

THE ASSOCIATION OF MUNICIPAL
ELECTRICITY UNDERTAKINGS
OF SOUTH AFRICA

DIE VERENIGING VAN MUNISIPALE
ELEKTRISITEITSONDERNEMINGS
VAN SUID-AFRIKA

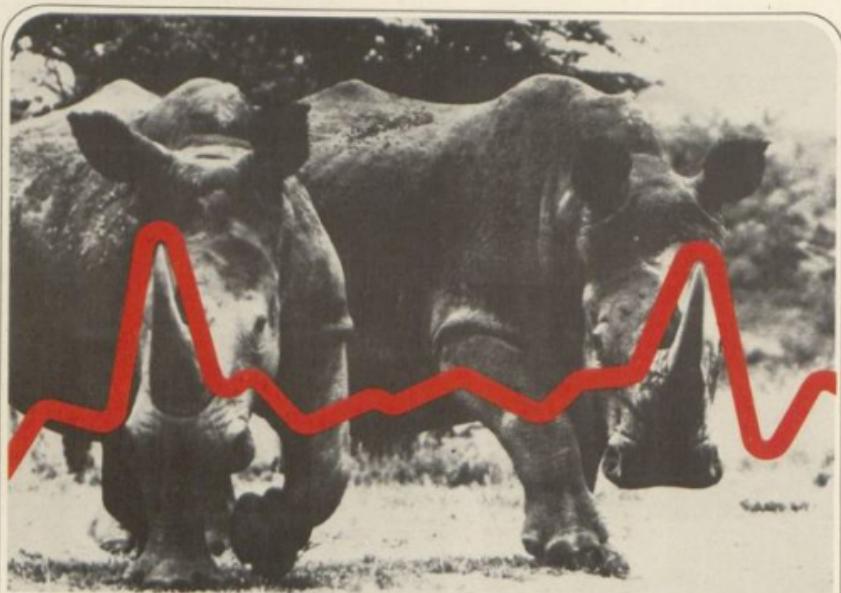


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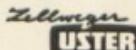
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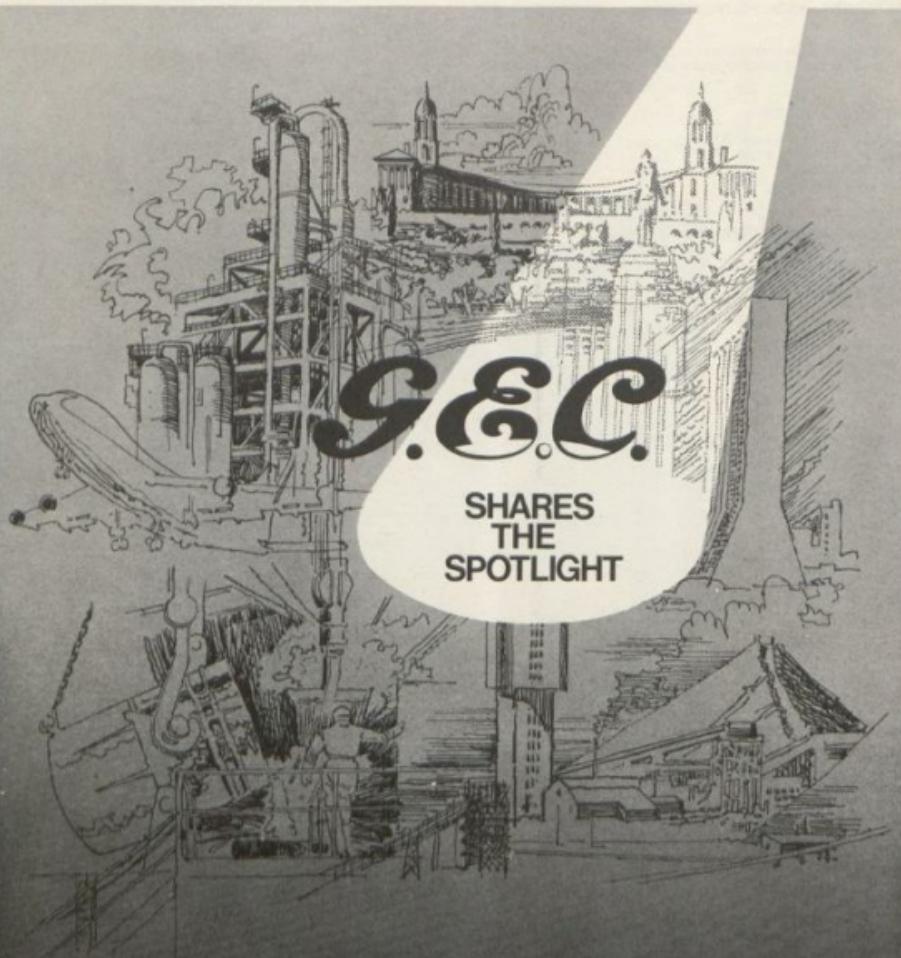
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MAY - MEI 1975

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THE REVEREND OWEN FRANKLIN OPENED THE CONVENTION
PROCEEDINGS WITH PRAYER

TABLE OF ATTENDANCE - TABEL VAN BYWONING

Honorary Members	5	Erelede
Past Members	2	Vormaligelede
Guests	20	Gaste
Engineers	80	Ingenieurs
Associates	1	Genasosieerde
Associate Members	15	Assosiasiateerde
Local Authorities	96	Plaaslike Besture
Organisations	15	Organisasies
Affiliates	118	Geaffilieerde
Lady Visitors	204	Damesbesoekers
	556	
Apologies	10	Versonkings

M.R. J.C. WADDY - PIETERMARITZBURG (RETIRING
PRESIDENT)

I extend to all of you a very warm welcome.

Now, ladies and gentlemen, you may wonder why we have so many distinguished guests on the platform here. Most of the members are, of course, aware that our incoming President is Eugene Pretorius of Potchefstroom and Potchefstroom is not yet quite grown to the size where it is able to offer sufficient hotel accommodation to accommodate over 500 people and so for that reason Durban kindly offered to host this convention, but Potchefstroom has contributed very well towards it and it is in fact Potchefstroom's convention.

Now we have here with us the Mayor and Mayoress of Potchefstroom, Councillor and Mrs. Schwellinus and Councillor and Mrs. Adams of Durban. I think without more ado I'll call on Councillor Adams to welcome you to Durban.

WELCOME TO DURBAN BY HIS WORSHIP THE MAYOR OF
DURBAN, CLR A.D. ADAMS

Mr President, your Worship the Mayor of Potchefstroom, Mr van Wyk, guest speaker for this morning, distinguished guests, ladies and gentlemen, it is fifteen years since the Association of Municipal Electricity Undertakings last came to Durban, when in a very happy ceremony, the then City Electrical Engineer of Durban, Mr R.P.M. Simpson, was inducted as President of the Association. It therefore gives me exceptional pleasure today to welcome you all to this City because your last visit was so long ago. Ek meen, mnr die President, dat u met my sal saamstem dat 'n toename in die hoeveelheid elektrisiteit wat verbruik word 'n betreklike betroubare aanduiding is aan hoe vinnig 'n stad groei en uitbrei. It is interesting to note that in the period from 1960 to 1974 the last year for which the figures are available, sales of electricity in Durban have increased at an average annual rate of 9.1% while the annual revenue of the undertakings has increased fivefold from 9.5 to 48.2 million Rand. To keep pace with the ever increasing demands for electricity in the City it is necessary to spend over 10 million Rand a year in capital development compared with less than two million Rand in 1960. It is pleasing to note, however that in spite of the tremendous rise in price of plant, equipment and labour the average price of electricity to the consumer has risen by only 38% in the past four years, to an average cost of 1,437 cents per unit in 1974. Delegates who have not been back to Durban since the last Convention will have noticed other evidence of growth in our City. They will have noticed a change in the skyline brought about by several new high-rise buildings and probably a good deal more congestion in the streets. Those who have negotiated the speed traps and travelled to Durban by motor car may have some difficulty in getting used to our one-way streets in the heart of the City. These have helped greatly to improve the flow of traffic to ease the lot of the motorist further. The Durban City Council is presently commissioning a 1.3 million Rand computer controlled traffic signalling system. A member of the staff of the City Electrical Engineer's Department will give you further information about this equipment in a paper to be presented during your Convention and those interested in the thechnicalities will have the opportunity of visiting the main control centre building on Wednesday afternoon.

Ek het verneem dat die Konvensie Program so gereg is dat die eggenotes van afgevaardigdes 'n besoek aan sommige van die stad se besienswaardighede sal kan bring en as dit mooi weer is, ook aan twee

van die Openbare Tuine. Die Burgemeestersvrou is baie bly dat sy kenners met die dames sal kan maak en hulle met 'n koppie tee sal kan trakteer. Ek is ook bly dat die Stadsraad in die geleentheid gestel is om gevryheid aan u te verleen by wyse van die skemerontstaal wat moere-aand in die Stadsaal gehou word en waar die Durbanse Stadsraadslede en hul gade met u gesellig saam kan verkeer. Weens ander amptelike, sal ek en my vrou tot ons spyt nie die verskillende onthale kan bywoon en u midde verkeer nie.

The pleasure of having you all in Durban is not in the least affected by our knowledge that your host is the Mayor of Potchefstroom. Indeed this happy partnership reminds me that Potchefstroom has a reputation for its hospitality to many a Durban Soldier and artillerian. Mr Mayor, you and the Mayoress of Potchefstroom, your visiting Councillor Mr C de Kock, Mr Pretorius your City Electrical Engineer and their wives are especially welcome. Mr President, I am aware of the good work being done by your Association and I trust that your deliberations here will be of value to you in the management of your undertakings and thereby enable you to contribute even more to the relief of the hard pressed consumer and no doubt to your municipal rates. Thank you very much indeed for giving me the opportunity to welcome your delegates and of course their wives, to Durban, and I trust that your stay will be a thoroughly enjoyable and beneficial one. Thank you.



His Worship, the Mayor of Durban, Clr. A.D. ADAMS
welcoming the delegates.

**VERWELKOMING DEUR SY EDELAGBARE DIE
BURGEMEESTER VAN POTCHEFSTROOM
RAADSLID J.P.C. SCHWELLNUS**

Mnr die President, Sy Edelagbare raadslid A.D. Adams en mev Adams, Burgemeesterspaar van Durban, geagte meneer van Wyk Direkteur van die Navorsingsinstituut vir Elektriese Ingenieurswese Pretoria, geagte my groot genot om u te verwelkom by die aanvang van die 44ste Konvensie van die Vereniging van Municipale Elektrisiteitsondernemings van Suid-Afrika.

Dat hierdie Kongres tot die prestige van u Vereniging sal bydra en vir die kongressangers tot groot voordeel sal strek, getuig uit die insigwende referate en die uitgelese referente wat tydens hierdie Konvensie sal optree. Met hierdie beplanning wens ek u mnr die President en u Reëlingsakomitee geluk. Ek hoop en glo dat nu hierdie Konvensie dan meer lig sal skyn, letterlik en figurierlik, oor en in verband met talle aspekte raking elektrisiteitsvoorsiening in ons Republiek.

Mr President, on behalf of the Convention, I wish to thank you and His Worship the Mayor of Durban for all the arrangements made for the convenience of us, the visitors to this wonderful City. A more suitable host City for a Convention of Municipal Electricity Undertakings of S.A. is hardly possible as, to my opinion, Durban is an example to all of us of what can be done in connection of lighting.

As representative of Potchefstroom I also wish to extend our greetings and best wishes of my Council to all of you and to express a special word of appreciation to my colleague, His Worship the Mayor of Durban, for having agreed to be the host of this Convention and thus allowing us to enjoy the fine weather and warm hospitality of his City.

Mr President allow me to thank you through those responsible for

bringing Potchefstroom to Durban by installing our Coat of Arms in this hall. This gesture is greatly appreciated.

Potchefstroom was established in 1838 as the first town North of the Vaal River.

The first emblem of the first Republic was designed there, the first newspaper was published in Potchefstroom. It was also the first town to be governed by local authority. With all these achievements, I think it would also have been the first place to instal electricity if this would have been possible in 1838.

Mnr die President, dames en here, Potchefstroom is 'n konserwatiewe stad wat veral trots is op sy baie skole, opvoedkundige inrigtings, groot getalle jeugdiges, baie eikelbome en bome al dan dat by medegeslae van hierdie Konvensie kon wees en dat by in 1975/76 die nuut-aangeswee President van die Suid-Afrikaanse Vereniging van Elektrisiteitsondernemings aan die hoof van sy Elektrisiteitsdepartement sal het – ons dank u vir hierdie eer wat u ons dorp aangedoen het. Ek weet dat u kus 'n gelukkige een sal wees.

Ten slotte, dames en here, het Potchefstroom en Durban in gemeen dat beide pragtige stede is, beide heerlike verblyf bied, behalwe dat my dorp se winters verskriklik koud is, maar in die winterseisoen is ons almal in Durban. Dit is seker ook die rede hoekom hierdie 44ste Konvensie nou in hierdie pragtige stad aangebied word en hoekom ek dus voorreg kan hé om u hier almal hartlik te verwelkom.

Ek hoop en vertrou dat u 'n aangename Kongres sal hé.

Mr President it was a great privilege and honour to welcome the delegates to this Convention – I thank you for allowing me to do so!



Sy Edelagbare die Burgemeester van Potchefstroom, Rld.
J.P.C. Schwellnus, verwelkom die afgevaardigdes.

MR. J.C. WADDY (RETIRING PRESIDENT)

The President, Mr Jack Waddy, thanked the two Mayors and Mr van Wyk for the welcoming and opening address and proceeded to outline the progress in regard to the principle matters dealt with by the Association during his two years of office. He also thanked the members of the Executive Council and of all the Associations and many sub-committees for the work done by them during his term as President and for the support which the Executive Council have given him.

The President paid tribute to the excellent service of the Secretary, Mr Bennie van der Walt who had taken up his appointment only shortly before the previous Convention, but had nevertheless quickly made himself familiar with the duties involved.

The President was particularly pleased about the greatly improved financial position of the Association which was due in large measure to the additional advertising revenue obtained by the Secretary.

Mr Waddy went on to thank the Secretary's wife Mrs Annatjie van

der Walt for all that she had done in assisting with the social side of the Association's activities.

In concluding his review Mr Waddy expressed his appreciation of the support given to him by the City Council of Pietermaritzburg without which it would not have been possible for him to take up the office of President.

Mr Waddy then proceeded with the induction of the new President, Mr Eugene Pretorius, who he felt certain would serve the Association with distinction during the ensuing two years. He expressed appreciation of the assistance which he had received from Mr Pretorius during his own term of office. Mr Pretorius's service on the Executive Council, as well as, in the Highveld Branch of the Association, of which he had been Secretary and Chairman, had fitted in well for the duties which he would now be required to undertake. Mr Waddy then bestowed the Chain of Office on the new President and congratulated him on attaining that high office.

OPENING ADDRESS - MR. J.D.N. VAN WYK,
DIRECTOR OF THE NATIONAL ELECTRICAL ENGINEERING
RESEARCH INSTITUTE, PRETORIA

OPENINGSREDE - MNR. J.D.N. VAN WYK,
DIREKTEUR VAN DIE NASIONALE NAVORSINGSINSTITUUT VIR
ELEKTRIESE INGENIEURSWESE, PRETORIA

MNR. J.D.N. VAN WYK

Mnr. Van Wyk is gebore op 10 Maart 1927 te Lady Grey, K.P. Hy behaal die graad B.Sc. (Elektriese Ingenieurswese) (met lof) aan die Universiteit van Kaapstad in 1949. Daarna sluit hy by die WNNR aan in 1950.

Hy word in 1957 hoof van die Afdeling Elektrotegniese Ingenieurswese van die NFNL, en sedert 1961, hoof van die Navorsingsdepartement Elektriese Ingenieurswese van die Nasionale Navorsingsinstituut vir Wiskundige Wetenshappe en word direkteur van die Nasionale Navorsingsinstituut vir Elektriese Ingenieurswese sedert sy stigting in Desember 1970.

Was president van die Ingenieursgenootskap van Suid-Afrika 1963.

Was president van die Suid-Afrikaanse Raad vir Outomatisasie en Berekening 1965 tot 1967 en tans nog lid van die Uitvoerende Komitee.

Is lid van die Toepassingskomitee en Vise-Voorsitter van die Rekenaarkomitee van die International Federation of Automatic Control (1972-1975). Sekundus-lid van S.A. Raad vir Professionele Ingenieurs en lid van die Registrasiekomitee.

Is 'n professionele ingenieur en lid van verskeie vakkundige verenigings, o.a. Genoot en Raadslid van die S.A. Instituut van Elektriese Ingenieurs, Volle Lid van S.A. Akademie vir Wetenskap en Kunse en Lid van die Fakulteitsraad Natuurwetenskap en Tegniek, en Ondervoorsitter van die Afdeling Wis- en Natuurkunde 1974 en 1975.

Genoot van Ingenieursgenootskap van S.A., Geassosieerde Lid van die Institute of Electrical Engineers, London.

Dit is seker vir u vreemd dat u vandag 'n navorsing het wat die openingsrede by hierdie, 44ste konvensie, lewer. Miskien is 1975 in meer as een opsig 'n buitengewone jaar; driekwart van die 20ste eeu is reeds verby en ons staan in die teken van die tyd waar die mens skielik en dramaties bewus geword het van sy afhanklikheid van energie en die beperkte voorrade van die meer bekende vorme daarvan. Indien ons hierdie bronne met maksimum doeltreffendheid wil gebruik en so lank as moontlik wil laat hou, sal diepgaande en uitgebreide navorsing nog gedoen moet word en sal u en ek as elektriese ingenieurs miskien baie van ons vooropgestelde idees moet prysge. Miskien dus nie so smaks dat u vandag na 'n navorsing moet luister nie.

Wanneer ons kommer uitspreek oor ons eindige voorraad van benutbare energie, is die meeste mense geneig om dit af te mask as 'n wolf-wolf geskreue. Lant ons egter kyk wat die wêreld tot sy beskikking het,

As ons die jongste rameings van herwinbare energiereserves neem soos by die Wêreld Energiekonferensie in 1974 aangegee, naamlik die bewese bronne van vaste brandstowwe, ruolie en aardgas en ons voeg hierby reserves van ruolie in skalle van die VSA en teersand in Kanada en bekende uraanreserves wat teen huidige aanvaarde ekonomiese prysie herwin kan word en ons gaan selfs verder en aanvaar dat ons 90% van hierdie uraan in kweekreaktore gaan gebruik ('n uiters optimistiese verwagting), dan het ons sowat 7.3×10^9 Joule beskikbaar. (Vir die dames kan ek net verduidelik dat die Joule 'n hoeveelheid energie is wat sowat 100 000 Joule nodig is om die water vir 'n kopje tee te kook. Vir die here wat miskien nie tegniek aangelê is nie, dit neem sowat 50 000 Joule om 'n bottel bier van 375 ml af te kool. U moet nou nie hieruit aflei dat ons liever hier as tee moet drink as ons energie



MNR. J.D.N. VAN WYK, Direkteur van die Nasionale Navorsingsinstituut vir Ingenieurswese, Pretoria, lewer die openingsrede

wil spaar nie!) Hierdie beskikbare reserves is 'n ontsaglike hoeveelheid sou u sê en ek stens saam, maar as ons kyk na die energieverbruik in die jaar 1970, wat sowat 2×10^{20} Joule was en ons onthou dat die gebruik die afgelope kwarteeën teen 'n gemiddelde groei koers van 4,8% per jaar toegenem het, dan toon 'n eenvoudige sommetjie dat teen hierdie tempo, reeds genoende voorrade alleen vir 'n skrale 62 jaar sal hou, d.w.s. tot by die jaar 2032 sowat.

Maar ons het mos ander bronne ook, kom ons voeg alle moontlike energie wat ons kan herwin van waterkrag, getye, goetemmerbron (en hier neem ons aan dat ons gemiddeld tot 3 km diep hiervoor gaan boor) en ook windkrag by. Hierdie is egter net 'n spreekwoordelijke druppel in die emmer, die resultaat bly dieselfde, ons gebruik nog alles op in 62 jaar.

Ons kan redeneer dat teen daardie tyd ons al die probleme in verband met kweekreaktore opgelos het en dat ons dan duurder uraan kan gebruik wat die reserves wat op 1 miljoen ton geraam word teen \$26/kg, kan opstoot tot honderde miljoene ton teen \$200/kg of slegs duisende miljoene ton teen \$500/kg. Daarmas sal uiteindelik kernfusie 'n praktiese metode van energieproduksie word en dan kan ons al die waterstof in die oseane gebruik en ons het onbeperkte energie. Dit is so, maar ongelukkig waarsku die klimataleid dat ons ons meer as sowat 3×10^{24} Joule per jaar bykomend tot die energie wat ons reeds op die aarde van die son kry, sou vrystel, ons gevaaar loop om die klimaat onomkeerbare te versteur. Weereens teen die huidige gebruik en groeiende sou ons hierdie byvoeging bereik in sowat 60 jaar vanaf nou. Ons sal dus reeds vroeg aangeweese wees op die direkte gebruik van die son-energie wat sowat 4×10^{24} Joule per jaar is, d.w.s. ongeveer 20 000 keer die hoeveel-

held van ons huidige wêreldenergieproduksie. Teen die huidige groei-kers sou dit ons darem deurstaan vir die volgende sowat 200 jaar, teen welke tyd ons dit volledig sal moet gebruik! As ons ter gedink dat Van Riebeek 'n skrale 323 jaar gelede aan die Kaap geland het, besef ons wat dit beteken.

Our concern is not new, it is only more urgent. Let me quote from a Scientific American of December 1924:

"There is suspicion that our resources of coal and oil are being wasted, that their exhaustion is no more than around the corner of the next century, and that our civilization is threatened, in consequence, with an early and disastrous end. There is talk of possible power from the waves and the winds, and of the stores of power that some scientists believe may be obtainable from the atoms of matter. Before considering these alternatives, however, we must first take stock of what resources we have. That was done during the past summer at the World Power Conference in London. Hundreds of engineers and experts met to report on the power resources of their respective countries. The conference resulted, among other things, in the most complete and accurate survey of world power resources ever made. The total coal of the world, for example, was found to aggregate 7 397 553 000 000 metric tons. At the present rate of use this is enough for some 4 000 years. Of course, the rate of use is increasing."

I do not wish to create the impression that the simplistic model of exponential growth I used is a realistic one over the time scales involved, nor that the estimates of reserves are accurate or final. Nevertheless these estimates make it abundantly clear that increasing the use of energy at the present rate, is not possible. Our way of life will have to change and we will have to budget more carefully for our energy requirements in future.

How is all this likely to influence us in South Africa and in particular what are the implications to you as retailers to the public of a popular form of energy. Let us look at a few examples only.

We are already embarrassed by lack of availability and the high cost of oil. Although it is expected that by the turn of the century, oil production rates will start declining, this, if a free economy was to apply, will not affect us as drastically as some other nations. Only 23% of our energy requirements presently come from oil as compared to 73% for Japan, 75% for Italy and 66% for France for example. About 75% of our energy comes from coal and we have an 'abundant supply'. In 1969 this was estimated at 16 431 million metric tons but already in 1973 we were mining this at a rate of 62 million tons per annum and production was growing at 3.9% per annum. If this rate should continue our reserves will last for only 65 years. Using a more realistic model in stead of an exponential one, the latest estimates show that production will reach a maximum of 236 million tons in the year 2020 and that the extent of the reserves will already begin to inhibit production growth by 1990. By the year 2100 it is expected that production will have fallen to some 10% of the maximum, or very nearly one third of what it is today. Fortunately we have large reserves of uranium, second only to that of the USA, which can be used eventually for power generation.

I come back to my opening remark that we as electrical engineers may have to change some of our ideas drastically. We will have to accept that the electricity is not always the best form in which to supply energy. If we think about domestic heating for example, if done by electricity the overall utilization of energy is of the order of 30% i.e. for each kW used in heating 2 kW's are wasted in the power station and in transmission. For this purpose it would be better to use the fuel directly, where for example in modern design of coal stoves 40-60% of the energy in the fuel is usefully converted to heat and in an anthracite stove as much as 70%. I cannot, however, see any of the ladies present here today, being willing to revert back to the coal stoves of their grandmothers, nor would the environmentalists agree. Waste heat from power stations should, however, be used for heating; where this was done in experimental installations, overall utilization of 80% or

more of the energy resulted. But the present trend is, for economic, environmental and other quite valid reasons, to put large thermal stations on top of coal fields, far away from a thermal load. As we change over to nuclear stations, this factor must be borne in mind. Safety considerations and particularly public reaction, force us at present to place these stations away from residential areas, but research will have to continue to make reactors ultra-safe so that they can be placed inside densely populated areas thus providing a direct source of heat as well as electricity.

As oil supplies become exhausted and fossil fuels in general deplete, our transport systems for one will have to change drastically. More use will obviously be made of electric propulsion. For road transport we will use battery powered vehicles and vehicles using fuels such as hydrogen. Both of these will make new demands on electric power generation and distribution. Large amounts of electricity will be used to generate hydrogen particularly in the off-peak periods or hydrogen could be produced by thermal cracking of steam in high temperature nuclear reactors. As better storage systems in the form of rechargeable batteries become available, the battery powered private vehicle will certainly become a factor to consider in designing reticulation systems both from the point of larger installed capacity in the private home, as well as to ensure the lowest waveform contamination from a large number of battery chargers. (The private individual will be difficult to satisfy, he has been spoilt in the past, if he pulls up at a petrol pump he was used to take on board energy at the rate of some 6.5 MW.)

In the long run, as I have mentioned before, we will have to use solar energy more and more to supply our energy requirements. It will certainly be possible to design our houses and living quarters in most parts of the world so as to use solar energy directly for heating and cooling. The generation of electric power from solar energy is feasible although the theoretical maximum efficiency using a silicon solar cell for example is only 22% and practical efficiencies today do not exceed 12% with capital costs which are still unacceptable and a vast field of research still exists to develop economic methods of conversion of solar energy to electric energy.

Solar energy can be used to grow vegetation to produce cellulose, but normally the efficiency of photosynthesis is rather low in this process, only a few tenths of a per cent. There are certain plants of which sugar cane and sorghum are examples, which do somewhat better having efficiencies approaching 3%. Investigations are being conducted to produce hydrogen from biophotolysis of water and an efficiency of some 10% conversion from photolithic energy into hydrogen is thought feasible.

In all the systems for using solar energy capital cost is an important factor and even if this can be significantly reduced, the energy has to be gathered over large areas and finding the necessary space in an overcrowded planet might eventually force us to place these collectors in space which will bring the cost factor back again.

The technical problems to be overcome in order to stave off the looming energy depression in the next century are thus enormous. Let us not despair however, technology has been blamed for many of the dilemmas in which we find ourselves today. Of these the high utilization of energy and environmental pollution are only two. It is, however, to technology that we will have to look to develop techniques to both stabilize our population growth and consolidate the use of energy at a suitable and acceptable level. I have great faith in the ingenuity and genius of our scientists and engineers to provide the technical solutions and I only hope that our political leaders of the future will apply these as wisely.

There is no doubt that this Association can and will play an important role in the wise use of energy in the country and my plea is that it takes timely action to contribute its share to both the technical and human problems we will face to ensure a continuous supply of energy which is so essential to prevent us from slipping back to the energy poor existence of the stone age man.

VERWYSINGS

- 1) World Energy Conference - Survey of Energy Resources 1974
- 2) 'n Raming van die vraag na en aanbod van Energie in Suid-Afrika tot die jaar 2 000. Departement van Beplanning en die Omgewing, 1974.
- 3) Graham Chedid - Cellulose from sunlight - New Scientist, 6 March 1975.
- 4) D.J. Kotzé - A forecast of energy requirements in South Africa - Proceedings of the Conference on Energy and its Future in Southern Africa, Cape Town, 28th April - 1st May 1975.



Mr. Eugene Pretorius is congratulated by Mr. Jack Waddy with his induction as the new President of the Association.

Mnr E. de C. Pretorius: Thank you very much Mr Waddy! Mr Mayor of Durban, mnr die Burgemeester van Potchefstroom, mnr van Wyk, geëerde gaste, ladies and gentlemen. To stand in front of you this morning as President of such an august body as the A M E U, is indeed a great moment in my life. The greatness of the occasion almost overwhelms me and talking of greatness, it reminds me of what I can still remember from my school days. We had 'Twelfth Night' as a prescribed book - I think it was Malvolio who said 'Be not afraid of greatness. Some are born great, some achieve greatness and some have greatness thrust upon them'. With this chain around my neck another piece of verse comes to mind which reads like this - 'The prisoner' of Emily Brontë - 'Oh dreadful is the check - intense the agony - when the ear begins to hear and the eye begins to see, when the pulse begins to throb, the brain to think again; the soul to feel the flesh and the flesh to feel the chain'.

Now I don't think I am quite a prisoner this moment, but from now on until my term of office expires, I will be your obedient servant.

It is with a considerable degree of trepidation that I stand in front of you and here I have a confession to make, ladies and gentlemen, I am a very poor speaker. Unfortunately, I was not born with the gift of the gab as some of my predecessors, and when this gift was dealt out at a later stage, I also missed out. Ek het, die dag toe hierdie gawe uitgedeel is, agter in die tou ingeval, heel dag gestaan en uiteindelik tot by die toonbank gekom waar dit uitgedel word, vind ek uit ek is by die verkeerde toonbank. Ek het darem een troos en dit is dat Moses vanouds ook nie kon spong met 'n gladdie mond nie, en hy het Israel uit Egypteland uitgeleei. Soos ek reeds gesê het, dit is vir my werklik 'n besondere eer, en ek glo ook vir die dorp wat ek verteenwoordig, Potchefstroom.

Daar is baie persone wat 'n besondere rol in my lewe gespeel het en wat bygedra het dat ek vanopgrend hier staan, en ek wil aan hulle hulde bring. Ons huidige Staatspresident, Dr Nic Diederichs, toe hy ingehuldig is, het in sy rede, heel aan die begin, hulde gebbring aan sy ouers, en dit het 'n geweldige indruk op my gemaak, en ek wil ook vanopgrend heel eerste aan my ouers hulde bring. Ek het 'n paar jaar gelede my moeder verloor, maar gelukkig in haak plek het ons 'n juweel van 'n stiefmoeder gekry. En nou kom ek by dit wat vir my werklik 'n groot voorreg is, nl. dat sy en my vader vanopgrend in hierdie gehoor aanwe-

sig is. Ek wil hulde bring aan my eggenote wat my deur dik en dun bygestaan het. Veral die afgelope tyd het dit maar moeilik gegaan, die seniowees was maar nie al die tyd van die beste gewees nie, ek is ook baie bly dat sy vir die eerste keer in 15 jaar saam met my na 'n konvensie toe kan kom, danksy die hooggewaardeerde goedgunstigheid van die Transvaliese Onderwysdepartement. Ek wil ook hulde bring aan al my leermeesters op Universiteit en ek is bly om te sê dat mnr Uys een van my lektore aan die Universiteit van Stellenbosch, ook vanopgrend hier is. Hy lyk nog net so jong soos daardie tyd. Ook die wat my prakties onderrig het, en hier verwyks ek eerstens na Evkom. In die Nataliese onderneming het ek my leerlingingenieurskap deuriop. Ek wil ook dankie sê aan mnr Koos Gericke van Klerksdorp wie se adjunk ek vir vier jaar was. By hom het ek baie dinge geleer - (ook 'n paar skeleinstreke). Ek bring hulde aan my geliefde dorps en my Stadsraad wat my die afgelope 15 jaar net die beste aangebied het. Ek bring hulde aan al my gode vriende, veral die van die VMEO, en hulle sal my nie verkwinklik as ek een uitsonder nie, dit is Jules von Afshiften.

Last, but by far not the least, - and this brings us to the next item on the programme - I wish to pay tribute to the retiring President, Mr Jack Waddy. Mr Waddy became President when his health was at a very low ebb. He nevertheless took the bit between the teeth and not only conquered his malady - and we are very grateful for this, and in this we also see the Divine Hand - but also headed the AMEU for the past two years in a most commendable and efficient manner.

His term of office will go down in the annals of the AMEU as outstanding and will be long remembered by those who had the privilege of serving under him. It is indeed a great pity that Mr Waddy will not be back on the Executive Council because he has not made himself available for election. I, for one, will certainly miss you, Jack, and I sincerely hope that your retirement from the Executive Council is temporary and for a short duration only, and we hope to see you back in 1977. On behalf of the AMEU I wish to thank you for your special and distinguished service on the Executive Council and especially the past two years as President.

As a small token of appreciation of your service, I wish to present to you, on behalf of the AMEU an address which is the first of a new series. This has been designed by our Secretary Mr Bennie van der Walt and I really think it is a work of art. It reads:- "The Association of

Municipal Electricity Undertakings of South Africa - Be it known hereby that this certificate has been presented on behalf of all the members of the Association to John Coulson Waddy. Mr J.C. Waddy was President of the Association of Municipal Electricity Undertakings of South Africa for the period 1973 - 1975 and this certificate is a token of appreciation of his particular and loyal services during that period in furthering the objects of the Association. Date, May, 1975". Jack, I hope this will occupy a place of honour in your office or home. Please also accept your Past President's badge which I shall now pin to your lapel.

Mr J C Waddy - Pietermaritzburg Mr President, I would like to express my sincere gratitude and thanks for this certificate. It is really a fine document and I can assure you that it will indeed occupy a place of honour either in my house or in my office.

Thank you again very much indeed.

ELECTION OF PRESIDENT ELECT VERKIESING VAN AANGEWESE PRESIDENT

Mr R W Barton (Welkom): Mr President, before I go on with the business, may I on behalf of all the rank and file of us in the body of the hall this morning, congratulate you on your election as President and wish you all the very best. We hope your Convention will be a very successful one and that your period of office will be equally successful and very fruitful. Mr President, it is my very pleasant duty to propose as President Elect, my old friend sitting next to me Mr Ken Robson of East London. We have all known Mr Robson for many years, we've known him so well, we have all grown to like him, but there are one or two depths of his murky past which we don't know and so while Ken sits around and wriggles, I am going to tell you a few secrets of his past. Mr President, Ken Robson was born in Kimberley in 1922, he matriculated at Kimberley High School in 1938. After completing his apprenticeship with de Beers Consolidated Mines Ltd., in 1944, he remained with the company until 1949 and during the period he also lectured at the then Griqualand West Technical Institute which was the old School of Mines. Then he was seconded in 1947 to the Anglo American Corporation to do experimental work on industrial diamond applications with the company which was then known as Board Products SA Ltd. Subsequent to that, in 1950 Ken was appointed Electrical and Waterworks Engineer of Alwai North and in 1952, Assistant Town Electrical Engineer at Queenstown. Then, in 1956, he was appointed Deputy Electrical Engineer of East London and subsequently became City Electrical Engineer in September 1968, when he succeeded Mr Percy Giles. Ken is a registered Professional Engineer, he is a Fellow of the South African Institute of Electrical Engineers, he is a Fellow of the South African Institution of Mechanical Engineers, and he is a member of the Institution of Certified Mechanical and Electrical Engineers. He has been a very active member of the Executive Council of this Association from 1968 to 1969 and again from 1971 until the present time. He is presently National Chairman of the National Occupational Safety Association. He has been very active on the various Sub-Committees of the AMEU. He has acted as Publicity Officer, our one and only Publicity Officer and very effectively, and he has and is serving now on numerous other Committees. Gentlemen, we sum up Ken very well and I think possibly his most important attribute is summed up in the words of Abraham Lincoln:

"With malice towards none, with charity for all"

I am sure that Ken Robson will make an excellent President. Mngr die President, dit is vir my 'n eer en voorreg om mngr Robson voor te stel as ons aangeeweze President.

PRESIDENTSREDE

deur

**E. de C. Pretorius, Pr. Ing., Elektrotegniese Stadsingenieur,
Potchefstroom**

1. Om 'n geskikte onderwerp te vind vir 'n presidentsrede is, soos my voorgangers ook sal kan getuig, nie 'n maklike taak nie, veral daar al reeds baalg leële is op 43 onderwerpe. Eienaardig genoeg is daar egter een onderwerp wat blykbaar, wel ten minste die afgelope 20 jaar, oor die hoof gesien is, nl. die VMEO.

2.1. Aangesien die VMEO vanjaar 60 jaar oud word, is dit soveel te meer vanpas om die kalklig 'n slaglie op onselfe te laat val.

2.2. Daar is seker meer as een vanoggend hier teenwoordig, selfs onder die ingenieur- en assosiasie, wat weinig of niets weet van die herkoms en ontpluiting van ons Vereniging nie.

3. Die VMEO is een van die oudste verenigings in die Republiek, moonlik die oudste, wat tot doen het met munisipale aangeleenthede. Dit het ontstaan as 'n vereniging wat bekend gestaan het as The Association of Municipal Electrical Engineers (Union of South Africa). Die stellingskongres is in Johannesburg gehou van Maandag 15 tot Saterdag 20 November 1915 ('n hele ses dae!). Die eerste president was die befaamde prof. (kol.) J.H. Dobson. Teenwoordig by die vergader-

Councillor H.G. Kipling (East London): Mr. President, Ladies and Gentlemen, first of all I would like to offer you Mr. President, sincere congratulations from the Council Members of this Association. In seconding the proposition, there is not much more I can say, it has all been said, but I would like to add that Ken Robson is one of natures Gentlemen - a dedicated Engineer and will be a worthy successor in the office held by his illustrious predecessors.

Dit is vir my 'n groot plesier, mnr. President, om die voorstel te sekondeer. Dankie."

President: Ken, you can probably say that Mark Twain said, after you heard what Bob Barton and Councillor Kipling had to say about you 'I can live for two months on a good compliment'. I hope you will live two years on those very good compliments. Menser Robson, ek is besondert bly om u aan my sy te hê. Ek het vanoggend gesê 'Some people are born great' - hy is een van hulle en hy is teman wat waarop ons waarpel ek persoonlik baie swaar gaan leun en ek doen dit met die wete dat ek dit mag doen. Ek weet dat u dienstry as aangeeweze President baie suksesvol sal wees. En nou vra ek vir u om u eerste plig na te kom nl. om die steel vir 'n paar oomblikke te beheljter tydens die geselskaplike lewe!"

Mr K G Robson (President Elect): Mngr die President, ek wens u alle geluk toe met u verkiezing vandag as President van die Vereniging. Ek kan u verset dat sal vir my 'n voorreg wees om saam met u te werk in die twee jaar wat voorle. Dit is vir my ook 'n groot eer om hier te staan as Aangeeweze President en my wil my dank en waardering uitspreek teenoor al die lede van die Vereniging vir hierdie besondere eer wat buite my aangeboden het hier vannoe.

Mr President, Ladies and Gentlemen, I did not realise what a difficult climb it was up these steps to come to this position, but it really is a very difficult climb! I would like to express my very special thanks to the Members of the Executive Council and particularly to my old friends, Mr Bob Barton and Councillor Bert Kipling, with whom I have been privileged to be associated for a number of years. I do thank them very sincerely for what they have said. I did not think that they were talking about the man that I know but I appreciate very much their remarks. Also to the Members of the Executive Council for their support and help over a number of years - this I value very much indeed. I consider it also a very particular honour to the City Council of East London. They have had former illustrious Presidents of this Association. I have only just seen my friend Percy Giles - the light was not shining on his bald head just where he is sitting. It is a particular pleasure to me - a personal pleasure - to know that he is here this morning and the fact that East London has once again been honoured in this way.

This year of 1975, happens to be my 25th year in Local Government services and I have come to value, in my personal and my professional life, the very special relationships which exists between Councillor and Engineer Members of this Association. I firmly believe that this unique character of the AMEU, with its Councillor and Engineer Members and with Affiliates, should be very zealously guarded and should be developed in the way that probably will bring greater honour and greater benefit, not only to the Association but to the industry in which we are privileged to serve. I trust that I may be able to serve this Membership here assembled, and others that no doubt will come along after us, in the very best traditions of my predecessors. Thank you again Mr President and members, for a very great honour.

Mr K.G. Robson (taking chair, while President delivers his address): This is indeed a very pleasant duty and a privilege to introduce to you formally our new President, Eugene, whom I am very happy to call my friend. We look forward very much to what he has to say to us here this morning in this, his first official duty as President of this Association and I now give you, Eugene Pretorius.

PRESIDENTIAL ADDRESS

by

**E. de C. Pretorius, Pr. Eng., Town Electrical Engineer,
Potchefstroom**

1. To find a subject suitable for a presidential address is not such an easy task as my predecessors can testify, especially if 43 subjects have already been claimed. It is however, surprising that there is one subject that has been overlooked, well at least the past twenty years, the AMEU itself.

2.1. The AMEU will be 60 this year, all the more the reason to let the limelight fall on ourselves for a change.

2.2. There is possibly more than one present here this morning, even among the engineer and associate members, who are ignorant of the descent and development of our Association.

3. The AMEU is one of the oldest associations in the Republic, if not the oldest, concerned with municipal affairs. It originated as an association that was known as The Association of Municipal Electrical Engineers (Union of South Africa). The inaugural conference was held in Johannesburg from Monday 15 to Saturday 20 November 1915 (six full days!). The first president was the renowned Prof (Col) J.H. Dobson. Present at this conference were personalities who in later years



E. de C. PRETORIUS.

ring was persoonlikheede wat in die jare daarvan diep spore op die terrein van die munisipale elektrotegniese ingenieurswese getrap het: die here E.T. Price, George Swingler en John Roberts. Laasgenoemde was die elektrotegniese stadsingenieur van ons gasheerstad, Durban, en was twee keer president van die AMEE, nl. 1917-1919 en 1924-1926.

