of 3 kVA per consumer in spite of the fact that a 2 kW water heater and a 3-plate stove has been installed in every house.

Sixty-nine mini-kiosks each of 65 kVA capacity have been provided to cater for 1,172 stands and each kiosk has accommodation for 20 consumers' meters. The layout lends itself to reinforcement at reasonable extra cost if at some future date additional transformer capacity is found necessary. The first of these load centres was put into service in November 1963 and the scheme was completed in July 1966.

During the severe Winter experienced in 1967, the maximum after diversity demand on kiosks feeding 20 consumers was 3.2 kVA. The scheme might be criticised on the basis that little transformer capacity is now available but it is felt that with the short duration of a Winter peak we can take advantage of the overload capacity of the transformers on a Winter night when the ambient temperature is low.

(c) **Victory Park Extension No. 18:**

This township comprises 62 ½-acre stands and is served by six mini-kiosks fed from one brick switching station. The maximum number of stands fed from a kiosk is 11 and the a.d.m.d. per consumer is 5 kVA.

This is a township of expensive stands and further load growth can be expected. When necessary the capacity of the reticulation can be readily reinforced.

**(5) WYSIGING VAN DIE KONSTRUKSIESTANDAARDE TE MONTGOMERY PARK:**

**(a) Substasies:**

Die eerste kiosks was 4' 6" x 4' 6" x 3' 6" hoog met 'n afsonderlike kompartement vir 'n lugdig-verseelde transformator wat in sy eie tenk gehuisves is. In die geval van die dorpe wat daarna van netwerke voorsien is, het ons gemeen dat die kiosks so ontwerp moet wees dat dit of op die spaaadjies aangebring kon word of so onopsigtelik moontlik teruggeskuif kon word sodat dit deel van die heining voor uitmaak. Aanvanklik is hierdie kiosks as 'n eenheid met drie kompartemente verskaf vir onderskeidelik die meterpaneel, die transformator-kern en die entkaste van die hoëspanningskabels. Daarna is die kiosks as drie afsonderlike eenhede wat aanekaar vasgebou is, vervaardig. Die voordeel van laasgenoemde tipe konstruksie is dat die transformator-kompartement, indien nodig, verwyder kan word. Ons moes wel die kern en wikkeling van een van die kiosks by Triomf, wat as gevolg van 'n fabrieksfout defek geraak het, vervang, maar dit het geen probleme opgelewer nie.

**(b) Kiosktoerusting:**

Hoëspanningskerings met 'n kapasiteit van 10 ampère is as foutbeveiliging vir die kiosks te Montgomery Park aangebring, terwyl verbruikers-miniaturstroombrekers transformatoroortroombeveiliging verseker. Aangesien transformatorfoute selde voorkom, is die hoëspanningskerings egter by daaropvolgende skemas weggelaat.

Soos reeds gesê, is miniaturstroombrekers in die kiosks geïnstalleer as foutbeveiliging vir die dienskabels van verbruikers.

In elke mini-kiosk is aardfoutaanwysers aan die uitgaande hoëspanningskabels aangebring en na ons mening is die ekstra koste verbonde aan hierdie aanwysers heeltemal geregtig.

**(6) TABEL VAN VERGELYKENDE KOSTE:**

In tabel 1 word die werklike koste van die voltooide werk per standplaas uiteengesit, sowel as die koste daarvan om 'n dorp volgens die Stadsraad se standaard bogronde laespanningnetwerkdistribusiestelsel, wat by die Konvensie van 1959 as 'n „nie-standaard stelsel” bestempelsel is, van 'n netwerk te voorsien. Na ons mening moet kostevergelykings van die aard besonderhede van die grootte van die standplaas, die frontlengte daarvan en die na-versekeidheidsaanvraagwaarde waarvoor voorsiening gemaak word, aantoon, aangesien hierdie faktore 'n aansienlike uitwerking op die koste van die skema het. Daarbenewens sal ek kommentaar oor die uiteindelik uitgawesfers wat verkry is, lewer en die verskil in koste probeer regverdig.