4. Met sy stigting het die AMEE 22 lede gehad uit 17 stede en dorpe. (In die beginjare kon die bestuurders van die tremwē-afdeling van stede ook lid word.) Die toenmalige elektrotechniese ingenieur van Potchefstroom, mnr. N.D. Ross, was een van dié lede, oor die jare het die lidmaatskap aangewas tot die huidige imposante getal van o.n. 139 ondernemings en 129 ingenieur- en assosiasielede. (Vir 'n volledige uiteensetting van lidmaatskap verwys ek u na die Sekretaris se verslag.)

5. Die volgende kongres is hier in Durban gehou van Maandag 27 tot Vrydag 31 Augustus 1917, 24 lede en ander afgevaardigdes het dit bygewoon. In daardie jaar was daar reeds 32 lede. (Die verrigtinge van daardie kongres beslaan nie minder as 103 bladsye nie!)

6. Dit is interessant om die verrigtinge van die eerste twee kongresse deur te blaai. Sestig jaar gelede het ons voorstaande reeds met dieselfde probleme as ons geworrel. Op die eerste kongres maak die President melding van standaardisasie, tariewe (selfs spertytariewe!), die aflesse van meters (sekere tye van die maand of aanneelend) en, flo dit as u wil, die lisensiëring van elektrotechniese draadwerkers (maar daarom nog nie aannemers nie).

7. In 1926 word Rhodesiërs tot die Vereniging toegelaat en sy naam word verander na The Association of Municipal Electrical Engineers (Union of South Africa and Rhodesia). In 1935, 40 jaar gelede, word die eerste stap gedoen om die Vereniging sy unieke inslag te gee (wat

played a leading role in the field of municipal electrical engineering: Messrs E.T. Price, George Swingler and John Roberts, who at that time was the city electrical engineer of our host city, Durban, and who was the president of the AMEE twice, in 1917-1919 and 1924-1926.

4. At the time of its foundation, the AMEE had 22 members who hailed from 17 cities and towns. (During the first years of its existence, managers of tramway departments could also become members.) The then electrical engineer of Potchefstroom, Mr N.D. Ross, was one of those 22 members. Over the years membership has gradually increased to the present impressive number comprising, inter alia, 139 undertakings and 129 engineer and associate members. (You are referred to the Secretary's report for a comprehensive exposition of our membership.)

5. The second conference was held here in Durban from Monday 27 to Friday 31 August 1917, which was attended by 24 members and other delegates. In that year the AMEE could already muster 32 members. (The proceedings of that conference took up no fewer than 103 pages!)

6. The proceedings of the first two conferences make interesting reading. Our forbears had to cope with very much the same problems as we have today. At the first conference the President referred to standardization, tariffs (even off-peak tariffs!), the reading of meters (certified days of the month or continuous) and, believe it or not, the licensing of electrical wiremen (though not yet contractors).

7. Rhodesians were first admitted to the Association in 1926 and its name was revised accordingly. In 1935, 40 years ago, the Association took the first step to implant its unique feature (which exists till this

tot vandag toe bestaan en hopelik altyd so sal bly), toe stads- en dorpsraadslede lid van die Vereniging kon word.

8. In 1948 word die Vereniging herdoop tot die Vereniging van Municipale Elektrisiteitsondernemings van Suidelike Afrika (die naam wat hy tot 1971 behou het). L.P.v. stadsraadslede word munisipale elektrisiteitsondernemings nou lid van die Vereniging, en elke onderneming is geregtig om deur twee stemgeregtiges, die hoof van die elektrisiteitsonderneming en 'n stads- of dorpsraadslid, op konvensies verteenwoordig te word. Dit is hierdie kenmerk van ons Vereniging wat dit so uniek maak, en ons behoort daarop trots te wees.

9. Ook in 1948 word ondernemings in die destydse Noord-Rhodesië tot die Vereniging toegelaat, maar weens verwikkelinge ten noorde van die Zambezi word lidmaatskap in 1965 weer eens beperk tot die Republiek, S.W.A. en Rhodesië.

10. Die VMEO moes, weens druk van owerheidswêreld, in 1971 die ongelukkige stap doen om ook die Rhodesiese ondernemings van lidmaatskap uit te stuur. (*Terselfdertyd word "Suidelike Afrika" in die Vereniging se naam vervang deur "Suid-Afrika".*) Die Vereniging het egter nie graag onder sy voete laat groei nie en het, deur die VMB, onlangs vertot tot die Minister van Binnelandse Sake gerig vir die hertoelating van Rhodesiese ondernemings. Ek en mynne, Jules van Aflhiften het gedurende Maart vanjaar, namens die Ultimorende Raad van die VMEO, saam met die Dagbestureur van die VMB, die Minister, Sy Ed. dr. Connie Mulder, te woord gestaan en ek het die indruk gekry dat hy die saak goedgesind is alhoewel hy nie bereid was om daar en dan ja of nee te sê nie. Hy het ons meegedeel dat hy eers baie deuglik oor die saak wyl nadink. Ten tye van die skrywe van hierdie rede is egter nog geen verdere tyding in hierdie verband ontvang nie. Sedertdien het ons die volgende antwoord van die Minister van Binnelandse Sake ontvang.

"In opdrag van Sy Edele dr. C.P. Mulder, Minister van Binnelandse Sake, verwys ek na die onderhoud wat u met hom op 10 Maart 1975 gehad het.

Die Minister het u saak aan die Kabinet voorgelê en dit is my opgedra om u mee te deel dat die Kabinet besluit het om nie aan u Vereniging se versoek te voldoen nie. Die standpunt van die Kabinet kan kortlikas so volg genoteer word:

Die blyk onlogies te wees dat 'n owerheidsliggame of liggame van 'n ander land (al is dit ookal op die langste viels) 'n lid kan wees van 'n Vereniging van Owerheidsliggames in 'n ander land.

Dr. Mulder is jammer dat daar nie in hierdie opsig 'n bevredigende oplossing gevind kon word nie."

11. Kongresse, oftewel konvensies, van die AMEE is, soos tans, al om die ander jaar gehou maar vanaf 1933 vind dit jaarliks plaas, en hierdie gebruik is deur die VMEO voortgesit. Die Administrateurs van die vier provinsies het egter, op aandring van die VMB, 10 jaar gelede besluit dat jaarlike kongresse taboe is en in 1965, die gouden jubileumjaar van die VMEO, vind dan die laaste jaarlike konvensie plaas. Ek dink eerlik dat hierdie, wat ons en ons kollegas, die stadsingenieurs, betref, 'n terugwaartse stap was ek hoop en vertrou dat die dag nie ver is dat ons sal terugkeer tot jaarlike konvensies nie. Indien dit te veel gevra is, behoort ons toegelaat te word om die Tegniese Vergadering, wat nou in die jare tussen konvensies gehou word, oor drie (selfs vier) dae te laat stiek i.p.v. die huidige twee.

12. Ons het nou gekom tot die jaar 1975; die VMEO is sesig jaar oud, 'n type ouderdom, en kan met trots terugkyk na die lang pad wat dit gekom het, 'n pad wat beslis nie altyd met rose besaaï was nie. Maar omdat ons nou 60 jaar is, mag ons nie daarom begin agteroorst en dink aan die dag van afstryde nie. Intendeel, ons betree 'n tydperk wat al hoer eise en groter uitdagings, en wel in 'n snel toenameende tempo, aan munisipale elektrisiteitsondernemings gaan stel. Gevestigde idees sal plek moet maak vir moderne en selfs futuristiese denke. Daarom is dit verbluyend om te sien hoe die jonger generasie onder die elektrotegniese ingenieurs die hoogste poste in die elektrisiteitsondernemings van ons groot stede begin beklek. Die drie jongste voorbeeldie is Knapskop, Johannesburg en Port Elizabeth.

13. Gepraat van eise: ek het onlangs gelees dat voor die einde van hierdie een 20 miljoen woonenhede in die Republiek opgerig sal moet word. Weisbaar sal 'n baie groot persentasie hiervan in die tuiste van Swartes tot stand kom maar dit doen nie afbreuk aan die feit dat dit geweldige hoë eise aan munisipale elektrisiteitsondernemings gaan stel nie, veral t.o.v. kapitaal en mannekrag, beide waarvan beslis nie in oorvloed is nie.

14.1. Oor die mannekragtekort (ingenieurs, tegnici en ambagsmannen) en die onrustbarende en onheilspellende, versnelende verswakking van die toestand is daar al tot vervaars gepraat en geskryf, en is daar al baie geflosfeer en getecoseer nie moontlike oplossings vir die probleem en ek wil u nie verder vervaar over hierdie onderwerp nie. Laat my egter toe om enkele aspekte wat my na aan die hart le, uit te wei.

14.2. In 'n artikel wat (onder die vanafel van die VMEO) in Munisipale Administrasie en Ingenieurswese van August 1974 verskyn het (die artikel wat almal gerus kan lees), sê die skrywer:

day and hopefully will remain), when city and town councillors were granted membership.

8. In 1948 the Association was rechristened the Association of Municipal Electricity Undertakings of Southern Africa (the name it retained until 1971). Instead of city and town councillors, municipal electricity undertakings could now become members of the Association; each undertaking was entitled to two representatives with voting rights, one a councillor and the other the head of the electricity department. It is this feature that gives our Association its unique character; we should take pride in this.

9. Also in 1948, undertakings in the then Northern Rhodesia were first admitted to the AMEU, but in 1965 membership was once again limited to South African, South West African and Rhodesian undertakings (due to complications north of the Zambezi).

10. Due to pressure from higher authorities the AMEU, in 1971, regrettably had to deprive Rhodesian undertakings of continued membership. (At the same time "Southern Africa" in the Association's name was changed to "South Africa".) The Association, however, did not allow grass to grow under its feet, and recently initiated negotiations, via the UME, with the Minister of the Interior for the reinstatement of membership of the Rhodesian undertakings. In March this year, Mr Jules van Aflhiften and I, together with the Standing Committee of the UME, interviewed the Minister, The Hon Dr Connie Mulder, on behalf of the AMEU, and I gained the impression that he was sympathetically inclined towards this matter although he was not prepared to say ay or nay without more ado. He told us that he needed some time to consider the matter. At the time of writing of this address nothing has yet been heard from the UME in this connection.

11. Conferences, or as we term it: conventions, of the AMEE were, as presently, held biennially but 1963 saw the introduction of annual conventions, which was continued by the AMEU. However, the Administrators of the four provinces, at the instance of the UME, 10 years ago decided that annual conferences were taboo and the golden jubilee of the AMEU (1965) was the last of the annual conventions. It is my considered opinion that this was a retrogressive step as far as we and our colleagues, the town engineers, are concerned and I sincerely hope that we will soon revert to annual conventions. If this is asking too much we should be permitted to extend our Technical Meetings, which are held in the years between conventions, to three (even four) days, instead of the present two.

12. We have now reached the year 1975; the AMEU is sixty years old, and can proudly look back at the long road it has come, a road which not always had been strewn with roses. But because we are 60 we dare not start relaxing and think of our retirement. On the contrary, we are entering an era of greater demands from and challenges to municipal electricity undertakings. These demands and challenges will be forthcoming at an accelerating rate. Established ideas will have to yield to modern and even futuristic lines of thought. For that reason it is gratifying that the younger generation of electrical engineers is gradually occupying the highest posts in the electricity undertakings of our large cities. Three recent examples are Cape Town, Johannesburg and Port Elizabeth

13. Talking of demands: I recently read that 20 million dwelling units will have to be established in the Republic before the turn of the century. Admittedly a large portion thereof will be erected in the homelands for Blacks, but this does not detract from the fact that this is going to place an enormous demand on municipal electricity undertakings, particularly with regard to capital and man-power, both of which are at a premium.

14.1. The subject of man-power shortage (engineers, technicians and artisans) and the alarmingly and ominously rapid deterioration of the position, has already been debated ad nauseum and many a philosophy and theory to find a solution to the problem have been put forward; it is not my intention to bore you on this subject any further. I should like however, to digress on certain aspects that are near to my heart.

14.2. In an article (under the banner of the AMEU) which appeared in Municipal Administration and Engineering of August 1974 – (everyone should read this article) – the author states:

"Recruitment and training staff for local government has become a nationwide problem. It is a problem which must be solved if local government is to survive. The U.M.E. is the most experienced and authoritative body in the country when it comes to dealing with problems common to all or most local authorities. It is submitted, therefore, that the U.M.E. should deal with the following aspects of the staff problem on behalf of local government as a whole:

(A) The obtaining of clear and permanent authority from the Government in regard to the extended use of Non-Europeans in the local-government service, at least to the extent to which they are employed by the State and statutory bodies.

(B) The elimination of external control over the salaries of officials in local government service on the ground of the bad effect of the present control on the image of the local authority as employer.

(C) The setting up of regional facilities for training in the fields mentioned in paragraph 24 of this report – on the basis of all local authorities contributing to the cost of such facilities and having the right to use them.

(D) The institution of a local government bursary scheme under the administration of the U.M.E. on the basis that bursars will serve in local government service after completion of their courses."

14.3. Ek hoop en vertrou die Uitvoerende Raad van die VMEO sal met hir en siel hierdie doelstellings ondersteun en self miskien baanbrekerswerk op sekere gebiede doen.

14.4. 'n Onrusbarende aspek van munisipale diens is dat dit nie meer die bewerking en aanklokkelheid (Engels: glamour) het van twintig, dertig jaar gelede nie, en salaris wat aan munisipale amptenare betaal word, speel geen geringe rol in die toesien wat jongmense teen munisipale diens ontwikkel het. In dieselfde artikel genoem in par.

14.2. hierbo, sê die skrywer:

"The young man who may want to make a career of local-government service is immediately put off when he realises that, regardless of his efforts and his merit, his own employer will not be able to pay him the salary which he should earn; and that his salary will be depressed because the salary of his head is depressed. When he looks at the salary of his head of department or at the salary of the town clerk, he finds it no great goal to aspire to. It is no use answering him by saying he must not be materialistic, for he thinks in materialistic terms."

14.5. 'n Sprekende voorbeeld van onrealistiese vergoeding is die salaris van die elektronegiese stadsingenieur aan die spits van die grootste munisipale elektrisiteitsonderneming in die wêreld, 'n onderneming met 'n spilvallei van nagenoeg 1 000 MW, nl. Johannesburg, wat 'n skrale R15 300 per jaar is. Dit skei ten hemel! Nou word daar in die betrokke ordonnansie gesê: hy mag nie meer as sy stadsklerk verdien nie, (wat in alle geval 'n argaische en aanvragbare idee is) wie se salaris deur die Administrator vasgeper word saldaar hy nie meer mag verdien as en so in die staatsdiens nie, wie se salaris op sy beurt bepaal word deur die salaris van 'n nog meer senior amptenaar van ampeksleer in die staatsdiens ensovoorts tot ons uiteindelik uitkom by die Eerste Minister, en daar lê die knoop. Ons land behoort sy kop in skamte te laat sak omdat ons Eerste Minister nie teen minstens R100 000 per jaar vergoed word nie, en ek bedoel dit eerlik.

14.6.1. Wat die opleiding van personeel, en in die besonder vakmanne, betref, sal daar spoedig iets drasties gedoen moet word. Ek was nog altyd daarvan oortuin dat as ons verseker wil weet dat ons in die toekoms die nodige ambagsmannate in voldoende getalle sal kan hê, 'n spesiale vakleerlingskapkomitee vir munisipale elektrisriëns in die lewe geroep moet word maak die weinig steun vir hierdie gedagte van my mededeel op die Uitvoerende Raad gekry; intendeel, sommige het dit as absoluut onuitvoerbaar beskou. Maar dat blyk vir my of my gedagte enersyds nie te vergesos en andersyds nie so naïef is nie want luister wat sê die Minister van Arbeid, Sy Ed. Marais Viljoen, in sy openingsrede tydens die 22e konferensie van die Suid-Afrikaanse Vereniging van Munisipale Werkers wat verlede jaar in Kaapstad gehou is – (ek haal aan uit die SAVMW-bulletin van Oktober 1974):

"Vir sover dit die opleiding van vakleerlinge vir openbare dienslewering betref, is dit gebruikelik dat munisipalteite op 'n vrywillige basis die jurisdiksie van vakleerlingskapkomitees aanvaar en hulle bind om die opleidingsvoorskrifte van dié komitees na te kom. Dit mag meebring dat munisipalteite hul vakleerlinge moet oplei volgens opleidingsroosters wat nie in alle opsigte aan hul besondere behoeftes voldoen nie."

'n Ander aspek wat probleme tot gevolg kan hê, is die feit dat munisipalteite uit die aard van die saak dat dienste van vakmannetjie in 'n wye verskeidenheid van ambagte nodig het, soos byvoorbeeldloodgieters, motorwerkuitkundiges, elektrisriëns, ensvoorts. Indien 'n plaslike overheid egter vakleerlinge in die drie ambagte wat ek genoem het sou oplei, sou dit beteken dat hy die jurisdiksie van drie verskillende komitees moet aanvaar. Die opleidingsvoorskrifte vir vakleerlinge verskil egter van nywerheid tot nywerheid en die gevraag bestaan dus dat ontevredeheid onder die vakleerlinge kan ontstaan indien hulle,

14.3. I sincerely hope that the Executive Council of the AMEU will support these objectives wholeheartedly and perhaps do some pioneering of their own in certain fields.

14.4. An ominous aspect of municipal service is that it is no longer as glamorous as it used to be two or three decades ago. The salaries paid to municipal officials is no mean factor in the growing aversion of the younger generation to municipal service. In the same article mentioned in par. 14.2. above, the author says:

14.5. A striking example of unrealistic remuneration is the salary of the city electrical engineer at the helm of the largest municipal electricity undertaking in the world, an undertaking which has a peak load in the vicinity of 1 000 MW, namely Johannesburg, which is a meagre R15 300 per annum. This cries to high heaven! This is just because the relevant ordinance stipulates that he shall not earn more than his town clerk (which, at any rate, is an archaic and disputable idea), whose salary is pegged by the Administrator lest he be remunerated higher than so and so in die civil service whose salary in turn is determined by the salary of an even more senior official or office-bearer etc. etc. until we get to the Prime Minister, and here lies the rub. Our country ought to be ashamed of itself for not paying its Prime Minister at least R100 000 per annum, and this is my honest opinion.

14.6.1. With regard to the training of personnel, particularly artisans, something drastic will have to be done, and quickly too. It has always been my considered opinion that if we want to be assured of an adequate supply of artisans in the future, the establishment of an apprenticeship committee for **municipal** electricians is the only answer. I found, however, very little support from my fellow-members on the Executive Council for this concept; on the contrary, some of them considered it totally impracticable and not feasible. It does appear, however, that my idea is neither too farfetched nor too naive because this is what the Minister of Labour, The Hon Marais Viljoen, said in his opening address at the 22nd conference of the South African Association of Municipal Employees which was held in Cape Town last year – (I quote from the SAAME Bulletin of October 1974):

vir sover dit diensvoorraades betref, nie almal oor dieselfde kam geskeer word nie.

Nog enige munisipale werkgewersvereniging nog u Vereniging geniet vereenwoording in vakleerlingkomitees en geemeen van u het dus enige seggenskap in verband met aangelaenthede betreffende vakopleiding by plaaslike overhede nie. Hierdie toedrag van sake lei dan ook tot probleme en die vrang ontstaan dus of die tyd nie aangetrek het dat die werkgewers en werkneemers in die plaaslike bestuursonderneming stappe doen met die oog op die daarstelling van 'n eie vakleerlingskapomitee of komitees vir hul onderneming nie.

Daar is geen wetlike beletsel teen die totstandkoming van sulke komitees nie en ek voorsien, in die lig van my vroeëre opmerkings, dat u Vereniging ook in hierdie verband 'n leidende rol sal kan speel."

14.6.2 Nouja, as dit nie 'n ope uitnodiging is nie, dan weet ek nie so mooi nie. Ek hoop die Uitvoerende Raad van die VMEO sal hierdie wens van die Minister opvolg.

14.7. Lets wat ek nie kan verklaar nie is dat immigrantevakmanne so wegkram van munisipale diens, want Yskor is (volgens 'n radionousberig) in April vanjaar oorval met aansoeke van vakmannen in Duitsland en Engeland ná 'n advertensieveldtog. Missien moet die Uitvoerende Raad van die VMEO daarom dink om een of meer van sy lede na die buiteland te stuur op 'n werwingsveldtog!

14.8. In Transvaal het plaaslike besture ook nog te doen met die sogenaamde Taalordonnansie wat sekere taalvaardigheidsovereistes vir sekere betrekkinge noerif. Dit is my bedoeling dat hierdie ordonnansie te kritiseer nie; intendeend, dit is my oortuiging dat dit in baie opsigte 'n goeie doel dien, en daar is basies niks daarmee verkeerd nie. Maar ek sien geen rede waarom 'n ingenieur wat nooit met die algemene publiek te deel kry nie, nie permanent aangestel mag word nie of bevordering (wat salarisverhoging insluit) ontsê word bloot weens die feit dat hy nie aan sekere taalvereistes voldoen nie. Die ontegoeglike toepassing van hierdie ordonnansie is 'n baie belangrike oorsak dat die groter stede nie elektrotechniese ingenieurs in die buiteland kan werf nie en dié wat hulle nog het, moet afstaan aan ander instansies, selfs staatsdepartemente, waar hulle nie onderwerp is aan dieselfde vereistes wat taalbedrewendheid betref nie.

14.9. Tot dusver was ons blykaar nog net bekommern oor geskooldere werkers, tegnici en ingenieurs, maar 'n ander probleem wat hier en daar so klop begin uitstaan en in die toekoms ons nog baie hoofbrekens gaan gee, is die beskikbaarheid van ongeskooldere arbeid.

15. Ek wil u aandag nou tot 'n ander nagmerrie van elektrisiteitsondernemings bepaal: **stygende kostes**.

15.1. Mnr. Von Ahlfen het in sy presidentiale rede ten tye van die 1971-konvensie van die VMEO die sandag gevgestig op die kosteparameters waaraan ondernemings geen beheer het nie. Hulle is leningrente-koste, koste van distribusiegoedere en die koste van elektrisiteitsaanbou. Min het hy kon weet dat in 'n kort tydsbestek van ietwat meer as drie jaar hierdie koste die hoogte sou inskiet.

15.2. Rentekoers.

15.2.1. Dit lyk of ons gelukkig die plafon bereik het. Sommige ekonomiese voorseen 'n awfaartse beweging alhoewel ons kan vergeet van 7% en 8% van net enkele jare gelede.

15.2.2.1. Ek weet baie min van ekonomiese beginsels of maar dit lyk vir my of elektrisiteitsondernemings in 'n groter mate van 'n kapitaalontwikkelingsfonds gebruik moet maak om in hulle kapitaalbehoefte te voorstaan en daardeur die rentelas te verlig. So 'n kapitaalontwikkelingsfonds val egter nie uit die lug nie maar moet opgebou en voortdurend aangevul word. En nou gaan ek my op 'n baie gevarenlirk terrein begeef: die profyte van elektrisiteitsondernemings wat aangevend word vir "verligting van belasting" is die aangewese bron om 'n kapitaalontwikkelingsfonds te voed.

15.2.2.2. Wat die hydree van elektrisiteitsondernemings tot die "verligting van belasting" betref, het ek insiggewende inligting in die jongste (1974) Munisipale Jaarboek gevind. Daarvolgens was daar 30 munisipale elektrisiteitsondernemings in die Republiek en SWA wat gedurende die betrokke boekjaar meer as 50 miljoen kWh verkopro. (Hierby moet nog 10 ander bygevoeg word wat die statistiese gegevens verstruk het nie. Ek vind dit jammer dat ondernemings nie die gevraagde statistiek aan die Munisipale Jaarboek stuur nie want dit is 'n baie waardeloole bron van inligting.) Dié 30 ondernemings se gesamentlike hydree was 10,4% van hulle inkomste – (15: 0 - 9%; 9: 10 - 19%; 6: 20% en meer – die hoogste was 24%). Die bedrag: R17 miljoen. Ek skat dat die bedrag vir die hele Republiek baie na aan R30 miljoen is, voorwaar 'n sensibele bedrag!

15.3. Koste van distribusietoerusting en goedere.

15.3.1. 1974 was 'n hose jaar wat prysstygings betref. Vergelyk met 1973 het die prys van klein distribusietransformators vyfvoordeel met amper 70% gestyg en dié van ondergrondse kabels met tussen 20% en 50%.

14.6.2. Well, if **this** is not an open invitation I do not know. It is hoped that the Executive Council of the AMEU will pursue this matter.

14.7. It is difficult to explain why immigrant artisans shy away from Municipal service, because (according to a radio news report) in April this year Iscor had been inundated with job applications from artisans in Germany and the UK, following an advertising campaign. Perhaps it would pay dividends if the Executive Council of the AMEU sent one or more of its members on an overseas recruitment expedition!

14.8. Transvaal local authorities are, on top of all the other vexations, up against the so called Language Ordinance which lays down certain language proficiency requirements for certain posts. I do not intend to criticise this ordinance; on the contrary, I am convinced that in many respects it serves a good purpose and basically it is sound. However, I do not see any reason why an engineer who **never** deals with the general public may not be appointed permanently or is debarred from promotion (which includes a salary increase) merely because he does not comply with certain language requirements. The unpalatable application of this ordinance is a very important reason for the bigger cities having little or no success in recruiting electrical engineers overseas or across the border and losing those that they still have to other bodies, even government departments, which do not apply such stringent requirements.

14.9. In the past the accent apparently has been only on skilled workers, technicians and engineers but another problem that is emerging here and there and which, in future, is going to cause a lot of headaches, is the availability of unskilled labour.

15. I wish to direct your attention to another nightmare of electricity undertakings: **the escalation of costs**.

15.1. In his presidential address to the 1971 convention of the AMEU, Mr. Von Ahlfen referred to those cost parameters over which undertakings have no control, loan interest rates, cost of distribution goods and the cost of electricity purchases. He did not realize at the time that a rough span of time, slightly more than three years, costs would leap sky high.

15.2. Interest rates.

15.2.1. It fortunately appears as though we have reached the ceiling. Some economists predict a downward trend. Nevertheless we can forget about 7% of a few years ago.

15.2.2.1. My knowledge of the rudiments of economics is very limited. However, in my opinion electricity undertakings will have to resort to capital development funds on an increasing scale for the financing of capital requirements thereby easing the interest burden. Capital development funds, however, do not fall from heaven but have to be built up and continuously replenished. An how I am setting foot on very dangerous ground: the obvious source from which money could be diverted to such a fund is the profits of electricity undertakings that are appropriated for "relief of rates".

15.2.2.2. With regard to the contribution of electricity undertakings to "relief of rates" the latest (1974) Municipal Year Book reveals the following interesting information: During the relevant financial year there were 30 municipal electricity undertakings in the Republic of SWA that sold more than 50 million kWh. (To this figure must be added another 10 undertakings that have not submitted any information. It is a pity that undertakings do not return the statistics requested to the Municipal Year Book as this is a very valuable source of information.) The sum total of the contribution of these 30 undertakings was 10,4% of their revenue – (15: 0 - 9%; 9: 10 - 19%; 6: 20% and more – the highest was 24%). The amount: R17 million. My estimate is that the total amount for whole of the Republic is very close on R30 million, by no means an insignificant amount!

15.3. The cost of distribution goods.

15.3.1. 1974 was a diabolical year as far as price escalations are concerned. In comparison with 1973 the price of small distribution transformers, as an example, increased by almost 70% and that of underground cable, by 20% - 50%.

15.3.2. Die geweldige hoë koste van ondergrondse kabels plas die ondergrondse LS-benetting van dorpsgebiede, veral tot die mate soos voorgestel is deur mnr. Raynal in sy referaat wat hy more sal lewer, buite die bereik van die kleiner ondernemings, waaronder ek Potchefstroom insluit en, ten spyte van al die besware teen bogrondse benetting, lyk dit vir my na een oplossing om die kostespiraal letwerk in toom te hou. Myns insiens sal die beplanning van strate van toekomstige dorpsgebiede hierdie aspek deeglik in ag moet neem.

15.4. Aankoop van elektrisiteit.

15.4.1. In die tydperk April 1965 tot April 1975 het Eskom se tarief vir plaaslike besture in die "gevestigde gebied" van sy Randse en OVS-onderneming met nagenoeg 50% gestyg. Die grootste stygging het in die tweede helfte van hierdie tydperk plaasgevind. Dan moet die opwaarde kWh-prysaanpassings ingevolge die sog. steenkoolklousale in die tarief ook in ag geneem word (wat moeilik berekenbaar is a.g.v. die tariefstruktuurwysing verlede jaar). Ek dink dit is veilig genoeg 60% was.

15.4.2. Dit is nie my bedoeling om Eskom aan die kaak te stel nie want ek is maar net te bewus van die geweldige probleme, waarvan die onbeheerbare kostespiraal seker nie die geringste is nie, waarmen Eskom ook maar moet worstel. Dit is egter seker nie te veel gevra dat Eskom 'n kort- en langtermynprojeksie van sy tarief maak en bekend stel nie, want so iets sal vir plaaslike besture van onskathbare waarde wees. Vir my lyk dit in alle geval van onsself moet gereedmaak vir tariefstygings van minstens 10% per jaar.

15.4.3. Die verhoging van Eskom se tarief is seker die vermaatste faktor wat die afgelope dekade bygedra het tot die verhoging van die elektrisiteitstariewe van plaaslike besture. Potchefstroom se tariewe is, met 1962 se tarief as basis, die eerste keer in 1967 met 'n toeslag van 3% belais en dan na, met tussenposes, 5%, 10%, 20%, 25%, 50% en, in April 1975, 62,5%. Al die verhogings wat die uitsondering van esm (toeslag verhoging van 25% tot 50%) was nodig om te kompenseer vir Eskom-tariefverhogings.

15.4.4. Daar is egter min kommoditeitie, indien enige, waarvan die prysstygging oor die afgelope dekade so gering as dié van elektrisiteit was, 'n prestatie wat voorwaar 'n pluimveer vir elektrisiteitsondernemings is.

15.5. Ek noem hierdie dinge met die hoop dat die publiek daarvan kennis neem en begin besef dat die dae van goedkoop elektrisiteit vir goed iets van die verlede is.

16.1. Laat my toe om oor nog 'n saak te praat wat my na aan die hart lê, nl. die aandeel wat elektrisiteitsvoorsieningsowerhede het in die uitputting van die wêreld se natuurlike hulpronne.

16.2. Die woord "energiekrisis" het die afgelope jaar van wat 'n huishoudelike woord geword. Gelukkig raak hierdie krisis ons land, wat elektrisiteitsvoorsiening betref (behalwe misken Kaapstad met sy olieverbrander kragtasties) nie juis dankses die groot steenkoolreserves waarmee ons land gesê is. Wat my egter bekommer, is die versnelde uitputting van twee ander natuurlike hulpronne waaronder elektrisiteitsvoorsiening soos ons dit vandag ken, haas ondenkbaar is, nl. koper en aluminium.

16.3. In 'n publikasie van Die S.A. Akademie vir Wetenskap en Kuns getitel "Die mens en sy beperkte hulpronne", verstrek dr. W.L. Grant, Hoofbestuurder van die Uraanverrykkingskorporasie van S.A., die volgende onrusbarende statistiek:

Bekende wêredreserves/Known world reserves (1970) (miljoen metriekse ton/million metric tons)
Voorspelde jaarlike verbruiksgroei koers/Predicted consumption growth rate, per annum
Lewensduur van reserwes met eksponentiële groei/Life expectancy of reserves with exponential growth
Lewensduur met 5x reserwes en eksponentiële groei/Life expectancy with 5x reserves and exponential growth

16.4. Op elektrisiteitsvoorsieningsowerhede, as een van die grootste gebruikers van hierdie twee metale, wat 'n belangrike taak om die kwade dag wanneer daar nie meer aluminium of koper beskikbaar sal wees vir opwerkters, transformators, kabels, luglyne e.d.m. so lank as maandelik uit te stel of moontlik miskien heetlemal af te weer. Municipale elektrisiteitsondernemings kan hulle deel bydra deur verbruikers op te voed om elektrisiteit, veral vir huishoudelike doeleindes, meer oordelkundig te gebruik sodat die las meer eweredigoor die 24 uur van die dag verspilde kan word. Die algemene opvatting by die publiek dat elektrisiteit onbeperk beskikbaar is, is futil en moet die nek ingeslaan word. Die publiek sal moet besef dat huishoudelike (en selfs ander) laste vroer of later tot die allermoeidaakklike beperk sal moet word. Luukshede soos byvoorbeeld drie en selfs meer waterverwarmers per huishouding, ondervloerse verwarming, e.d.m. sal die een of ander tyd

15.3.2. The enormously high cost of underground cable places the LV underground reticulation of townships, especially to the extent advocated by Mr. Raynal in his paper to be read tomorrow, outside the means of the smaller undertakings, including Potchefstroom, and notwithstanding all the objections to overhead LV reticulation, this appears to me to be one of the solutions to keep the cost spiral in check to a certain extent. In my opinion the planning of streets in future townships should seriously take this aspect in consideration.

15.4. The purchase of electricity.

15.4.1. During the period April 1965 to April 1975 Eskom's tariff for local authorities in the "established area" of its Rand and OVS undertaking escalated by almost 50%. The biggest increase occurred during the second half of this period. In addition there is the nett upward kWh price adjustment in terms of the so called "coal clause" in the tariff (which is difficult to assess due to the change last year in the tariff structure). I surmise that the overall tariff increase during the past decade was almost 60%.

15.4.2. It is not my intention to pillory Eskom, because I am only too aware of the tremendous problems, of which the uncontrollable cost spiral is not the least, they also have to cope with. It is perhaps not asking too much if Eskom could make and publicise short and long term projections of its tariff which would be of extremely great value to local authorities. At any rate it appears to me that we will have to brace ourselves for annual tariff increases of 10% at least.

15.4.3. Eskom price increases probably contributed more than anything else to the increase in electricity tariffs of local authorities during the past decade. Potchefstroom's tariff, with the 1962 tariff as basis, for the first time in 1967 included a surcharge of 3%, and thereafter, at various intervals, 5%, 10%, 20%, 25%, 50% and, in April 1975, 62,5%. All these surcharges, with one exception (25% to 50%) were necessary to compensate for Eskom tariff increases.

15.4.4. It is however, gratifying to know that there are few, if any, commodities of which the price increase during the past decade was as small as that of electricity, at least which is a feather in the cap of electricity undertakings.

15.5. I mention these matter because I want the public to take cognisance thereof and to realise that the days of cheap electricity are something of the past for good.

16.1. Allow me to digress on another topic that is close to my heart: the played by electricity supply authorities in the depletion of the world's natural resources.

16.2. The words "energy crisis" have become part of the everyday vocabulary. This crisis fortunately does not really affect our country as far as electricity supply is concerned (with the exception perhaps of Cape Town with her oil-fired power stations) thanks to the enormous coal reserves with which our country is blessed. What worries me, however, is the accelerated depletion of two other natural resources without which electricity supply, as we know it today, is almost inconceivable, i.e. copper and aluminium.

16.3. In a publication of Die S.A. Akademie vir Wetenskap en Kuns titled "Die mens en sy beperkte hulpronne", Dr. W.L. Grant, General Manager of the Uranium Enrichment Corporation of S.A., gives the following ominous statistics:

	Koper/Copper	Aluminium
Bekende wêredreserves/Known world reserves (1970) (miljoen metriekse ton/million metric tons)	279	1 050
Voorspelde jaarlike verbruiksgroei koers/Predicted consumption growth rate, per annum	4,6%	6,4%
Lewensduur van reserwes met eksponentiële groei/Life expectancy of reserves with exponential growth	21	31 jaar/years
Lewensduur met 5x reserwes en eksponentiële groei/Life expectancy with 5x reserves and exponential growth	48	55 jaar/years

16.4. An important task rests on the shoulders of electricity supply authorities, possibly one of the largest users of these two metals; to postpone as long as possible or perhaps completely ward off the evil day when no more copper aluminium will be available for generators, transformers, cables, overhead lines etc. Municipal electricity undertakings can contribute to this end by educating their consumers to use electricity particularly for domestic purposes, more judiciously, thereby distributing the load more evenly over the 24 hours of the day. The general conception of the public that electricity is available in unlimited quantities is futile and must be undone. The public will have to realise that domestic (and even other) loads sooner or later will have to be limited to bare necessities. Luxuries such as three or even more geysers per household, underfloor heating, etc. at some time or other will have to disappear (unless the consumer subjects himself to self dis-

moet verdwyn (tenys die verbruiker selfdissipline toepas) want ons kan nie net aangaan en aangaan om hoofleidings te verswaar en addisionele transformators te installeer wat 'n sware las plans op die wêreld se natuurlike hulphulle.

16.5. Heelwat munisipale elektrisiteitsondernemings doen reeds hulle deel om hierdie probleem – alhoewel nie spesifiek met daardie doel nie – die hoof te bied, hyvoerde d.m.v. sentrale lasbeheer en stroombrekertariewe (alhoewel lg. nog nie die hoër inkomstegroepie vir wie koeste geen probleem is, aan bande lê nie).

16.6. Ek moet liewe nie verder oor hierdie onderwerp uitrei nie anders word ek net nou van kettery beskuldig.

17. Om af te sluit, wil ek nog net twee ander sakies wat ons as munisipale elektrisiteitsondernemings strem, aanraak (waarvan ons gefilieerde lede tog aab. moet kennis neem).

17.1.1. Die eerste is die aflewering van distribusiegoedere wat, soos dit vir my voorkom, 'n steeds groeiende probleem word. Ons moet seker maar aanvaar dat die aflewering van sekere aldaagse items tot soveel as 52 weke (en selfs langer) is. Maar wat beslis krap, is dat leveransiers nie by hulle gekwoteerde afleweringstye hou nie, meestal sonder tydige kennisgewing, en dit selfs met soveel as 50% en meer oorskry. Dit plaas ons as munisipale elektrisiteitsondernemings soms in baie groot verlegenheid.

17.1.2. Dan vind jy ook heel dikwels dat, nadat jy die beste deel van die jaar vir 'n artikel gewag het, dié artikel nie aan jou spesifikasie voldoen nie, terwyl daarvan die baie ure daarvan bestee is om dit so noukeuring en ondubbelisning moontlik op te stel. Omdat jy feitlik sonder uitsondering verleë is, moet jy dit maar gedwee aanvaar.

17.2. Die tweede is die beskikbaarheid van onderdele vir distribusie-toerusting. My departement het byvoorbeeld van baie 11-kV-skakeltuig van baie bekende fabrikaat wat ongeveer 4 jaar gelede aangekoop is. Dan is daar die probleem dat verlengingspaneel vir 11-kV-skakelborde wat slegs enkele jare gelede aangekoop is, eenvoudig net nie meer beskikbaar is nie. Rasionalisering is miskien 'n goeie ding vir die handel maar dithou beslis nadele in vir die gebruiker.

18. Ek bedank u dat u so geduldig na my geluister het.

Mr. J.C. Waddy (Pietermaritzburg): Mr. President, I think your choice of subject was most appropriate for this the 60th year of the Association's existence.

You touched on quite a number of points and I don't want to take up time by commenting on all of them, but it is as well to remember that when the Association was started in 1915, there was a world war raging and I think possibly that the reason for the formation of the Association, which you have not mentioned, was that there must have been a tremendous number of problems confronting supply engineers at that time. One should remember that there was then no local manufacture whatsoever, so that the engineers of that time must have had a tremendous problem on their hands, particularly as shipping was being sunk when carrying supplies to this country from overseas. There appears to be no mention of such problems in the journal at all so it may be that they took the problems in their stride and were able to ignore the major ones and concentrate on the minor ones, i.e. tariffs, meter reading, licencing of wiremen and so on.

You mentioned that the establishment of an Apprenticeship Committee for Municipal electricians would assure an adequate supply of artisans; it may well be that such a Committee would be of assistance, but I very much doubt whether it would assure an adequate supply of artisans. One of the most disappointing things about training apprentices is that when they complete their time, some immediately leave and go elsewhere. Quite a number of them take up an entirely different occupation and I don't see how a separate Committee is going to overcome that. I think the only way we can hold them in the long run is to pay them adequately. You mentioned also the possibility of the Association undertaking overseas recruitment of artisans. I think that is quite a good idea, and I would suggest that the Executive give it some thought. It might well be that a joint recruiting campaign would serve a very useful purpose but there would, of course, be a problem in keeping some of the recruits in the smaller centres.

You mentioned also the problem of the availability of unskilled labour, which is now nearing its head. That is indeed becoming a problem; we find in Pietermaritzburg, for instance, that it is very difficult to get labourers for excavation work. The Europeans, Indians and Coloureds won't do it and the Bantu are now showing increasing reluctance. If they can possibly get any other work, they take it. I think we have to face up to the fact that we will have to mechanise to a far greater extent than we are doing at the moment.

Also you mentioned that the days of cheap electricity are something of the past but "cheap" is a relative term. Electricity is no longer cheap in relation to what it cost 20 years ago but I do think that it is still fairly cheap in relation to other goods and services, in this country. However, that may not apply in some other countries, particularly those in

cipline) because we just cannot afford carrying on increasing mains and installing additional transformers which place a heavy burden on the world's natural resources.

16.5. Various municipal authorities are already making a contribution to combat this problem – though not specifically to this end – e.g. by means of centralized load control and circuit breaker tariffs (although the latter does not put the higher income group, to whom cost is no object, under restraint).

16.6. I should not digress any further on this subject lest I be accused of heresy!

17. In conclusion I wish to touch on two other matters that seriously affect us as municipal electricity undertakings – our affiliates must please note.

17.1.1. The first is the delivery of distribution goods which, as it appears to me, is becoming a growing problem. I suppose we must simply accept and live with the fact that delivery of certain everyday items is as much as 52 weeks (and even more). But what really irritates us is that suppliers do not keep to their quoted delivery periods, invariably without even giving timely notice, and exceed it by as much as 50% and more. This sometimes causes a great deal of embarrassment to us as municipal electricity undertakings.

17.1.2. Then, after having waited the best part of a year for a certain item one finds that the relevant article does not comply with your specification despite the fact that many hours had been devoted to drafting it as precisely and unambiguously as humanly possible. Generally one is badly in need of that article and has no option but to accept it – sort of grin and bear it.

17.2. The second is the availability of spare parts for distribution equipment. For example, my department had to wait more than a year for three simple bushing insulators for 11-kV switchgear of a very well known manufacturer which had been purchased approximately 4 years previously. Another problem is that extension panels for 11-kV switchboards that had been acquired only a few years previously are simply no longer available. Rationalisation probably has its benefits as far as the trade is concerned but it certainly places the user at a disadvantage at times.

18. I thank you for having so patiently listened to me.

which electricity is generated from oil. I read recently that in some electricity undertakings have had to put up their charges to such an extent that consumers are paying more for electricity than they are paying on the bonds on their houses. I hope it does not come to that here.

Mr. President I now propose a vote of thanks to you for your most interesting Presidential Address. Thank you.

GREETINGS – GROETE

Mr. S.R. Baker (Johannesburg): Mr. President, I would like to extend my thanks for your kindness for inviting my wife and me to this very interesting and informative 44th Convention. Then, Sir, may I say to you personally, our congratulations on your appointment to this very high and very responsible office. May I bring to your Association the greetings of the Coal Industry in total. Many of your members will know, Sir, that the Coal Industry is currently experiencing some problems. We would like to say to you, Sir, that despite those problems, we are doing all that we can to ensure that adequate supply of coal will in fact be available for the very necessary task of generating the country's electricity requirements. Mr van Wyk quite frankly reminded us this morning of the problems of depleting resources in so far as coal is concerned. There is obviously a limited to our total reserves, and I suppose that both producer and consumer have a very great area of concern about this matter.

I understand, Sir, that the Coal Resources Commission report is already in the hands of the Minister of Mines and is likely to be released fairly shortly. It is always dangerous, Sir, to prophesy, but I am fairly confident that when the report is issued, it will show reserves very much greater than the 16 000 M tons which was forecast in 1969, so that it may give us just a little relief from the concern which we all feel. May I wish you, Sir, a very happy and a very successful Convention. Once again, our good wishes on behalf of the Coal Industry.

Ch. P.G. Joynt (Tzaneen): Mr. President, ek bring die goede oor van die Elektrieseiteitskomitee van die Transvalse Landbou-Unie en dan ook van die Suid-Afrikaanse Landbou-Unie aan u. Ek wil u ook baie gelukwens met u vertrekking as President. U weet, die Landbou is die 2de been van plaaslike owerhede van die dorpe. Ons is u baie dankbaar dat ons dit lig laat staan. Dankie.

Mr. R.W. Barton (Welkom): Mr. President I bring you the greetings of the President and Members of the S.A. National Committee on Illumination and their very best wishes for a happy and successful Convention and equally successful term of office.

Mr. A.F.W. Eggers (Post Office): Mr. President on behalf of the P.O. I would like to congratulate you on your election to this very high post and I would also like to thank the members of the AMEU very

much for the co-operation that we have received in the past. I think it is wellknown that we lie very close to each other in the side walks and streets of the Republic and it is here where this co-operation is very valued. Thank you Mr. President.

Mnr. J.E. Heydenrych (Middelburg): Mnr. President, namens die Hoeveldtak van die VMEO wil ek u van harte gelukwens met u verkiezing. Ek kan u verseker dat ons tak besonder trots is op u; dat ons nog 'n President opgelewer het. U word 'n suksesvolle ampstermynd toegewens. Dankie.

Mr. D.H. Fraser (Durban): Mr. President, may I on behalf of the Natal Local Centre of the S.A. Institute of Electrical Engineers extend greetings from the Natal Centre and congratulate you on the choice of venue.

PLEK VAN TEGNIESE VERGADERING 1976

VENUE OF TECHNICAL MEETING 1976

President: Dames en here, die volgende item op die Agenda is die Plek van die Tegniese Vergadering, 1976. Raadslid van Zyl, van Rustenburg, het iets hieroor te sê:

Raadslid J.F. van Zyl (Rustenburg): Mnr die President, net voor-

dat ek vervaag tot daardie funksie, lasat my toe om vir u en ook vir die Aangewese President baie geluk te wens met u verkiezing vanoggend. Ons kan vir u verseker dat waar ons in die afgelope paar jaar vir u geleer ken het, my Stadsraad en ek dink dat almal in hierdie saal vanoggend baie tevreden is met die keuse.

Mr. President it now gives me great pleasure that on behalf of my Council of Rustenburg to invite your Association to have your 1976 Technical Meeting at Rustenburg. We cannot offer you the same as Durban, but we can offer you very close to that, except for the sea. If you swallow enough salt water now and bring it over to Rustenburg, I think you will be able to enjoy your stay at Rustenburg as much as you can here in Durban. Thank you very much for this opportunity of inviting you to come over to Rustenburg for your Technical Meeting. Thank you.

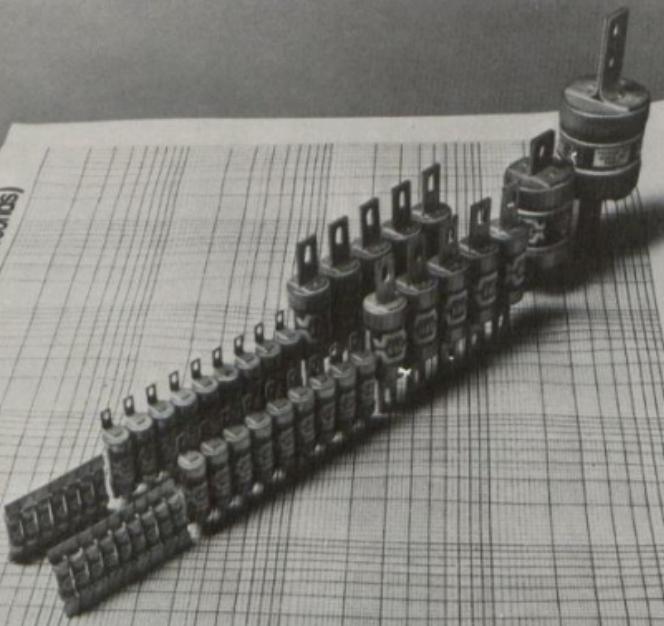
VENUE OF 1977 CONVENTION PLEK VAN 1977 KONVENSIE

Councillor H.G. Kipling (East London): Mr President, members of AMEU, Ladies and Gentlemen, it is with great pleasure that we invite you to hold your next Convention in East London. I can assure you that the President Elect has already made certain preparations which he will definitely extend in the coming 12 months.



MR. KEN ROBSON.

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GRONDWETWYSIGINGS

CONSTITUTION AMENDMENTS

Voeg by Artikel 3.bis

3.bis „WAPEN”

Wapen:

In goud, 'n verhoogde uitgetande dwarsbalk van blou belnai met 'n versmale dwarsbalk van silwer, in die skildhoof ver gesel van vyf ringe en rooi en in die skildvoet van 'n tondrat van blou binne in drie bliksemtrale van rooi, driehoeksgewys met punte na benede.

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Dekkiede:

Goud en Blou.

Wapenspreuk:

FIAT LUX

11. STEMMING DEUR LEDE

Wysig Artikel 11.2 om te lees:

„Geen ander lid of verteenwoordiger het stemreg nie en geen persoon sal geregtig wees om te stem namens meer as een onderneming”.

12. PROCEDURE BY DIE KONVENTSIE OF TEGNIESE VERGADERING

Wysig Artikel 12.3 deur die byvoeging ná „kworum” van die volgende:-

12.3 „As daar nie binne vyftien (15) minute na die tyd waarvoor die vergadering belê is, 'n kworum is nie, word die vergadering uitgestel vir een (1) uur, en as daar dan geen kworum teenwoordig is, word die vergadering voortgesit”.

Wysig Artikel 12.5 om te lees:

12.5 „Oor alle sake (behalwe vir die verkiesing van lede van die Raad wat per stembrief geskik word) word by wyse van die opstek van hande gestem tensy enige ses stemgeregtige persone versoek dat deur middel van stembriefes gestem moet word”.

Wysig Artikel 12.6 om te lees:

12.6 „In die geval van 'n staking van stemme, op watter wyse ookal, beskik die voorvasser van die vergadering, bo en behalwe sy gewone stem oor 'n beslissende stem.”

Voeg by Artikel 14.3

14.3 „Nominasies vir lidmaatskap van die Uitvoerende Raad moet deur die Sekretaris skriftelik ontvang word ten minste dertig (30) dae voor die Konvensie, en geteken wees deur een stemgeregtige lid, sowel as deur die genoemde wat sy aanvaarding van die nominasie bevestig”.

Wysig Artikel 15.3 om te lees:

15.3 „Die Uitvoerende Raad kan, mits minstens twee-derdes van die stemgeregtiges op 'n vergadering daarvoor stem, enige persoon ko-opteer om in die Uitvoerende Raad te dien. So 'n persoon se lidmaatskap van die Uitvoerende Raad eindig by die eer volgende konvensie, tensy dit vroeër deur die Uitvoerende Raad be-eindig word. Sodanige gekoopteerde lid sal dien in 'n advise rende hoedanigheid sonder stemreg”.

Insert Section 3.bis

3.bis "COAT-OF-ARMS"

Arms:

Or, on a fess enhanced indented Azure between in chief five annulets Gules and in base a cogwheel Azure within three flashes of lighting disposed in triangle point downwards Gules, a burrulet Argent.

Crest:

Isuant from a mural crown Gules, a torch Or enflamed proper.

Mantling:

Or and Azure.

Motto:

FIAT LUX

11. VOTING BY MEMBERS

Amend Section 11.2 to read:-

“No other member or representative shall have voting rights and no person shall be entitled to vote on behalf of more than one undertaking”.

12. PROCEDURE AT CONVENTION OR TECHNICAL MEETING

Amend Section 12.3 through the addition after “quorum” of the following:-

12.3 “If a quorum is not present within fifteen (15) minutes after the stated time of commencement of the meeting, the meeting shall be postponed for one (1) hour, and if there is then no quorum present the meeting shall proceed”.

Amend Section 12.5 to read:-

12.5 “All matters (except the election of members of the Council which shall be by ballot) shall be voted upon by the raising of hands, unless any six persons, entitled to vote, request that voting takes place by ballot”.

Amend Section 12.6 to read:-

12.6 “In case of equality votes in whatever manner, the Chairman of the Meeting shall, in addition to his ordinary vote, have at his disposal a casting vote”.

14. EXECUTIVE COUNCIL

Amend Section 14.1.5 of the English version to read:-

14.1.5 “eight engineer members, other than those already mentioned, who shall be elected by the convention; Provided that each of the five regions, the precise boundaries of which shall be determined by the Executive Council, shall have at least one representative”.

Insert Section 14.3

14.3 “Nominations for membership of the Executive Council must be received by the Secretary in writing at least thirty (30) days prior to the Convention, and signed by one member entitled to vote, as well as by the nominee, signifying his acceptance of nomination”.

15. PERIOD OF OFFICE OF EXECUTIVE COUNCIL, CASUAL VACANCIES AND CO-OPTION

Amend Section 15.1 of the English version to read:-

15.1 “The Executive Council shall hold office until the election of a new Executive Council at the next convention”.

Amend Section 15.3 to read:-

15.3 “The Executive Council may, by not less than a two-thirds majority of those present at the meeting, co-opt any person to serve on the Executive Council. Such person's membership of the Executive Council shall, unless previously terminated by the Executive Council, terminate at the first ensuing convention. Such co-opted members shall be in an advisory capacity without a vote”.

16. PLIGTE EN BEVOEDGHEDE VAN DIE UITVOERENDE RAAD

Wysig Artikel 16.4 om te lees:-

16.4 „Om 'n dagbestuur aan te wys wat bestaan uit die Predisnet, die Aangewese President en hulle onderskeie raadsverteenvoerders, en ten minste een maar nie meer as twee ingenieurslede van die Uitvoerende Raad. Die dagbestuur is teenoor die Uitvoerende Raad aanspreeklik vir die administrasie van die gedelegeerde en dringende sake van die Vereniging in die tydperke tussen vergaderings van die Uitvoerende Raad".

19. FINANSIELE JAAR VAN DIE VERENIGING

Wysig Artikel 19 om te lees:-

„Die boekjaar van die Vereniging strek van 1 Januarie tot 31 Desember van elke jaar, tensy die Uitvoerende Raad anders besluit".

24. ONTBINDING VAN DIE VERENIGING

Wysig Artikel 24.3 om te lees:-

24.3 „Ingeval daar by die likwidasié van ontbinding van die Vereniging na vereffening van alle skulde en laste, enige eiendom hoegenaam corby, mag dit nie aan die lede van die VERENIGING uitbaatbaar word of onder hulle verdeel word nie, maar moet dit aan die een of ander inrigting of inrigtings met dieselfde doelstellings as die van die VERENIGING en wat self van inkomstebelasting vrygestel is, geskenk of oorgedra word, soos by of voor die ontbinding deur die lede van die VERENIGING, of by geskrewe daarvan deur die betrokke Minister vrygestel word".

16. DUTIES AND POWERS OF THE EXECUTIVE COUNCIL

Amend Section 16.4 to read:-

16.4 "To appoint a Standing Committee consisting of the President, the President Elect and their respective council representatives and at least one but not more than two engineer members of the Executive Council, which committee shall be responsible to the Executive Council for the administration of delegated and urgent affairs of the Association between meetings of the Executive Council".

19. FINANCIAL YEAR OF THE ASSOCIATION

Amend Section 19 to read:-

"The financial year of the Association shall be from 1 January to 31 December of each year unless the Executive Council decide otherwise".

24. DISSOLUTION OF THE ASSOCIATION

Amend Section 24.3 to read:-

24.3 "Upon liquidation or dissolution of the ASSOCIATION there remains any property whatsoever after the satisfaction of all debts and liabilities, the same shall not be paid to or distributed among members of the ASSOCIATION, but shall be given or transferred to some other institution or institutions having objects similar to those of the ASSOCIATION, and which are themselves exempt from income tax, to be determined by the members of the ASSOCIATION at or before the time of dissolution, and in default thereof by the relevant Minister"

**PROPOSED AMENDMENTS TO THE CONSTITUTION
VOORGESTELDE WYSIGINGS VAN DIE GRONDWET**

Mnr. J.K. von Ahlfen (Springs): Mnr. President, voor ek aangaan met die motivering, laat my toe om u hartlik geluk te wens as 'n Stellenboscher met u verkiezing as President. Dis nou in 'n kort bestek van 4 jaar waar Stellenbosch nou twee presidente opgelewer het. Ons is besonder trots op u prestasie.

Mnr. President, dames en here, namens die Uitvoerende Raad wil ek net graag kortlik die motivering gee, wat hoofsaaklik daarop gemik is vir die doeltreffende bestuur en administrasie van die Vereniging se sake en om sekere artikels van die grondwet en procedures meer duidelik te omskrywe.

Mnr. die President die eerste belangrike wysiging is Artikel 11.2 – **Stemming deur lede**. Dit het nodig geword om duidelik te bepaal dat slegs die lid van verteenwoordiger van 'n lidonderneming namens daardie spesifieke onderneming mag stem, niestaande die feit of die lid van verteenwoordiger ook 'n ander onderneming verteenwoordig. Daar het gevallen van hierdie aard voorgekom en mag weer voorkom en soos die grondwet tans lees is dit nie duidelik wat die regposisie in sulke gevalle sou wees nie. Dit is die Uitvoerende Raad se mening dat dit in elk geval nie meer as reg is dat slegs volgens werklike verteenwoordiging gestem behoort te word. Artikels 12.3, 12.5 en 12.6 is slegs aanpassings van korrekte procedure soos dit in alle grondwette voorkom wat stemming by wyse van stembrief en wat die beslissende stem van die Voorzitter betref. Die volgende belangrike wysiging in Artikel 14 is 'n byvoeging van Artikel 14.3 wat die voorstelle van nominasies vir die Uit-

voerende Raad betrek, wat nou spesifiek bepaal dat dit skriftelik gedoen moet word, 30 dae voor die Konvensie, en wat skriftelik deur die genomineerde aanvaar moet word. U sal u herinner dat daar in die vorige probleme geopper is deur lede in hierdie verband, dat hulle voorgestel is en nie teenwoordig was nie en nie kon meld van hulle nie nominasie aanvaar. The next amendment to Section 15, is merely to indicate that any co-opted person to the Executive Council shall be in an advisory capacity only without a vote. The present constitution does not clearly provide for this which is an accepted procedure in all constitutions. Furthermore, if it should not become necessary to extend the Standing Committee, it is not necessary for the co-opted person to the Executive Council to be also co-opted to the Standing Committee. The Executive Council should have the authority to appoint an additional member to the Standing Committee who is a member of the Executive Council to serve on this Committee. It is for this reason that Section 16.4 has been amended accordingly, and the last sentence in Section 15.3 deleted. Mnr. President, met hierdie paar worte, wil ek dus formeel voorstel dat die voorgestelde wysigings van die grondwet formeel deur die Konvensie aanvaar word. Baie dankie.

President

Is daar ander voorstelle. Geen. Baie dankie dan aanvaar die Konvensie hierdie wysigings in die geheel.

**ELECTION OF EXECUTIVE COUNCIL
VERKIESING VAN UITVOERENDE RAAD**

**NOMINATIONS RECEIVED
NOMINASIES ONTVANG**

Northern Region – Noordelike Streek

BOTES P.J.
BOYACK I.F.
DE VILLIERS E.E.
VAN DEN BERG A.J.

Roodepoort
Pretoria
Rustenburg
Krugersdorp

Central Region – Sentrale Streek

BARNARD W.
BARTON W.
LOUBSER J.A.
VON AHLFTEN J.K.

Johannesburg
Welkom
Benoni
Springs

Eastern Region – Oostelike Streek

CLARKE M.P.P.
FRASER D.H.

Newcastle
Durban

Southern Region – Suidelike Streek

DAWSON J.D.
ROBSON K.G.

Uitenhage
East London

Western Region – Westelike Streek

DREYER H.C.
PALSER D.C.

Paarl
Cape Town

In view of the fact that Mr. K.G. Robson was elected President Elect, his name was deleted from the ballot paper.
Die volgende agt persone is per stembrief verkieks:-

Northern Region - Noordelike Streek

BOTES P.J.

VAN DEN BERG A.J.

Roodpoort
Krugersdorp

Central Region - Sentrale Streek

BARNARD W.

LOURSER J.A.

VON AHLFSEN J.K.

Johannesburg
Benzoni
Springs

Eastern Region - Oostelike Streek

FRASER D.H.

Durban

Southern Region - Suidelike Streek

DAWSON J.D.

Uitenhage

Western Region - Westelike Streek

DREYER H.C.

Paarl

Scrutineers - Stemopnemers

P.P. CAPRA
V. COHEN
G. GERBER
A.A. MIDDLECOTE
D.C. PLOWDEN
J.P. THOMAS



Twee van die buffettafsels - 'n fees vir die oog en die tong, soos die ete op manjefieke wyse voorberei en voorgesit is deur die Ellangeni Hotel.



The retiring President, Mr. Jack Waddy welcoming the guests and delegates to the 44th Convention in Durban:
Left to right: Brian Jones (Assistant), Bennie van der Walt (Secretary), Mrs. H. Schwellnus and Councillor J.P.C. Schwellnus (Mayor of Potchefstroom), Eugene Pretorius (Incoming President), Jack Waddy (President), J.D.N. van Wyk (Guest Speaker), Councillor A.D. Adams (Mayor of Durban), Mrs. Adams (obscured by the floral decoration), Dennis Fraser (City Electrical Engineer, Durban), and Rev. Owen Franklin.



'n Beeld van die sowat 550 afgevaardigdes in die vergadersaal.

AAN DIE UITVOERENDE RAAD EN LEDE VAN DIE V.M.E.O.

Dit is met genoeg dat ek hiermee aan u verslag doen van die werkzaamhede van die VMEO vir die jare 1973 en 1974.

Met ingang 1 Januarie 1973 is my firma aangestel as die nuwe sekretaris van u Vereniging, in opvolging van die firma Davidson en Ewing (Edms) Beperk wat vir 'n tydperk van 18 jaar die sekretariaat behartig het.

1. BESTUUR:

Die sake van u Vereniging word bestuur deur 'n Uitvoerende Raad wat bestaan uit 10 ingenieurslede tesame met hulle onderskeie raadslede. Die Uitvoerende Raad het vier keer vergader en daar is behoflik nootle van al die vergaderings gehou.

Die Dagbestuur bestaan uit die president en aangewese president, tesame met hulle onderskeie raadslede, en mnr J.K. von Ahlfen en D.C. Plowden. Die Dagbestuur het vyf keer vergader.

2. VERTEENWOORDIGERS EN KOMITEES:

Die volgende verteenwoordigers en komitees is benoem vir die termyn onder oenskou, t.w.

Finansies/Finance: Mnre/Messrs. J.K. von Ahlfen en/and D.C. Plowden.
Referate/Papers: Mnre/Messrs. J.C. Waddy en/and E. de C. Pretorius.

Aanbevelingskomitee/Recommendations Committee: Mnre/Messrs. R.W. Barton en/and J.K. von Ahlfen.

Tegniese Opleiding/Technical Training: Mnre/Messrs. D.C. Plowden, T.W. Barton, P.J. Botes, E.E. de Villiers, H.C. Dreyer, D.H. Fraser en/and K.G. Robson.

SABS Koördineerde/SABS Co-ordinator: Mnre/Messrs. E.E. de Villiers, E. de C. Pretorius, D.C. Plowden en/and L.B. Cumming.

EVKOM-onderkomitee/ESCOM Sub-committee: Mnre/Messrs. J.C. Waddy, P.J. Botes, H.C. Dreyer, D.H. Fraser en/and K.G. Robson.

Wysigingswet op Elektrotegniese Draadwerkers en Aannemers/Electrical Wiremen & Contractors Amendment Act: Mnre/Messrs. J.K. von Ahlfen, R.W. Barton, E.E. de Villiers en/and J.C. Waddy.

Registrasieraad vir Elektrotegniese Draadwerkers/Electrical Wiremen's Registration Board:

Mnr/Mr. J.K. von Ahlfen.

WNNR-advisieskomitee vir Elektriese Ingenieurswese/CSIR Advisory Committee for Electrical Engineering: Mnr/Mr. J.K. von Ahlfen.

SANKV/SANCI: Mnr/Mr. R.W. Barton.

Wêreld Kragbronkonferensie/World Energy Conference: Mnr/Mr. R.W. Barton.

Die Vereniging van Raadgewende Elektrotechniese en Meganiese Ingenieurs/The Association of Consulting Electrical and Mechanical Engineers: Mnr/Mr. E.E. de Villiers.

Hoogspannings-laboratoriumgeriewe/High Tension Laboratory Facilities: Mnr/Mr. D.C. Plowden.

Ko-ordinerende Komitee vir Dienste/Co-ordinating Committee for Services: Mnr/Mr. G.C. Theron.

Pers en Publiseit/Press and Publicity: Mnr/Mr. K.G. Robson.

S.A. Komitee l.s. Elektrolytiese Verwerking/S.A. Committee for Electrolytic Corrosion: Mnr/Mr. D.C. Plowden in die hoofkomitee met/on the Main Committee, with Mnre/Messrs. G.H. Dawse (Witwatersrand Streekkomitee/Witwatersrand Regional Committee) D.H. Fraser (Natalse Streekkomitee/Natal Regional Committee) K.J. Murphy (Wes-Kaapland/Western Cape) en/and G. Forbes (Noord-Kaapland/Northern Cape).

3. TAKKE

Die volgende vier Takke het gefunksioneer:-

Hoëveld

Natal

Goeie Hoop

Oos-Kaapland

Ons ontvang gereeld die agendas en notules van al die takvergaderings. Daaruit blyk dat dat die lede hul werkzaamhede besonderlik ter harte neem. Deurdringende studie en besprekings vind plaas oor allerlei onderwerpe waarmee die beroep genoeg is. Lede woon in die algemeen die Takvergaderings goed by as die afstande wat afgelo moet word ons by vergaderings te kom, in ag geneem word. Die Takke het die verskeie sake na die Uitvoerende Raad verwys vir aandag. Dit is ook die aangewese weg wat Takke moet volg. Die Uitvoerende Raad het alle sake wat aldus verwys is, simpatiek oorweeg, dit na die betrokke overhede verwys indien nodig en andersins binne die raamwerk van die Grondwet van die VMEO afgehandel.

Ons wil langs hierdie weg ons dank en waardering teenoor die voorstellers en sekretaries van die takke betuig vir die tyd wat hulle so goedgunstig in belang van die VMEO opoffer.

4. ERELIDMAATSKAP:

Die Uitvoerende Raad het aanbeveel dat aan die volgende persone erelidmaatskap toegeken word vir hul besondere en ustaande dienste wat hul oor baie jare aan die VMEO gelewer het, t.w.:-

TO THE EXECUTIVE COUNCIL AND MEMBERS OF THE A.M.E.U.

It gives me great pleasure to submit to you my report regarding the activities of the AMEU for the years 1973 and 1974.

As from 1st January, 1973, my firm was appointed as the new Secretaries of your Association, in succession to messrs. Davidson & Ewing (Pty.) Ltd., who carried out the secretarial duties for a period of 18 years.

1. MANAGEMENT:

The affairs of your Association are managed by an Executive Council, consisting of 10 Engineer members together with their respective Councillors. The Executive held four meetings and the proceedings were duly minuted.

The Standing Committee consists of the President and the President Elect, together with their respective councillors, and Messrs. J.K. von Ahlfen and D.C. Plowden. The Standing Committee held 5 meetings.

2. REPRESENTATIVES AND COMMITTEES:

The following representatives and Committees were nominated for the period under review:-

3. BRANCHES

The following four branches were in operation:-

Highveld

Natal

Goodhope

Eastern Cape

The agendas and minutes of all the branch meetings are regularly submitted to us. From these documents it is clear that the members take their duties very seriously indeed. Penetrating study and discussions regarding various matters concerning the profession take place regularly. Having regard to the distances to be travelled by members in order to attend meetings, the branch meetings are generally well attended. The branches have referred various matters to the Executive Council for attention. This is the correct procedure for branches to follow. The Executive Council gave sympathetic consideration to these matters, referred them to the proper authorities where necessary or otherwise dealt with them within the framework of the AMEU constitution.

We wish to take this opportunity of expressing our thanks and appreciation to the Chairman and Secretaries of the branches for the time which they so kindly devote to the affairs of the AMEU.

4. HONORARY MEMBERSHIP:

The Executive Council recommended to confer honorary membership on the following persons in recognition of the special and outstanding services rendered to the AMEU by them over a period of many years:-

Raadslid/Councillor	H.G. Kipling	- Oos-London/East London
Mnr/Mr.	C. Lombard	- Germiston
Mnr/Mr.	D.C. Plowden	- Johannesburg
Mnr/Mr.	J.G. Wannenborg	- Hoofinspekteur van Fabriek/Chief Inspector of Factories

5. RHODESIESE ONDERNEMINGS:

Die Uitvoerende Raad het die hele aangeleentheid van die hertoeling van Rhodesiese plaaslike elektriesiteitsvoorsieningspoderhede tot die VMEO na die Verenigde Munisipale Bestuur van S.A. verwyf. Die bestuur van die VMB ondersteun die standpunt van die VMEO, en gevólglik is 'n gemotiveerde memorandum opgestel wat aan Sy Edelle die Minister van Binnelandse Sake voorgeleg is. Ons vertrou dat ons seëls reëling oor die aangeleentheid by die Konvensie bekend gestel sal kan word.

6. LIDMAATSKAP:

Die ledetal van die VMEO het bestendig gegroei en het op 31 Desember 1974 soos volg daaruit gesien:

Erelede/Honorary Members	- 25
Voormalige Lede/Past members	- 31
Ingenieurslede/Engineers members	- 93
Geassosieerde/Associates	- 21
Assosiatiede/Associate members	- 36
Plaaslike Besture/Local authorities	- 139
Gefalifieerde/Affiliates	- 94
	<hr/>
	- 439

Ons het kennis gekry van die volgende afsterwe:

V.E.O. Barratt
V.G. Flint
G.R. Hain
D. Hugo
J.F. Lategan
J.A. Macques
W. Rössler

- Queenstown
- Heilbron
- Johannesburg
- Pretoria
- Stellenbosch
- Stilfontein
- Pretoria

We have been notified of the passing away of the following persons:-

7. GRONDWET:

Die Uitvoerende Raad het na die praktiese implementering van verskeie Artikels in die Grondwet gekyk en gevind dat dit geregtig is om die betrokke Artikels te wysig. Die voorgetelde wysiginge is aan al die lede genirkuleer, en sal vir die 1975 Konvensie dien vir finale bekragtiging.

8. WAPEN:

Sodoos u reeds bewus is, is 'n nuwe Wapen vir die Vereniging aanvaar. Die ontwerp is deur 'n voormalige lid mnr J.G.F. Erikson gedoen, aan wie ons baie dank verskuldig is. Die Wapen is by die Departement van Heraldiek geregistreer met die volgende beskrywing, nl.:-

Wapen:

In goud, 'n verhoogde uitgetande dwarsbalk van blou belseai met 'n versmalende dwarsbalk van silwer, in die skildhoof vergesel van vyf ringe van rooi en in die skildvoet van 'n tandrat van blou binne in drie bliksemstreale van rooi, driehoeksgewys met punt na benede.

Helmteken:

'n Muurkroon van rooi met 'n uitkomende fakkell van goud, gevlam van natuurlike kleur.

Dekklede:

Goud en blou.

Wapenspreuk:

FIAT LUX

9. PUBLIKASIES:

Weens praktiese corwegings het die Uitvoerende Raad besluit dat daar jaarliks net een uitgawe van die verrigtinge van die konvensie en tegnieke vergaderings gedruk word. Hierdie publikasies verskyn na afloop van die byeenkomste en bevat die detail van die programme, verslae en besprekings, wat 'n geheelheid van die verrigtinge verskaf. Hierdie basiskonvensie vergemaklik die naslaan van besprekings. Dit is ook ekonomiese geregtigheid om net een publikasie van gehalte te lank te druk. Graag wil ons die Gefalificeerde lede en die adverteerders van harte bedank vir hul samewerking en ondersteuning. U kan verseker wees dat u advertensies gelees word, en altyd onder die aandag is van die mense wat werklik te doen het met die aankoop van elektriese toerusting en aanverwante produkte. Die publikasies van die VMEO word gebruik vir naslaandendeleindes.

5. RHODESIAN UNDERTAKINGS:

The Executive Council have referred the whole question of the readmittance to the AMEU of local electricity supply authorities in Rhodesia, to the United Municipal Executive of S.A. The Executive of the U.M.E. supported the views of the AMEU and have prepared a motivated memorandum for submission to the Honourable Minister of the Interior. We trust that a definite arrangement about this subject will be announced at the Convention.

6. MEMBERSHIP:

The membership of the AMEU showed a sustained increase and on 31st December, 1974 was constituted as follows:-

- 25
- 31
- 93
- 21
- 36
- 139
- 94
<hr/>
- 439

We have been notified of the passing away of the following persons:-

- Queenstown
- Heilbron
- Johannesburg
- Pretoria
- Stellenbosch
- Stilfontein
- Pretoria

7. CONSTITUTION:

The Executive Council considered the practical implementation of various sections of the Constitution and found that the amendment of these sections was justified. The proposed amendments have been circulated to all members and will be submitted to the 1975 Convention for final approval.

8. COAT OF ARMS:

As you are aware, a new coat of arms has been adopted by the Association. The design is by a former member, Mr. J.G.F. Erikson, to whom we owe a debt of great gratitude. The coat of arms has been registered at the Department of Heraldry, with the following description:-

Arms:

Or, on a fess enhanced indented Azure between in chief five annulets Gules and in base a cogwheel Azure within three flashes of lightning disposed in triangle point downwards Gules, a barrulet Argent.

Crest:

Issuant from a mural crown Gules, a torch or enflamed proper.

Mantling:

Or and Azure.

Motto:

FIAT LUX.

9. PUBLICATIONS:

For practical reasons, the Executive Council resolved that only one edition of the proceedings of the conventions and technical meetings will be printed annually. These publications will be published after these meetings and will contain details of the programmes, reports and discussions, which will give a complete picture of the proceedings. This procedure will facilitate reference to particular discussions. It is also economically justified to print only one publication of good quality. We should like to convey our thanks to the affiliated members and the advertisers for their co-operation and support. You may rest assured that your advertisements are being read, and are constantly brought to the attention of those people who are actually concerned with the purchase of electrical equipment and related products. All publications of the AMEU are kept for reference purposes.

10. FINANSIES:

Die Uitvoerende Raad het besluit dat die boekjaar van die VMEO saam moet val met 'n kalenderjaar, derhalwe weerspieël 1973 se finansiële jaarstate 'n tydperk van 10 maande, synde van Maart tot Desember 1973, terwyl 1974 se finansiële state die volle jaar weergee.

Die finansiële resultate met 'n oogopslag is soos volg:

Totale Inkomste/Total Income	13 415
Totale Uitgawe/Total Expenditure	12 735
Netto Surplus/Nett Surplus	680
Opgehoede Fondse/Accumulated Funds	(566)

10. FINANCE:

The Executive Council have resolved that the financial year of the AMEU should co-incide with the calendar year, and consequently the financial statements for 1973 cover a period of 10 months only, viz. from March to December 1973, whilst the statements for 1974 reflect the position for a full year.

Briefly, the financial results are as follows:

	1972	1973	1974
	(10 Maande)	(10 Months)	
Totale Inkomste/Total Income	13 415	24 893	27 253
Totale Uitgawe/Total Expenditure	12 735	15 419	14 658
Netto Surplus/Nett Surplus	680	9 474	12 595
Opgehoede Fondse/Accumulated Funds	(566)	8 907	21 502

(tekort/deficit)

11. SLOT:

Die voorgaande gegewens is 'n beknopte weergawe van die aktiwiteite van die VMEO en moet saamgelees word met die verslae van die verteenwoordigers en komitees. Selfs dan weerspieël dit nog nie volledig die omvang van die werkzaamhede van die VMEO nie. Ons kan met vrymoedigheid konstateer dat u Organisasie gesond en lewenskrachtige groei openbaar, danksy die belangstelling en hulp van al ons lede.

Ons spreek ons dank en waardering uit vir die voortgesette same-werking van Evkom, SABS, Staatsdepartemente, Organisasies en Plaaslike Besture.

Daar dien ook melding gemaak te word van die onbaatsugtige dienste wat verteenwoordigers in liggame en/of komitees lever. Baie tyd word opgeoffer en die VMEO kan met reg trots wees op al sy verteenwoordigers.

11. CONCLUSION:

The foregoing is a brief summary of the activities of the AMEU and should be read in conjunction with the reports of the representatives and committees. Even then it does not give a complete picture of the full scope of the activities of the AMEU. We make bold to say that your organisation is experiencing a period of sound and virile growth, thanks to the interest and assistance of all our members.

We wish to express our thanks and appreciation for the sustained co-operation of ESCOM, the SABS, State Departments, organisations and local authorities.

Reference should also be made to the unselfish services rendered by representatives on organisations and/or committees. A great deal of time and energy is devoted to this work, and the AMEU has every reason to be proud of all its representatives.

Bennie van der Walt

VAN DER WALT & KIE/CO
SEKRETARISSE/SECRETARIES

Mnr. J.K. von Ahlfen (Springs): Baie dankie Mnr. President vir die geleenthede ons iets te sê oor die Finansies as Voorsitter van die Finansiekomitee. Op bladsy 5 van die verslag van die Sekretaris onder Finansies, sal u sien hoe die finansiële sake van die Vereniging verloopt het gedurende die jare 1972, 1973 en 1974. Nou met die eerste oogopslag lyk dit na 'n geweldige surplus wat ons Vereniging ophou. In 1972 was daar 'n verlies van R567 en in 1973 toe 'n opgehoede surplus van R8 907 en toe in 1974 R21 000. Dit mag vir u misken lyk na 'n geweldige toename in fondse maar as 'n mens na die beginning kyk van 1975, sal 'n mens weer 'n ander prentjie sien, dat die uitgawe met so 'n Konvensie soos hierdie geweldige koste ten gevolge het. Volgens die konsep begroot vir 1975 beoog ons vir 'n netto surplus van omstreng R6 150. As 'n mens die 1974 syfer vergelyk, dan sal 'n mens sien dat die bywoording van die EIK Konferensie het natuurlik omstreng 'n uitgawe van R1 200 tot gevolg gehad en ek dink dit is baie belangrik dat ons Vereniging 'n surplus ophou. Dit is tyd dat ons self-versorgend raak in hierdie opsig.

Om het baie verglyking wat ons moetnakom en ek dink dit strek ons Sekretaris tot eer dat hy ons uit 'n benarde posisie uitgehelp het en so goed geslaag het. Maar as u nou na die bedryfsresultate kyk, inkomste en uitgawe, sal u sien dat alhoewel die ledelinge santerlik gestyg het, was 'n groot bron van inkomste die advertenties en ek dink daaroor moet ons mnr. Bennie van der Walt ook baie dankie sê. In hierdie opsig, as 'n mens natuurlik die kommissie oor advertenties in ag neem, is dit 'n addisionele inkomste van R5 000 'n jaar. Die Vereniging het hierdie fondse nodig. Ek dink ons het die tyd bereyk waar ons nie meer van plaaslike bestuur so baie afhangklik moet wees om ons eie sake te reël nie. Waar ons konvensies reël behoort ons uit ons eie fondse ons sake te kan reël.

Ek wil dit net hier noem, dat alhoewel dit misken mag blyk, soos vanoggend deur mnr. Waddy genoem, dat ons surpluses misken groot is, in werklikheid is dit nie so groot nie.

Iets wat ons natuurlik moet onthou Mnr. President is dat ons drukkoste geweldige afmetings aanneem. Ons sal almal saamstem dat drukkoste 'n geweldige groot uitgawe is, so ook is die bywooning van die Internasionale Kongresse 'n groot uitgawe. Dit is noodsaaklik dat ons daardie Kongresse bywoon, maar gesien in sy geheel is ons finansiële posisie baie gesond en daar wil ek net van die geleenthede gebruik maak om ons Sekretaris, mnr. Van der Walt, baie hartlik te bedank dat ons nou die stadium bereik het waar ons werkbaar kan doen waarvoor ons hier aangestel is en dit is om ons sake self te reël en self te behartig. Ek wil nou voorstel dat die finansiële verslag en die Sekretaris se verslag

soos dit hier voorgelê is aangeneem word, met 'n spesiale woord van dank aan ons Sekretaris vir die geweldig groot taak wat hy uitgerig het en die goeie resultate wat hy bereik het. Baie dankie.

President: Dames en here, ek wil net op een klein regstelling wys in die finansiële verslag, dit is op die tweede bladsy van die dokument. Die Balansant onder die opschrift Bedryfs Bates, die bedrag van R1 234,05 moet R1 233,45 wees. Just a slight correction under Current Assets the amount shown as R1 234,05 should read R1 233,45.

Mnr. C. Lombard (Germiston): Mnr. President in die verlede was dit altyd die gebruik gewees om die referate en verslae behoorlik te druk en saam te bind in die vorm van 'n Joernaal. Ek weet daar was probleme gevrees om die referate betyds uit te kry as gevolg van die feit dat dit nie gou genoeg gedruk kon word nie. Ek merk op dat hierdie jaar is die referate en verslae in die vorm van afergeloide stukke uitgestuur. Nou weet ek nie of dit 'n finansiële maatreaf is om koste te bespaar nie en dit is om tyd te bespaar nie. Wat ek graag wil vra is of dit nog die gedagte is om hierdie referate en verslae te laat druk en saam te bind in die vorm van 'n behoorlike Joernaal wat maklik bewaar kan word. Dankie.

Mnr. Bennie van der Walt (Sekretaris): Mnr. President die Uitvoerende Raad het om verskeie redes besluit dat die verslae en konvensies in afergeloide vorm beskikbaar gestel word. Daar sal net een publikasie gedruk word wat die referate, besprekings en verslae sal bevat, aangesien die Uitvoerende Raad van mening is dat 'n enkelt publikasie in doeltreffender rekord sal wees. Die stygende drukkoste is 'n faktor wat ook aanleiding tot die besluit gegee het. Paragraaf 9 van die Sekretarieelverslag verduidelik die posisie verder.

President: Ek wil net verwys na afergeloide onder paragraaf 6 van die Sekretarieelverslag. U sal merk dat 7 van ons lede ons ontval het in die afgelopen 2 jaar: mnr. Barratt, 'n lid, mnr. Flint 'n assosiatied, mnr. Hain, Afiliataat, mnr. Dirk Hugo, 'n voormalige President 'n erelid, mnr. J.F. Lategan, 'n erelid, mnr. J.A. Maques, 'n voormalige lid en mnr. Rossler 'n erelid. Gentlemen as a tribute to their memory and expression of sympathy to those who have been bereaved, I ask you to stand for a few moments. Thank you.