**(5) MODIFICATIONS TO THE MONTGOMERY PARK CONSTRUCTION STANDARDS:**

**(a) Substations:**

The first kiosks measure 4' 6" x 4' 6" x 3' 6" high and had a separate compartment for a hermetically sealed transformer housed in its own tank. For the subsequent townships reticulated we felt that the kiosks should be designed for either pavement mounting or to be set back as nonobtrusively as possible to form part of the front boundary fence. These kiosks initially were supplied as a unit with three compartments to house the meter panel, the transformer core and the high voltage cable and boxes respectively. Subsequent kiosks were manufactured as three separate compartments bolted together. This latter form of construction has the advantage that the transformer compartment can be removed if necessary. We did find it necessary to replace the core and windings of one of the Triomf kiosks which failed as a result of a manufacturing defect and this was however accomplished without difficulty.

**(b) Kiosk Equipment:**

High voltage fuses of 10 ampere capacity were provided as fault protection of the Montgomery Park kiosks and transformer over-current protection was catered for by the consumers' miniature circuit breakers. On the subsequent schemes the high voltage fuses have been omitted since the incidence of transformer faults is rare.

As previously stated miniature circuit breakers have been installed in the kiosks to give fault protection to the consumers' service cables.

Earth fault indicators have been installed on the out-going high voltage cables in each mini-kiosk and we consider the extra cost of these indicators fully justified.

**(6) COST COMPARISON TABLE:**

Table I sets out the actual cost per stand of completed work, together with the cost to reticulate a township by the City Council's standard low voltage overhead mains distribution which was referred to at the 1959 Convention as a "non-standard system".

It is felt that cost comparisons of this nature should give details of the stand size, its frontage and the after diversity demand value catered for since these factors have an important bearing on the cost of the scheme. In addition I will comment on the expenditure results attained and endeavour to justify the difference in costs.

TAFEL 1 — KOSTEVERGADERING

Dorp	STANDPLASE			NETWERK		Koste Uitgesonderd Straatverligting		Na-verskeidenheidsaanvraag		Jaar waarin voltooi is
	Nr.	Grootte Acre	Gemiddelde Straatfront	Hs. Og.	Bg.	Hele Dorp	Per standplaas	Voorsiening per standplaas	Gemeet	
Montgomery Park	468	3/16 tot ½	63'	Ja	—	R78,000	R166	6 kVA	4 kVA	1961
Triomf	1,172	½	50'	Ja	—	R336,000	R287	3 kVA	3 kVA	1966
Victory Park-Uitbreiding Nr. 18	63	½	125'	Ja	—	R25,780	R409	6 kVA	5 kVA	1965
Kensington	140	½ tot ½	50'	Ja	—	R50,224	R358	5 kVA	5 kVA	1964
Bramley Gardens	160	½ tot ½	105'	—	Ja	R56,400	R352*	6 kVA	6 kVA	1966

\* Sluit pale en netwerk vir straatverligting in, maar nie toebehoere en steunstukke nie.

TABLE I — COMPARISON OF COSTS

Township	STANDS			RETICULATION		Cost Excluding Street Lighting		After Diversity Demand		Year Work Completed
	No.	Size Acre	Average Street Frontage	H.V. U.G.	O.H.	Whole Township	Per Stand	Catered For Per Stand	Measured	
Montgomery Park	468	3/16 to ½	63'	Yes	—	R78,000	R166	6 kVA	4 kVA	1961
Triomf	1,172	½	50'	Yes	—	R336,000	R287	3 kVA	3 kVA	1966
Victory Park Extension No. 18	63	½	125'	Yes	—	R25,780	R409	6 kVA	5 kVA	1965
Kensington	140	½ to ½	50'	Yes	—	R50,224	R358	5 kVA	5 kVA	1964
Bramley Gardens	160	½ to ½	105'	—	Yes	R56,400	R352*	6 kVA	6 kVA	1966

\* Includes poles and street lighting mains but not fittings and brackets.

(a) **Kensington:**

Hierdie koste behoort nie in aanmerking geneem te word nie, aangesien die werk wat gedoen is wysigings aan 'n bestaande skema behels het en selfs veranderings aan die bedragsinstallasies van verbruikers ingesluit het. Dit kan dus nie as ware uitgawes aan 'n hoëspanningsnetwerk beskou word nie.

(c) **Victory Park:**

Die hoë koste per standplaas is daaraan toe te skryf dat die skema die koste van 'n hoëspanningsvoerder en -skakelstasie van baksteen moes dra. Dit beteken dat daar een stasie vir elke 63 verbruikers is, terwyl Montgomery Park en Triomf onderskeidelik 468 en 586 verbruikers per stasie het.