Mnr. Von Ahlten het die aanname van die Sekretariëleverslag voorgestel. Ek sal mnr. Dreyer van die Paarl vra om dit asseblief te sekondéer.

Mnr. H.C. Dreyer (Paarl): Mnr. President, dit doen my groot genoeg om die voorstel van mnr. Von Ahlten te sekondéer, die sanname van ons Sekretariële verslag. Vergun my 'n paar woorde om net my dan uit te spreek en mnr. Van der Walt te komplimenteer vir die geweldige bekwaamheid waarop hy die afgelope 2 jaar die belang van hierdie Vereniging behartig het. U onthou dat hy in 1973 vir die eerste keer die Sekretariële oorgeneem het en hy en sy spannetjie was maar nou gewees. Daar was woorde van kritiek, maar here, ons moet onthou dat ons nou 'n liggaam hier het wat hoogs tegniese besprekings voer en dit is nie maklik vir enige Sekretariaat om daardie tegniese besprekings te boekstaaf nie. Ek weet dat daar 'n bietjie kritiek was oor die wyse waarop ons vergriping genootuur is. Ek dink as ons in ag neem die kort tydje wat mnr. Van der Walt en sy spannetjie dit vir ons waargeneem het, dan is daardie bietjie kritiek, en dis die enigste kritiek wat ek van weet, 'n bietjie onregverdig. Ek is seker daarvan dat mnr. Van der Walt en sy span vir ons vorentoe sommer nog baie pleiser gaan gee. Ons wat in die Suidé is, taamlik ver van die sentrums, waardere daardie diens wat ons kry van die Sekretariaat. Daardie nuusbrieven en inligting wat vir ons gegee word. Ek wil graag by hierdie geleentheid my waardering daarvoor uitspreek. Mnr. President, I have pleasure in seconding the motion for the acceptance of the Secretary's Report. Thank you.

KO-ORDINERENDE KOMITEE VIR HOOGSPANNINGSNAVORSING EN TOETSFASILITEITE

A. Die elfde vergadering van die Komitee, wat 'n informele vergadering was, is gehou in die Afdeling van Elektrotegniese Ingenieurswese van die Universiteit van Natal, Durban op 10 Junie 1974.

Die volgende is die hooftrekke wat uit die vergadering voortgespruit het:-

(1) Navorsing in die Vervaardigingsbedryf.

Daar is versing gedoen dat die Kabelvervaardigers-Vereeniging genader is om die lede van die werksgroep te ontmoot met die doel om vraagstukke in verband met brandweerstand van PVC en kortsiluutingsvermoë van polimeriese kabels te bespreek.

(2) Weerlig en Stuwingsaflieiers

'n Program van ondersoek na die oorsake van die faal van stuwingsaflieiers is ingestel. Evkom het alreeds begin met die opstelling van twee registrerinrigtings om stuwingsstromte te meet, terwyl die SABS die toerusting vir die besondere toets wat nodig is, bestel het.

(3) Isolering en Inwendige Ontladings

Daar is voorgestel dat oorweging geskenk word aan die uitbreiding van die huidige toetsprogramme deur die NEERI wat toesgawe was op die periodiese bepaling van isolering van een hoogspanningsmotor om verswakking vas te stel voordat onklaarkaking plaasvind.

(4) Uitwendige Isolering en Besoedeling

Daar is berig dat S.A. voortaan vereenwoerdig sal wees op die werksgroep van CIGRE Studiegroep 33 wat gemoeid is met uitwendige isolering en besoedeling.

B. Die twaalfde vergadering van die Komitee is gehou in die Raadsaal, Hoofkantoor, SCIENTIA, op 20 November 1974.

Die volgende is die hooftrekke wat uit die vergadering voortgespruit het:-

(1) Navorsing en Ontwikkeling deur Nywerhede

Geen vergaderings met die Kabelvervaardigings-Vereeniging is gehou teen die tyd van die Komitee se vergadering nie maar dit word verwag dat 'n informele vergadering versdaags sal plaasvind.

(2) Verslae van die Ko-ordineerders

(a) Weerlig en Stuwings

Dr. Anderson het berig dat 'n ontwerpskema vir die registrer van weerligslae onderneming is met geldelike bystand van verskeie groot ondernemings. Ongeveer 400 tellers wat om en by R120 elk kos, sal oor die hele land ingerig word. Die hulp van munisipaliteite om die skema te bedien sal ook gesoek word.

Mnr. Bennie van der Walt (Sekretaris): Mr. President allow me to express my sincere thanks and appreciation in the first place to Mr. Jack Waddy for the guidance he has given me over the past 2 years. I must say it was a very fortunate position in which I found myself with such a President who realised my shortcomings. I would also like to thank the members of the Standing Committee, especially Messrs. Pretorius, Von Ahlten and Plowden for the work they have done and for the assistance that I have received from them. It was a pleasure to do my duties as Secretary of the AMEU with their help and understanding. I also wish to express my sincere thanks to those Affiliate Members who really gave their co-operation so freely at all times when I had to ask them for advertisements in the AMEU proceedings. I must say that if it was not for their financial assistance we would not have been able to produce a prestige publication. I hope that this year's printed proceedings will be even better.

Mnr. President dit is werklik vir my aangenaam om met die lede van die VMEO saam te werk, omdat hulle weet wat hulle wil en waarheen hulle wil. Wanneer 'n mens met manne werk wat doelgerig is, kan so 'n liggaam uitgebou word en steeds groter sukses behaal, en dit is die hoofrede waarom ons eintlik sukses bereik het met die gesonde finansiële posisie van die VMEO. Laat ons steeds vorentoe kyk en bou. Baie hartlik dank.

CO-ORDINATING COMMITTEE FOR HIGH VOLTAGE RESEARCH AND TESTING FACILITIES

A. The eleventh meeting of the Committee, which was an informal meeting, was held in the Department of Electrical Engineering at the University of Natal, Durban, on 10 June 1974.

The following are the main points arising from the meeting:-

(1) Research in the Manufacturing Industry.

It was reported that an approach had been made to the Cable Manufacturers' Association to meet members of the working group with a view to discussing problems relating to fire resistance of PVC and short circuit ratings of polymeric cables.

(2) Lightning Surge Divertors

A programme of investigation into the causes of failures of surge divertors has been initiated. Escom has already commenced the installation of two recording stations to measure surge currents, while the SABS has ordered equipment for the specialised tests required.

(3) Insulation and Internal Discharges

It was proposed that consideration be given to expanding the testing programme currently undertaken by the NEERI which was aimed at periodically assessing the insulation of high voltage motors in order to detect degradation before a failure occurred.

(4) External Insulation and Pollution

It was reported that South Africa would henceforth be represented on the working group of CIGRE Study Group 33 which was concerned with external insulation and pollution.

B. The twelfth meeting of the Committee was held in the Board Room, Head Office, SCIENTIA on 20 November 1974.

The following are the main points arising from the meeting:-

(1) Research and Development by Industry

No meetings with the Cable Manufacturers' Association had taken place at the time of the Committee's meeting but it was expected that an informal meeting would follow shortly.

(2) Reports of the Co-ordinators

(a) Lightning and Surges

Dr. Anderson reported that a project for recording lightning strokes had been initiated with financial assistance from several large organisations. Approximately 400 counters costing about R120 each would be installed throughout the country. The assistance of municipalities in operating the scheme would also be sought.

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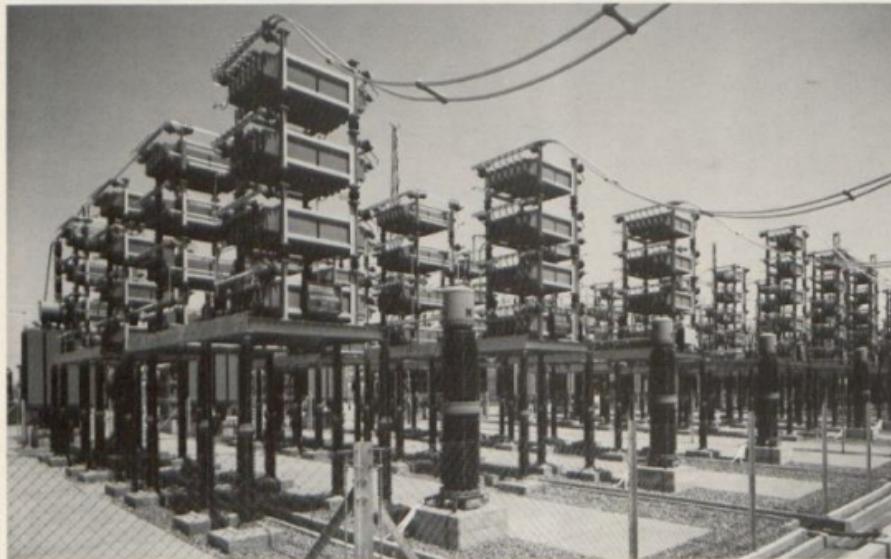


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Die WNNR se 60 m toring, opgerig te SCIENTIA, is 10 maal raakgeslaan gedurende die afgelope seisoen en die strome wat aangemerk is, was aansienlik groter as die waardes wat in Europa gemeet is. Die uitslae wat hier behaal word, sal toegespas word op ander navorsing wat op die gebied gedaan word.

Die samewerkende projekte om stuwingssysteme op te teken, het baie bruikbare gegeweens opgelewer, wat nou oorweg word in verband met verbeteringe in ontwerp en beveiliging.

'n Verdere projek is belas met stuwingssysteme wat plaasvind in laagspanningsbeheer- en toegishouende stelsels ten einde die kwesbaarheid van onderdele van te stel en om die waarde van beveiligingsmaatreels wat op sulke toerusting toegespas kan word, te bepaal.

(b) Korona en Vronking

Professor Heymann het berig dat die invloed van merke op gladde geleiers en van grofgemakte geleiers op radiogeeraas en koronastroom, ondersoek word. Meting van radiogeeraas word ook gemaak by Apollo.

(c) Isolering

Professor Hellawell het sy verslae oor die bedrywigheede van die tweewerkgroep gemoed met sy gebied, ter tafel gelê.

'n Drukvertrek word gesamentlik deur die SABS en die isolerdervervaardigers opgerig om R.S.S. en besoedelings-toets te verskillende drukke en voggehalte te doen. Dit word verwag dat R.S.S. peile al hoe meer belangrik sal word in die toekoms en 'n Nasionale Komitee is deur die SABS aangestel om 'n studie te maak van al die kante van die vraagstuk.

In besprekking is dit berig dat veldproewe met „cycloaliphatic epoxy“ isolasiestelsel deur die SAS en Eskom beplan word.

'n Verder veldproef met verskeie tipes isolators wat onderwerp sal word aan strawwe nywerheidssadesoeding, word deur die Johannesburgse Elektrieseafdeling beplan met die doel om weerstande in verband te bring met isolator lekstroom. Eskom het alreeds omvattende proewe gedoen om die uitwerking van soutbesoeding in 'n kuigebied op spanninglose isolators vas te stel. Proewe met isolators onder spanning sal volg.

'n Skema is nou ontwerp vir die berig van foute in motorisolasie en finale voorbereiding vir die uitvoering van die skema is onderweg.

(3) Be-aarding

Mnr. Middlecote het verslag gedaan oor die werk wat aan die Universiteit van Stellenbosch gedoen word oor be-aarding van kragtstelsels en deur die SAS oor die moonlik uitwerking van die Apollo Substasie se aardelektrodes op die petroleum produktpiplyn. Die SABS het voorgestel om 'n Gebruikskode oor be-aarding te ondernem en 'n mate van besprekking oor lewensgevaarlike strome het alreeds plaasgevind.

(4) Program van Weerlignavorsing in S.A.

Dr. Anderson het verslag gedaan dat dit die voorneme is om 'n weerlig vroeë-waarskuwingstelsel te ontwikkel wat van waarde sal wees vir lughawens en vir oprigting- en onderhoudsSpanne op oorbrengingsleidings. 'n Informele simposium oor weerlignavorsing sal gedurende 1975 gereel moet word.

(5) Fout Beriggewing

Mnr. Randall het berig dat daar geen verandering in die stand van die program plaasgevind het nie.

D.C. PLOWDEN
VERTEENWOORDIGER/REPRESENTATIVE

Mr. J.D.N. van Wyk (CSIR): Mr. President, I was asked at the last meeting of this committee to bring to the attention of members of your Association that part of the proceedings of the High Voltage Coordinating Committee is a set of schedules dealing with, firstly, a review of local research in high voltage and allied fields covering the work done at the universities, CSIR, ESCOM, SABS, SAR & H and others. Then, what is probably of more direct interest to your members, is a list of high voltage facilities available in the country and then finally there is a chronological list of local publications, theses and reports since 1960. Anybody who would like to have such information can

The CSIR's 60 m tower erected at SCIENTIA was struck 10 times during the past season and the currents observed were substantially higher than the values measured in Europe. The results obtained here will be applied to other research being undertaken in this field.

The cooperative projects for recording surges on systems have yielded much useful data which is now being considered in relation to improvements in design and protection.

Another project is concerned with surges occurring in low voltage control and supervisory systems to determine the vulnerability of components and to evaluate protective methods which can be applied to such equipment.

(b) Corona and Sparks

Professor Heymann reported that the influence on radio noise and corona current of scars on smooth conductors and of roughened conductors was being investigated. Measurements of radio noise were also being made at Apollo.

(c) Insulation

Professor Hellawell tabled his reports on the activities of the two working groups concerned with this field.

A pressure chamber is being built jointly by the SABS and insulator manufacturers to carry out RIV and pollution tests at various pressures and humidity levels. It was expected that RIV levels would become increasingly important in the future and a National Committee to study all aspects of the problem had been formed by the SABS.

In discussion it was reported that field trials with cycloaliphatic epoxy insulator systems are being planned by the SAR and Escom.

Another field trial with several types of insulators which would be subjected to severe industrial pollution is planned by the Johannesburg Electricity Department with a view to correlating weather conditions with insulator leakage current. Escom already conducted extensive trials to determine the effects of salt pollution at a coastal site on dead insulators.

Tests with live insulators will follow.

A scheme has now been devised for the reporting of faults in motor insulation and final preparations for implementation of the scheme are under way.

(3) Earthing

Mr. Middlecote reported on the work being done at the University of Stellenbosch on earthing of power systems and by the SAR on the possible effects of the Apollo Substation earth electrodes on the petroleum products pipe line. The SABS proposed to initiate a Code of Practice on earthing and some discussion on lethal currents had already taken place.

(4) Programme of Lightning Research in South Africa

Dr. Anderson reported that it was proposed to develop a lightning early warning system which would be of value to airports and transmission line construction and maintenance teams. An informal symposium on lightning research is to be arranged during 1975.

(5) Fault Reporting

Mnr. Randall reported that there had not been any changes in the status of the programme.

contact the Technical Secretary at the CSIR. Then one additional point is to thank in advance members of this organisation who will co-operate in our country wide deployment of the new lightning flash counter. We have already started with this deployment; some 400 of these counters will be installed, covering the whole of the Republic and South West Africa. The idea is to be able to draw up a lightning density map and for this we have to gather data for quite a number of years. We may still have to approach individual municipalities if there are gaps in the coverage as we have it planned at present. Thank you.

KOORDINERENDE KOMITEE VIR DIENSTE

Die VMEO verteenwoordigers op die Komitee is Mnre. Plowden, Botes en Theron.

Die komitee het twee keer gedurende 1974 vergader met die doel om die gebruikskode wat by geleentheid van die konvensie in Oktober 1971 in Kaapstad vrygestel is, in hersiening te neem.

Verskeie lodeskemas is in verskillende dele van die Republiek in die afgelope drie jaar aangepak en die ondervinding aldus versamel, word as basis gebruik vir die hersiening van die gebruikskode.

Wysigings voorgestel deur beide die VMEO en die departement van telekommunikasie word oorweeg. Die werk word voortgesit.

CO-ORDINATING COMMITTEE FOR SERVICES

The AMEO representatives on the Committee are Messrs. Plowden, Botes and Theron.

The committee met twice during 1974, for the purpose of revising the code of practice issued at the convention in October, 1971 in Cape Town.

Several pilot schemes have been embarked upon in various places in the Republic during the past three years and the experience thus gained is used as the basis for the revision of the code.

Both the AMEU and the department of telecommunications are proposing amendments for consideration. The work is continuing.

G.C. THERON

VERTEENWOORDIGER/REPRESENTATIVE

Mnr. G.C. Theron (Vanderbijlpark): Mnr. President, die gewysige gebruikskode het finale besluit gekry in Desember 1974 waarna dit aan die Uitvoerende Komitee van u Vereniging voorgele is. Sedert gemelde datum het 'n nuwe ontwikkeling egter plaasgevind naamlik dat die Departement van Telekommunikasie besluit het om alle verbindingskabels in die toekoms in pyp te lê en nie direk in die grond nie.

U verteenwoordigers is van mening dat **pypwerk** beter met die waternetwerk sal paar as met elektriese kabels en in opdrag van die V.M.B. word verdere samesprekings ook met verteenwoordigers van die siviele ingenieurs gevoer. In sekere areas kan 'n gesamentlike uitgraving vir al drie dienste groot voordele inhou maar dit sal baie deeglike koordinasie vereis en heelwat probleme moet nog uitgestryk word.

In die tussentyd word die aanvaarding van die Desember 1974 gebruikskode as 'n basis vir coreenkoms in die uitvoering van enige werk op die verdeelde uitgraving-basis **aanbeveel**.

Mr. A.F.W.H. Eggers (Pretoria): Mr. President, I can't really add anything to what Mr. Theron has already said except to express my sincere appreciation to Mr. Theron, Mr. Plowden, Mr. Botes, Mr. Raynal, who assisted in the preparation of this code of practice who were

present, and made their facilities available and also gave very valuable hints and information which served as a basis for the preparation thereof. As has already been mentioned, the P.O. has decided, in future, to install distribution cables in pipes which, we hope, will help a great deal to avoid damage during the installation of other services such as sewerage and water, possibly also electric cables. Our problem there is, as far as the Civil side is concerned, that is perhaps not quite as easy as far as negotiation is concerned, as they were with the AMEU. In so far as that I am aware there is no national body of Civil Town Engineers who could be consulted in this respect and from that point of view the discussion has commenced with the United Municipal Executive. Where this is going to lead us, at the moment, I don't know. I do hope though as time goes on we will make far greater use of the labour which is involved in trenching operations for the installation of services in new towns. It is important, as we heard already this morning, the difficulty is arising more and more that insufficient rough labour or unskilled labour can be found for the installation of services. I think this is a matter of importance as far as the P.O. is concerned as much as it is important as far as the local authorities are concerned. Thank you Mr. President.

JAARVERSLAG VAN DIE WNNR SE ADVIESKOMITEE INSAKE ELEKTROTEGNIESE INGENIEURSWESE

Hierdie Komitee, onder die Voorzitterskap van die Vice-President van die WNNR, kom eenkeer per jaar in November byeen, by welke geleenthed die werkzaamhede van die Nasionale Navorsingsinstituut insake Elektrotegniese Ingenieurswese in oënskou geneem en die voorgestelde navorsingsprogram vir die komende jaar bespreek word.

Ongelukkig kon u verteenwoordiger, weens ander verpligtinge in verband met dringende Raadsaangeleenthede, nie uit die vergadering op 8 November 1974 bywoon nie. Uit die jaarverslag vir 1973/74 wat deer die Direkteur aan die Komitee voorgele is, kan die volgende opsmetting egter gemaak word van die werk wat deer die Afdeling Krag-Elektrontegnieke Ingenieurswese van die Instituut onder die leiding van Dr. R.B. Andersen, gedoen word en wat vir munisipale elektrisiteitsondernemings van belang mag wees:

1. Elektriese Resistiwiteit van Grond en Aardingsstelsel

2. Termiese Resistiwiteit van Grond: Agtergrond

Inligting aangaande die termiese resistiwiteit van grond is belangrik om die oorstoomb-aanslag van ondergrondse kabels te kan bepaal. 'n Opname van die termiese resistiwiteit van die grond langs 'n voorgestelde kabelroete stel die ingenieur in staat om die gedeeltes waar daar hoge resistiwiteitswaarde voorkom, te identifiseer, sodat geskikte terugvultuurmatiel met 'n lae resistiwiteit in daardie gebiede gebruik kan word nadat die kabel gelê is.

Faktore soos die invloed van die voginhoud op die seisoenswisseling van die grond se termiese resistiwiteit onder normale toestande moet nog verder ondersoek word. Stelsels waarvolgens kunsmatige vogbeheer toegepas word is onder sekere omstandighede ekonomies, en die toepassing daarvan onder plausiele omstandighede kan ook ondersoek word.

3. Werk tot op datum gedoen

'n Opname van termiese resistiwiteit wat 'n kabelroete van 20km vir 'n voorgestelde 132 KV-kabel gedek het, is ten behoeve van 'n munisipaliteit gemaak. Die resistiwiteitswaardes het gewissel van 0,15

ANNUAL REPORT ON THE CSIR ADVISORY COMMITTEE FOR ELECTRICAL ENGINEERING

This Committee under the Chairmanship of the Vice-President of the CSIR meets once a year in November when the work of the National Electrical Engineering Research Institute is reviewed and the proposed research programme for the following year's is discussed.

Unfortunately your representative could not attend the meeting on the 8th November 1974 due to prior commitments on urgent Council business. However from the annual report for 1973/74 submitted by the Director to the Committee the following is a short summary of the work being done by the Institute in the Power Electrical Engineering Division under Dr. R.B. Andersen which is of interest to municipal electricity undertakings.

1. Electrical Resistivity of Soils and Earthing Systems

Research in this field has been motivated by the knowledge that electrical resistivity of soil in different parts of South Africa varies over a wide range. The long term aim of the research is the development of better methods of measurement to survey the conditions throughout the R.S.A. and to determine the extent of seasonal change.

2. Thermal Resistivity of Soils: Background

Information regarding the thermal resistivity of soils is important where it is desired to establish the over-current rating of underground power cables. A survey of the soil thermal resistivity along a proposed cable route enables the engineer to identify sections with high resistivity material with a low resistivity can be introduced in those areas when the cable is laid.

Factors such as the influence of moisture content on the seasonal variation of soil thermal resistivity under natural conditions still have to be investigated further. Systems in which artificial moisture control is applied are economical under certain circumstances, and their application under local conditions may also be investigated.

3. Work done to date

A thermal resistivity survey which covered 20 km of cable route for an intended 132 KV cable was carried out for a municipality. Values of resistivity varied from 0,15 to 5,20 mKW-1, indicating the

tot 5,20 mKW-1, wat 'n aanduiding gee van die graad van deurdringing vanaf die syfer van 1,20 mKW-1, waarop die termiese aanslag van kabel wat vir toestande in Europa ontwerp is, gebaseer word. In hierdie gevval was die moontlik om 'n ontwerpvlak van 1,40 mKW-1 vir spesifikasie doeleindes aan te beveel. Gedurende installasie sou dit nodig wees om terugvinningsmateriale met 'n laer resistiwiteit te gebruik in die gedeeltes van die roete waar die resistiwiteit van die grond hoër as die ontwerpvlak van die kabel is.

4. Weerlig Navorsing

Die grootste belangstelling in weerlig, vanuit 'n ingenieurs-oogpunt gesien, is die ontwikkeling van doeltreffende beskermsysteem vir strukture en elektriese installasies. Dit is bv. dat standaard-beskermsysteure, soos bv. weerligafleiers, wat op groot skaal in die verspreiding van elektriese kraag gebruik word, teen 'n onstelbare tempo beskadig word, en die hoop word gekoester dat die huidige navorsing in verband met die parameters van weerlig meer lig op die rodes vir hierdie verskyne sal werp.

5. Opname van Stuwings en Korona in Transmisie- en Verspreidingslyne

Die hoof-oogmerk van hierdie program is die versameling van inligting aangaande die grootte, duur en eienskappe van oorspannings in transmisie- en verspreidingsstelsels. Bonoop is die tydverspreiding van dié stuwings sowel as hul kenmerkende golfformasies, van belang. Hierdie inligting word benodig by die ontwerp van stelsels en by die opstel van spesifikasies vir beskerme toerusting om aan dié stelsels te koppel.

Die golfformasies van oorspannings is van belang omdat hulle die ontwerp van spanningsverdeelers wat akkuuraat kan meet, bepaal. Die doeltreffendheid van die isolasie van die betrokke toerusting hang ook af van die golfformasie van die stuwings wat in die stelsel voorkom. Die oogmerk van hierdie werk is om toerusting en tegnieke vir die automatisasie meting en aantekening van stuwings te ontwikkel.

6. Isolasie-Navorsing

Weens die voorkeur wat aan ander projekte verleent moes word, was daar baie min tyd beskikbaar vir basiese navorsing in verband met isolasie, alhoewel die afdeling 'n aandeel gehad het in die bedrywigheid van twee werkgroepse van die Ko-ordinerende Komitee insake Hoogspanningsnavorsing en Toetsgeriewe, nl. die werkgroep vir Eksterne Isolasie en Besoedeling, en die vir Insulasie en Interne Ontslagings.

Ander belangwekkende projekte sluit in navorsing na die beskerming van vliegtuie teen weerlig, batterye-aangedrewe elektriese voertuie, en die aawending van semi-geleier-tegnieke in swaarstroom-ingenieurswese.

Die ander afdelings van die Instituut hou hulself hoofsaaklik besig met navorsingsprogramme insake toegepaste elektronika, otomatisasie, elektroniese instrumentasie, seinprosessering en elektronika in die vase staan - alles werk van 'n baie belangrike en gesofistikeerde aard.

Ongelukkig moes die Direkteur ook soos volg verslag doen:-

Daar was teen die einde van die verslagjaar 'n drastiese afname in die beskermdheid van navorsings- en tegnieke personeel. Ten tyd van ons ter perse gaan was daar in die Instituut se gelede 14 vakature vir navorsers en 26 in tegniese poste. Dit verteenwoordig ongeveer 25% uit 'n totaal van 143 poste. Hierdie situasie is uiterst ernstig, aangesien ongeveer 42% van die beskikbare mannekrag bedoel is vir kontrakwerk, hoofsaaklik van 'n vertroulike en baie dringende aard. Pogings om personeel te werf was nie baie suksesvol nie en geen onmiddelike verligting is in sig nie.

Die Direkteur moet egter geluk gewens word met die uitstekende werk wat deur die Instituut gedoen word, tensypte van die voortdurende personeeltekort waarna reeds in die jaarverslag vir 1972/73 verwys is.

J.K. VON AHLFSEN

VERTEENWOORDIGER/REPRESENTATIVE

Mnr. J.K. von Ahlfen (Springs): Mnr. President, ongelukkig kon ek nie die vergadering van die advieskomitee bywoon nie, maar ek het u 'n uittreksel gegee van die Direkteur se verslag en werkzaamhede van die advieskomitee. Een interessante berig wat nou die dag in die "Financial Gazette" van 9 Mei 1975 verskyn het is die plaslike vervaardiging van batterye-aangedrewe voertuie, waar onder andere gemeld word dat 62 voertuie op bestelling vir Municipale Elektrisiteits ondernemings vervaardig word.

Ek wil die Direkteur van harte geluk wens met die werk wat hulle kon behartig met so 'n tekort van personeel wat elke jaar weer onderwind word.

Die President: Ek persoonlik het net een vraag aan mnr. Von Ahlfen; is daar nie 'n mate van corveeuwing van die werkzaamhede van hierdie komitee en die koördinerende komitee vir Hoogspanningsnavorsing en Toetsfasiliteite nie?

degree of dispersion from the figure of 1,20 mKW-1, on which the thermal rating of cables, designed for conditions in Europe, is based. It was possible in this case to recommend a design level of 1,40 mKW-⁻¹, for specification purposes. During installation it would be necessary to use backfill of lower resistivity in those portions of the route where the soil resistivity exceeded the design level for the cable.

4. Lightning Research

The main interest in lightning from the engineering point of view is the development of efficient protective systems for structures and electrical installations. It is known for instance that standard protective equipment, such as lightning arresters which are being used on a large scale in the electrical power distribution industry, are being damaged at an alarming rate, and it is hoped that present research on the parameters of lightning will shed more light on the reasons for this.

5. Survey of Surges and Corona on Transmission and Distribution Lines

The main objective of this programme is the collection of information regarding the magnitudes, durations and characteristics of overvoltages in transmission and distribution systems.

In addition, the distribution in time of such surges and their characteristic waveforms are of interest. This information is required when systems have to be designed and when specifications have to be drawn up for protective equipment to be connected to these systems.

The waveforms of overvoltages are of importance because they determine the design of accurate measuring voltage dividers. The effectiveness of the insulation of the equipment involved also depends on the waveform of the surges that occur on a system. It is the purpose of this work to develop equipment and techniques for the automatic measurement and recording of surges.

6. Insulation Research

Owing to the priority which had to be given to other projects, very little time was available for basic insulation research, although the division participated in the Activities of two working groups of the Co-ordinating Committee for high Voltage Research and Testing Facilities, viz: the working groups for External Isolation and Pollution and the working group for Insulation and Internal Discharges.

Other projects of interest include research on protection of aircraft against lightning, battery electric vehicles and the application of semiconductor techniques in heavy current engineering.

The other divisions of the Institute are primarily concerned with research programmes on applied electronics, automation electronic instrumentation, signal processing and solid state electronics. All work of a very important and sophisticated nature.

Unfortunately the Director had to report as follows:-

The availability of research and technical personnel deteriorated drastically towards the end of the year under discussion. At the time of going to press, the Institute had 13 research posts and 26 technical posts vacant. This is some 25% out of a total of 143 posts. This situation is very serious since about 42% of the available manpower is intended for contract work, mostly of a confidential and urgent nature. Efforts to recruit staff members did not meet with great success and no immediate relief is in evidence.

However the Director is to be congratulated on the excellent work being done by the Institute despite the continued shortage of staff also referred to in the annual report for 1972/73.



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REGISTRASIERAAD VIR ELEKTROTEGNIESE DRAADWERKERS

ELECTRICAL WIREMEN'S REGISTRATION BOARD

Die Raad vir 1974 was as volg saamgestel:-

Voor sitter/Ghaiman : Mnr/Mr. J.G. Wannenburg
 Lede/Members : Mnr/Mesars. D.F. Kneale, G.R. Venter, A.H.M. Drysdale, en/and
 J.K. von Ahlfen

Mnr. Hare van die Sentrale Organisasie vir Ambagtoete, Olifantsfontein, het die vergaderings van die Raad in 'n raadgewende hoedanigheid bygewoon.

Vergaderings van die Raad en Aansoeke vir Registrasie

Die Registrasieraad vir Elektrotegniese Draadwerkers het gedurende 1974 12 vergaderings gehou en oorweging verleen aan 1 087 nuwe aansoeke vir registrasie. Hiervan is 1 048 of tot die eksams toegelaan of geheel of gedeeltelik daarvan vrygestel en 39 aansoeke is geweier. Die Raad het ook voorlopige registrasie-sertifikate of die hermuwing van sulke sertifikate ten opsigte van 1 660 applikante toegestaan.

Eksamens

Drie geskrewe eksamens is by 41 eksamensentre gehou, 1969 kandidaate was daarvoor ingeskryf. Die uitslae was as volg:-

Deel 1/Part 1: (Bedradingregulasies) (On the Standard Regulations for the Wiring of Premises)

Druij/Failed	519	519
Slaag/Passed		361

Deel 2/Part 2: (Elektriese Teorie) (On Electrical Theory)

Druij/Failed	308	
Slaag/Passed	95	
Afwezig/Absentees	686	
Totaal/Total	1 969	

'n Aantal kandidate wat om verskillende redes nie die skriftelike eksamens kon afle of slaag nie, is toegelaan om mondellike eksamens te onderraag.

Gedurende die verslagjaar is 289 praktiese eksamens in die tien vername sentre gehou. Toetsreelings is ten opsigte van 2 661 kandidaate getref van wie 448 geslaag het en 555 was afwezig. Van die 1 658 wat gedruip het, het 'n hele aantal in sommige van die take geslaag en is vrystelling in latere toetses toegestaan. Die slaagmerk vir elke toets is 60%. Bogenoemde totale van 1969 en 2 661 sluit kandidate in wat in die vorige jaar gedruip het.

Registrasie-sertifikate

Besonderhede van registrasie-sertifikate wat sedert die inwerktingdag van die Wet uitgereik is word hieronder weer gegee:-

REGISTRASIE-SERTIFIKATE UITGEREIK/REGISTRATION CERTIFICATES ISSUED

JAAR/YEAR	AAN APPLIKANTE WAT VAN DIE EKSAMENS VRYGESTEL IS/TO APPLICANTS EXEMPTED FROM THE EXAMINATIONS.	AAN APPLIKANTE WAT GEDURENDE 1974 OF IN VORIGE JARE IN DIE EKSAMENS GESLAAG HET/TO APPLICANTS WHO PASSED THE EXAMINATIONS DURING 1974 OR IN PREVIOUS YEARS.	TOTAAL/TOTAL
1940/69	2 775	7 617	10 392
1970	89	371	460
1971	133	460	593
1972	94	546	640
1973	55	549	604
1974	31	495	526
	3 177	10 038	13 215

Besonderhede van die aantal voorlopige registrasie-sertifikate wat gedurende die afgelope 7 jaar uitgereik is (hermuwings uitgesluit) is soos volg:-

Aantal/Number	Jaar/Year
386	1968
465	1969
702	1970
1027	1971
1288	1972
810	1973
680	1974

Particulars of the number of provisional registration certificates issued over the last 7 years (excluding renewals thereof) are as follows:-

Voorgestelde Wysigings aan die Wet:

Die eerste konsep vir die wysiging van die Wet, is tans onder oorweging en op versoek van die Departement van Arbeid is die kommentaar van die Vereniging van Municipale Elektriesiteitsondernemings van Suid-Afrika gedurende November 1974 ingedien na bespreking en oorweging deur die VMEO-subkomitee en met goedkeuring van die Uitvoerende Raad.

Algemeen

Gedurende Februarie 1974 het die Raad 'n spesiale vergadering belê wat bygewoon is deur verteenwoordigers van die Elektriese Kontrakteurs Vereniging, Elektriese Werkers Vereniging, die Departement van Arbeid en die Hoof Toets beumpot (Elektries) van die Sentrale Organisasie vir Ambagtoets. Die samesprekings het gegaan oor die daarstelling van 'n halfgeskoold ambagsman in die bedryf wat bekend sou staan as Elektriesegleibuisinstalleerdeerder.

Die voorstelle was dat hierdie halfgeskoold ambagsmanne, wat van enige ras kon wees, in buiswerk praktiese opleiding vir 'n maksimum tydperk van twee jaar sou ontvang en daarna toets sou afvir wat die eksaminateur van die bovermelde werkgewers en werkneemers vereniging afgeneem wou word deur middel van die onderskeie Nywerheidsrade.

Aan hierdie halfgeskoold ambagsmanne sou registrasie van beperkte bestek deur die Raad verleen word om slegs buiswerk uit die toesig van 'n gekwalifiseerde draadwerker te mag verrig.

Alhoewel daar geen vaste besluit oor die aangeleenthed is deur die Raad geneem is nie omdat daar nog verskeie aspekte tussen die partye uitgestryk moet word soos om te verseker dat 'n goeie standaard vir die toetse gehandhaaf sal word, die verhouding tussen geskoonde en ongeskoonde arbeid, die hersiening van Nywerheidsraadoordeelkomste, was die algemene enparige gevoel tog dat stappe geneem moet word om die bedryf in staat te stel om die beste gebruik van die beskikbare mannekrag te maak.

Die Raad het later aangedui dat die voorstelle in beginself goedgekeur is.

Ten slotte wil ek graag die Raad vir die inligting wat in hierdie verslag vervat is, sowel as vir die nodige toestemming om dit aan die Konvensie voor te leé, bedank.

J.K. VON AHLFTEN
VERTEENWOORDIGER/REPRESENTATIVE

ELECTRICAL WIREMENS & CONTRACTORS ACT (1939) – PROPOSED AMENDMENTS FIRST DRAFT

DEFINITIONS:

The AMEU submitted the following comments on the first draft proposed amendments to this Act, to the Chief Inspector of Factories, Mr J G Wannenburg, viz:-

DEFINITIONS:

- (iii) the words "bywet" should be scrapped and the words "verordening" be used, in the Afrikaans text.
- (v) to be amended to read: - "consumer's terminals" – that point on the consumer's premises where the supplier connects his electricity supply to the fixed wiring on the consumer's premises;
- (vii) "conduit" to be changed to "wireway" and that the term "wireway" replaces the term "conduits" throughout the Act
- (ix) delete the word "electrical" as the Act itself covers electrical work only and amend to read "wireway installer".
- (x) to be amended to read: - "fixed wiring" means any cable, conductor, fitting, apparatus or wireway beyond the consumer's terminals but excluding that beyond the point of outlet.
- (xi) to be amended to read: - "learner wireway installer" means holder of a provisional registration certificate of limited scope issued to him in terms of section 13(1) for the purpose of being trained as a wireway installer;
- (xv) to be amended to read: - "point of outlet" – any point in the fixed wiring at which an appliance, fitting or lamp can be connected or plugged into an accessory without the use of tools.
- (xxiii) to be amended to read: - "wiring work" means the installation, alteration, repair or testing of fixed wiring but does not include any such work . . .
- (iv)(b) na, die woorde "elektriese stroom" voeg by die volgende woorde "na 'n elektriese toestel".
- (xvi) Paragraph (d) of the definition of "wiring work" to be amended to read:
"any cable, conductor, fitting apparatus or wireway used or intended for use in connection with machinery as defined in Section (1) of the Mines and Works Act, 1956 (Act No. 27 of 1956) or in connection with machinery as defined in Chapter I Section (2) of the Factories, Machinery and Building Work Act, 1941, (Act No. 22 of 1941) as amended, where a responsible person has been or is required to be appointed in terms of these Acts."
- This paragraph should appear under Section 19 and 29 of the Act.
- (xvii) Paragraph (e) insert the words "or exceed 100 volts" after the words "40 volts".

Subsection 13(2)

We recommend that this subsection should not be amended in accordance with your proposal, but would recommend that a provisional

Proposed Amendments to the Act:

The first draft for the amendments of the Act is present under consideration and upon request of the Department of Labour the comments of the Association of Municipal Electricity Undertakings of South Africa were submitted to the Department of Labour during November 1974 after consideration and discussion by the AMEU Sub-Committee and upon approval of the Executive Council.

General

During February 1974, the Board held a special meeting which was attended by representatives of the Electrical Contractor's Association, the Electrical Workers' Association, the Department of Labour and the Chief Testing Officer (Electrical) of the Central Organisation for Trade Testing. The discussions were in connection with the introduction of a semi-skilled artisan into the trade which was to be named an Electrical Conduit Installer.

The proposals were that this semi-skilled artisan could be of any race, be trained on site for a maximum period of two years, undergo tests conducted by examiners appointed by the employers' and employees' associations, mentioned above, through the Industrial Councils concerned and that such artisans were to be issued with registration of limited scope by the Board to do only conduit installing under the supervision of qualified artisans.

Although no firm decision was taken on the matter by the Board because there were still certain aspects to be ironed out between the parties concerned, such as ensuring that good standards were to be maintained in the tests, the ratio between skilled and semi-skilled workers, the revision of Industrial Council Agreements, there was general unanimity that steps should be taken to enable the industry to make better use of the available labour force.

The Board later indicated that it approved of the proposals in principle.

In conclusion I wish to thank the Board for the information provided in this report and for permission to submit it to the Convention.

certificate should only be granted after a reasonable pass in oral test of the Regulations.

Subsection 19(1)(b)

Add the words "or permit such a connection" after the word "connection".

Sections 19 and 20 - Exemptions

We suggest that all the exemptions in the definition of wiring work should appear in Sections 19 and 30 of the Act.

Subsection 19(1) (a) (b) and (c) - amend the

1. words "wiring work" to read "fixed wiring".
2. The last two lines of paragraph 3 of the proposed subsection 19(1) (c) state "it will be at no cost to the consumer". It is agreed that this should be so the first instance but when failure to remedy defects necessitates subsequent inspections a charge in accordance with the supply authority tariff should be made.

Subsection (1) of Section 9(e)

We request a more specific definition of the "code of practice" in terms of the SABS Wiring Regulations.

Subsection 21(3) (v)

Delete the word "valid" and insert the word "unprovisional".

GENERAL COMMENTS: The following additional comments are submitted for your attention, viz:-

J.K. VON AHLFITTEN
REPRESENTATIVE/VERTEENWOORDIGER

Mnr. J.K. von Ahlfittens (Springs): Die VMEO het sy voorstelle en sy kommentaar ingedien op die voorstelle, soos ek ook in my verslag noem. Die vordering daaroor sal mnr. Wannenburg misken verder oor verslag kan doen. Kortlik, wat hier gebeur het, Mnr. President, is dat ons voorstelle van al die takke ingewag het wat deur die Sub-Komitee oorweg is. Daar is 'n paar ingrypende wysigings wat ons wel ondersteun het, byvoorbeeld, „Consumers Terminals”, het ons 'n ander definisie voorgestel. Die ander een was vir „Point of outlet”. Dit is 'n punt waarneem ons nog altyd probleme in die verlede ondervind het. Ons het die voorstel van die Wes-Kaaplandse tak ondersteun, dat dit wel beteken was iets ingeprop kan word, of aangesluit kan word met behulp van geredeskap. Ons het al die voorstelle deurgegaan Mnr. President, en deurgestuur na die Departement van Arbeid toe en wat die situasie met die wysiging aan die Wet nou is, weet ek nie. Misken kan mnr. Wannenburg vir ons daarop antwoord. Die volgende verslag wat ek het wat nie hier getoont word nie Mnr. President, is die verslag van die IERK.

Ek het 'n kort verslag van die SABS gekry oor die S.A. Nasionale Komitee van die IEK. Op die oomblik, TCI handel oor Terminologie, TC8 oor standaard Spanninge en suu's weet Mnr. die President, het die SABS 'n dokument uitgebring Nr. 1019, van 1975 waarin standaard spanninge afgekondig sal word wat Suid-Afrika betref. TC14 handel oor Transformers, TC17 handel oor skakeltuig en beheertoerusting, TC 15 over isolasie materiale, TC 23E oor stroombrekers wat eintlik oor aardlek eenheid insluit, en op die oomblik is die hele situasie wat aardlek betref op internasionale vlak nog nie uitgestryk nie. TC 28 handel oor isolasie ko-ordinasie, T32 met Sekerings, TC 43 met iampe, TC 64 het te doen met elektriese installasies, en TC 61 handel oor veiligheid van die huishoudlike elektriese toerusting. Misken wil mnr. Wannenburg nog iets byvoeg tot hierdie verslae. Ek het miks verder by ts voeg nie, behalwe om die WNNR geluk te wenst met die werk wat hulle doen en om mnr. Wannenburg as Voorstitter van die Registrasie Raad hartlik te bedank vir die samewerking wat ons van hom kry aangeboden. Die Buro vir Standarde te bedank vir die werklike uitstaande werk wat hulle lewer op die IEK.

Mnr. E.E. de Villiers (Rustenburg): Mnr. President. Ek wil maar net misken iets byvoeg tot die verslag van mnr. Von Ahlfittens; misken is hy nie op die oomblik bewus gewees daarvan nie, of misken het hy dit verget. Een van die komitees wat misken 'n baie belangrike komitee in die toekoms gaan word is 'n nuwe komitee van die Internationale Elektrotegniese Kommissie, nl. Tegniese Komitee 77, ek dink ek het die naam reg - Electro Magnetic Compatibility Between Electrical Equipment Including Networks. In Afrikaans: Elektro-Magnetiese Versoenbaarheid Tussen Elektriese Toerusting Insulante Netwerke. Dit klink 'n vreeslike hoë naam, maar dit gaan eintlik oor steurings wat veroorsaak word op elektriese leidings deur verskillende toerusting en op stelsels. Ek het die voorreg gehad om ook die eerste vergaderings van daardie komitee by te woon en het die baie interessant gevind. Ek het nou in die afgelope week of twee die notules van hierdie vergaderings teruggeky en sal nou kon verslag doen aan die SABS oor die aangeleenthed (ek was die enigste verteenwoordiger vir Suid-Afri-

1. The AMEU request you to include a definition for "supervision" and "direct personal supervision" also in the Act.
2. The words "licence" should be deleted in Sections 21, 22 and 23 of the Act and be replaced by the word "registration certificate".
3. Provision should be made for the same wiremen for one contractor only in subsection 21(3) (a).
4. Provision should be made that a contractor's licence be withdrawn if not the personal holder or employer of a registered wireman any longer.
5. Will an electrical wireway installer be permitted to perform electrical wireway work only or will he be permitted to assist a registered wireman in carrying out wiring work at all times under the direct supervision of such a registered wireman?
6. After an approved period of training will an electrical wireway installer be accepted as a candidate for examination for an electrical wireman?
- The question is asked as to how training of a learner electrical wireway installer is to be carried out under the direction of a registered wireman.
7. Should the definition of Contractor not be amended in order to clearly differentiate between a registered electrical contractor who carries out electrical wiring work for gain and an industrial firm who employs electrical wiremen to carry out wiring work on his own behalf?
8. The terms "suitable premises" and "adequate equipment" should be made more clear by expanding on the particular minimum requirements in the Regulations of the Act.

ka op daardie komitee) en ek sal ook graag die notules aan die Vereniging wil voorsien wat u misken later kan publiseer of opneem in die Verrigtinge. Dankie.

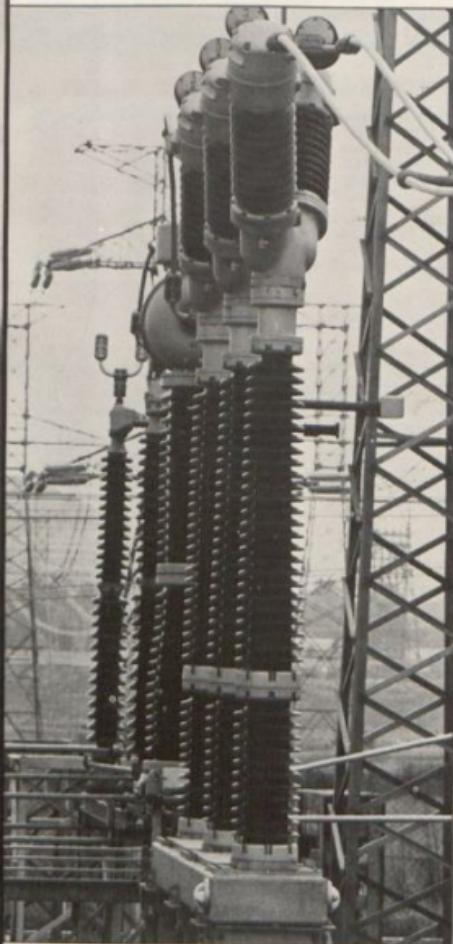
Mnr. J.G. Wannenburg (Departement van Arbeid): Mnr. President, sou ek as die registrasie raad aangan, wil ek in die eerste plek die lede van die raad baie hartlik bedank vir hulle ondersteuning en hulp wat ek van hulle ontvang het in die afgeloop jaar, veral mnr. Von Ahlfittens wat 'n paar keer wat ek nie by die Raad kon voorstel nie, my plek volgstaan het en dit baie goed gedoen het. Verder het ek miks vir sover as die Registrasie Raad betref nie, behalwe 'n paar dingetjies wat altyd voorkom by ons vergadering. Een sakie wat baie voorkom, en ek het ook al voorheen daaroor gespraaier maar dit lyk vir my asos dit nog nie beoorlik lingeinstig het nie, is hierdie kwessie van persone toe te laat om kontrakteurs te word as hulle net 'n voorlopige registrasie sertifikat besit. Die gee vir ons voortdurende die moeilikhede dat daardie persone,veral as hul 'n eemman besighed het en die net vir hulself werk, nie tyd het om te kom vir die eksamens nie. Ek het in die afgeloop week weer so'n geval gehad. Mnr. Turnbull weet ook van die geval. Daardie persoon het oor die afgeloop 2 jaar gewerк met voorlopige registrasie. En nou dat dit op stuk van sake kom, dat hy hom in 'n hoek vasgeloop het, het ons hom gevra om die eksamen te doen sodat ons kan sien of hy werklikwaar 'n registrasiesertifikaat kan kry al dan nie, en u sal verbaas wees om te hoor dat daardie man in sy 1ste gedeelte van die B gedeelte van die eksamen, die praktiese gedeelte, 23% gekry het, in die 2de gedeelte wat redelik maklik is, het hy 9% gekry, en vir die 3de gedeelte vir toetsing, het hy 'n ronde nul gekry. Daardie persoon is 'n kontrakteur, of hy gelyk homself vir 'n kontrakteur uit, en dit is 'n baie ongesonde ding want wat gaan ons nou met daardie man maak as hy weer 'n verdere vrystelling van sertifikatu kry vir 6 maande, en dit is sy finale voorlopige sertifikatu wat hy kan kry. Na die verstyrking van die sertifikatu, darf hy nie meer werk nie. Wat gaan ons nou met hom doen? Dit is iets wat ek tog so grang by die lede van U Vereniging wil inskerp om personele tog asb, te ontmoedig liever as om hulle aan te moedig om op hulle eie te begin werk, as hulle net voorlopige registrasie besit.

Vir sover as wat dit die wysiging van die Draadwerkers Wet betref, het ek vir u slegte nuus. Die arme Wet, lyk vir my, kan net nie aan die gang kom nie. Dit is meer as 2 jaar gelede dat dit van my weggenome is en dit aan die Wetgestudeerde van ons Departement oorhandig is. Die daarmee gesit en dit van een persoon wie dit ander toe gegooi en elke keer se die persoon wie dit kry, dit is tegniek van aard en hy weet daar nijs van nie. Ek het die verlede jaar die hele spulletjie oorgeneem, net na Juliemaand en omtrant die middel van Augustus soos u self weet is, het ek die eerste konsep uitgestuur. Ongelukkig het ek van sekere mense, instede van om voorstaan te kry hoe ons daardie Wet verder kan wysis, onvergaarde kritiek gekry. Dit is tog iets wat die lede asbief moet verstaan, as 'n mens' 'n eerste wysigings-konsep van 'n Wet of regulasies uitstaan, dan vorm dit dood eenvoudig net 'n basis waarop jy kan begin redeeneer en argumenteer. Maar nou is daar mense wat vir my gesê het, hoe kan jy nou dit en hoe kan jy nou dat wil doen. 'n Eerste konsep is nie 'n finale dokument nie. Wanneer daardie konsep weer 'n keer goed deurgegaan en nagesien word, asbief, gee dan vir

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ons opbouende kritiek of gee vir ons kommentaar, maar nie afbreken de kritiek nie. Die datum waarop kommentaar moes ingelewer gewees het, was 30 November 1974. Ek het gedink dat soe en 'n half maande daarom sekerlik genoeg sou wees, aangesien so baie mense so haastig was om die Wet wgywys te sien. Maar toe is daar vir uitstel gevra tot 28 Februarie 1975 en toe die 28 Februarie kom, het die besondere organisasie, - geen name, geen pakdrif nie, instede van om kommentaar te stuur, 'n brief aan die Sekretaris van Arbeid geskrywe en gevra dat 'n kommissie van onderzoek aangestel moet word om die hele aangeleentheid te ondersoek. Dit het nog 'n verdere vertraging veroorsaak. Die brief het na die Sekretaris van Arbeid gegaan en die antwoord was, dat daar geen rede was waarond daar so 'n kommissie van onderzoek aangestel behoort te word nie, en dat ons hul kommentaar invrag so gou as moontlik, sodat daar met die werk nangoegan kan word. Nou is daardie wysisig weersens van my weggegaan en dis weereens aan die Wetgedeelede van ons Departement oorhandig, en die persoon wat nou daarmee besig is, is 'n man wat alles van die wet af weet, maar hy kry swaar met dié tegniese kant. Hy is bo en behalwe dit, oorlaai met regulasies wat opgestel moet word, vir gesondheid in die wyretheids en dit is 'n eisvaardige groot taak wat baie aandag geniet en spoedig deurgeest moet word. Hoekom dit so vreeslik haastig is, dink ek sal u self kan verstaan, maar die wetgewing van regulasies waarmee ons besig is handel oos tukkies stowwe, ventilasie, beligting, gehoor en 'n hele duisterin van ander goed, lond-vergifting, kroon, kwik, ens. . . Wanneer daardie arme persoon wat nou daarmee belas is gaan kana kry om daarmee aan te gaan, weet ek nie. Ek het verlede Vrydag voor ek weg is, gevra wanneer hy kan begin. Sy antwoord was dat dit onregverdig is om dit vir hom te gee. Toe sê ek vir hom, my kantoor is daar, as jy wil, kom enige tyd en kom vra. Ek kan ongelukkig nie vir u sê dat daarder sedert verleide jaar baie gevorder is nie, behalwe dat die eerste konsep van

daardie regulasies uitgestuur was vir kommentaar. Hoe gouer ons nou kommentaar inky, hoe gouer sal ons daarnemee kan sanguan, maar een ding is seker – en dit staan soos 'n paal bo water – die wysisigswetgewing vir daardie besondere Wet sal seer-sekerlike nie in 1975 deur die Parlement gaan nie, want alle wysisigs moet volledig deur al die statuums wees – dit het ek ook al voorheen gesê – die vertalers, wetmesse, wetadviseurs en terug en weer na hulle toe, totdat dit behoorlik aannembaar getimmer is, en dit moet klaar wees voor 1 September van elke jaar. Vir vanjaar kan 'n mens dus maar sê, dit is af. As ons nou redelik gou die uitstaande kommentaar kan in kry, en as die persoon wat daarmee belas is tyd sal kry om dit te doen, of as dit weer aan my teruggestuur word dat ek self die kommentaar kan ko-ordineer, dan miskien aanstaande jaar, maar nie hierdie jaar nie. Mnr. President ek wil u en mnr. Robson graag baie hartlik gelukwens met julle benoemings as President en aangeswes President, ek hoop dat julle 'n vrugbare jaar tegemoet gaan en dat julle lekkier saam sal werk. 'n Better paar saam, kan ek my nie voorstel nie. Ek ken julle allebei baie goed. Dankie.

Mnr. J.K. von Ahlfiten (Springs): Mnr. President. Mnr. Wannenburg is beeltemal korrek. Daar was aangevra vir kommentaar op die eerste konsep wysisig van die Wet en ons as Vereeniging het bloot 'n kommentaar ingestuur. Ons het glad nie kritiek gelewer op die voorgestelde wysisigs van die Wet nie. Ons het sekere voorstelle aan die hand gedaan, sekere wysisigs aan definisies ens., maar kritiek het ons nie gelewer nie. Ek dink mnr. Wannenburg verwys hier na ander organisasies wat ook gemoeid is met die Wet. Maar die VMEO het bloot sy kommentaar gegee op die Wet, sekere voorstelle aan die hand gedaan, maar nie kritiek gelewer nie. Ek wil dit net baie duidelik gestel hê. Baie dankie Mnr. President.

VERSLAG VAN EVKOM-SUBKOMITEE

Hierdie komitee wat bestaan uit die here Botes, Dreyer, Fraser en Robson tesame met ondertegende as sameroeper het aan twee sake aand gekenken.

Die eerste is die aankoop van EVKOM se plassiale retikulasienetwerke deur Munisipaliteit. 'n Memorandum is aan die Vereeniging Munisipale Bestuur voorgele waarin versoeke is dat stappe gedaan word om uitvoering te gee aan die tweede aanbeveling van die Borckenhagen-kommissie, nl. dat „behalwe vir sekere uitsonderinge moet EVKOM so ver moontlik sy aktiwiteite beperk tot dat van vervaardiger van die groothandelaar in elektriese kraag en die kleinhandelverdeling aan plassiale owerhede en soortgelyke liggame laai.“ Die Regering het hierdie aanbeveling aanvaar maar die saak is blykbaar daar gelast. Die VMB het die saak by die Departement van Nywerheidswese aangevoer, maar ten tyd van die opstel van hierdie verslag was die uitslag van die VMB se vertoog nie bekend nie.

Die tweede saak wat die sub-komitee behandel het, is EVKOM se verantwoordelikheid teenoor plassiale overhede ten opsigte van die foutvermoë van skakeluitval. 'n Aansienlike hoeveelheid inligting is van verskillende lede ondernemings ingewen ten opsigte van probleme wat hulle ondervind het en daar word oorweging geskenk daarvan om binnekort 'n memorandum aan EVKOM voor te le.

'n Ander saak wat moontlik deur die subkomitee bespreek sal word, is 'n versoeke van die Goeie-Hoop-tak dat die VMEO EVKOM moet versoek om plassiale owerhede hoogsens gedurende September van elke jaar van voorgestelde tariefverhogings in kennis te stel.

**J.C. WADDY
SAMEROEPEER/CONVENOR**

Mr J C Waddy (Pietermaritzburg): Mr President, this report was prepared at the end of last year and since then there have been some developments. The first matter mentioned in the report was the purchase of Escom local reticulation networks by Municipal authorities. The Sub-Committee has met recently and is of the opinion that his matter should be considered in two parts.

The first part is the implementation of the second recommendation of the Borckenhagen Committee. The Sub-Committee felt that the United Municipal Executive should be requested to pursue this matter and that the AMEU should show that where local authorities purchase supplies from ESCOM, they cannot offer tariff scales as low as Escom's because of the additional cost of reticulation; Durban would be able to provide figures to prove this.

The second part of the problem concerns, more particularly, areas which are reticulated by Escom but which are incorporated into the areas of jurisdiction of local authorities. The Sub-Committee considered that the Electricity Act should be amended to provide that in such cases the local authority should have the option to supply electricity and to take over the existing reticulation system at a value to be agreed upon with Escom. In the event of agreement not being reached the value would be determined by the Control Board.

The amendment to the Electricity Act envisaged, would require the

REPORT OF ESCOM SUB-COMMITTEE

This committee, which comprises Messrs. Botes, Dreyer, Fraser and Robson, together with myself as convenor, has been dealing with two matters.

The first of these concerns the purchase of ESCOM local reticulation networks by municipalities. A memorandum was submitted to the United Municipal Executive requesting that steps be taken to give effect to the second recommendation of the Borckenhagen Committee which was that "with certain exceptions ESCOM should as far as possible confine its activities to that of producer and wholesaler of electric power, leaving retail distribution to local authorities and similar bodies." This recommendation was accepted by the Government but nothing further appears to have been done about it. The UME has taken the matter up with the Department of Industries but at the time of writing this report the outcome of the UME's representation is not known.

The second matter with which the sub-committee has been dealing is Escom's responsibilities vis-a-vis local authorities regarding fault capacity of switchgear. A considerable amount of information has been gathered from various member undertakings regarding difficulties which they have experienced and it is intended to submit a memorandum to ESCOM in the near future.

A further matter which will probably be dealt with by the committee is a request by the Good Hope Branch that the AMEU should request ESCOM to inform local authorities not later than September of each year regarding proposed tariff increases.

Control Board to amend the area of supply covered by the Escom licence and would thereby prevent Escom from giving supply to the consumers concerned, except with the consent of the local authority. Existing agreements between Escom and its consumers would then be invalidated.

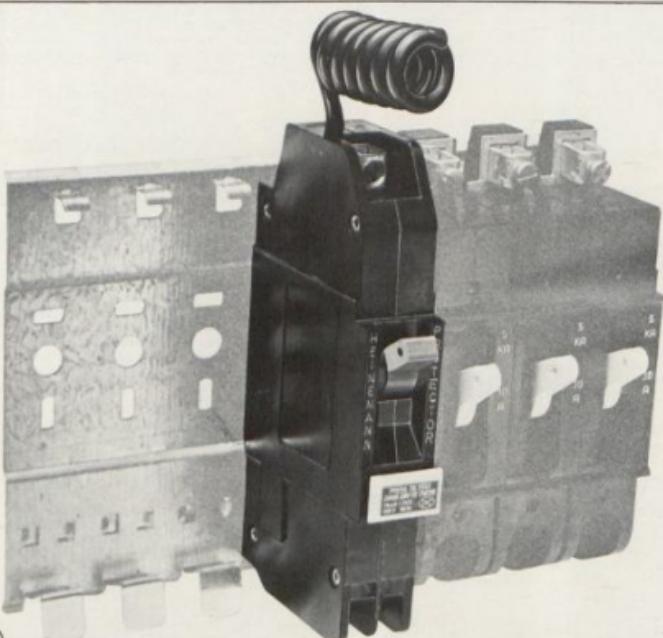
These two recommendations will be considered by the Executive Council later this week.

The other matter which I referred to in the report before you, was Escom's responsibilities to local authorities regarding fault capacity of the latter's switchgear. This is rather a difficult matter and the Sub-Committee considered that the best way to progress with it was to have a discussion with Escom. The Sub-Committee has, therefore, recommended accordingly and this will also be considered by the Executive at its next meeting.

In the report, I referred briefly to another matter, which had only just then come up. That was a request by the Good Hope Branch that the AMEU should request Escom to inform local authorities not later than September of each year regarding proposed tariff increases. This also presented some difficulty because different provinces have different financial years and although advance notice by September of each year would suit the Cape Province whose financial year coincides with the calendar year, it would not suit some of the other provinces. The

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Sub-Committee, therefore, felt that it would be reasonable to ask Escom to give 6 months notice of proposed tariff increases and has recommended accordingly to the Executive Council.

There were also one or two other points dealt with by Sub-Committee. One of these was the representation of local authorities on the Electricity Supply Commission; that went through the UME to the Department of Industries but was turned down and, after careful consideration, the Executive decided not to pursue the matter. Another

natter, which unfortunately appears to have been overlooked a few years ago, was raised by Dr Strazacker at the Cape Convention in 1971 regarding the limit of 150 kW on supplies by municipalities to mining or industrial consumers outside municipal areas of jurisdiction. Dr Strazacker suggested that we should take this matter up and try to get the limit of 150 kW abolished. The Escom Sub-Committee has not put a recommendation forward to the Executive Council that the matter be taken up again.

VERSLAG OOR PUBLISISETTE VIR VMEO-SAKE EN AKTIWITEITE

Voor die konvensie van die Vereniging wat in Oktober 1971 in Kaapstad gehou is, het beperkte publisiteit oor die aktiwiteite van die Vereniging ongerekeld in die uitgawe van die tydskrif „S.A. Engineer and Electrical Review“ verskyn. Veral in 1973 is verslae gepubliseer oor uitbreidings van die Durban- en Johannesburg-ondernehemings en van die verrigtinge van die 1973-konvensie in Pietermaritzburg. Hoewel hierdie tydskrif oor sulke aktiwiteite verslag gedoen het, was dit nooit as die Vereniging se amptelike lyfblad aangestel nie.

Op 'n vergadering van die Uitvoerende Raad van die Vereniging wat op 23 Oktober 1971 in Kaapstad gehou is, is besluit om Raadslid B. Eagar en mnr. D.C. Plowden af te vaardig om die publisiteit vir die Vereniging te besprek met mnr. R.E. Calburn, die redakteur van die tydskrif „Municipal Administration and Engineerswese“ wat lank reeds in sy uitgawes munisipale aktiwiteite en ontwikkelinge oor 'n breë front dek. By dieselfde vergadering is die skrywer as die Vereniging se publisetsbeambte aangestel om die hele aangeleentheid van publisiteit te ondersoek – insluitend persverstellingen en die publikasie van aangeleentheids wat vir die Vereniging van belang is. Amtelike vorms is opgestel en aan alle lede gestuur vir die indien van artikels van aktuele belang oor persone en ontwikkelings in munisipale elektrisiteitsondernemings.

Voorstuurpruit uit die onderhandelinge tussen Raadslid Eagar, mnr. Plowden en mnr. Calburn het die Uitvoerende Raad op 'n vergadering wat op 16 November 1973 te Kemptonpark gehou is, besluit dat „Municipale Administrasie en Ingenieurswese“ as die amptelike lyfblad van die Vereniging aangestel word en 'n ooreenkoms is met die redakteur aangegaan dat alle material wat die Vereniging se naam en wapen gepubliseer sal word. Die redakteur van „S.A. Engineer and Electrical Review“ is van hiedien beslisning in kennis gestel en die Vereniging se waardering is aan hom toegegaan vir sy hulp en samewerking in die verlede.

In opvolging van die nuwe ooreenkoms met „Municipale Administrasie en Ingenieurswese“ het die eerste artikel in die uitgawe van Julie 1974 verskyn. Dit is geskryf deur mnr. D.C. Plowden onder die titel: „The Association of Municipal Electricity Undertakings - It's importance and its history.“ Die volgende artikels is ook gepubliseer:

„The Training and Retention of Local Government Staff“ – Augustus 1974

'n Referaat oor:

„Sensitive Earth Fault Protection on High Voltage Transmission Lines“ deur mnr. V. Cohen

Die blad het ook publisiteit verleen aan die 1973-konvensie in Pietermaritzburg – bo en behalwe die wye persdekkung wat die Nataliese koerante aan die konvensie gegeen het.

Ongelyklik het 'n artikel onder die Vereniging se naam in die uitgawe van Oktober 1974 verskyn onder die titel „Power Stations, Transmission Lines and the Environment“ wat 'n herdruk is van 'n referaat wat mnr. N.T. van der Walt voorgedaan het by die Internasionale Simposium vir die Beplanning van Omgewingsbewaring wat in die tweede helfte van 1974 in Suid-Afrika gehou is. Die redakteur se aandag is daarop gevertext dat die Vereniging nie na die simposium uitgenooi is nie of daarby betrokke was nie en daar moet verseker word dat daar in die toekoms slegs goedgekeurde materiaal wat spesifiek op die Vereniging se aktiwiteite betrekking het onder die Vereniging se naam en wapen gepubliseer word.

Erkentlikeheid word betuig aan die lede van die Vereniging wat so goedhartig bydraais vir publikasies gelewer het en aan die sekretaris, mnr. Bennie van der Walt. In die besonder word dank betuig aan mnr. D.C. Plowden vir sy bekware bystand en samewerking.

REPORT ON PUBLICITY OF AMEU AFFAIRS AND ACTIVITIES

For some time prior to the Convention of the Association held in Cape Town in October, 1971 limited publicity of the activities of the Association had appeared infrequently in issues of the Journal "S.A. Engineer and Electrical Review." In particular during 1973 reports were published of extensions to the Durban and Johannesburg Undertakings and of proceedings at the 1973 Convention in Pietermaritzburg. Although this publication reported such activities, at no time had it been appointed the Association's official journal.

At a meeting of the Executive Council of the Association held in Cape Town on the 22nd October, 1971 it was resolved that Councillor B. Eagar and Mr. D.C. Plowden be delegated to discuss the question of publicity for the Association with Mr. R.E. Calburn, Editor of the journal "Municipal Administration and Engineering," which for many years had covered in its issues a wide range of Municipal activities and developments. At the same meeting the writer was appointed the Association's Publicity Officer to investigate the whole question of publicity generally, including press releases and publication of matter of importance to the Association. Official forms were drawn up and circulated to all members for the submission of items of topical interest concerning personalities and developments in Municipal Electricity Undertakings.

Arising from the negotiations between Councillor Eagar, Mr. Plowden and Mr. Calburn the Executive Council at a meeting held at Kempton Park on the 16th November, 1973 it was resolved that "Municipal Administration and Engineering" be appointed the official journal of the Association, agreement having been reached with the Editor that all material concerning the Association would be published under the Association's name and Coat of Arms. The Editor of "S.A. Engineer and Electrical Review" was informed of this decision and the appreciation of the Association extended to him for past assistance and cooperation.

Following the new agreement with "Municipal Administration and Engineering" the first article appeared in the issue of July, 1974 having been written by Mr. D.C. Plowden under the title "The Association of Municipal Electricity Undertakings - It's importance and its history." Further items have been published as follows:

"The Training and Retention of Local Government Staff" – August, 1974.

Paper on "Sensitive Earth Protection on High Voltage Transmission Lines" by Mr. V. Cohen.

Publicity was also given in the journal concerning the 1973 Convention in Pietermaritzburg, in addition to which extensive press coverage of the Convention was given by Natal newspapers.

Regrettably, an article appeared under the name of the Association in the October, 1974 issue with the title "Power Stations, Transmission Systems and the Environment" which was a reproduction of a paper by Mr. N.T. van der Walt, read at the International Planning for Environmental Conservation Symposium which was held in South Africa in the latter half of 1974. The attention of the Editor was drawn to the fact that the Association had not been invited to or involved in this Symposium and that it should be ensured that in the future only approved material relating specifically to the activities of the Association be published under the name and Coat of Arms of the Association.

Acknowledgement is recorded to many members of the Association who have so willingly submitted contributions for publication and to the Secretary, Mr. Bennie van der Walt. In particular appreciation is expressed to Mr. D.C. Plowden for his effective assistance and cooperation.

K.G. ROBSON PUBLISISETSBEAMPTE/PUBLICITY OFFICER

Mr K G Robson (East London): Mr President, Gentleman, I am sorry that Mr Calburn seems to have disappeared just at the crucial moment! Although he has been mentioned this morning I think that it is fitting that we should welcome him officially to this Convention. It is the first that he is attending as the Editor of our Official Jour-

nal, Municipal Administration and Engineering and we can be very happy and honoured that Mr Calburn has come to this Convention. I do believe that in the years that come, if we maintain the kind of relationship that has been established, this Journal will become increasingly important in the activities and affairs of the Association. It

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CHEMILITE

took us a good deal of time before the decision was eventually made that this Journal should be approached and the Journal itself is honoured by the Association having made this decision.

May just make another appeal to the members - I know that all of us are inherently modest about sending reports not only of ourselves but also of the activities of our own particular Undertakings. May I request that feelings of modesty be put aside in the interest of the greater good and that if you have a story to tell, either let the editor Mr Calburn have it, or let me have it. I think that those of us who have been concerned with publicity were encouraged by the March issue which

had a very wide coverage, not only of developments but of people that form part of the Association - and this is as important an aspect of the official Journal as is the recording of things technical, new developments and so on. We will continue to have both, but may I repeat that others are interested in your activities and in what is going on in your towns and cities. Please send the story forward as briefly as you can make it so that you can be assured that it will receive publication in due course. Finally, Mr Chairman, our thanks again to Mr Calburn - we have had difficulties and comment is made in the Report that there have been ironed out and will not occur again. That is all Mr President."

VERSLAG VAN DIE AANBEVELINGSKOMITEE VIR NUWE ELEKTRIESE TOEBEHORE 1973-1974

Die komitee bestaan uit die volgende persone:

Mnre/Messrs. R.W. Barton
J.K. von Ahfoten
D.C. Plowden

G.H. Kohler
E.J. Chapple
A.A. Middlecote
J.V. Grant
F.J. Prince
A.F.W. Eggers
R.A. Leigh
J.T. Williams
M. Jochelson
F.A. Michael
J.A. Morrison
R. Everett

Die VMEO behartig die administrasie van die komitee.

Gedurende die tydperk 1973 en 1974 het die komitee 8 keer vergader. Sowat 62 items is nagesien, waarvan die komitee 47 items goedgekeur het vir gebruik, terwyl 15 items afgekeur is. Al die elektriese toebehore wat aanbeveel word is toestelle wat vas geïnstalleer word. Na elke vergadering word die lede ingelig oor die produkte wat aanbeveel is. 'n Volledige lys van die aanbevelings tot 1974 is ook saamgestel en aan lede gestuur. 'n Soortgelyk lys sal jaarliks opgestel en aan lede gestuur word vir naslaande ledes.

Elke applikant wie se produkte goedgekeur is word voorsien van 'n goedkeuringsbrief wat as bewys kan dien vir elektrisiteitsvoorsieningswerhede.

Die komitee het aanbeveel dat die Standaard-bedradingregulasies voorsiening moet maak vir die moontlike gebruik van 'n nuwe en revolusionêre bedradingstelsel, wat uiteraard goedkoper sal wees.

REPORT OF THE RECOMMENDATIONS COMMITTEE FOR NEW ELECTRICAL COMMODITIES 1973-1974

The Committee consists of the following persons:

- Sameroeper (VMEO)/(Convenor) AMEU
- Johannesburg Elektrisiteitsdepartement/
Johannesburg Electrical Department
- Evkom/Ecom
- Evkom/Ecom
- SABS
- SABS
- SABS
- Posts en Telegraafwese/Posts and Telegraphs
- SAIE/SAIE
- SAIE/SAIE
- EKV (SA)/ECA (SA)
- EKV (SA)/ECA (SA)
- EIAN/VEEAIA
- SAVRL/SAACE

The AMEU is responsible for the administration of this Committee.

During the period 1973/74 the Committee held 8 meetings. Some 62 items were considered, of which 47 were approved as suitable for use, whilst 15 items were rejected. All the approved items are fixed electrical appliances. After every meeting the members are informed regarding the products recommended. A complete list of the recommendations up to 1974 was also drawn up and circulated to members. A similar list will be compiled annually and forwarded to members for reference purposes.

Every applicant whose products are approved, is furnished with a letter of approval which serves as a recommendation to electricity supply authorities.

The Committee has recommended that the Standard Wiring Regulations should make provision for the possible use of a new and revolutionary wiring system, which will be considerably cheaper.

R.W. BARTON
SAMEROEPEL/CONVENOR

Mr R.W. Barton (Welkom): Mr President, the final paragraph of this report has resulted in queries from one or two of our Affiliate members. If I may just read it, "the committee has recommended that the standard wiring regulations should make provision for the possible use of a new and revolutionary wiring system, which will be considerable cheaper." The two gentlemen who phoned me, I think, were very worried that their competitors may have devised a system of wiring that was going to put the rest out of business. I would like to put their minds at rest. This paragraph is intended in a very general sense, not specific at all and the idea was that if a new and revolutionary wiring system which was a big improvement on what we have now was developed it should not be killed simply because the wiring regulations did not allow it. Mr President, while I am on my feet I

would like to thank all the people and organisations mentioned here, for their interest and hard work, and a special word of thanks to our Secretary Mr Bennie van der Walt who has been given a lot to think about and do by the Committee. Thank you.

Mr H P Alexander (Eacom, Natal): Mr President, I crave your indulgence just to say a word about this Committee for the approval of electrical products. I think the Committee could be a little bit more helpful to engineers generally. Instead of approving a product, subject to any conditions imposed by the electrical engineer, they should be more positive. I think some guidance should be given and they either approve the thing and state under what conditions it should be permitted or they should not approve it.

1974-VERSLAG OOR DIE HERSIENING VAN DIE STANDAARD REGULASIES VIR DIE BEDRADING VAN PERSELE

Werkgroep 3 van die SABS-hoofkomitee

Werkgroep 3 het 'n aantal dokumente bespreek van IEC TC 64 (international Electrotechnical Commission Technical Committee 64) wat die volgende onderwerpe dek:

Deel 1: Omvang, doel, grondbeginsels.

Deel 2: Definisiens.

Deel 3: Waardebepaling van algemene eienskappe: Installasiestructuur (maksimum aanvraag, tipes stelsels, tovoere en verde-

1974 REPORT ON THE REVISION OF THE STANDARD REGULATIONS FOR THE WIRING OF PREMISES

Working Group 3 of the SABS Main Committee

The Working Group 3 discussed a number of IEC TC 64 (International Electrotechnical Commission, Technical Committee No. 64) documents relating to the following subjects:

Part 1: Scope, Object, Fundamental Principles.

Part 2: Definitions.

Part 3: Assessment of General Characteristics: Installation Structure (Maksimum demand, types of system, supplies and distribu-

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(SOUTH AFRICA)



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ling); klassifikasie van eksterne invloede; aanpasbaarheid; instandhoudingsmoontlikheide.

Deel 4: Beveiliging vir veiligheid: Beskerming teen skok (onder normale diens en in geval van 'n fout); beveiliging teen termiese effekte onder normale diens; beveiliging teen oorstroom; beveiliging teen oerspanning; beveiliging teen onderspanning; afsondering en handskakeling; toepassing van veiligheidsmaatreel vir veiligheid (algemene vereistes, beveiliging teen skok, beveiliging teen oorstroom, beveiliging teen oerspanning, ens.)

Met die nuwe indeling van die werk van TC 64 sal die verdere dele en hoofstukke soos volg wees:

Deel 5: Keuse en oprigting van uitrusting:

Algemene reëls, kabels, geleiers en bedradingsmateriale; skaalkuitga (vir beveiliging, afsondering en handskakeling); aarding en beskermende geleiers; ander uitrusting.

Deel 6: Aanvanklike inspeksie en toetsing:

Inspeksie (ter voldoen aan die aanbevelings); toetsing.

Al die kommentaar oor die TC 64-dokumente is na die IEC se sentrale kantoor in Genève gestuur en is saam met die kommentaar van ander lande na die algemene vergadering van die IEC gedurende September 1974 in Bucharest besprek.

Goeie voordeeling is gemaak oordanksie die feit dat heelwat tyd bestee moes word om probleme op te los wat uit die aanvaarding van die nuwe reëlling gespruit het.

As gevolg van 'n interessante bespreking oor die omvang van TC 64 oor openbare tovoerstelsels het 'n ad hoc-werkgroep by die Bucharest-vergadering soos volg verslag gedoen:

- Die ad hoc-werkgroep het kennis geneem dat die omvang van TC 64 soos dit in publikasie IEC 364-1 uiteengesit is nie openbare tovoerstelsels meld nie maar daar word wel in voorwoord van die publikasie daarvan melding gemaak. Daar word gemeld dat die aanbevelings toegespas kan word op openbare tovoerstelsels in dié lande waar sukseslike stelsels nie reeds deur Nasionale reëls gedek word nie. 'n Afvaardiging na TC 64 het gevole dat die huidige bewoording onbegrypend is en die toepassing van die werk van TC 64 op openbare tovoerstelsels duidelik omskryf moet word. Die werkgroep het gevole dat openbare tovoerstelsels dus in die omvang sowel as die voorwoord tot publikasie 364-1 gemeld moet word.
- Daar is ingesien dat die werk van TC 64 tot dusver nie na hoogspanningsnetwerke verwys het nie en dus glad nie op enige wyse hoogspanningsnetwerke dek nie. Die werkgroep het aanvaar dat as die werk van die komitee later uitgebrei word om hoogspanningsnetwerke vir industriële installasies in te sluit hierdie werk op die openbare tovoer van toepassing mag wees. Totdat dit bereyk word, kan die huidige bewoording van die voorwoord misleidend wees.
- Die lede van die werkgroep kon nie ooreenkome oor die geskiktheid en volledigheid van die aanbevelings wat tot dusver deur TC 64 saamgestel is vir gebruik op laagspanningsopenbare tovoerstelsels nie. Daar is egter ooreenkome dat vir soort dit hulle aanvaag die werk wat tot dusver gedoen is voorbereid is deur 'n meerderheid persone met ondervinding van private installasies en moontlik nie van openbare tovoere nie (behalwe miskien in die wisselwerk van hierdie stelsels). Die Werkgroep verbaatregte dus die uitbreiding van die reëls in hulle huidige vorm na openbare netwerke sonder verwysing na openbare voorzieningswerretheide.
- Die werkgroepoorweeg dit ook dat as die komitee die bykomende werk aanvaar wat vereis word om openbare tovoerstelsels te dek dit oorweging moet skeen aan die verantwoordelikheid vir dié werk. Een moontlike alternatief is dat TC 64 hierdie werk in 'n subkomitee doen en 'n ander alternatief is dat die saak na die IEC-aksiekomitee verwys word.

5. Aanbevelings:

Nadat hierdie sake oorweeg is, wil die werkgroep die volgende aanbeveel:

- Dat die verwysing na openbare tovoerstelsels in die voorwoord van publikasie 364-1 in sy huidige vorm behou word.
- Dat afdeling 1.1 van publikasie 364-1 wat die omvang van TC 64 dek, uitgebrei word een van die volgende stellings in te sluit:
of
„Besondere reëls kan vir openbare verdeelstelsels vereis word.“

tion); Classification of External Influences; Compatibility; Maintainability.

Part 4: Protection for Safety: Protection against shock (in normal service and in case of a fault); Protection against thermal effects in normal service; Protection against overcurrent; Protection against overvoltage; Protection against undervoltage; Isolation and manual switching; Application of Protective Measures for Safety (General requirements, protection against shock, protection against overcurrents, protection against overvoltage, etc.).

Under the new arrangement of the work of TC 64 that has been adopted, the ensuing parts and chapters will be as follows:

Part 5: Selection and Erection of Equipment: Common Rules; Cables, conductors and Wiring Materials; Switchgear (for protection, isolation and manual switching); Earthing and Protective Conductors; Other Equipment.

Part 6: Initial Inspection and Testing:

Inspection (for compliance with the Recommendations); Tests.

Comments on TC 64 documents were all forwarded to the IEC Central Office in Geneva and were considered together with the comments of other countries at the IEC General Meeting in Bucharest during September 1974.

Notwithstanding the fact that a lot of time had to be devoted to solving problems that arose from the adoption of the new arrangement, good progress was made.

Resulting from an interesting discussion on the Scope of TC 64 in relation to Public Supply Systems, an Ad Hoc Working Group at the Bucharest Meeting reported as follows:-

- The Ad Hoc Working Group noted that the Scope of TC 64 as set down in Publication IEC 364-1 does not mention public supply systems, but that reference is made to them in the Preface to that publication. It is stated that the Recommendations may be applied to public supply systems in those countries where such systems are not already covered by National rules. Some delegation to TC 64 had considered that the present wording was unsatisfactory and that the applicability of the work of TC 64 to public supply systems should be more clearly defined. The Working Group considered that public supply systems should therefore be mentioned in the Scope as well as in the Preface to Publication 364-1.
 - It was recognised that up to the present time the work of TC 64 had not referred to high voltage networks and did not therefore, in any way, cover high voltage public supply systems. The Working Group accepted that if the work of the Committee were extended at a future date to include high voltage networks for industrial installations, this work might be applicable to public supply. Until this is achieved the present wording of the Preface could mislead.
 - The Working Group members could not agree as to the suitability and completeness of the recommendations, so far prepared by TC 64, for use on low voltage public supply networks. It was agreed however, that in their opinion the work so far achieved, had been prepared by a majority of people with expertise in private installations and possibly not in public supply (except perhaps in the inter action of these systems). The Working Group therefore, question the extension of the rules in their present form to public networks without reference to public supply authorities.
 - The Working Group also consider that if the Committee accept that additional work is required to deal with public supply systems, they should give consideration as to the responsibility for such work. One possible alternative would be for TC 64 to carry out this work in a Sub-Committee, an alternative might be to refer the matter to the IEC Committee of Action.
- #### 5. Recommendations:
- Having considered these matters the Working Group wish to recommend the following:-
- that the reference to public supply networks in the Preface to Publication 364-1 should remain in its present form.
 - that Section 1.1. of Publication 364-1 dealing with the Scope of TC 64 should be extended to include one of the following statements:
either
“Particular rules may be required for public distribution systems”.