(c) **Montgomery Park en Triomf:**

Die redes vir die verskil in die koste van hierdie twee skemas kan soos volg opgesom word:—

- (i) In die tyd wat tussen die installering van hierdie skemas verloop het, het die prys van arbeid sowel as materiaal gestyg.
- (ii) Uitgrawingswerk te Triomf was moeilik weens die hardheid van die terrein terwyl die terrein te Montgomery Park sag was. Die hoër koste van uitgrawings te Triomf kan egter teen die besparing op die koste van grootmaatvoerokabels verreken word, aangesien gebruik gemaak is van hoëspanningstoever wat vir die voormalige dorp Sophiatown, waar Triomf sedertdien gestig is, geïnstalleer is.
- (iii) Die Triomf-skema sou ongeveer R50 per standplaas duurder gewees het indien die skema so ontwerp was dat dit vir 'n m.n.v.a. van bv. 6 kVA per standplaas voorsiening gemaak het.

(d) **Bramley Gardens:**

Die kragnet in hierdie dorp maak vir 'n m.n.v.a. van 6 kVA per standplaas voorsiening, maar ten einde vir 'n spanningsval voorsiening te maak, is meer transformatorokioske opgerig as wat met die oog op belasting nodig is. Die bedrag van R352 per standplaas sluit pale en hoofleidings vir straatverligting in en moet met ongeveer R30 per standplaas verminder word om die vergelykende koste te verkry.

(7) **BESPREKING:**

(a) **Bogronde Lae-teenoor Hoëspanningsdistribusie:**

Dit blyk dat dit moontlik is om 'n hoëspanningsnetwerkskema te installeer teen 'n prys wat gunstig met die van die Raad se standaard bogronde netwerk vergelyk, mits uitgrawings in betreklik sagte terrein plaasvind en die dorp uit minstens 300 to 400 standplase bestaan om die hoëspanningskabelstasie te regverdig.

(a) **Kensington:**

These costs should be disregarded since the work carried out involved modifications to an existing scheme and even include alterations to consumers' wiring installations. It cannot therefore be regarded as expenditure on a true high voltage reticulation.

(b) **Victory Park:**

The cost per stand is high due to the fact that the scheme has been charged with the cost of a brick high voltage feeder and switching station, i.e. one station for 63 consumers whereas Montgomery Park and Triomf have 468 and 586 consumers respectively per station.

(c) **Montgomery Park and Triomf:**

The reasons for the difference in cost between these two schemes can be summarised as follows:—

- (i) During the interval between the installation of these schemes prices of labour and materials increased.
- (ii) The digging at Triomf was hard whereas soft digging was encountered at Montgomery Park. The increased cost of digging at Triomf can however be offset against the saving in bulk supply cable cost since use was made of the high voltage supply installed to serve the old township of Sophiatown on which ground Triomf was established.
- (iii) The cost of the Triomf scheme would have been approximately R50 per stand higher had the design of the scheme catered for an a.d.m.d. of say 6 kVA per stand.

(d) **Bramley Gardens:**

The mains in this township cater for an a.d.m.d. of 6 kVA per stand but to cater for voltage drop, more transformer kiosks were established than are necessary from the loading point of view. The figure of R352 per stand includes poles and mains for street lighting and should be reduced by say R30 per stand to obtain a comparable cost.

(7) **DISCUSSION:**

(a) **Overhead Low Tension Versus High Voltage Distribution:**

It seems that a high voltage reticulation scheme can be installed at a price comparable to the Council's standard overhead reticulation if the digging is reasonably soft and there are at least 300 to 400 stands in the township to justify the high voltage switching station.



By Montgomery Park en die latere skemas is die spanningsregulering op verbruikers se persele maklik binne die perke van die statutêre vereiste van omtrent 5% gehou. In die geval van grondse netwerkdistribusie is dit egter uiters moeilik.

(b) **Enkel-teenoor Driefasiedistribusie:**

Dit wil voorkom asof daar vandag 'n neiging ten gunste van 3-fase-hoëspanningsdistribusie is en ek stem saam dat 3-fase-distribusie baie besliste voordele inhou waar daar vir 'n aantal verbruikers voorsiening gemaak word in wye se aanvraag 'n 80-ampère-enkelfaseaansluiting nie kan voorsien nie. My redes vir hierdie keuse is soos volg:—

(i) Die 3-fase-transformator met 'n kapasiteit van meer as 50 kVA kan gewoonlik kleiner gemaak word as die enkelfase-eenheid van gelykwaardige kapasiteit en dit kan belangrik wees in gevalle waar die kiosk op die voorste grenslyn van 'n perseel of op 'n syaadjie aangebring gaan word.