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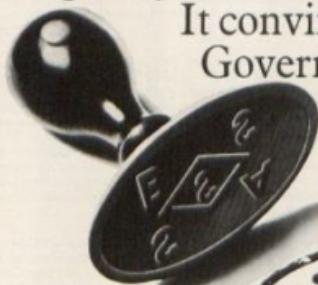
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.Bykomende reëls kan vir openbare verdeelstelsels vereis word."

- (c) Dat komitee TC 64 moet besluit of die omvang van sy werk uitgebrei moet word om opstel van besondere (of bykomende) reëls vir openbare toevernernetwerke in te sluit en of die saak na die IEC-aksiekomitee verwoes moet word.

By die oorweging van hierdie verslag het TC 64 soos volg besluit: Die voorstuur het voorgestel dat kennis van die verslag geneem word maar dat geen stappe oor die omvang geneem word nie aangesien die omvang 'n kompromis is wat na lang besprekings bereik is. Dit is nie die moeite word om hierdie besprekings hier voor te sit nie aangesien dit die werklike werk van TC 64 aansienlik sal vertrag.

'n Stemming oor hierdie onderwerp het getoon dat daar gebelangstelling in hierdie saak is nie - 'n klein meerderheid was ten gunste daarvan dat die huidige bewoording van die toepaslike paragrafe behou word.

Mnr Brice het erken dat hierdie probleem weer 'n lang besprekking kan uitlok. Hy het egter daarop aangedring dat die hersiening van die omvang nodig is aangesien die bewoording na die Britse afvaardiging se mening nie duidelik genoeg is nie. Die afvaardiging van die USSR wou ook hê dat die verslag van die ad hoc werkgroep bespreek word.

Die voorvoerster het toe besluit om die verslag van die ad hoc werkgroep as 'n sekretariaatdokument te sirkuleer en om hierdie item op die agenda van die volgende vergadering te plaas.

Die volgende vergadering van TC 64 sal in Mei 1975 in Istanbul Turkye gehou word.

Werkgroep 4 van die SABS-hoofkomitee:

Hierdie werkgroep wat die bestaande Bedrulingsregulاسies rediger en verbeter, het hulle werk voortgesit en 'n aantal aanbevelings gedoen wat deur die hoofkomitee aangehandel is op 'n vergadering wat op 9 Oktober 1974 gehou is. 'n Aantal probleme wat opgedruk het, is of opgelos of vir verdere oorweging en onderzoek terugverwys.

'n Belangrike aangeleenthed was verpligte aardlekbeveiliging. Werkgroep 4 het gerapporteer dat daar gevind is dat die verpligtende gebruik van aardlekbeveiliging soos dit bevat is in Regulasie 226(F) soos met die Maart 1974 wysiging van die Bedrulingsregulасies gewysig in sommige gevalle baie beswarend kan wees. Na 'n diepgaande besprekking het die hoofkomitee besluit om die bewoording van Regulasie 226(F) soos volg te wysig:

"(F) As from the date of publication of this amendment, circuits supplying lighting fittings and socket-outlets in domestic premises, in hotels and boarding houses and in the corridors and public rooms of multi-dwelling units (e.g. blocks of flats or apartments) shall be provided with automatic earth leakage protection in the following specific cases:

- In every new installation unless otherwise approved, but only for a reasonable period of time;
- where any rewiring of or extension to an existing domestic installation is carried out, in which case the protection shall be applied to all the lighting and socket-outlet circuits of that installation;
- where any rewiring of or extension to an existing installation is carried out in an hotel or boarding house or in the corridors or public rooms of a multidwelling unit, in which case the protection shall be applied to the circuits that are so rewired or extended.

NOTE 1: Essentially emergency lighting circuits do not fall within the scope of this regulation.

NOTE 2: Any coupler which is specifically intended for the connection of a cooking appliance falling within the scope of SARS 153 and which cannot accept a plug manufactured in accordance with SABS 164 is not deemed to be a socket-outlet in terms of this regulation and need not be included in the automatic earth leakage protection."

Hierdie wysiging sal in Afrikaans vertaal word en die wysiging in albei amptelike tale sal so gou moontlik gepubliseer word.

"Supplementary rules may be required for public distribution systems".

- (c) that TC 64 Committee should decide whether the scope of its work should be extended to include the drafting of particular (or supplementary) rules for public supply networks or whether the matter should be referred to the IEC Committee of Action."

Considering this Report, TC 64 resolved as follows:

The Chairman suggested to note the report but to take no action with regard to the scope as the latter was a compromise which had been reached after long discussions. It would be of no worth to resume these discussions now but would considerable delay the proper work of TC 64.

A vote taken on this matter showed that there was not interest at all in this question; a slight majority was in favour of retaining the actual wording of the relevant passages.

Mr. Brice admitted that this problem might again raise a long discussion; he insisted, however, in the necessity of revising the scope as in the opinion of the British delegation the present wording was not clear enough. This was supported by the Italian delegation. Also the USSR delegation wanted to have the report of the ad-hoc working group discussed.

The Chairman therupon decided to circulate the report of the ad-hoc working group as a secretarial document and to put this item on the agenda of the next meeting.

The next meeting of TC 64 is scheduled for May 1975 in Istanbul, Turkey.

Working Group 4 of the SABS Main Committee

This Working Group, editing and improving the present Wiring Regulations, continued with their work and produced a number of recommendations which were dealt with by the Main Committee at a meeting held on 9th October, 1974. A number of difficulties that had been encountered were either solved or referred back for further consideration and investigation.

A matter of importance concerned compulsory earth leakage protection. Working Group 4 reported that it had been found that the mandatory use of earth leakage protection as contained in Regulation 226(F) as amended in the March 1974 amendments of the Wiring Regulations could be extremely onerous in certain circumstances. After detailed discussion the Main Committee resolved to revise the wording of Regulation 226(F) to the following:

"(F) As from the date of publication of this amendment, circuits supplying lighting fittings and socket-outlets in domestic premises, in hotels and boarding houses and in the corridors and public rooms of multi-dwelling units (e.g. blocks of flats or apartments) shall be provided with automatic earth leakage protection in the following specific cases:

- In every new installation unless otherwise approved, but only for a reasonable period of time;
- where any rewiring of or extension to an existing domestic installation is carried out, in which case the protection shall be applied to all the lighting and socket-outlet circuits of that installation;
- where any rewiring of or extension to an existing installation is carried out in an hotel or boarding house or in the corridors or public rooms of a multidwelling unit, in which case the protection shall be applied to the circuits that are so rewired or extended.

NOTE 1: Essentially emergency lighting circuits do not fall within the scope of this regulation.

NOTE 2: Any coupler which is specifically intended for the connection of a cooking appliance falling within the scope of SARS 153 and which cannot accept a plug manufactured in accordance with SABS 164 is not deemed to be a socket-outlet in terms of this regulation and need not be included in the automatic earth leakage protection."

This amendment will be translated into Afrikaans and the amendment in both official languages published as soon as possible.

E.E. DE VILLIERS PR(ING.) B.S.C. (ING.).
VERTEENWOORDIGER/REPRESENTATIVE

Mnr E.E. de Villiers (Rustenburg): Mnr President in verband met die verslag oor die hersiening van die Bedrulingsregulасies. Eerstens moet ek darem net sê ek het later tyd nie direk met die ommiddellike hersiening te doen gekry nie; dit is Mnr Cuming van Johannesburg (ek glo nie hy is by die Kongres vandag nie). Dit skyn asof u nie 'n aparte verslag van hom gekry het nie. U sal oplett dat ek in my verslag op bladsy 4 'n bietjie inligting weergee wat ek wel verky het. Dit is ongelukkig nie heeltemal volledig nie. Daar is heelwat meer werk gedoen sedert die verslag opgestel was. Ek denk Mnr Middlecoote van die SABS kan u verder inlig in verband met die Tegniese Komitee 64, waarvan hy natuurlik die voorstuur is (dit, terloops, is ook 'n eer vir Suid-Afrika; dit is al 'n paar jaar wat hy die posisie bekleek). Miskena kan u ook daar kortlike daaroor inlig. Dankie.

Mr A.A. Middlecoote (Pretoria): Mr. President, I think in TC 64 we had quite a lot of difficulty, because as you might realise we had quite a few quarrels in this Country. The urban versus the rural and the rest versus the rest but internationally, you have many countries deciding who should govern the trend, in shall we say the wiring regulations or regulations regarding installations and forgetting the Americans or the Japanese or any one else, it's fundamentally these days a quarrel between the common market countries. In fact, if you can ever get an agreement between Britain, France and Germany then you are quite lucky. However we got somewhere there, but it's quite an uphill battle. We still have quite a lot of fun here, and if I can digress and make the meeting a little lighter, I would like to tell you the story about what happened in Bucharest. Well first of all you must realise that South Africa has a decided advantage in that we have the English name and there are two international languages, English and French. The English name is South Africa and the French name is Afrique du Sud. If you know the right contacts in international affairs, if you want to speak late, then you say you are South Africa, and if you want to talk early you say you are Afrique du Sud and it's quite an advantage and you don't realise how this sort of thing can be to our credit. But I just want to tell you the story about the last meeting at Bucharest, where at the very back was the U.S.S.R. This is all done in alphabetical order and in front of them were the United Kingdom,

and in front of them were the U.S.A. and for this purpose of course we were rather impertinent.

We were "Afrique du Sud" and therefore right at the front. Nevertheless, the Russian, who was a Olga Vasaline Nogh, she put over a point that was rather difficult and we could not quite understand what they were getting at. Then she got embarrassed in trying to explain to me as to what she really meant. Then she said "Monsieur Le President, leave it, I am wasting the committee's time, but during the recess I will ask the South Africans to translate this into very good English." This is

absolutely true!

I am evading the issue, I think the point is that we are going along together. There is a delay in international agreement on the wiring regulations, not because of the rest of the world, but because of the difficulty in the common market who have quite an influence on deciding what is an acceptable agreement between the highly developed countries of France, Germany and Britain regarding "wiring rules". Thank you.

SABS VORDERINGSVERSLAG VIR 1974

Dit is vir my weer 'n genoeg om die vorderingsverslag van die S.A.B.S. Tegniese Komitees voor te lê. In die gevalle waar daar geen vergadering was gedurende die afgelopen jaar nie en waar die werk reeds voltooi is, sal die projek nie voorkom op die lys nie.

Met verwysing na S.A.B.S. 15/14/14-Kabels en Buigsame Koord, lewer die VerteenwoordigerMin. G.C. Theron soos volg verslag:-

"Hierdie komitee het op 31 Oktober 1974 saam met verteenwoordigers van die weermag vergader. Die doel was om die werk van die Nasionale Kodifikasiestelsel te besprek en die voorgestelde identifikasiekodeskrwyings vir kabels en drade goed te keur.

Die stelsel skakel met N.A.T.O. en ander gassosieerde lande en word in die R.S.A. deur die weermag beheer.

EVKOM IS reeds besig om daarby in te skakel en die S.A.S. & H., Hoof Poskantoor, ens., corweeg dit. Die uiteindelike doelstelling is om alle groot verbruikers, vervaardigers en handelaars landswyd daarby te betrek sodat voorrade deur internasionale kode-nommers bestel, bepaal en aangevra kan word.

Organisasies soos dié reeds genoem en die groter munisipaliteite sal rekening met die Weermag skakel terwyl die ander munisipaliteite verkiess vir praktiese redes deur 'n koördinerende liggaam soos die VMEO moet word.

Dit was duidelik dat van ons gebruiksterme en selfs S.A.B.S. bewoording mettertyd sal moet verander om die wêreldwyse terminologie aan te pas om verwarring uit te skakel."

In verband met S.A.B.S. 15/14/44/5 - Miniatuurstasies, is die volgende belangrike besluite geneem:

1. Verseelde transformatore sal standaard wees;
2. Eenheid met 'n kenwaarde bokant 315 KVa is slegs vir nywerhede bedoel.

Baie min nuwe komitees is saamgestel en wil ek net verteenwoordigers benoem op dié komitees wat werklik vir ons van belang is.

Weerens wil ek net grang al die VMEO lede wat op komitees dien bedank vir die toegewyheid en die ernaar waarmee hulle hulle van hul taak kwyt.

Grang wil ek die SABS in die besonder bedank vir die leiding wat hulle verskaaf en al die harde werk.

Die afgelope jaar was gekenmerk deur die nouer samewerking wat nou bestaan.

P.J. BOTSE

KO-ORDINERENDE VERTEEENWOORDIGER
CO-ORDINATING REPRESENTATIVE

S.A.B.S. VERWYS NR/ REF. NO.	ONDERWERP/TITLE	VERTEENWOOR- DIGER REPRESENTA- TIVE	AANTAL VERGADE- RINGS/ NO OF MEETINGS	VERSLAG/REPORT
15/7/19	Keuring en metodes van ontleding van brandstof.	G.T. Stevens	Een	Voorgestelde konsepgebruikskode vir die toetsing van kole word uitgestuur vir kommentaar en toetsing onder praktiese omstandighede. Subkomitee sal voortgaan met die ander gedeeltes van die kode soos:- (a) Voorbereiding van monster vir ontleding, en (b) Metodes vir die chemiese ontleding en fisiese toetsing van kole.

S.A.B.S. VERWYS NR/ REF. NO.	ONDERWERP/TITLE	VERTEENWOOR- DIGER REPRESENTA- TIVE	AANTAL VERGADE- RINGS/ NO OF MEETINGS	VERSLAG/REPORT
	Sampling van methods of analysis of solid fuels.		One	Proposed draft code of practice for sampling of coal to be sent out for comments and testing under practical conditions. Sub-committee to continue with the various other parts of the code viz:- (a) Preparation of sample for analysis, and (b) Methods for the various chemical analysis and physical tests on coal.
15/7/22	Isoleerolie vir transformators en skakeltoerusting.	V.A. Raynal	Drie	Byna voltooi. Eenstemmigheid is bereik oor alle hoof items.
	Insulating oil for transformers and switchgear.		Three	Virtually complete. All main items have been agreed to.
15/14/3/1	Veiligheid van elektriese toestelle. Standing advisory committee on electrical safety.	G.C. Theron	Een	Aaneenlopend deur middel van korrespondensie.
			One	Continuous by means of correspondence.
15/14/5/1	Omholde handluggreck- en afsonder-skakelaars. (Hersiening van SABS) (152/1951)	D.P. Viljoen	Een	Die werksgroep is versoen om sekere aspekte van die jongste SABS konsep sepsifikasié te ondersoek en terug te rapporteer aan die hoof komitee in Desember 1974.
	Manually operated enclosed type airbreak switches and isolators (Rev. of SABS 152/1951)		One	The working group was required to investigate certain aspects of the newly drafted SABS specification and to report back to the main committee in December 1974.
15/14/5/2	Muur- en toestelskakelaars- SABS 163/1963	J.A. Loubser	Een	Voorgestelde wysings sal uitgestuur word vir kommentaar.
	SABS 163/1963 Wall and Appliance switches		One	Proposed amendments will be circulated for comments.
15/14/5/3	Vlakge monteerde binneshuis elektriese paneelborde.	J.A. Loubser	Een	Wysings reeds geïmplementeer. Verdere vergaderings sal gereel word.
	Flush-mounted indoor electrical panelboards.		One	Amendments have been introduced. Further meetings to be arranged.
15/14/9/1	Drie-fase induksie motors. (hersiening van SABS 948/1969)	P.J. Botes	Twee	Sub-seksie goedgekeur deur Raad.
	Three-phase induction motors (Rev. of SABS 948/1969)		Two	Sub-division approved by Council.
15/14/9/2	Enkelefasie wisselstroom motors	H.J. de Bruin	Twee	Derde konsep spesifikasié is bespreek en verdere wysings is aangebring.
	Single-phase alternating current motors.		Two	Third draft specification discussed and further amendments introduced.
15/14/10/4	Straatligrarmature	M. Dempster	Twee	Goeie vordering. Waarskynlik 'n verdere twee vergaderings.
	Streetlighting Luminaires		Two	Well under way. Probably two more meetings.
15/14/10/8	Binneshuis Armature	M. Dempster	Twee	Goeie vordering en waarskynlik sal 'n verdere twee vergaderings nog gereel word.
	Interior Luminaires.		Two	Good Progress. Probably two more meetings.
15/14/14	Buigsame koorde vir krag- en verligtingstoestelle. (Ko-ordinerende Komitee) G.C. Theron General Co-ordinating Committee (Cables) (Flexible Cords)	G.C. Theron	Twee	Sien verslag van Ko-ordinerende Verteenwoordiger.
	Hittestabende kabels vir gebruik by die binnebedrading van elektriese toestelle. (Hersiening van SABS 529/1956)	A.J. van den Berg	One	See report by Co-ordinating Representative.
15/14/14/18	Heat resisting cables for use in the internal wiring of electrical appliances. (Rev. of SABS 529-1956)		Een	Spesifikasié tydens laaste vergadering finaliseer, maar kabelvervaardigers nie tewrede met die dikte van omhulsel nie, dit sal onekonomies vir hulle wees. Mr. Hancock van Scottish Cables moet nuwe tabellêre voorlê. Daar word vertrou dat dit gedurende 1975 gefinaliseer sal word.
			One	Specification finalised at last meeting. Cable manufacturers not satisfied with thickness of insulating covering of conductors. Waiting for Mr. Hancock of Scottish Cables to submit new tables. Hoping to finalise same during 1975.
15/14/14/1	Buigsame koorde vir krag en verligtingstoestelle. (Hersiening van SABS 168/1952) G.C. Theron		Twee	Sien verslag van Ko-ordinerende verteenwoordiger.
	Medium voltage vulcanized rubber insulated cables and flexible cords for power and lighting purposes. (Rev. of SABS 168-1952)		Two	See report by Co-ordinating Representative.
15/14/14/24	Gekartelde of drukksluiters	H. Barnard	Een	Vergadering ehou op 1/3/74 en besluit van vergadering wat op 29/11/73 gehou was op te volg, andersins geen verdere vordering.

S.A.B.S. VERWYS NR/ REF. NO.	ONDERWERP/TITLE	VERTEENWOOR- DIGER REPRESEN- TATIVE	AANTAL VERGADE- RINGS/ NO OF MEETINGS	VERSLAG/REPORT
	Crimped or pressure type connectors.		One	Meeting held on 1/3/74 to follow-up resolution of 29/11/73, otherwise no progress.
15/14/34	Elektriese opgaar-waterverwarmers. (Hersiening van SABS 151/1958)	A.J. van den Berg	Een	Buitengewone vergadering gehou op 14/5/74, notule gesikuler gedurende Junie 1974. Was tegnies hersien en vertaal en sal hopevol gedurende die eerste kwartaal van 1975 gefinaliseer word.
	Electric storage water heaters (Rev. of SABS 151/1958)		One	Special meeting held on 14/5/74, minutes circulated June, 1974. Technically reviewed and translated. Is to be submitted to next meeting and should be finalised during first quarter of 1975.
15/14/37	Tweepool en aardigspen proppe en sokkuitgangs, (metriek eenhede)	H. Barnard	Twee	Daar is ooreengekom dat 'n ad-hoc werkgroep sekere aspekte wat betrekking het op hierdie spesifikasie sal ondersoek. Geen verdere wordering is nog gerapporteer nie.
	Two-pole and Earthing-pin Plugs and socket outlets. (Metric Units)		Two	It was agreed that an ad hoc working group would investigate certain matters pertaining to this specification. No progress has been reported.
15/14/44/5	Kompakte transformatorsubstasies vir gebruik in openbare gebiede.	E. de C. Pretorius	Een	Sien verslag van Ko-ordinerende Verteenwoordiger.
	Compact transformer substations		One	See report by Co-ordinating Representative.
15/14/64/1	Ko-ordinering van isolering. (Laag-spanning)	J.C. Strauss	Een	Kommentaar wat ontvang is word bespreek.
	Insulation co-ordination for low voltage equipment.		One	Discussion of collated comments.
15/14/73/2	Bedradingsroeteering en - vloerlyste.	J.J. Boshoff	Een	Die konsep spesifikasie wat by die vergadering bespreek was is behandel as die eerste konsep.
	Wiring Trunkings and Skirtings.		One	The draft specification discussed was treated as the first draft.
19/3/3	Beskerming van gebou teen weerlig.	J.A. Loubsar	Twee	Wysigings wat deur die komitee aanvaar is, sal deur die SABS in die korrekte taal gestel word. Die dokument behoort erafsaags afgelê te word. Die Hoëveldskaf van die VMOE ondervind egter probleme met die voorgestelde aardingsmetodes en 'n sub-komitee is aangewys om dit verder met die SABS en WNNR te bespreek.
	Protection of Buildings against Lightning – COP (Rev. and subdivision of SABS 03/1952 – SANS 03/1952)		Two	Amendments accepted by the committee will be put in the correct grammatical form by the SABS. The document should be completed shortly. The Highveld Branch of the AMEU are experiencing problems with the proposed earthing methods, and a sub-committee has been appointed to discuss it with the SABS and CSIR.

Mnr. P.J. Botes (Roodepoort): Mnr President verskoon my 'n paar woorde voor ek my kommentaar lewer. Dit is vir my 'n groot vreugde om u in die Presidentstoel te sien en ek wil graag u en u gade gelukwens en u beide 'n aangename twee jaar toewens en dat u altyd sal terug dink aan hierdie twee jaar.

I also wish to congratulate my friend Mr Ken Robson on his election as President elect. Mnr President bale dankie vir die voorreg om weer iets by te voeg tot die verslag. Ek wil graag net meld dat waar ek voorheen aangehaal het dat ek net graag verteenwoordigers wil benoem op die Suid-Afrikaanse Buro van Standardele komitees wat vir ons van belang is, het dit egter onder my aansig gekom dat sekere spesifikasies soos byvoorbereeld 'n standaard spesifikasie vir stofsuiers ens. waar ons nou nie ernstig baie belang in het nie, daar egter nie 'n enkele gebruiker verteenwoordig op daardie komitee was nie, met die gevolg dat ek voel dat ons hier 'n taak het om te verrig en dit wil dus voorkom dat ek wel deelgelyk moet met die SABS sal moet saamwerk om te bepaal of hierdie Vereniging verteenwoordig moet wees op so 'n komitee, met ander woorde of dit in belang is van die gebruiker van die artikel.

Ek wil verwys na Mnr Theron se kommentaar onder die SABS kabels en buigsaame kable en ek wonder of Mnr Theron misken verder kommentaar wil lewer of 'n voorstel wil indien oor die aangeleentheid.

Dan wil ek oors my dank uitstrek teenoor die VMOE verteenwoordigers, Stadverteenwoordigers soos byvoorbeeld Johannesburg, Durban en Pretoria, verteenwoordigers van EVKOM en ook van die mynwese as gebruikers van miniatuur substasies wat so spontaan saamgewerk het en saamgestaan het, met die opsel van die spesifikasie van die miniatuur substasies. Ek dink daar was geen samwerkking gewees van die gebruikers se kant af. Aan hulle my dank. Onder hierdie spesifikasie moet daar verstaan word dat alhoewel daar genoem is dat miniatuur substasies uit die verskeie tipe sal wees en dit alleen tot in grotte van 115 kVA beskikbaar sal wees, dat hierdie beperking net betrekking het op miniatuur transformatore wat die standaard

merk sal dra. U kan nog enige tyd u persoonlike vereistes daarstel, met ander woorde nie die verskeie tipies nie of met 'n kapasiteit wat hoër is as 315 kVA.

Dit is ongelukkig so dat ons nie almal tevreden kan stel nie maar wel die groot meerderheid se belang word na ongesien.

Ook ons dank aan die amptenare van die SABS vir hulle leiding. Ook wil ek die stadsrade en hul verteenwoordigers hier bedank vir die toesetting wat hulle verleen het aan hulle ingenieurs om hierdie vergadering by te woon asook die finansiering van die vervoerkoste daarvan verbonde. Dit is alles in belang van die munisipaliteite en ook in belang van die gebruikers van artikels.

President: As ek iets mag byvoeg tot SABS, dit is missien nie die regte plek nie, maar ek wil darem van hierdie geleentheid gebruik mak om die SABS geluk te wen met 'n geweldig groot prestasie dat hulle ons land weer eens op die wêreldkaart geplaas het: vanaf 1 Januarie 1975 word die SABS verteenwoordig op die Internationale Standarde Organisasie (I.S.O.) en dit is werklik 'n groot prestasie.

Mnr. G.C. Theron (Vanderbijlpark): Mnr President die item wat Mnr Botes na verwys het gaan eintlik oor die kodifikasie van elektriese toerusting o.a. kables. Die kabels was op daardie stadium die belangrikste en dringendste item en dit gaan om internasionale aansluiting van Suid-Afrika op die NAVO, kodifikasie stelsel. Die vergadering was 'n voorlopige vergadering om die gevolels te kry en Mnr Prins van die SABS het ondernem om op die saak verder in te gaan en dan weer 'n vergadering te helé. Dankie.

Mr. A.A. Middlecote (Pretoria): Mr President, everyone argues too much but Mr Prins has it in hand and I think you'll just have to be patient because this sort of problem takes quite a long time to solve but we'll hurry it up. Thank you.

1974 VERSLAG VAN DIE SUID-AFRIKAANSE NASIONALE KOMITEE VIR VERLIGTING

Die een en twintigste algemene jaarvergadering van die SANKV is van 20 tot 24 Mei 1974 in die Burgersparkhotel, Pretoria gehou.

Die President mnr. D.W. Young was die voorstaander. Een honderd en sesien lede, gaste en besoekers was teenwoordig.

Opening

Sy Edele die burgermeester van Pretoria, Raadslid C.A. Young, het al die gaste en afgevaardigdes verwelkom met 'n kort maar kragtige toespraak met die tema dat lig 'n voorvereiste is vir enige groei of ordelike ontwikkeling.

Sy Edele die Minister van Beplanning en die Omgewing en van Statistiek, mnr. J.J. Loots, het die vergadering geopen deur die spesiale oorese gaste te verwelkom, nl. mnr. W.R. Stevens, president van die CIE, mnr. G. Rae van Holophane, USA en Dr. D. Fischer van Philips, Nederland. Hy het gesê dat die Staat sulke gevalle van internasionale samewerking baie verwelkom.

Die Minister het voortgegaan met 'n baie interessante toespraak waarin hy verwyss dat na die beginning van verligting en verligtingsuitrusting en het toe die stigting van die CIE en die SANKV bespreek. Hy het met trots gepraat oor die aktiwiteite van die verskillende subkomitees van die SANKV, veral dié wat met internationale liggame saamwerk.

Die Minister het daarna na die verskilke tussen die hoof padongeluksyfer verwys en het 'n beroep op die SANKV gedoen om alles moontlik te doen sowel ten opsigte van straatverligting as voertuigverligting, om 'n verlaging in die napongeluksyfer te weeg te bring. Hy het gevra vir beter verligting in huise en fabrieke asook die opvoeding van al die mens in die doeltreffende gebruik van lig en verligting. Hy het aanbeveel dat behoorlik opgeleide en gekwalifiseerde verligtingsingenieurs op alle vlakke in die Staatsdiens, sowel as die Handel, Nywerheid, Mynwese en Vervoer gebruik word.

Laastens het die Minister na die energiekrisis en besoedeling van die omgewing verweys. Hy het verwyss na die redelik voordeelige posisie waarin die Republiek homself bevind as gevolg van die oor-vloed van steenkool en dus goedkoop elektrisiteit. Hy het 'n beroep op alle owerhede gedoen om hierdie krag te gebruik om ons nagieltlike omgewing veilig, ekonomies en op 'n esteties aanvaarbare wyse te verlig.

Presidensiële Rede

In 'n beslissende rede met die titel **The people who practice Lighting in South Africa** het die president, mnr. Young die wisselwerking tussen die wetenskaplike, ingenieur en argitek in die kuns en praktyk van verligting beklemtoon. Hy het 'n beroep gedoen dat die dris as 'n span funksionere en dat elk die ander se hydrae tot die resultaat in ag neem.

Mnr. Young het gewys op die baie werklike voordeel wat voortvloei uit vergaderings van toegewye persone, souk hierdie kongres, waar idees geruil kan word en terugvoering van ondervinding kan plassing en waar miskin die belangrikste faktor die entoesiasme oor lig en verligting is.

Referate

Die volgende tien referate is voorgedra en bespreek:

1. The Growth and Work of the Commission Internationale de l'Eclairage deur mnr. W.R. Stevens, president van die CIE.

Mnr. Stevens het op 'n bondige en onderhoudbare wyse 'n bresig van die oorsprong, ontwikkeling, struktuur en funksies van die CIE gegee. Dit is in 1900 gestig – hoofsaaklik om die fotometrië van gasmantels te bestudeer. Vandag is dit nog steeds betrokke by fotometrie en verbonde sake soos visie en kleurvergaarsmaar by baie internasionale komitees is baie ander onderwerpe betrokke, soos bv. straat-verligting, binneshuise verligting, die toneel, atelje- en televisie-verligting, daglig en sulke fundamentele probleme soos: 'wat veroorsaak gerief of ongerief.'

Dit is verbluffend om daarop te let dat 'n belangrike subkomitee, nl. Studiegroep B: Verligting en Argitektuur, in Suid-Afrika gesetel is. Dit beklemtoon die noue samewerking tussen die SANKV en die CIE.

2. A Spectroradiometric approach to the Unit of Light deur mnr. F. Hengstburger, Nasionale Fisiese Navorsingslaboratorium.

Die outeur verduidelik die noodsaklikheid vir 'n nuwe evaluasie van die eenheid van lig aan die hand van die feit dat die hoogste akuraatheid wat vandaag met die huidige standaard verkyk kan word slegs 1,5 dele op 100 is – wat baie swak is as dit vergelyk word met die akuraatheidstandaard wat met ander wetenskaplike eenhede verkyk kan word. 'n Sekonde kan byvoorbeeld met 'n akuraatheid van beter as een deel op 1012 gemeet word.

In die nuwe spektroradiometriese benadering vir die eenheid van lig word die standaard bron deur 'n standaard ontvanger vervang.

1974 REPORT ON THE SOUTH AFRICAN COMMITTEE ON ILLUMINATION

The twenty first Annual General Meeting of SANCI was held in the Burgerspark Hotel, Pretoria from the 20th to the 22nd May, 1974.

The President, Mr. D. W. Young was in the chair. One hundred and sixteen members, guests and visitors attended.

Opening

His Worship, the Mayor of Pretoria, Councillor C.A. Young welcomed all the guests and delegates, in a short but cogent address having as its theme that light is a pre-requisite to any growth or orderly development.

The Honourable Minister of Planning and the Environment and of Statistics, Mr. J.J. Loots, opened the meeting by welcoming the special guests from overseas, namely, Mr. W.R. Stevens, President of the CIE, Mr. G. Rae of Holophane, USA and Dr. D. Fischer of Philips, Holland. He said the Government welcomes greatly such instances of international co-operation.

The Minister went on in an interesting speech to refer to the early days of lighting and lighting equipment and led up to the establishment of the CIE and of SANCI. He spoke with pride of the activities of the many sub-committees of SANCI especially those collaborating with international bodies.

The Minister next dealt with the appallingly high road accident rate and called upon SANCI to exert every effort, both in the field of street-lighting and of vehicle lighting to bring about a reduction in night-time accidents. He called for better lighting in homes and factories and for the education of all our peoples in the more effective use of light and lighting. He recommended the employment of properly trained and qualified lighting Engineers at all levels of Government, as well as in Commerce, Industry, Mining and Transport.

Finally, the Minister referred to the energy crises and the pollution of our environment. He drew attention to the relatively fortunate situation in which the Republic finds itself as a result of the abundance of coal and hence cheap electricity. He appealed to all authorities to use this power to light our night environment safely, economically and in an aesthetically acceptable way.

Presidential Address

In an inspired address, entitled **"The People who Practice Lighting in South Africa"** the President, Mr. Young, stressed the interplay between the Scientist, the Engineer and the Architect in the art and practice of lighting. He called for the three to function as a team, and to appreciate each other's contribution to the final result.

Mr. Young pointed to the very real benefits which flow from gatherings of dedicated people, such as this congress, where cross-pollination of ideas and feed back of experiences can take place, and where perhaps the most important factor is enthusiasm about light and lighting.

Papers

The following ten papers were read and discussed:

1. "The Growth and Work of the Commission Internationale de l'Eclairage" by Mr. W.R. Stevens, President of the CIE.

Mr. Stevens presented in concise and entertaining fashion an extensive review of the origins, development, structure and functions of the CIE. It was born in 1900 largely of a need to study the photometry of gas mantles. Today it is still concerned with photometry, and associated matters such as vision and colour rendering, but its numerous international committees are involved with many other subjects, such as streetlighting, interior lighting, the stage, studio and television lighting, daylight, and such basic problems as 'what creates comfort or discomfort.'

It is gratifying to note that an important sub-committee is centred in South Africa, namely Study Group B – Lighting and Architecture. This highlights the close relationship between SANCI and the CIE.

2. "A Spectroradiometric approach to the Unit of Light" by Mr. F. Hengstburger, National Physical Research Laboratory.

The author explains the need for a new evaluation of the unit of light by the fact that the greatest accuracy obtainable today with the existing unit is only 1.5 parts in 100, which is extremely poor when compared with the standards of accuracy attained with other scientific units. A second of time, for instance can be measured with an accuracy better than one part in 10¹².

In the new spectroradiometric approach to the unit of light the standard source is replaced by a standard receiver. This receiver, equip-

Hierdie ontvanger wat die standaard fotopiese weergawe het, meet deur 'n proses van elektriese kompensasie die stralingskrag wat deur die nagebootste cog daarop invai direk in wstt.

3. An Illuminating Education – or and Education in Illumination? deur mnr. A. Chalmers, Universiteit van Natal.

Die outeur tref 'n onderskeid tussen 'n tegniese opleiding in verlichtingsontwerp – wat hoofsaaklik van toepassing is op die voorbereiding vir 'n beroep as 'n verlichtingsingenieur – en 'n professionele opleiding in verlichtingsingenieurswese nie alleen as 'n voorbereiding vir ontwerpfunksies nie maar ook vir die breër ingenieursverantwoordelikhede van beplanning en ontwerp. Hoewel dit geseensaai die belangrikheid van die Tegnikusontwerper minimeer nie, behandel hierdie referaat die vraagstuk van die opleiding van die professionele ingenieur.

4. European Views on Quality and Quantity in Interior Lighting deur Dr. D. Fischer Philips, Eindhoven, Nederland.

In 'n referaat wat paslik met verskeie diagramme, grafiese en tabelle toegelig is, het die outeur die resultate van 'n baie produktiewe periode van navorsing oor verligtingstoepassing behandel wat meer as twintig jaar gelede begin is en nou voltooiing nader.

Die resultate van ondersoeke na optimum verligtingopele, met verskillende oortwegings in gedagte soos bv. sigprestasie, minimum aantal foute, minste uitputting is almal in ooreenstemming met mekaar.

Die aanbevolle verligtingswaarde wat verskillende grade van waarnembaarheid van die vertikale eienskappe van bekende voorwerpe met 'n medium grootte vereis, word aangevul deur gidslyne vir die aanbevolle verligting van die hoofvlakte van die sigveid in 'n kammer, nl. die mure en plafon.

Die verskillende benaderings en aspekte word toegelig deur sowel diagramme as voorbeeld van verligtinginstallasies wat onlangs voltooi is.

5. Art and Lighting deur mnr. M. Dempster, Elektrisiteitsdepartement, Stadsraad van Johannesburg.

Die outeur behandel die verligting van museums en kunsgalerye en toon dat die waarde en belangrikheid van die betrokke visuele take so hoog is dat hulle spesiale behandeling regverdig. Hy stel probleme ten opsigte van die verskillende kriteria wat toegepas word en verskaaf praktiese antwoorde deur te verwys na installasies in bekende museums en kunsgalerye oor die hele wêreld.

6. "Borrowing the Night – Lighting and Road Safety" deur mnr. R. Yates, Elektrisiteitsdepartement, Stadsraad van Johannesburg.

Die data in hierdie referaat is geneem uit 'n verslag met die titel *Light and Road Safety* deur die outeur oor 'n ondersoek na verskeie aspekte van verligting en die uitwerking wat dit op padveiligheid het. Die ondersoek het gespits uit op 'n studiebeurs wat die outomobiel assosiasie van Suid-Afrika en A.A. Onderlinge Versekeringsmaatskappy aan mnr. Yates toekenget het.

Die outeur definieer goede verligting en ton dat sulke verligting sonder twyfel 'n verbetering in die padveiligheidsituasies teweeg bring wat, behalwe die humanitêre oortwegings, ook baie meer in terme van rand en sent bespaar as wat dit kos om dit te installeer en te bedryf.

7. "Lighting of Colour Television Studios" deur mnr. J.M. Page, K. Baker en Vennotte.

Hierdie referaat dek kortlik die dimensie van kleur in televisie – met verwysing na die spesiale probleme van kleur-temperatuur wat nie in monochroomproduksies teëgekom word asook die tipes verligtingstoestelle wat gebruik word en hulle verbonde eienaardighede.

Ten besluite is melding gemaak van die beheeruitrusting vir verligting toesame met die gevolgtrekking dat die verligting van kleurtelevisie-ateljeeën meer 'n kuns as 'n wetenskap is.

8. "Veiling Reflections and their Effect on Task Visibility" deur mnr. G. Rae, Holophane, Denver, VSA.

Hierdie referaat dek die geskiedenis en uiteenlopende navorsing, eers in die laboratoria en later onder veildoeftende in kontore en klaskamers om die verhouding te bepalen tussen die sluier van weerkaatsings en taaksigbaarheid.

Hierdie navorsing het getoon dat daar breë sigstrekke vir gegeve verligtingspeile is. Die gevolgtrekkings toon dat sig verbeter kan word of deur nuwe begrippe te aanvaar – soos ligverdelings wat swart-wit verspreiding bevorder met minimum afwaaiste vloed – of deur die konvensionele intensiteite op die taak aansienlik te verhoog. Aanvaarding van die minimum kriteria van ekwivalente sferiese verligting sal nie alleen sigprestasie volhou nie maar sal dit teen ekonomiese beleggings- en onderhoudskoste en met 'n maksimum energiebewaring doen.

ped with the standard photopic response, measures the radiant power reaching it through the simulated eye directly in watts by a process of electrical compensation.

3. "An Illuminating Education – or an Education in Illumination?" by Mr. A. Chalmers University of Natal.

The author draws a distinction between a technical training in illumination design – which is appropriate mainly as a preparation for a career as a lighting designer – and a professional education in illumination engineering, as a preparation not only for design functions, but also for the wider engineering responsibilities of planning and research. While in my way minimizing the importance of the technician-designer, this paper concentrates on the question of the Education of the engineering professional.

4. "European Views on Quality and Quantity in Interior Lighting" by Dr. D. Fischer, Philips, Eindhoven, Holland.

In a paper well-illustrated with numerous diagrams, graphs and tables, the author deals with the results of a very productive period of lighting application research which was started more than twenty years ago and is now approaching completion.

The results of investigations into optimum lighting levels, with different consideration in mind – visual performances, minimum number of errors, least fatigue, maximum preference, are all in agreement with one another.

The recommended values of illuminance required for different degrees of perceptibility of the vertical features of medium sized familiar objects, are supplemented by guide lines for the recommended luminaire of the main surfaces of the visual field in a room, which are the walls and ceiling.

The different approaches and aspects are illustrated both by diagrams and by examples of recently completed lighting installations.

5. "Art and Lighting" by Mr. M. Dempster, Electricity Department, City Council of Johannesburg.

The author deals with the lighting of museums and art galleries and shows that the value and importance of the visual tasks involved is so high that they warrant very special treatment. He poses problems regarding the different criteria which apply and provides practical answers by reference to installations in well-known museums and art galleries all over the world.

6. "Borrowing the Night – Lighting and Road Safety" by Mr. R. Yates, Electricity Department, City Council of Johannesburg.

The data given in this paper are taken from a report, entitled "Light and Road Safety," by the author on an investigation into various aspects of lighting and the effect it has on road safety. The investigation resulted from a study bursary granted to Mr. Yates by the Automobile Association of South Africa and the A.A. Mutual Insurance Association.

The author defines "good lighting" and shows that such lighting beyond any doubt results in an improvement in the road accident situation which, quite apart from considerations of humanity, saves far more in terms of rands and cents than it costs to install and operate.

7. "Lighting of Colour Television Studios" by Mr. J.M. Page, K. Baker and Associates.

This paper covers briefly the dimension of colour in television, allied to the special problems of colour temperature not found in monochrome productions. Mention is also made of some of the definitions found in this field and types of luminaires used with their associate peculiarities.

In conclusion, to control equipment for lighting is mentioned, together with the conclusion that the lighting of colour television studios is more an art than a science.

8. "Veiling Reflections and their Effect on Task Visibility" by Mr. G. Rae, Holophane, Denver, USA.

This paper cites the history and extensive research, first in the laboratories and then, under field conditions, in offices and classrooms to establish the relationship between veiling reflections and task visibility.