(ii) Dit is dikwels noodsaaklik dat verbruikers wye se belasting 'n m.n.v.a. van hierdie omvang bereik, 'n 3-fase-toevoer beskikbaar het en ek meen dat dit sal help om 'n gebalanseerde belasting in die dorp in sy geheel te verseker indien sulke verbruikers oor 'n 3-fase-diensaansluiting beskik.

Indien 'n mens bereid is om 'n agtergrensnetwerk te aanvaar, kan driefasiedistribusie ook besparend wees. Dit beteken dat indien die meters in die kiosk saamgegroeper is, 'n 4-aa-kabel gelê word om drie enkelfaseverbruikers te bedien. So nie, indien daar besluit word om die meters op die verbruikers se persele te installeer, kan 'n vieraa-kabel gelê word om meer as drie verbruikers te bedien. Die skema is dan 'n kombinasie van 'n hoëspanningsdistribusieskema wat ondergrondse laespanningsverdelers van toevoer voorsien.

Benewens voorgaande voordele, kan ek myself dorpsaanleggings voorstel waar dit onmoontlik sal wees om die vereiste getal enkel-faseringe te verskaf wat nodig sal wees vir 'n gebalanseerde 3-fase-toevoer. In so 'n geval het 3-faseverdeling besliste voordele.

(8) **TEN SLOTTE:**

Soos gewoonlik het die oorspronklike idee van hoëspanningsdistribusie deur middel van mini-kiosks om die stygende koste te bekamp en spanningsregulering en estetiese voorkoms te verbeter, in die kompromieë geëindig. Dit is dus; nodig om al die baie faktore wat die ontwerp daarvan raak, te oorweeg en die geskikste vir die doel te kies. Hoëspanningsdistribusieskemas vir risidensieële dorpsaanleggings het egter 'n blywende instelling geword en het bewys dat dit die voordele inhou waarop daar aanspraak gemaak is.

The voltage regulation on the consumer's premises has been maintained well within the approx. 5% statutory requirement at Montgomery and the subsequent schemes. This is extremely difficult to ensure with the overhead mains distribution.

(b) **Single Versus Three Phase Distribution:**

The trend of thought today seems to favour 3-phase high voltage distribution and I agree that 3-phase has very distinct advantages if one is catering for a number of consumers whose demands are in excess of the capacity of an 80 ampere single phase connection. My reasons for this choice are:—

(i) The 3-phase transformer of higher capacities than 50 kVA can generally be made smaller than the equivalent single phase unit and this may be important where the kiosk is to be mounted on the front boundary of a stand or on a pavement.

(ii) For consumers whose loading results in a a.d.m.d. of this magnitude it is frequently essential that they have a 3-phase supply available and I think it will assist to maintain a balanced loading within the township as a whole to give such consumers a 3-phase service connection.

Three phase distribution may also offer savings if one is prepared to adopt a rear boundary reticulation. This involves laying a 4-core cable to serve three single phase consumers if the meters are grouped in the kiosk. Alternatively if it be decided to instal the meters on the consumer's premises, then a four core cable can be laid to serve more than three consumers and the scheme becomes a combination of a high voltage distribution scheme supplying low voltage underground distributors.

In addition to the foregoing advantages, I can visualise township layouts where it is not possible to provide the requisite number of single phase rings necessary to maintain a balanced 3-phase supply and in this case the 3-phase distribution has an advantage to commend it.

(8) **CONCLUSION:**

The original thought prompting the high voltage mini-kiosk form of distribution to curb rising costs, to improve voltage regulation and aesthetic appearance, has resulted in the usual problem of compromise. It is therefore necessary to consider all of the many factors influencing design and select the most suitable for the purpose. Without a doubt the high voltage distribution scheme for residential townships is here to stay and it has proved to have the advantages claimed for it.



## LEDEFORUM

### ELEKTRISITEITSONDERNEMINGS

#### VRAAG 1:

Na die mening van die lede, is die huidige tekort aan ingenieurs genoeg regverdiging vir die Vereniging om verder in te gaan op die voorstel dat ondernemings wat na aan mekaar geleë is, op 'n streegrondslag gekoördineer moet word?