These researches have shown that there are wide ranges in visibility for given levels of illumination. The conclusions show that visibility can be improved either by accepting new concepts – like light distributions that favour sideways spreads with minimum downward flux – or by greatly increasing conventional intensities on the task. Adoption of minimum criteria of equivalent spherical illumination will not only preserve visual performance, but will do so at economical investment and operating costs, and a maximum energy conservation.

9. "Simple calculation methods for the Lighting of Passage and Tunnels" deur Dr. H. Einhorn, erelid.

In hierdie referaat ontwikkel die auteur metodes vir die verligting van gange en tonnels en lig dit met uitgewerkte voorbeelde toe.

10. "The Lighting of a New Steel Factory" deur mnr. H. Stevenson Yskor, Newcastle.

Hierdie referaat is bedoel as 'n insiggewende samenvatting van die beplanning wat plaasgevind het ten einde 'n doeltreffende en betroubare hoogaam-verligtingsinstallasie vir die derde YSKOR-staalafrikie by Newcastle te verkry.

Besonderbede is gegee van die ondersoek wat uitgevoer is wat geleid het tot die keuse van hoëdruknatruimontladingslamp in omhulde armatuur. Die indrukke wat verkry word oor die grootte en ingewikkeldheid van die staalfabriek self was ook baie interessant.

Vraagforum

By hierdie geleenthed is 'n forumsessie gehou – soortgelyk aan die VMEO se ledeforum – waar mnr. J. von Ahlfen voorgesit het.

Vrae soos die volgende is gestel:

By hoeveel ongelukke was straatverligtingskolomme betrokke?

Moet verbruikers alle straatverligtingstoebere sommer aanneem?

Is die SANKV geken in die Departement van Handel se konsepaanbeveling oor nooddverligting?

Wat kan omtrent raserige ballasse gedoen word?

Wat is die gemiddelde luminansie van 'n pad en hoe word dit gemeet?

Toepasslike antwoorde is van die lede verkry.

Verslae van Tegniese Komitees

Die jaarlikse vorderingsverslag van die tegniese subkomitees en CIE-korrespondente is ter tafel gelê en bespreek. Die meeste van die baie komitees was baie aktief – onder die volgende hoofde:

Woordeskast; Eenheid en standaarde; Huishoudelike verligting; Sportverligting; Sigprosesie van verskillende rasse; Fotometrie; Kleurmeting; Fotopiese, mesopiese en skotopiese visie; Bronne van sigbare straling; Bronne van UV- en IR-straling; Armatuur; Grondbeginnels van die fisiese omgewing; Onbehagelikheidskittering; Binnenhuise verligting (myntverligting ingesluit) dagligverligting; Verligting en argitektuur; Voertuigverligting en verligtingstastiek.

Die Gebruikskode vir Binnenuhuise Verligting, Deel 1 en die Gebruikskode vir Openbare Verligting, Deel 11 is voltooi en is van die Bureau vir Standaarde beskikbaar.

SANKV het mnr. R.S. Yates en C.E. Gaynor afgevaardig om die tweede Europese Verligtingskonferensie by te woon wat gedurende September 1973 in Brussel gehou is. 'n Interessante verslag oor die verrigtings is ter tafel gelê.

Bestuursverslag

In die bestuursverslag vir 1973/74 het die President na die voortdurende groei van SANKV verwys. Met 12 nuwe lede wat gedurende die jaar aangesluit het, is die totaal nou 131 – met inbegrip van 33 munisipaliteite.

Die bestuur konseentreer op sy pogings om vir die toekoms te beplan en siaa meer sandag skenk aan die vroeë oor en implikasies van opvoeding, publikasies, skakeling met ILESA en ander liggange soos die SABS, NBVO, VMEO, SAIEE, internasionale CIE-aktiwiteite, nasionale ondersoek na verligting, sig- en veiligheidsprobleme, kongrestentoonstellings en -organisasie en baie ander take.

Verkliesing van Bestuur

Mnr. D.W. Young is weer as President verkieks met mnr. M. Dempster as senior vice-president en mnr. L. Foster as vice-president. Twee VMEO-lede, mnr. J. von Ahlfen en R.W. Barton is as bestuurslede verkieks.

Algemeen

Hierdie een en twintigste algemene jaarvergadering waar SANKV mondig geword het, was soos gewoonlik baie goed gereel en geleid. Die aangebode ete was uitstekend en die afgevaardigdes was baie waardeerend.

9. "Simple calculation methods for the Lighting of Passages and Tunnels" by Dr. H. Einhorn, Honorary Member.

In this paper the author develops methods for the lighting of passages and tunnels and illustrates them by means of worked examples.

10. "The Lighting of a New Steel Factory" by Mr. H. Stevenson, Iscor, Newcastle.

This paper is intended to be an informative condensation of the planning which took place in order to attain an efficient and reliable high bay lighting installation for the third ISCOR Steelworks at Newcastle.

Details are given of the investigations undertaken, which lead to the choice of high pressure sodium discharge lamps in enclosed style luminaires. Not least interesting is the impressions which emerges of the size and complexity of the steelworks itself.

QUESTION FORUM

On this occasion a forum session was held, similar to the AMEU Members Forum, chaired by Mr. J.K. van Ahlfen.

Questions such as the following were posed:

How many accidents involved streetlighting columns?

Must consumers accept all streetlighting fittings at face value?

Was SANCI consulted on the Department of Labour draft recommendation for emergency lighting?

What can be done about noisy ballasts?

What is meant by average luminance of a road and how is it measured?

Suitable answers were forthcoming, from the floor.

TECHNICAL COMMITTEE REPORTS

The Annual Progress Report of the Technical Sub-Committees and CIE correspondents was tabled and discussed. The majority of the many committees were extremely active, under the following headings:

Vocabulary; Units and Standards; Domestic Lighting; Sports Lighting; Visual Performance of different races; Photometry; Colorimetry; Photopic, Mesopic and Scotopic; Sources of visible radiation; Sources of UV and IR radiation; Luminaires; Fundamentals of Physical environment; discomfort glare; interior lighting (including mine lighting); daylighting; Lighting and Architecture; Automobile Lighting and Lighting Statistics.

The Code of Practice for Interior Lighting, Part 1 and the Code of Practice for Public Lighting, Part 11 have been completed and are available from the Bureau of Standards.

SANCI delegated Messrs. R.S. Yates and C.E. Gaynor to attend the Second European Lighting Congress which was held in Brussels during September, 1973. An interesting report on the proceedings was tabled.

Executive Report

In the Executive Report for 1973/74 the President referred to the continued growth of SANCI. The addition of 12 new members during the year brought the total to 131, including 33 municipalities.

The Executive is concentrating its efforts on planning for the future and will consider in greater detail the questions and implications of education, publications, liaison with ILESA and other bodies such as SABS, NOSA, AMEU, SAIEE, International CIE activity, national investigation into lighting, visual and safety problems, congress exhibitions and organisation and many other tasks.

Election of Executive Committee

Mr. D.W. Young was re-elected as President, with Mr. M. Dempster as Senior Vice-President and Mr. L. Foster as Vice-President. Two AMEU Members were elected as Committee Members, namely Messrs. J.K. von Ahlfen and R.W. Barton.

General

This twenty first Annual General Meeting and Congress at which SANCI came of age was very well organised and conducted, as usual. The fare offered was excellent and delegates were most appreciative.

R.W. BARTON

VERTEENWOORDIGER/REPRESENTATIVE

SUID-AFRIKAANSE ELEKTROLITIESE VERWERINGS KOMITEE

Die agste vergadering van die Hoofkomitee is te Johannesburg gehou op die 4 September 1974 onder die vooritterskap van mnr. L.H. James (Rand Waterraad) met mnr. A.F. Eggers (HPK) as Adjunk Vooritter.

Verslae van die verteenwoordigers van die verskillende Streeks-Veldkomitees het daarop gedui dat hierdie komitees werkzaam bly en dat hulle beradselings van onderlinge waarde is vir alle genoemde instansies.

Met verwysing na die vereiste om nie slegs die elektriese maar ook die stiel en werkverkuikundige afdelings van plaaslike overhede ingelig te hou sanguanda die werkzaamhede van Streeks-Veldkomitees, het die verteenwoordiger van die Witwatersrand en O.V.S. Komitee bevestig dat sy Komitee afskryfe van die notule van sy vergaderings aan die Stadsklerke van plaaslike overhede binne sy amptgebied aanstaar. Aangesien hierdie beleid blybaar die gewennde doel dien, het die Hoofkomitee besluit om die ander Streeks-Veldkomitees te versoek om 'n soortgelyke beleid te volg.

Die Witwatersrand en O.V.S. se Streekskomitee ondersoek die daartelling van 'n rekenaars-sleutelplan van verskillende dienste. Op 'n proefgrondslag word al die gegevens vanuit 'n toetastrook wat vanaf Sasolburg tot aan die Vaalrivier strek, opgeteken en, vir 'n tydperk van 12 maande, daar die WNNR die koste van die proef. Daarna sal die volle geldelike oorwegings beraam word.

Sedert die laaste vergadering van die Hoofkomitee is geen verdere vordering gemaak met die Gebruikskode vir Korrozie Beveiliging van Staal Pypeleidings nie. Daar is derhalwe besluit dat die SABS versoek word om die saak te bespoedig.

'n Konsep van die Gebruikskode vir die Katodiese beskerming van Ondergrondse Strukture is voltooi en onder die betrokke instansies versprei vir kommentaar.

D.C. PLOWDEN

VERTEENWOORDIGER/REPRESENTATIVE

1974 VERSLAG : WES-KAAPLANDSE STREEK KOMITEE IN-SAKE ELEKTROLITIESE VERWERING

Die is met genoeg dat ek hiermee my verslag van die aktiwiteitie van bo-genoemde komitee gedurende 1974 voorlê.

Vergaderings is kwartaalslik gehou, en is goed bygewoon deur die verskeie verteenwoordigers van verskeie Goewernement, Munisipale en private liggame wat belang het by die voorkoming, of oplossing van elektrolitiese verwering probleme, soos ondervind byveral ondergrondse dienste.

'n Item van nasionale belang bespreek op een van die vergaderings gedurende die tydperk onder corsig, was die voorbereiding deur die SABS van die spesifikasie vir die beskerming van staal pypeleidings teen korrozie. Kennis is ook geneem van die nuut gepubliseerde joernaal van die Suid-Afrikaanse Komitee insake elektrolitiese verwering, tans beskikbaar (teen R5,00 per jaar).

Een van die belangrikste dienste wat besonder kwasbaar is vir verwering van elektrolitiese aard is die drie pypeleidings, (2 gietyster, 1 staal), tussen die Steembas Dam en Kaapstad wat parallel of na aan 'n elektrifiseerde spoorlyn lê vir 'n sanienslike afstand.

Met die oog op die belangrikheid van dié pypeleidings verskyn hul dikwels op die agendas van die vergaderings. Die beskerming in dié gevalle is gewoonlik in die vorm van geforseerde dreinering waarby diodes met stuwingsweerdeurs gebruik word.

'n Ander pypeleiding bespreek, is 'n riool uitval in die see, naastenby 1,2 km lank. Die pyp is reeds vanaf 1929 in gebruik, en was katodies beskerm vir staal anodes in die see. Dit was aan die vergadering gerapporteer dat nuwe anodes (titaan) geïnstalleer sou word in die grond by die kus, met die doel om die stroom vanaf 24 amperes tot naastenby 70 amperes te vermeerder om die duur van die pypeleiding te verleng.

Addisionele bunkeri pypeleidings sal elersdaags geïnstalleer word in die Kaapstadse hawegebied deur oilemaatskappy. Dit is gerapporteer dat katodiese beskerming met geforseerde dreinering voorgestel is vir die beskerming van dié dienste.

Gaspypleidings wat deur magnesium anodes beskerm word waar nodig geag, blyk nou min skade te ly weens korrosie. Sekere waterpypleidings word beskerm deur magnesium anodes.

Verslede dui daarop dat aardlekstrome vanaf die S.A.S.-spoortsel seltsaas goed onder beheer is. Die Komitee word geadviseer wanneer verandering, uitbreidings, ens., ten opsigte van spoorlyne, pypeleidings, ens., beplan word.

SOUTH AFRICAN ELECTROLYTIC CORROSION COMMITTEE

The eighth meeting of the Main Committee was held in Johannesburg on the 4 September 1974 under the chairmanship of Mr. L.H. James (Rand Water Board) with Mr. A.F. Eggers (GPO) as Deputy Chairman.

Reports from the representatives of the various Regional Field Committees indicated that these Committees continue to be active and that their deliberations are mutually beneficial to all parties concerned.

Referring to the necessity for keeping not only the electrical but also the civil and mechanical departments of local authorities informed of the activities of Regional Field Committees, the representative of the Witwatersrand and O.F.S. Committee confirmed that his committee was sending copies of the minutes of its meetings to the Town Clerks of local authorities within its area of jurisdiction. Since this policy appeared to be achieving the desired purpose, the Main Committee decided to request the other Regional Field Committees to adopt a similar practice.

The Witwatersrand and O.F.S. Regional Committee is investigating the establishment of a computerised master plan of various services. On a trial basis, all information from a test strip stretching from Sasolburg to the Vaal River is being logged and, for a period of 12 months, the CSIR is bearing the cost of the exercise. Thereafter the full financial implications will be assessed.

Since the last meeting of the Main Committee, no further progress has been made on the Code of Practice for Corrosion Protection of Steel Pipe-lines. It was therefore agreed that the SABS be requested to expedite this matter.

A draft of the Code of Practice for the Cathodic Protection of Buried Structures has been completed and circulated to the relevant parties for comment.

1974 REPORT : CAPE WESTERN ELECTROLYTIC CORROSION REGIONAL FIELD COMMITTEE

I take pleasure in submitting herewith my report on the activities of the above Committee during 1974.

Meetings were held quarterly and were well attended by elected representatives of various Governmental, Municipal and private bodies concerned with the prevention or solution of electrolytic corrosion problems, particularly as experienced in underground services.

An item of national importance discussed at one of the meetings during the period under review, was the preparation by the South African Bureau of Standards of a specification for the protection of steel pipelines against corrosion. The official journal of the South African Corrosion Council, (costing R5,00 per annum) was also mentioned in this report.

One of the major services vulnerable to corrosion, particularly of the electrolytic form are three pipelines, (2 cast iron, 1 steel), between the Steenbras Dam and Cape Town, which are parallel or close to an electrified railway for a considerable distance. In view of the importance of these pipelines, they always appear on agendas for the meetings. The protection in these cases is generally in the form of forced drainage using diodes provided with surge protection.

Another pipeline discussed is a sewerage outfall into the sea, approximately 1,2 km long. This pipe has been in service since 1929 and has been protected cathodically with the sacrificial (steel) anodes in the sea. It was reported to a meeting that new anodes (titanium) were to be installed in the ground on the shore with the object of increasing the current from 25 amperes to about 70 amperes to prolong the life of the pipeline.

The merits of computerised cartography were discussed and noted with interest. The Cape Town Council intends employing such a system for locating its services.

Additional bunkering pipelines are to be installed in the harbour area by the oil companies. It was reported that cathodic protection and forced drainage were proposed for protecting these services.

Gas pipelines which are protected with magnesium anodes, where considered necessary, appear to suffer very little from corrosion. Certain water-mains are also being protected with magnesium anodes.

Reports indicate that leakage currents from the railway system are at present well under control. The Committee is advised when alterations, additions, etc., in respect of tracks, pipelines, etc., are contemplated. Measurements of potential are usually made before and after the work.

Komitee vergadering besprekings het aan die lig gebring dat terwyl telefoon kabels dikwels onderhewig is aan verwering, terwyl kragkabels in die Skiereiland 'n goeie geskiedenis het in die oopsig, ten spyte van die feit dat sommige 11 KV kabels reeds vanaf elektrifisasië in 1929 na dan die spoorlyn lê.

Ander sake van belang verwys na die komitee, sluit in verweerde warmwater elemente. Aangesien die voorheen syfer egter baie laag is, en dit blyk diesselfde fabriek te wees en daar geen lekstroom gevind is nie, is voorgestel dat die klagtes na die verskaffer verwys word.

Samewerking tussen die verskeie liggame is goed en hulp word weder syde verleen waar moontlik.

Ten slotte wil ek graag die Voorsitter van die Komitee, mnr. R.R. Gilmour bedank vir sy hulp in die voorbereiding van die beknopte verslag.

K.J. MURPHY
VERTEENWOORDIGER/REPRESENTATIVE

**1974 VERSLAG : NOORD-KAAPLANDSE STREEKS KOMITEE
INSAKE ELEKTROLITIESE VERWERING**

Ek doen graag soos volg verslag insake die bedrywigheede van bogennemende Komitee.

Die Noord-Kaaplandse Streekskomitee bestaan uit verteenwoordigers van die volgende organisasies.

S.A. Spoorweë-administrasie
Vereniging van Municipale Elektrisiteitsondernemings
Die Stadsraad van Kimberley
Die Elektrisiteitsvoorsieningskommissie
De Beers Consolidated Mines
Die Departement van Waterwese
Die Verwerkingsbeheergroep van die Olieverwerfheid
Die Departement Pos en Telekommunikasiessense

Vergaderings is op 20 Februarie 1974 en 26 September 1974 gehou.

Mnr. J.A. Mathews het gedurende die jaar as Voorsitter uitgetree toe hy uit die diens van die De Beers Consolidated Mynmatskappery afgetree het en mnr. D.M.F. Heymans van die Suid-Afrikaanse Spoorweë is as Voorsitter aangewys.

Probleme betreffende die elektrolitiese verwering van ondergrondse diente is tot weder syde voordeel besprek.

Alhoewel geen elektrolitiese verweringsprobleme deur lede van die VMEO in Noord-Kaapland aan die Komitee voorgele is nie, is ek daarvan oortuig dat verteenwoordiging van die VMEO in die Komitee tot voordeel van die Vereniging is.

G. FORBES
VERTEENWOORDIGER/REPRESENTATIVE

1974 VERSLAG NATAL STREEK KOMITEE I.S. ELEKTROLITIESE VERWERING

Ek ge hieronder my verslag van bogemelde komitee se werkzaamhede gedurende 1974.

Die Komitee van die Natal Streek bestaan uit verteenwoordigers van die volgende organisasies:

Suid-Afrikaanse Spoorweë en Hawens
Vereniging van Municipale Elektrisiteitsondernemings
Elektrisiteitsvoorsieningskommissie
Departement van Waterwese
Sasol
Korosiebeheergroep van die olie-industrie
Fuel Flow (SFF)

Die huidige ampsdraers is:

Voorsitter/Chairman:
Vise-Voorsitter/Deputy Chairman:

twee vergaderings, nl. op 9 Mei 1974 en 7 November 1974 is vanjaar gehou. Probleme ten opsigte van korrosie is tot almal se voordeel bespreek en in sommige gevalle bevredigend opgelos.

Onder ander was daar die volgende:

- (a) AE & CI-pipeline by Umbogintwini - roetine- en periodieke toetsing
AE & CI pipeline services Umbogintwini - routine and periodical testing.
- (b) Department van Waterwese - Newcastle
Department of Water Affairs, Newcastle
- (c) P & D-installasie - Island View
P & D Installation - Island View

Discussions at the committee meetings revealed that while telephone cables frequently suffered from corrosion, power cables in the Peninsula had a good record in this respect, despite the fact that some 11 KV cables had lain near the railway since electrification in 1929.

Other items of interest referred to the committee included corroded water heater elements. However, the incidence is very low, and since the same make appeared to be involved and stray current absent it was suggested that the complaints be referred to the supplier.

Co-operation between various bodies is good and mutual assistance readily given where possible.

In conclusion, I should like to thank the Chairman of the Committee, Mr. R.R. Gilmour for his assistance in preparing this brief report.

1974 REPORT : NORTHERN CAPE ELECTROLYTIC CORROSION REGIONAL FIELD COMMITTEE

I set out below my report on the activities of the above Committee. The Northern Cape Regional Field Committee comprises representatives of the following organisations.

South African Railways Administration
Association of Municipal Electricity Undertakings
Kimberley City Council
Electricity Supply Commission
De Beers Consolidated Mines
Department of Water Affairs
The Oil Industry Corrosion Control Group
Department of Posts and Telecommunications

Meetings were held on the 20th February, 1974 and 26th September, 1974.

Mnr. J.A. Mathews retired as Chairman of the Committee during the year due to his retirement from the De Beers Consolidated Mines Company and Mr. D.M.F. Heymans of the South African Railways was appointed as Chairman of the Committee.

Problems relating to the electrolytic corrosion of underground services were discussed to mutual advantage.

Although no electrolytic corrosion problems were submitted to the Committee by members of the AMEU in the Northern Cape, I am confident that representation on this Committee is beneficial.

1974 REPORT : NATAL ELECTROLYTIC CORROSION REGIONAL FIELD COMMITTEE

I set out below my report on the activities of the above Committee during 1974.

The Natal Regional Field Committee comprises representatives of the following organisations:-

South African Railways Administration
Association of Municipal Electricity Undertakings
Electricity Supply Commission
Department of Water Affairs
S.A. Coal, Oil and Gas Corporation
Oil Industries Corrosion Control Group
Fuel Flow (SFF)

The present office bearers are:

Mnr/Mr. C.R. Stafford - SAS/SAR
Mnr/Mr. D.H. Fraser - VMEO/AMEU

Two meetings were held during the year, on 9th May and 7th November 1974, at which problems relating to corrosion were discussed to mutual advantage and in some cases satisfactorily resolved.

Amongst these were:-

- (d) Chatsworth-bebuisingskema – Durban
Chatsworth Housing Scheme – Durban
- (e) SFF-pyleiding – Reunions na Island View
SFF Pipeline – Reunions to Island View
- (f) Durban-korporasie – staalhoofwaterpyp van Phoenix na Effingham
Durban Steel Water Main Phoenix to Effingham

Die komitee het kennis geneem dat die SABS-gebruikskode vir katoeniese beskerming van ondergrondse en onderwaterstrukture

Deel 1 – Algemene maatstawwe, en

Deel 2 – Kabels en pyleidings wat spoorlyne kruis, nou voltooi is en wanneer dit gepubliseer word, sal hierdie dokument vir die belanghebbende partye van belang wees.

Die notules van die Natalse Streek Komitee is gestuur na alle taklede van die VMO wat versoek is om die Departemente van Siviele Ingenieurswese van al die plaaslike owerhede in die gebiede waar hulle elektrisiteit verspreef, ten opsigte van probleme met elektrolytiese korrozie te verteenwoordig. Sulle probleme kan na die komitee verwys word. Daar word voorgestel dat die Streekwaterkorporasies in die streek, wat nie onder die jurisdiksie van die Plaaslike Owerhede val nie, waan nodig via die kantoor van die Provinciale Administrasie van die komitee se werkzaamhede in kennis gestel word.

Ek is tevreden dat ons verteenwoordiging op hierdie liggama nog voordeilig en nodig is. Die uitruil van notules van vergaderings tussen die Hoof- en Streekskomitees word as voordeilig beskou.

The Committee noted that S.A. Bureau of Standards Code of Practice for Cathodic Protection of Underground and Submerged Structures

Part I General

Part II Cables & Pipeline Crossing Railway Tracks, has now been completed and when published this document should be of value to interested parties.

The minutes of the Natal Regional Committee have been circulated to all Branch Members of the AMEU who have been requested to represent the Civil Engineering Departments of all the Local Authorities within their areas of electricity supply in electrolytic corrosion problems, which may be referred to the Committee. It is proposed that Regional Water Services Corporations within the Region, which do not fall under the jurisdiction of the Local Authorities, will be informed of the activities of the Committee as necessary, through the offices of the Provincial Authorities.

I am satisfied that our representation on this body continues to be beneficial and necessary. The exchange of minutes of meetings between the Main and Regional Committees is considered useful.

D.H. FRASER
VERTEENWOORDIGER/REPRESENTATIVE



DIE POTCHEFSTROOMSE UNIVERSITEIT VIR C.H.O.

kondig met genoeg aan die instelling van die volgende kursusse in die Ingenieurswese wat deur S.A.R.P.I. erken word vir doeleindes van registrasie as ingenieur of ingenieur-in-opleiding

B.Sc. (Ingenieurschemie):	'n vierjarige graad in Chemiese Ingenieurswese
B.Sc. (Elektrotegniek):	'n vierjarige graad in Elektrotechniese Ingenieurswese

In ander vertakkinge van die Ingenieurswese word opleiding tot aan die einde van die tweede studiejaar aangebied.

Rig navrae aan:

Die Registrateur (Akademies), P.U. vir C.H.O.,
POTCHEFSTROOM, 2520.

VERSLAG OOR DIE TEGNIESE OPLEIDING VAN PERSOENEL

In die verslag voorgelê is aan die Tegniese Vergadering gehou gedurende Mei 1974 te Roodepoort, is dit gemeld dat die Instituut van Stadsklere, op versoek van die Verenigde Munisipale Dagbestuur, 'n onderkomitee daargestel het om ondersoek in te stael na anbevelings te maak oor die opleiding en behoud van personeel in diens van plaaslike overhede en dat die VMEO versoek is om twee verteenwoordigers aan te stel om op hierdie onder-komitee te dien. 'n Afskrif van die aantekeninge oor die onderwerp, opgestel deur die Instituut van Stadsklere was ingesluit by die verslag.

Ten tye van opstel van hierdie verslag het die onder-komitee reeds op vry geleenthede saamgekom en het sy eerste verslag ingehandig by die Vaste Komitee aangestel deur die Verenigde Munisipale Dagbestuur om uitvoering van die voorstelle ingedien deur die onder-komitee, te oorweeg. Die Vaste Komitee bestaan uit die Voorsitters, van hulle plasservanger, van die vier Provinciale Munisipale Verenigings.

Die eerste verslag handel hoofsaaklik oor die opleiding en indienstneming, in hulle eie gebiede, van Kleurlinge, Asiatis en Bantoes in geskoolde en half-geskoolde beroepse. 'n Tweede verslag, nou in konsep-vorm, handel oor die kwestie om die beeld van die plaaslike overheid as werkgever te verbeter, reclame makende vir die arbeid en prestasies van plaaslike overhede en verskoeing dat genoegsame maatreëls getref word om personeel te werf en te behou.

Dit word verwag dat, op die volgende vergadering van die onder-komitee, die sukses van opleiding van ambagslui en die behoefte om doeltreffend geleef basiese opleidingscentra op te rig, voorweg sal word. Een van die Metalen Industrie se Vakleerlingekomitees het kommer uitgespreek oor die swak uitslae wat deer vakleerlingelektrisins van verskillende munisipaliteite oor die land as geheel behaal word en het aangevul dat dit moontlik mag wees as gevolg van die beperkte werkgebied wat deer hierdie munisipaliteite gedek word.

'n Oplossing wat voorgestel is, is om die vak van „Munisipale Elektrisien“ in die lewe te roep. 'n Soortgelyke voorstel is ingedien deur een van die VMEO Takke op die Tegniese Vergadering gehou te Roodepoort gedurende Mei 1974 en die sukses daarvan is deur die Uitvoerende Raad na die Tegniese Opleidingskomitee verwyts, vir overweging. Die gevolg-trekking van die Onder-Komitee, soon aan die Uitvoerende Raad berig en deer hulle aangeneem op die vergadering van 15 November 1974, was as volg:

1. Omdat meeste munisipaliteite nie slegs elektrisien oplei nie, maar ook vakkliu in baie van die ander geskoolde ambagte, sal 'n Munisipale Vakleerlingskapkomitee verteenwoordigers van elkeen van die genoemde Vakbunde moet insluit. Dit kan as gevolg 'n groot en gevoldig logge komitee gevorm.
2. Die bestek van werk deur elektrisien gedoen in die grotere munisipaliteite is in werklikheid breër as omskryf in die leerplan van die Metalen Industrie, en elektrisien wat elders opgelei is onder die leerplan moet gewoonlik aanvullende opleiding ondergaan om aan die vereistes van die grotere munisipaliteite te voldoen. Derhalwe, vir daardie munisipaliteite, is die leerplan van die Metalen Industrie die minimum wat aanvaarbaar is.
3. Vakbonde is nie ten gunste van verlaging in die standaard of bestek van opleiding nie.
4. Enige poging om vakleerlinge volgens 'n verlaagde standaard op te lei, sal ongetwyfeld die toenemende moeilikheid om jongmanne vir die beroep te werf, vererger.
5. Om 'n ambag van „Munisipale Elektrisien“ met 'n beperkte opleidings-leerplan te skep is nie die oplossing van die vraagstuk nie aangesien die leerplan moet voldoen aan die vereistes van alle munisipaliteite en nie net die kleinerne nie.

Die Tegniese Opleidings Onder-Komitee herhaal sy mening dat die oprigting van basiese opleidingscentra in strategiese gebiede, bekom-base vir die meerderheid van munisipale voorseeningsondernemings, die hoofvereiste is om die huidige opleidingsprobleme uit te skakel. Die probleme wat die VMEO in die sig staar by die oprigting van sulke sentra is in vroeëre verslae uitgegeset, maar daar is nou 'n goeie kans dat, deur gebruik te maak van die Onder-Komitee aangestel deur die Instituut van Stadsklere om die opleiding en behoud van plaaslike overhede se personeel te ondersoek, hierdie probleme oorkom kan word.

D.C. PLOWDEN
SAMEROEPEP/CONVENER

Mr. D.C. Plowden (Johannesburg): Mr President, gentlemen, in the various reports that I have submitted in the past to Conventions and Technical Meetings of this Association, I have endeavoured to give as fully as possible the progress that the Technical Training Sub-Committee has made in its deliberations, so I can't really add very much

REPORT ON THE TECHNICAL TRAINING OF STAFF

In the report presented to the Technical Meeting held during May 1974 in Roodepoort, it was stated that the Institute of Town Clerks had, at the request of the United Municipal Executive, established a sub-committee to investigate and make recommendations on the training and retention of local government staff and that the AMEU had been invited to appoint two representatives to serve on this sub-committee. A copy of a memorandum on this subject drawn up by the institute of Town Clerks was included with the report.

At the time of writing this report, the sub-committee has met on four occasions and has submitted its first report to the Standing Committee appointed by the United Municipal Executive to consider implementation of the proposals submitted by the sub-committee. The Standing Committee consists of the Presidents, or their nominees, of the four Provincial Municipal Associations.

The first report deals mainly with the training and employment within their own areas of Coloured, Asians and Blacks in skilled and semi-skilled occupations. A second report, now in draft form, deals with the question of improving the image of the local authority as an employer, giving publicity to the tasks and achievements of local government and ensuring that adequate steps are taken to recruit and retain staff.

It is expected that at the next meeting of the sub-committee the question of training artisans and the need for establishing suitably situated basic training centres will be considered.

One of the Metal Industries Apprenticeship Committees has expressed concern at the poor results being obtained in trade tests by apprentice electricians from various municipalities throughout the country and felt that this might be due to the narrow field of work covered in these municipalities.

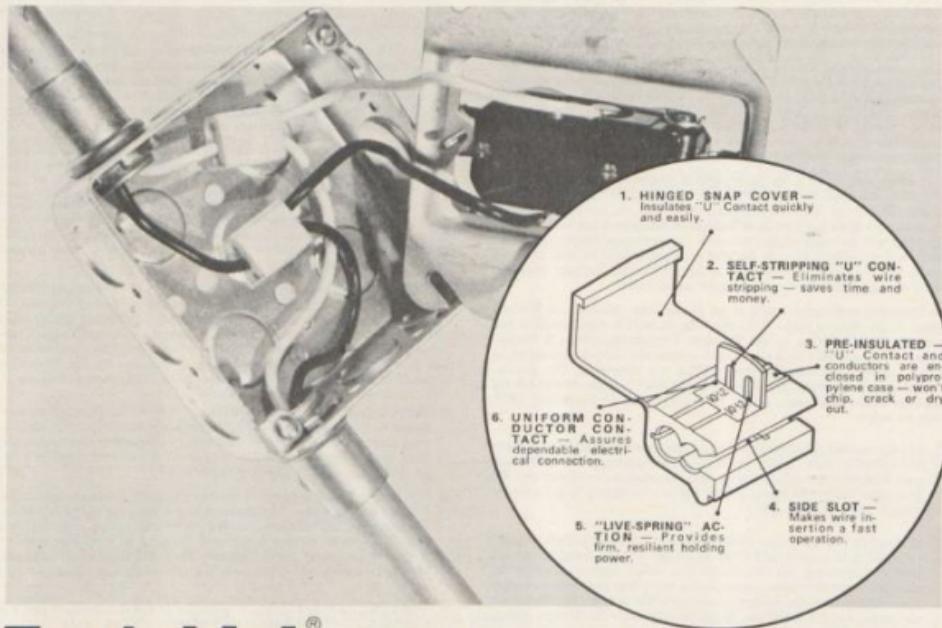
A solution suggested was to establish the trade of "Municipal Electrician." A similar suggestion was put forward by one of the AMEU Branches at the Technical Meeting held in Roodepoort during May 1974 and the matter was referred by the Executive Council to the Technical Training Sub-Committee, for consideration. The conclusions of the Sub-Committee, as reported to and accepted by the Executive Council at its meeting on the 15 November 1974, were as follows:-

1. Because most municipalities train not only electricians but also artisans in many of the other skilled trades, a Municipal Apprenticeship Committee would have to include as members representatives from each of the Trade Unions concerned. This could result in a large and consequently unwieldy committee.
2. The scope of work performed by electricians in the larger municipalities is in fact wider than defined in the syllabus of the Metal Industries and electricians trained elsewhere under this syllabus usually have to receive additional training to meet the requirements of the larger municipalities. Thus, for these municipalities, the Metal Industries syllabus is the minimum that can be accepted.
3. Trade Unions do not favour a reduction in the standards or scope of training.
4. Any attempt to train apprentices to a reduced syllabus would undoubtedly aggravate the ever increasing difficulty in attracting young men to the trade.
5. To establish a trade of "Municipal Electrician" with a restricted training syllabus is not the answer to the problem because the syllabus must meet the requirements of all municipalities and not only the smaller ones.

The Technical Training Sub-Committees reiterates its opinion that the establishment of basic training centres in strategic areas accessible to the majority of municipal supply undertakings is the major requirement towards eliminating the present training problems. The difficulties facing the AMEU in establishing such centres have been defined in earlier reports, but there is now every hope that, by working through the Sub-Committee appointed by the Institute of Town Clerks to investigate the training and retention of local government staff, these difficulties may be overcome.

to that but since this is the last occasion on which I shall speak about the activities of Technical Training Sub-Committee, I would like to take this opportunity of paying tribute to the whole-hearted co-operation and support that I have received from the members of the sub-committee, the present members of which are Messrs. Barton, Botes,

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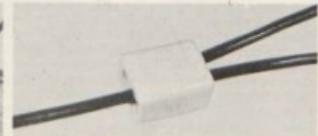
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de Villiers, Dreyer, Fraser and Robinson and to each of these gentlemen I would like to say very sincere thank you. I might just summarise very briefly what has been happening. You all know that a number of years ago there was a great deal of concern about the shortage of technical staff and also, in many instances, the inadequate quality of staff. So, several years ago, the Executive Council decided to establish a sub-committee to investigate the training of technical staff which, in this context, comprises engineers, technicians and artisans. In any early stage of its deliberations, the sub-committee came to the conclusion that the training of engineers and technicians was adequately catered for by the Universities and Colleges for Advanced Technical Education. Thus the Association's subcommittee confirmed its investigations to the training of artisans and it came to an early conclusion that one of the most important things was to establish basic training centres for apprentices. The reason for this is that the majority of undertakings, particularly the smaller ones, cannot afford the costs of establishing such training centres and it is only the larger ones who can do so. The need for training centres is brought out very clearly in the success in trade test results of those organisations which have been able to establish training centres. Generally the failure rate in trade tests has been very high indeed but Johannesburg, for instance, has for a matter of ten years or more been getting a pass rate of over 90%; more recently Escom has established a very large training centre and its pass rate has increased materially since that time. So there is no doubt that a very important thing in the training of artisans is to provide adequate basic training. Now we are aware that this is needed, but the difficulty we are faced with is that the A.M.E.U. as a body has no resources nor the powers, legislative or otherwise, to establish and administer basic training centres and, of course, there is another little problem; that is that electricity undertakings are not the only local authority departments which employ artisans and train apprentices. Fortunately the United Municipal Executive, following the presidential address given about two years ago by Mr. A.P. Burger, Town Clerk of Johannesburg, on the recruitment, training and retention of staff of all categories, not

just technical, requested the Institute of Town Clerks to establish a sub-committee to investigate the question of recruitment and retention of staff, and the A.M.E.U. was invited to appoint representatives to work on this sub-committee. Mr. Botes and myself were appointed by the Executive Council. The sub-committee of the Institute of Town Clerks met on five occasions and, at the time of my latest information, had submitted two reports to the Standing Committee appointed by the V.M.E.O. in my report in front of you today. The last report was ready to go up about two months ago must have been submitted by now. In this report, the two things that interest us most are the recommendations that more bursaries should be established for training at universities and technical colleges and that basic training centres for apprentices should be established in four or five regions. I think that, because we as an Association were unable on our own to push this concept any further, we might optimistically look forward to more success now that the United Municipal Executive is taking an active interest in it. I think gentlemen that is all I have to say. Thank you.

Mr. D.H. Fraser (Durban): Mr. President I wonder if Mr. Plowden can give us some indication of how the UME are likely to finance the provision of these training centres?

Mr. D.C. Plowden (Johannesburg): I have come a long way Mr. President to tell Mr. Fraser that I just don't know how they are going to do it. But I think it is fairly obvious that the UME can exert a great deal more influence in municipal affairs towards introducing legislation that might, for instance, make it compulsory for all local authorities in particular those who cannot establish their own training centres, to contribute towards costs of the establishing these centres, on a basis perhaps of the number of artisans they employ or the number of apprentices they train.

President: I think we as AMEU are very much indebted to Mr. Plowden for the amount of work he has put into this Committee. Thank you very much Mr. Plowden.

VERSLAG OOR DIE WERELDENERGIEKONFERENSIE

Die Wêreldenergiekonferensie is 'n vereniging van ongeveer 83 lande wat homself ten doel stel die ontwikkeling en vredesame gebruik van energiebronne – sowel nasionaal as internasionaal. Elke land word deur 'n nasionale komitee vertewordig. Die Suid-Afrikaanse Nasionale Komitee (SANWEK) bestaan uit die Elektrisiteitsvorsingskommissie, die Vereniging van Munisipale Elektrisiteitsondernemings van Suid-Afrika, die Raad op Atoomkrag, die Kamer van Mynwese, die Departement van Beplanning en die Omgewing, die Brandstofnavorsingsinstituut van Suid-Afrika, die Suid-Afrikaanse Steenkool-, Olie- en Gaskorporasie Bpk., die Suid-Afrikaanse Wetenskaplike en Nywerheidsnavorsingsrad, die Suid-Afrikaanse Instituut van Elektriese Ingenieurs, die Suid-Afrikaanse Instituut van Meganiese Ingenieurs en die Suid-Afrikaanse Spoerbed en Hawens. Die Suid-Afrikaanse Nasionale Komitee vir Groot Damme het waarnemersstatus.

Die jaarlikse vergadering van SANWEK is op 21 Februarie 1975 in die EVKOM-sentrum in Johannesburg onder vooritterskap van Dr. Staszacker gehou.

Die voorritter het verslag gedoen oor die Negende Wêreldenergiekonferensie wat in September 1974 in Detroit, Verenigde State van Amerika gehou is en waarheen 'n afvaardiging van 38 persone uit Suid-Afrika gelei het. Altesaam 223 tegnieke referate is voorgedaan waaroor drie van die Suid-Afrikaanse afvaardiging, nl.:-

1. "The design and operation of a dry cooling system for a 200 MW turbogenerator at Grootvlei Power Station" deur N.T. van der Walt, T.J. Sheer en D. Kuball van EVKOM.
2. "Pollution and the power industry in South Africa" deur R.D. Dutkiewicz van die Universiteit van Kapstad.
3. "A forecast of energy supply and demand in South Africa" deur D.J. Kotze van die Departement van Beplanning en die Omgewing.

Meer as 4 000 mense het die kongres bygewoon wat baie goed georganiseer was. President Ford het die verrigtinge geopen en heelwaal belangrike persone, onder andere Sheikh Yamani, Saoedi-Arabië se Minister van Petroleumbronne, het deelgeneem.

Mr. Jan H. Smith die Hoofbestuurder van EVKOM en Dr. D.S. Kotze het oor verskeie aspekte van die kongres verslag gedoen terwyl Dr. R.D. Dutkiewicz die geheel soos volg opgesom het:-

"The papers presented showed that rapid progress was being made in the fields of alternate energy source utilization, and in pollution abatement. However, it was obvious that anti-pollution measures were taking a back seat to economic considerations. It appeared that no one thought that alternate energy sources could be utilized in the near future, and that oil would have a large energy source for some time to come. The economics of energy production and utilization were viewed with alarm and the high oil-cost was considered to be a large factor in the high inflation rate in the world."

REPORT ON THE WORLD ENERGY CONFERENCE

The World Energy Conference is an association of some 83 countries whose object it is to promote the development and the peaceful use of energy resources to the greatest benefit of all, both nationally and internationally. Each country is represented by a National Committee. The South African National Committee (SANWEC) consists of the Electricity Supply Commission, The Association of Municipal Electricity Undertakings of South Africa, the Atomic Energy Board, the Chamber of Mines, the Department of Labour, the Department of Mines, the Department of Planning and the Environment, the Fuel Research Institute of South Africa, the South African Coal, Oil and Gas Corporation Ltd., the South African Council for Scientific and Industrial Research, the South African Institute of Electrical Engineers, the South African Institute of Mechanical Engineers and the South African Railways. The South African National Committee on large Dams has observer status.