#### VRAAG 2:

Dit wil voorkom asof dit die Regering se beleid is, om nasionale redes, om die opwekking van elektrisiteit aan EVKOM toe te vertrou. Aangesien dit die geval is, is die tyd nie nou geleë vir aangewese plaaslike owerhede om die rasionalisering van hul distribusieondernemings te oorweeg en sodoenige mannekrag- en maeriaalbesparings teweeg te bring wat tot die belastingbetalers se voordeel sal strek nie?

#### VRAAG 3:

Dit is 'n aanvaarde beginsel in S.A. dat persoonlike dienste aan die publiek wat nie by privaatondernemings of by die Departement van Pos-en-Telegraafwese berus nie, deur Plaaslike Owerhede gelewer word. Stem die lede dus met die beginsel saam dat, ten einde die beste diens aan verbruikers te lewer, aangesien die Plaaslike Owerheid die derde vlak van die Regering en naaste aan die publiek is, hy waar doelik die enigste een moet wees wat binne of buite die Munisipale grense elektrisiteit aan individuele verbruikers verskaf?

### VERBRUIKERSINSTALLASIES

#### VRAAG 4:

Daar word in die Standaard Draadwerkregulasies voorsiening gemaak vir 4-penprop-en -sokuitgang vir driefasestowe. Met die oog op die groter aantal eenfasestowe met 'n vermoë van meer as 15 ampere wat tans geïnstalleer word, het die tyd nie nou aangebreek om 'n tweesokuitgang van 40 ampere vir eenfasestowe te standaardiseer nie?

### SPEKIFIKASIES WAT IN REGULASIES VAN TOEPASSING IS

#### VRAAG 5:

Volgens die „Standaard Regulasies vir die Bedrading van Persele” moet alle draadwerk, ens., aan die vereistes van die toepaslike spesifikasie wat as 'n S.A. Spesifikasie van die SABS omskryf word, voldoen, of, indien daar nie so 'n spesifikasie is nie, aan die toepaslike B.S.-spesifikasie. 'n Opmerking by die omskrywing meld dat 'n veiligheidspeksifikasie van die SABS aan die vereistes van die regulasies sal voldoen.

- (a) Hoe kan 'n inspekteur vasstel of 'n artikel aan die voorgeskrewe veiligheidspeksifikasie voldoen as dit nie tot 'n verpligte spesifikasie verklaar is nie en ook nie die SABS-merk dra nie, of as 'n SABS-spesifikasie ontbreek, dat die artikel aan die vereistes van 'n B.S.-spesifikasie voldoen?

## MEMBERS' FORUM

### ELECTRICITY UNDERTAKINGS

#### QUESTION 1:

In the opinion of the membership does the present shortage of engineers warrant the Association pursuing the suggestion that closely situated undertakings be co-ordinated on regional basis.

#### QUESTION 2:

It appears to be Government policy for national reasons to vest the generation of electricity with ESCOM. This being the case is the time not appropriate that suitably placed local authorities should consider the rationalising of their distribution undertakings and thereby effecting manpower and material savings for the benefit of the ratepayers?

#### QUESTION 3:

It is an accepted principle in S.A. that personal services to the public not vested in private enterprise or the Department of Post and Telegraphs are rendered by Local Authorities. Does the membership therefore agree with the principle that for the best service to consumers the Local Authority being the third level of Government closest to the public should where practicable be the sole supplier of electricity to individual consumers within or outside the Municipal boundaries?

### CONSUMERS' INSTALLATIONS

#### QUESTION 4:

Provision is made in the Standard Wiring Regulations for 4 pin plug and socket outlet for 3-phase stoves. In view of the large number of single phase stoves of over 15 ampere capacity now being installed is the time not now ripe to standardise on a 40 ampere two socket outlet for single phase stoves?

### SPECIFICATIONS APPLICABLE IN REGULATIONS

#### QUESTION 5:

According to the "Standard Regulations for the Wiring of Premises" all wiring etc. shall comply with the applicable specification which is defined as a S.A. Specification of the S.A.B.S. or in the absence of such a specification the appropriate B.S. Specification. A note to the definition states that a S.A.B.S. safety specification will satisfy the requirements of the regulations.

- (a) How can an inspector determine whether an article complies with the safety specification prescribed when this has not been declared a compulsory specification nor carries the S.A.B.S. mark or in the absence of a S.A.B.S. specification that the article complies with a B.S. Specification.

- (b) Wat word in die geval van ander artikels en toestelle wat in ander dele van die wêreld vervaardig word? Moet hulle voor die vet verbied word?
- (c) Hoe moet die regulasie toegepas word in die geval van 'n verbruiker wat 'n gebruikte stoof of toestel wil installeer?

**QUESTION 6:**

Artikel 19 van Wet No. 20/1939 soos gewysig in Wet No. 48/1962 lees:—

„Met dien verstande dat die bepalinge van hierdie sub-artikel nie geld met betrekking tot draadwerk deur of ten behoeve van die Regering . . . nie.”

Regulasie C.61(2) van die Wet op Fabriek, Masjinerie en Bouwerk No. 22/1941 lees:—

„Geen leweransier mag 'n elektriese toevoer koppel aan 'n gebou . . . voordat hy hmself oortuig het dat alle metaaldakke, geute . . . van die gebou en alle ontblote metaaldele van die elektriese installasie ge-aard is nie.”

**Die vraag is nou:**

Moet die voorsiener staatsgebue toets vir aarding al dan nie?

**STRAATVERLIGTING**

**VRAAG 7:**

**LAMPKAPPE VIR STRAATLAMPE:**

Kan 'n Raad weier om 'n straatlamp af te skerm? Of moet die klaer die kamer teen die lig afskerm? Is dit die Raad se plig om die straat lampe af te skerm?

**VRAAG 8:**

**GROEPVERVANGING VAN STRAATLAMPE NADAT HULLE SOWAT 1,000 UUR GEBRAND HET**

Het lede enige ondervinding van hierdie skeme en is dit bevredigend en ekonomies?

**VRAAG 9:**

Wat is die beste metode, gesien uit die oogpunt van doeltreffendheid en koste, om straatligte te patrolleer en lampe te vervang?

**DISTRIBUSIE VAN ELEKTRISITEIT**

**VRAAG 10:**

**SERWITUTE VIR ELEKTRISITEITKABELS:**

Wat is Municipaliteite se reg in hierdie opsig?

Moet vergoeding betaal word?

Moet serwitute geregistreer word?

**VRAAG 11:**

Is dit ekonomies en tegnies wenslik om "uitgebrande" transformers te herwikkell, of moet hulle afgekeur word?

**VRAAG 12:**

Van watter verskeidenheidsfaktorkrommes vir verbruikers word daar gebruik gemaak by die ontwerp van laespanningsnetwerk vir verbruikers in Bantoestadsgebiede en kan kopieë van hierdie krommes beskikbaar gestel word?

**VRAAG 13:**

Wat is die optimum vermoë in MVA van 'n distribusieentrale met 'n sekondere spanning van XkVA? (Verel in die geval waar X 33 en 11 is).

(b) What about other articles and appliances manufactured in other parts of the world. Must they all be prohibited?

(c) How must the regulation be applied in respect of a consumer wishing to install a used stove or appliance?

**VRAAG 6:**

Section 19 of Act No. 20/1939, as amended by Act No. 48/1962, reads:—

“Provided that the provisions of this sub-section do not apply in relation to wiring by or on behalf of the Government.”

Regulation C.61(2) of the Factories, Machinery and Building Work Act No. 22/1941 reads:—

“No supplier shall connect an electric supply to a building . . . before he has satisfied himself that all metal roofs, gutters . . . of the building and all exposed metallic parts of the electrical installation are earthed.”

**The question now remains:**

Must the supplier test government buildings for earthing or not?

**STREET LIGHTING**

**QUESTION 7:**

**SHADING OF STREET LAMPS:**

Can a Council refuse to shade a street lamp? Or must the complainant shade the room from the light. Is it a duty incumbent upon a Council to shade the street lamps?

**QUESTION 8:**

**GROUP REPLACEMENT OF STREET LAMPS AT SAY 1,000 HOURS BURNING**

Have members experience of this scheme and is it satisfactory and economic?

**QUESTION 9:**

What is the best method, seen from the point of view of efficiency and cost, to patrol street lights and replace lamps?

**ELECTRICITY DISTRIBUTION**

**QUESTION 10:**

**SERVITUDES FOR ELECTRICITY CABLES:**

What rights have Municipalities in this regard?

Must compensation be paid?

Should servitudes be registered?

**QUESTION 11:**

Is it economical and technically desirable to rewind "burn-out" transformers or should they be scrapped?

**QUESTION 12:**

What consumer diversity factor curves are used in designing the low voltage reticulation for consumers in Bantu Townships and could copies of these curves be made available.

**QUESTION 13:**

What is the optimum capacity in MVA of a distribution centre with a secondary voltage of X kVA? (Particular in the case where X is 33 and 11).