The annual meeting of SANWEC was held at Escom Centre, Johannesburg, on the 21st February, 1975, under the Chairmanship of Dr Staszacker.

The Chairman reported on the Ninth World Energy Conference which was held in Detroit, United States of America, in September, 1974, and to which he led a delegation of no less than 38 people of South Africa. A total of 223 technical papers were presented, including three from the South African delegation, namely:-

1. "The design and operation of a dry cooling system for a 200 MW turbogenerator at Grootvlei Power Station" - by N T van der Walt, L A West, T J Sheer and D Kuball, of Escom.
2. "Pollution and the power industry in South Africa" - by R D Dutkiewicz of the University of Cape Town.
3. "A forecast of energy supply and demand in South Africa" - by D J Kotze of the Department of Planning and Environment.

More than 4 000 persons attended the Conference which was superbly organised. President Ford opened the proceedings and many notabilities took part, including Sheikh Yamani, Saudi Arabia's Minister of Petroleum Resources.

Mr Jan H Smith, General Manager of Escom and Dr D S Kotze reported on various aspects of the conference, while the whole was summarised by Dr R D Dutkiewicz, as follows:-

Dr. Straszacker het dit beklemtoon dat bo en behalwe die formele vergunning van die konferensie daar ook informele kontak met afgevaardigdes van ander lande was wat van groot nut en belang was. Die Suid-Afrikaanse lede is deur almal vriendelik ontvang en daar was geen onangename voorvalle nie. EVKOM se droei koeltoer by Grootvlei – so ver bekend die grootste in die wêreld en sekertier in die westerse wêreld, het groot belangstelling uitgelok.

Die kernkragsentrale wat in die Kaap gebou gaan word het ook heelwat besprekking uitgelole veral ten opsigte van die veiligheidsaspek en die beskikking oor kernaafval.

Die energiekrise het by al die afgevaardigdes 'n belangrike plek ingenomen. Die eenvormige benadering blyk 'n verhoging in steenkoolverbruik te wees en om energieverbruik te verlaag. In Detroit was daar heelwat sprake van die elektriese motorkar maar dit blyk dat die groot motorvervaardigers nog min vordering gemaak het. Net so was daar basie oor sonenergie gepraat maar daar blyk nie veel optimisme vir grootaalslike ontwikkelinge te wees nie.

Die totale voorbeeld van daar in die meeste lande se energiebeplanning 'n tekort aan samewerking was. Die Suid-Afrikaanse bedeling lyk meer gevorderd as die meeste.

Die beplannde verlaging in die groeitempo in die VSA was 5,1% na 3,6% wat 'n besparing van 2 000 000 vate olie per dag verteenwoordig. Daar is egter tans 'n groter vermorsing van energie in die VSA as op enige ander plek.

ADMINISTRASIE

Verskeie sake is besprek waaronder die volgende:-

Wêreldenergie-inligtingsentrum:

Die wêreldenergiekonferensie skenk aandag aan die stigting van 'n wêreldenergie-inligtingsentrum wat deur die wêreldenergiekonferensie bedryf sal word en verantwoordelik sal wees vir insameling, Koördinering, verspreiding en die hywer van inligting oor die wêreld se energiebronne.

Terme vir energie-economie:

'n Werkgroep, waarop SANWEK verteenwoordig is, is opgestel met die doel om 'n lys van standaard terme vir algemene gebruik in energie-economie op te stel. Ongeveer 800 terms is op die lys geplaas en in 'n aantal tale vertaal.

Bewaringskommissie:

'n Kommissie wat uit ingenieurs, ekonome en sosioloë bestaan wat almal internasionaal bekend is en wat bygestaan word 'n voltydse projekdirekteur en sy assistent wat sekretariële pligte uitvoer, sal deur die WEC in die lewe geropen word. Die algemene doelstelling is om in die lig van wat 'n toenemende skaarte aan brandstof in die komende dekades daarvan aandag te skeen van die ekonomiese grondbeginsels vir die keuse van energieprojekte nie verander moet word nie om groter kapitaalbesteding in die belang van toekomstige besparing aan te moedig en, indien wel, tot watter mate. Omgewingsgehalte, hoewel dit nie 'n direkte doelstelling van die kommissie is nie sal deur so 'n beleid gestrek word – in die opsig dat verlaagende brandstofverbruiken en minder afvalhitte 'n kleiner uitwerking op die omgewing sal he.

Ledegeled vir die wêreldenergiekonferensie:

As gevolg van die uitwerking van monetêre inflasie was dit nodig om SANWEK se jaarlikse ledegeled vir die wêreldenergiekonferensie van £400 (sterling) tot £600 (sterling) te verhoog in ooreenstemming hiermee sal VMEO se ledegeled vir SANWEK met ingang 1976 van R50 tot R75 verhoog word.

Temafilm: "A World of Energy"

'n 16-mm-klanckfilm wat die tema van die negende wêreldenergiekonferensie illustreer, is vervaardig. Twee lidorganisasies van SANWEK het ek 'n afdruk gekoop en hulle is bereed om dit aan ander verenigings te leen om hulle lede te vertoon.

ALGEMEEN

Daar word berig dat die Universiteit van Kaapstad teen die einde van die jaar 'n energiekonferensie sal hou; dat die Geassosieerde Wetenskaplike en Tegniese Verenigings' konferensie oor energiebronne gevolg het wat gedurende September 1975 by die Randse Afrikaanse Universiteit gehou sal word; dat die Britse Instituut van Brandstof 'n tak in die Republiek gestig het; dat die Steenkoolverwerkingsvereniging gestig is en dat 'n Sonenergie Vereniging gestig is.

TOEKOMSTIGE VERGADERINGS

Daar is besluit dat Dr Straszacker, mnr Jan H Smith en Dr D J Kotze SANWEK by die vergadering van die Internationale Bestuur gedurende Mei 1975 in Copenhagen sal verteenwoordig.

Die volgende Wêreldenergiekonferensie sal gedurende 1977 in Istanbul, Turkye gehou word.

Dr Straszacker emphasised that quite apart from the formal business of the Conference, the informal contacts made with delegates from other countries was of great benefit and importance. The South African members had been well received by all and there were no unpleasant incidents. Great interest was shown in Escom's dry cooling tower at Grootvlei, which is the largest in the world as far as is known – certainly in the Western World.

The nuclear power station to be built in the Cape also aroused much comment, particularly with regard to the safety aspect and the disposal of waste.

The energy crisis was uppermost in all delegate's minds. The universal approach seems to be to increase the use of coal and to reduce energy consumption. In Detroit there was much talk about the electric motor car, but very little progress by the large motor car manufacturers. Similarly, with solar energy there was a great deal of talk but little optimism as regards large scale developments.

There seemed to be a lack of co-ordination of energy planning in most countries. The South African set-up appears to be more advanced than most.

The planned reduction in growth rate in the USA was from 5,1% to 3,6% representing a saving of 2 000 000 barrels of oil per day. However, there was more wastage of energy in the USA at present than anywhere else.

ADMINISTRATION

Numerous matters were discussed, including the following:-

World Energy Information Centre:

The World Energy Conference is giving consideration to the formation of a world energy information centre which would be operated by the World Energy Conference and which would be responsible for the gathering, co-ordination, dissemination and up-dating of information on the energy resources of the world.

Terms of Energy Economy:

A working group has been set up, on which SANWEC is represented, whose function is the preparation of a list of standard terms for general use in the energy economy. Some 800 terms have been listed and translated into a number of languages.

Conservation Commission:

A commission consisting of Engineers, Economists and a Sociologist, all of international standing, assisted by a full-time Project Director and Assistant, with secretarial facilities, is to be established by WEC. The general terms of reference would be to consider, in the light of what appears to be the progressive scarcity of fuel during the coming decades, whether the economic ground rules for the choice of energy projects should be so altered as to encourage more capital expenditure in the interest of future economy in fuel consumption, and if so, to what extent. Environmental quality, though not the direct objective of the Commission, would be affected by such a policy, to the extent that reduced fuel combustion and less waste heat would mean less effect on the environment.

Subscriptions to World Energy Conference

As a result of the effects of monetary inflation it has been necessary to increase the annual subscription of SANWEC to World Energy Conference from 400 to 600 pounds sterling. Following on this the AMEU's subscription to SANWEC will be raised from R50 to R75 with effect from 1976.

Theme film "A World of Energy"

A 16 mm sound film illustrating the theme of the Ninth World Energy Conference has been produced. Two copies have been purchased by two member organisations of SANWEC who are prepared to lend them to other bodies for showing to their members.

GENERAL

It was reported that the University of Cape Town would be holding an Energy Conference towards the end of the year, that the Associated Scientific and Technical Societies had arranged a conference on energy resources to be held at the Rand Afrikaans University in September, 1975; that the British Institute of Fuel has formed a branch in the Republic; that the Coal Processing Society has been established, and that the formation of the Solar Energy Society has taken place.

FUTURE MEETINGS

It was decided that Dr Straszacker, Mr Jan H Smith and Dr D J Kotze would present SANWEC at the meeting of the International Executive Council in Copenhagen in May, 1975.

The next World Energy Conference will be held in Istanbul, Turkey, in 1977.

**VERSLAG VAN WERKSAAMHEDE VAN DIE S.A.B.S KOMITEE
VIR DIE OPSTEL VAN 'N GEBRUIKSDODE VIR
KATODIESE BESKERMING VAN ONDERGRONDSE EN
ONDERWATERESTRUCTURE.**

1. Die Komitee was gedurende 1974 besonder aktief en het ses vergaderings gehou waarop die volgende indelings van die gebruikskode bespreek is:-

- 1.1 Faktore wat die behoeftes aan korroosiebeheer bepaal.
- 1.2 Voorsiening wat in die ontwerpstadium van 'n Struktuur gemaak moet word.
- 1.3 Ontwerp van Katodiese Beskermingstelsels.
- 1.4 Tipiese Katodiese Beskerming stelsel.
- 1.5 Offer-anodesysteems saak Opgelegde stroomstelsels.
- 1.6 Beheer van swerstroms.

2. Die Komitee is soos volg saamgestel:-

S A B S : Mnz/Mr. J. van Heerden (Voorsitter/Chairman) en/and Mnz/Mr. J.C. Elliston.
Suid-Afrikaanse Spoerew/South African Railways: Mnz/Mr. A.M. George, en/and G.B. Jack.
Kamer van Mynweise van S.A./South African Chamber of Mines: Mnz/Mr. B.J. Cheek.
Rand Waterraad/Rand Water Board: Mnre/Msrs L.H. James en/and R.G. Marks.
Universiteit van Witwatersrand/University of Witwatersrand: Prof. F.P.A. Robinson.
Nasionale Navorsingsinstituut vir Elektrotegniese Ingenieurs:
National Research Institute for Electrical Engineering: Mnz/Mr. H. Kröninger.
V M E O / A M E U: Mnre/Msers. E.E. de Villiers en/and J.M. Engelbrecht.
Cortec: Mnz/Mr. J.R. Hay.
South African Association of Consulting Engineers (Metal and Pipe Line Endurance): Mnz/Mr. E.H. Gilbert.
The South African Gas Distribution Corporation Ltd: Mnz/Mr. D.G. Kotze.
Wetenskaplike en Nywerheidenvoringsraad/Council for Scientific and Industrial Research: Dr. E.E. Bind.
Oil Industry Corrosion Control: Mnre/Msers. E.G.E. Beestje en/and B.H. Edwards.
Privaat Ingenieurs Kaapstad/Private Engineers Cape Town: Mnz/Mr. R. Leslie.

3. Die aanduidings is dat die volledige kode binne afsiabare tyd beskikbaar sal wees.

REPORT ON THE ACTIVITIES OF THE S A B S COMMITTEE FOR THE PREPARATION OF A CODE OF PRACTICE FOR THE CATHODIC PROTECTION OF UNDERGROUND AND UNDER-WATER STRUCTURES.

1. The committee was very active during 1974 and held six meetings where the following classifications of the code of practice were discussed:-

- 1.1 Factors that determine the need for corrosion control.
- 1.2 Provision to be made in the design stage of a structure.
- 1.3 Design of cathodic protection system.
- 1.4 Types of cathodic protection system.
- 1.5 Offer anode systems as well as superposed current systems.
- 1.6 Control of stray currents.

2. The Committee is composed as follows:-

3. The indications are that the complete code will be available soon.

**VERSLAG : DIE VERENIGING VAN RAADGEWENDE
ELEKTROTEGNIESE EN MEGANISSE INGENIEURS :
STANDAARD KONTRAKVOORWAARDES VIR ELEKTRIESE
WERKE.**

Sedert daar 'n paar jaar gelede op een vergadering van die boegnoemde Vereniging 'n bespreking oor die saak was en 'n komitee benoem was om die werk te doen, kon alle pogings ten spyt, nog geen verdere inligting van vordering verkry word nie.

Ek doen aan die hand dat ons hierdie hele saak laat gaan.

E.E. DE VILLIERS PR. ING., B.Sc. (ING.)
REPRESENTATIVE/VERTEENWOORDIGER

REPORT : THE ASSOCIATION OF CONSULTING ELECTRICAL AND MECHANICAL ENGINEERS: STANDARD CONTRACT CONDITIONS FOR ELECTRICAL WORK.

Since there has been a discussion on this subject a few years ago at one of the meetings of this association and a committee was named to do the work, no information of any progress could be obtained.

I suggest we drop this issue.

Mr. A.A. Middlecote (Pretoria): Mr. President, You compelled me to count roads and I lost track. I should have answered rather more fully what the present position is as regards the Wiring Regulations. I like to let everyone know that the willing workers have worked very hard. Since October they have met fifteen times and they have more or less worked out the basic arrangement for the new regulations and the present position is that there are eight sections:- Section 1: Scope and Definitions; 2: General requirements for installations; 3: Wiring, design and protection; 4: Wiring materials and systems; 5: General equipment; and that is as far as we got with agreement so far and then there is section 6: Special Equipment; 7: Special Locations and 8: Testing.

These are now almost complete and we feel that, apart from the tables and the schedules which are not that important, the progress should be that by about September we should start discussing and passing on the Main Committee these amended regulations. So I think that towards the end of the year we should see the new regulations but there is a further, shall we say development, and that is that we should along with the Chief Inspector factories, Mr. Wannenburg, write these in a form of a code because under the new legislation if the old Wiring regulations become a code, he can declare this as a requirement under The Electrical Wiremen and Contractors Act, and this would get over a lot of difficulty of promulgating these regulations under Ordinances or some other by-laws. One could then just have them easily and

regularly amended in a quick time (two or three months) without having to wait for the difficulties of promulgation. I think that the position I should say that by September we will have more or less at least half the new look and then shortly afterwards it should be a code of practice and this can be more easily handled under the Electrical Wiremen and Contractors Act to make it much easier. I would like to say thank you to the people on the very hard working groups, Mr. de Villiers is one of them, and there are electrical consultants, and contractors and there are manufacturers. They have done a very good job of work and I like to thank them. I hope you are pleased with the progress.

President: Thank you Mr. Middlecote, we certainly are very pleased with the progress and thank you for the very good news.

Mr. E.E. de Villiers (Rustenburg): Mr President, I think you mentioned just a minute ago the code of practice for the cathodic protection for underground and underwater structures. Actually, you have circulated a small report I have brought out and I don't know if there is anything else people want to know about that, but perhaps just to bring to their attention. While I am on my feet, there is just a short line at the bottom of this report regarding standard contract conditions for electrical work and I suggest that we drop this, unless there is somebody from the Association of Electrical and Mechanical Consulting Engineers who may wish to say something about that, but we have lost complete contact with them. Thank You.

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VRAAG VAN MNR. J.K. VON AHLFTEN

Die volgende gevolgtrekkings en aanbevelings word bevat in die onlangse studie verslag oor „Light and Road Safety“ wat deur die Automobiel-Assosiasie van Suid-Afrika gepubliseer is en raak munisipale elektrisiteitsondernemings:

1. Skittering van straatligte op weg nie in Suid-Afrika die aandag gee wat dit toekom nie. Daar is nog te veel nuwe installasies met 'n høë skitteringswaarde wat die algemene doeltreffendheid van die installasies verlaag.
2. Onvoldoende gedetailleerde statistiek is in Suid-Afrika beskikbaar om akkurate studies van die effek van straatligte en padveiligheid te maak.
3. Daar moet meer aandag geskenk word aan losbrektoestelle op lampalle asook materiale wat in die geval van 'n ongeluk minder gevarelik is.
4. Wanneer 'n munisipaliteit nie verligting van 'n aanvaarbare standaard kan installeer nie, moet die Provinciale Administrasie die koste subsidieer.
5. Die verligtingstandaard op enige straat of motorweg moet nie langer wees as dié wat in SABS-gebruikskode 098 negele is nie en kan in baie gevalle die hoër standaard van die CIE wees.

Die vraag ontstaan dat in hoe 'n mate munisipale elektrisiteitsondernemings in Suid-Afrika verantwoordelik is vir onvoldoende straatverligtingsinstallasies wat nie aan SABS 098 voldoen nie en wat die VMEO tot die implementering van hierdie aanbevelings kan bydra en tweedens tot watter mate kan of het die vervaardigers van straatverligtingstoestelles en -gestukke in Suid-Afrika tot 'n oplossing van hierdie probleme bygedra.

VRAE VAN DIE GOEIE HOOP-TAK

1. Tydens 'n onlangse kragonderbreking in die Wes-Kaapland, wat in sommige gebiede redelik lank geduur het, is baie mense lank sonder lig in hybsake vangeke. Aangesien dit weens algemene kragonderbreking onmoontlik was om hyserwerksgeskiediges in die hande te kry, kon hierdie mense eers na 'n lang tyd vrygestel word. Wat dink die forum van hierdie probleem? Moet daar nie in die Fabrieksweet en -Regulasies voorsiening vir noodverligting en -ventilasie gemaak word nie?
2. Aangesien dit nie altyd vir alle lede moontlik is om konvensies by te woon nie, word sulke lede uiteraars die stemreg ontnem as daar vir lede van die Uitvoerende Bestuur gestem word. Dink die forum dat dit onregverdig ten teenlike lede is?
3. Konsultante en anderdele kla dikwels teenoor lede dat hulle weens die groot versoeningstempo van dielectriciteitsonderwerke dat hulle verskeie tarieffekte ontkom. Moet daar nie nog 'n poging aangevind word om standaardisasie in die struktuur of vorm van elektrisiteitsstariewe te verkry nie?
4. Lede ondervind dikwels probleme met kontakteurs met die toepassing van regulasies wanneer die kontakteurs daarop aanspraak maak dat EVKOM nie sukses regulasies het nie of nie die regulasies toepas nie. Dit blyk dat dubbele standaarde gehandhaaf word en die vraag word gevra of daar nie standaarde by die toepassing van regulasies moet wees nie- met inbegrip van die aardregulasies.
5. Tans lant die Bedradingregulasies nie die installering van 'n sok in 'n badkamer (soos gedefinieer) toe nie - selfs al is aardlekbeveiliging nou verpligtend. In 'n kombuis of waskamer word 'n sok egter binne ses voet van 'n kraan toegelaat as dit deur 'n aardlekrelé beveilig word. Moet die regulasies ten opsigte van sokke in badkamers nie nou gewysig word nie?
6. Dit blyk dat ons in Suid-Afrika twee stelsels vir neutraalaarding het - sommige voorseeningsowerhede vereis dat die neutraal by die verbruiker se perseel geaard word en ander weer nie. Dit verwarr kontakteurs en die vraag word gestel of daar nie op 'n stelsel vir neutraalaarding gestandaardiseer moet word nie. Wat is die voordele van enigeen van die stelsels soos dit deur verskillende voorseeningsowerhede ondervind word?

VRAE VAN MNR. C.E. ADAMS

1. Is die huidige „Code of Practice for Overhead Power Lines for Conditions Prevailing in South Africa“ wat deur die Suid-Afrikaanse Instituut van Elektriese Ingenieurs uitgereik is voldoende - veral ten opsigte van windbelasting of moet dit hersien word?
2. Het lede van die Vereniging enige mate van ondervinding met die gebruik van hermeties versoeide verdeeltransformators of het hulle enige probleme met sulke eenhede ondervind?

QUESTION FROM MR. J.R. VON AHLFTEN - SPRINGS

The following conclusions and recommendations are contained in the recent study report on "Light and Road Safety" published by the Automobile Association of South Africa which effects municipal electricity supply undertakings:-

1. Glare from streetlights is not given the consideration it deserves in South Africa. There are still too many new installations of high glare value which reduces the overall effectiveness of the installations.
2. Insufficient detailed statistics are available in South Africa to permit accurate studies of the effects of streetlighting and road safety.
3. The use of break-away devices on lighting columns and materials which are less hazardous in the event of a collision should receive greater attention.
4. That where a municipality cannot afford to install an acceptable standard of lighting the cost be subsidised by the Provincial Authority or Government.
5. The Standard of lighting on any street or motorway should not be less than that laid down in die SABS Code of Practice 098 and could in many cases, be to the higher standards of the CIE.

The question now arises to what extent are municipal electricity supply undertakings in South Africa responsible for inadequate street-lighting installations not conforming to SABS 098 and what can the AMEU do towards the implementation of these recommendations and secondly to what extent can or have the manufacturers of streetlighting fittings and fixtures in South Africa contributed towards a solution of these problems.

QUESTIONS FROM THE GOOD HOPE BRANCH

1. During a recent power failure in the Western Cape, which lasted several hours in some areas, many people were trapped in lifts for a long time without lights. As it was impossible in view of the widespread failure of supply to obtain lift mechanics, these people could not be released for a long time. What does the Forum think of this problem? Should not provision be made in the Factories Act and Regulations for emergency lighting and ventilation in lifts?
2. As it is not always possible for all members to attend Conventions, such members are in effect disfranchised when it comes to voting for members of the Executive Council. Does the Forum not think this is unfair on such members?
3. Consultants and others frequently complain to members that because of the wide variety of tariffs they find it difficult to interpret them and relate costs of supply under various tariff rates. Should not another attempt be made to achieve some standardisation in the structure or form of electricity tariffs?
4. Members often have difficulties with contractors in applying regulations when these contractors claim that Escom have no such regulations or do not apply the regulations. It would seem that double standards are being applied and the question is asked whether there should not be standards in the application of regulations including the earthing regulations.
5. At present the Wiring Regulations do not allow the installation of a socket outlet in a bathroom (as defined), even though earth leakage protection is now compulsory. In a kitchen or laundry a socket outlet is however allowed within six feet of a tap if protected by-an earth leakage relay. Should the regulations regarding socket outlets in bathrooms now not be amended?
6. It would seem that in South Africa we have two systems of neutral earthing - some supply authorities require the neutral to be earthed at consumer's premises, others do not. This confuses contractors and the question is asked whether a system of neutral earthing should not be standardised on. What are the advantages of either systems as experienced by various supply authorities?

QUESTIONS FROM MR. C.E. ADAMS

1. Is the present Code of Practice for Overhead Power Lines for Conditions Prevailing in South Africa issued by the South African Institute of Electrical Engineers adequate, particularly in respect of wind loadings, or should it be revised?
2. Have members of the Association had any length of experience with the use of hermetically sealed distribution transformers or experienced any problems with such units?

3. Dink lede van die Vereniging dat die verpligte installering van aardlekrelais, soos dit in die jongste wysiging van die Standaard Regulasies vir die Bedrading van Persele vereis word, heroorweeg moet word?

VRAE VAN MNR P. VAN E. RAUTENBACH

- Die Ekonomiese Adviesraad van die Eerste Minister is tans besig met 'n skakelprogram om die koers van inflasie te bekamp in Suid-Afrika.

Die aanbevelings van die Ekonomiese Adviesraad het te doen met sekere kort- en langtermyn stappe. Op die korttermyn neem alle Staatsdepartemente, Provinciale Administrasies en Plaaslike-bestede stappe ten opsigte van besteding wat nie kan regverdig word in die huidige ekonomiese toestand nie en nie genik is op die uitbouing van die infrastruktuur. Op langtermyn probeer die Ekonomiese Adviesraad dat daar meer aandag geskenk word aan eeniformiteit en standaardisasie.

U sal onthou dat die Afgevaardigdes van die Vereniging tydens die Tegniesevergadering te Roodepoort en die Konvensie te Pietermaritzburg, versoeke het dat daar slegs geskenk word aan die uitreiking van Aannemeslisensies op 'n landswyevlak. Toe die sank bespreek by die Tegniesevergadering te Roodepoort was daar aangevoer dat indien die voorstel aanvaar word dit sal lei tot die verlies van toegangshoud en beheer oor Aannemers deur Voorsieners. Dit is egter nie noodwendig dat geval nie en die Nasionalebestuur van hierdie Vereniging is nog van mening dat hierdie beginsel ondersoek moet word. In die tussentyd stel ons die vraag of daar 'n behoefte is vir Voorsieners vir 'n eeniforme benadering ten opsigte van dokumentasie en ander vereistes vir die uitreiking van lisensies aan Aannemers.

- Dit is nie slegs hierdie aspek wat behoort ondersoek te word nie. Die Nasionalebestuur van die Vereniging, op 'n onlangse vergadering, het kennis geneem van die groot aantal verskillende formate en ontwerpe van „Aanvangs- en Voltooiingsvorms“ wat voorgeskryf word deur Voorsieners. Ons stel die vraag of die tyd nie aangebreek het nie vir die VMEO om op hoe vlak aandag te skenk aan die standaardisasie van die vorms wat gebruik word deur sy lede?
- Bestaan daar 'n behoefte om bestaande wetgewing te ondersoek wat daarop gemik is om die veiligheid van verbruikers van vaste elektriese installasies in of op persele insluitende fabrieke te bevorder?
- Bestaan daar 'n behoefte om bestaande wetgewing te ondersoek wat daarop gemik is om die veiligheid van werkers wat elektriesewerk in persoon verrig te bevorder?
- Bestaan daar 'n behoefte om bestaande wetgewing te ondersoek wat daarop gemik is om brand veroorsaak deur foutelelektriese werk of onveilige elektriese installasies te voorkom?
- Bestaan daar 'n behoefte om die bestaande wetgewing te ondersoek ten opsigte van aanspaaibarheid met die vereistes van die Elektrisiteitswet, die wet op Fabriekse, Masjinerie en Bouwerk, die Ongevallewet, die Wet op Vakleerlinge, Provinciale Ordinansies en die Standard Regulasie vir die Bedrading van Persele?

VRAE VAN MNR. L. FUTCHER

1. MAKSIMUM AANVRAAGTARIEWE

- My Raad se elektrisiteitsstariewe maak onder andere voorsiening daarvoor dat swart nywerhede, spesiale ooreenkomsen en spesiale sakoplek kompleks teen 'n KVA maksimum aanvraag plus 'n eenheidstelar aangeslaan word. Die rede hiervoor is om die verbruiker met 'n swak arbeidsfaktor te penaliseer.
- By nadere ondersoek is gevind dat die verbruikers met 'n arbeidsfaktor laer as 0,8 wel in die minderheid is, maar dat 'n skriflike oproep op sodalike verbruikers om hulle arbeidsfaktor ter verbeter, grotendeels op dowe ore gevall het.
- Indien die oogmerk penalisering moet wees, waarom nie deurgaans penaliseer en 'n KVA maksimum aanvraag plus 'n KVA h tarief toepas nie?
- Indien 'n voorsieningsoverheid sou besluit om na die tarief in 1.3 genoem oor te skakel, kan dit met verloop van tyd gedoen word, aangesien bestaande verbruikers nie gedurende die oorgangstyd daardoor benadeel word nie, of moet alle betrokke meters op 'n bepaalde datum geruil wees?

VRAAG VAN MNR. W. BARNARD

Daar bestaan 'n mate van onsekerheid of die Elektriese Ingenieur TV-antennestelsels moet toets en goedkeur en of kennissiging 3722 in die Provinciale Koerant en Administrateurs-kennigging 1966, d.d. 29 Oktober 1974, hierdie verpligting op die plaaslike overheid plaas.

- Do members of the Association consider that the compulsory installation of earth leakage relays, as required in recent amendments to the Standard Regulations for the Wiring of Premises should be reviewed?

QUESTIONS FROM MR. P. VAN E. RAUTENBACH

- The Prime Minister's Economic Advisory Council has embarked on a collective programme of action to reduce the rate of inflation in South Africa.

The recommendations of the Economic Advisory Council deals with both short and long term measures. One of the short term measures directed at all Government Departments, Provincial Administrations and Local Authorities applies to expenditure which cannot be justified in the present economic situation and not related to the creation of a productive infrastructure. On the long term the Economic Advisory Council is striving that increased attention should be given to uniformity and standardisation.

You may remember that representatives of the Association, at both your recent Technical Meeting in Roodepoort and Convention in Pietermaritzburg suggested that urgent attention would be given to the concept of the national registration of Electrical Contractors. When this was discussed at the Technical Meeting in Roodepoort, the fear was expressed that the proposal, if accepted, would lead to the loss of supervision or control over Electrical Contractors by Suppliers. This need not be the case and the National Executive Committee of this Association is still of the opinion that this concept should be pursued. During the interim period, we pose the question whether there is a need to adopt an uniform approach by Suppliers in respect of the documentation and other requirements in the licensing of Electrical Contractors?

- This, however is only one aspect that needs further investigation. The National Executive Committee of our Association, at its most recent meeting took note of the great number of different formats and designs for "Commencement of Work" and "Completion of Work" forms used by Supply Authorities. We simply pose the question whether the time has not arrived for the Association of Municipal Electricity Undertakings to devote top level attention to the standardisation of the forms used by its members?
- Is there a need to investigate existing legislation aimed at ensuring the safety of consumers of fixed electrical installations in or on premises including factories etc.?
- Is there a need to investigate existing legislation aimed at ensuring the safety of electrical workers doing electrical work in person?
- Is there a need to investigate existing legislation aimed at fire prevention which could be caused by faulty electrical work or defective electrical installations?
- Is there a need to investigate the compatibility of such legislation with the requirements of the Electricity Act, the Industrial Conciliation Act, the Mines and Works Act, the Factories, Machinery and Building Work Act, the Workmen's Compensation Act, the Apprenticeship Act, Provincial Ordinances and the Standard Wiring Regulations for Premises?

QUESTIONS FROM MR. L. FUTCHER

1. MAXIMUM DEMAND TARIFFS

- My Council's electricity tariffs make provision for a KVA maximum demand plus a unit charge from heavy industries, special agreements and special businesses. The reason for this is to penalize the consumer with a bad power factor.
- On further investigation it was found that consumers having a power factor below 0,8 are in the minority, a written request to such consumers to improve power factors did not have the desired effect.
- Should the object be to penalize, why not penalize throughout and impose a KVA maximum demand plus a KVA h charge?
- Should a supply authority decide to adopt the tariff mentioned in 1.3 above, could it be implemented over a period of time, since the existing consumers concerned are not adversely affected during the transition period, or must all meters concerned be interchanged on a predetermined date?

QUESTION FROM MR. W. BARNARD

A certain amount of confusion exists as to whether the Electrical Engineers must test and approve T.V. Aerial systems and whether Provincial Gazette Notice No. 3722, Administrator's Notice 1966, dated 29 October 1974, imposes this responsibility on the local authority.

Wat is die Elektriese Ingenieur se verantwoordelikheid by die goedkeuring van TV-antennestelsels deur Plaaslike Owerhede?

VRAAG VAN SABS

NIE-METAALLEIPIYP

Nie-metaalleiyp (PVC) wat ooreenkomsdig SABS 950 vervaardig is, word ongever fyj jaar lank in Suid-Afrika gebruik.

Ons wil graag weet of hierdie leiyp enige installeerprobleme opgelewer het en of 'n enige voorbehoed ten opsigte van die gebruik daarvan het?

Beskuu u die bestaande gehaltepeil as aanvaarbaar of moet die spesifikasie hersien word?

QUIZMASTERS: PAT MIDDLECOTE
VRAESTELLERS: JULES VON AHLFEN

Pat Middlecote: Good morning ladies and gentlemen, I think the President has already put it to you that we should be productive in the Forum this morning. The motto of work is the three S's, specialise, standardise and simplify. But I think we in the A.M.E.U. have a new three S's. It's stand up, speak up and shut up. Let's start with the second question of the Good Hope Branch. They said that during a recent power failure in the Western Cape, which lasted several hours in some areas, many people were trapped in lifts for a long time and this is the actual problem. The question now is: should not provision be made in the Factories Act and Regulations for emergency lighting and ventilation in lifts. Now this reminds me of the schoolboy who was asked to write about the black hole of Calcutta where 30 chaps were locked up in a room with one small window, but the little boy wrote "they were locked up in this room with one small window and the next morning only two were alive." Anyhow, I think there are problems here. I don't think the lights are the problem but the ventilation and possibly the claustrophobic effect. Could we have any opinions from the floor please?

Mr. W.P. Rattey (Strand): We actually posed this question because at one stage this became a very real problem when ESCOM were having trouble with their newly commissioned 400 kV line and we were having places like the Strand, Somerset West, Stellenbosch and other places as much as 3 to 4 hours without power. This was a general power failure that effected the whole area and possibly parts of Cape Town as well. As the lift mechanics are situated in Cape Town itself and the Strand, for instance, is about 40 - 50 km from Cape Town, we had people who were becoming hysterical in stuck lifts and when called upon to try and release them, we refused because we felt that we were not qualified nor responsible to undertake this operation and in the event of anybody getting injured during the course of the rescue operation, we could be held liable. I was personally placed in a rather awkward position where I had the knowledge but I felt that I did not have the legal right and I therefore put forward this question hoping that our friend from the Department of Labour might be able to at least give us some thoughts on this problem.

Mr. J.G. Wannenburg (Department of Labour): Mr. President, I am afraid I cannot help our friend from the Cape very much. Look if we have to legislate for each and every thing under the sun, the law book would eventually be of an enormous size. Now surely there is absolutely nothing stopping anybody who wants to install or to have a lift installed to specify that lift must be fitted with emergency lighting and with a ventilation fan or something like that, but to call for legislation as far as that is concerned I don't feel it's really necessary. Besides that it is not so very long ago that the Department sent out the first draft on emergency lighting. If you knew the answers we got back and what I was called for sending out a first draft on emergency lighting we would at present not even dream of talking about emergency lighting again. It was so unpopular that we shelved it for an indefinite period of time. But I repeat that there is absolutely nothing stopping any elevator company or any person who will be the user of an elevator to have something like that installed. I would recall the accident that they had at one of the mines in the Klerksdorp area where quite a number of Bantu were killed as a result of a cage stopping between stations and it was impossible to release the brakes. There was something wrong with the brake mechanism. This cage was very well ventilated and it was in a downcast shaft where one could not wish for better ventilation, and yet a large number of persons were killed as a result of panic. It is a commonly known fact that as soon as somebody is landed in the dark, they start pushing about. If only they would have stood still as they had been told from the station, then nothing would have happened. The same thing always happens in an elevator which is hung up. People will start pushing about and the more they push about the more heat they generate and the more afraid they get. This is about all I can say about this problem.

Councillor A.H. Honikman (Cape Town): "Mr. President, it seems to met that the public are waiting for a lead from your organisation.

What is the Electrical Engineer's responsibility in the approval of T.V. Aerial systems by Local Authorities?

QUESTION FROM SABS

NON-METALLIC CONDUIT

Non-metallic (PVC) conduit manufactured to SABS 950 has been used in South Africa for approximately five years.

We are anxious to know whether such conduit has created any installation problems and whether you have any reservations on its use?

Do you consider that the existing quality level is acceptable or is the specification in need of revision?

They are waiting also for a lead from the Factory Inspector. Our concern is whether or not it is reasonable to expect the private developer to provide auxiliary power in each and every building. Now I think it is up to the electrical engineers to tell us if this is not an unreasonable requirement; can it be done at reasonable cost. I think that this is all that the Factory Inspector should be waiting for. If it can be done on a reasonable basis, then the kind of panic and the hazards which accompany stoppages in our lifts, may be overcome by auxiliary power. If that is out of the question, then we should know that too, but at the moment we are left in a vacuum because we are waiting for advice from our technical experts. Thank you."

Mr E.C. Lynch (Salisbury): Reading the question makes me ask whether it is really necessary to leave people out for 3 or 4 hours continuously under these conditions. As I understand it, the interruptions in supply were caused by failures on the lines from the Transvaal and would only have been a partial failure. It was explained that these occurred surrounding Cape Town whereas I imagined Cape Town had full supplies. Now I should have thought the obvious action would be to rotate these people that are left without supply not leave a few areas with nothing, for 3 or 4 hours, but to have restored supply for a short period so that at least these people could operate the lift and get out. That is what I try to do in Salisbury if we have an interruption of this type, we try not to leave people off for a very long time, then switch somebody else out so that they do have an opportunity to be released from the lift. I know you can't do anything if it is a complete failure, but where 10 or 20% of load is lost I think rotation of the interruption is the answer.

Mnr. P.J. Botes (Roodepoort): Mnr die Vraesteller, ek weet nie, ons is nou weer op moeilike terrein. Ek sien die noodsaaklikheid daarvan, maar u moet weet dat die regulasies van die fabriekswet nie inspeksie van hysers spesifiek uitsluit. Ons hoof dit nie te inspekteer nie, die inspekteurs van die Departement van Arbeid toets dié hysers uit. As ons nou weer gaan staan en peuter, sal ons netso weer hysers moet gaan toets, en ek is nie geinteresseerd daarin nie, maar ek sien die noodsaaklikheid daarvan in, en ek dink ook dit is 'n saak vir die Departement self om te besluit of hulle dit wil hé of nie. Dankie.

Mr. J.F. Uys (Stellenbosch): Ek sou dink dat die oplossing vir die vraagstuk is, kry die mense uit die hysbak uit. Kan daar nie op een of ander manier meganiese voorziening gemaak word dat die hysbak opgetrek kan word en die deure oopgemaak kan word nie. Waarom die mense in die hysbak last, en nooit dienste voorsien.

Mr. I.F. Boyack (Pretoria): We have had this problem discussed quite extensively in Pretoria from a point of view of Civil Defence and particularly with respect to high rise buildings, and there the arrangement has been that the Fire Master insists on an automatic emergency plant for high rise buildings, that is for buildings above 10 floors. We had a discussion with the lift manufacturers to see if they could not install equipment which would at least level the lift and open the doors, but there appears to be some technical problems on that score although I heard there was equipment available in Italy to provide this facility. However, we did not get any further on that basis and the lift companies have just got to get around to these buildings, which they assure us that they can do.

This is a very serious problem but, as I have said, as far as high rise buildings are concerned, we insist on emergency plant.

Mar. C.P. du Plessis (Worcester): Mnr. Vraesteller, die vorige spreker se opmerkings is interessant. In Worcester het ons nou nie bain hyser nie, maar daar het die brandweer amptenare in die verlede meganies die hysbak verstuif om die mense uit te kry, maar dit is stopgesit onlangs deur die Departement Arbeid. Dit is 'n oplossing as hulle die toestemming kan kry.

Mr. W. Bozeczo (Estcourt): Mr. Quizmaster, would I be out of place if I suggested that the AMEU should write to the manufacturers of lifts and if possibly find out whether provision could be made for instance such as this.

Mnr. A.J. van den Berg (Krugersdorp): Mnr. die vraesteller kan 'n mens nie die skag van die hysbak so ontpunt dat 'n mens met 'n

minimale hoeveelheid energie, die hysbak kan laat sak tot op 'n minimum van die skag, en dat die mens daaruit vryelik losgaan kan word nie. Dit is nie nodig om diesselfde energie daar te stel wat 'n mens nodig het om die hysbak op te neem nie, so ek neem aan in groot geboue kan 'n mens miskien 'n ontwikkelaar installeer wat otomatiese aansaksel en die hysbak stadiig laat sak, met spesiale skag fasiliteite. Baie dankie.

Mr. J.C. Wannenburg (Pretoria): As far as this problem is concerned, you can go about it in a 101 ways to get people out and to leave the car, but if the lift industries, or the general public feel that something like that must be done, well, why don't they write in to the Department and suggest something like that. We cannot make these regulations out of our own. If we do, then we get unpopular. If it comes from the elevator companies or from industry in general then something can be done about it but I must repeat, that we cannot legislate for each and everything. It was a very fortunate thing that last we did not have very many elevators in the area where I live, because we had a black out there for almost 12 hours and I was nipping straws as far as my frige full of meat was concerned, let alone people trapped in elevators!

MR. PAT MIDDLECOTE - QUIZMASTER

I think that we have aired this enough. I would say, that if you combined Mr. van den Berg and Mr. Bozvczko's comments, they sum it up. I think you all agree that there should be some steps taken to ensure emergency lighting, emergency ventilation and possibly some mechanical means of bringing the lift to a level where people can be released. I would suggest that the best thing is for the A.M.E.U. to take this matter up with the lift manufacturers, and see if they can give a very simple set of rules which could be forwarded to the Department of Labour for their consideration. I can see Mr. van den Berg's trouble. He does not want stacks of detail, but I think a simple rule could effectively be worked out by the lift manufacturers. Do you agree on that? I think we know that this is the answer to this question.

MR PAT MIDDLECOTE - QUIZMASTER

QUESTION 1

The following conclusions and recommendations are contained in the recent study report on "Light and Road Safety", published by the AA and the real question that comes out of all this is how and to what extent can Municipal Electricity Supply Undertakings be held responsible for in-adequate streetlighting installations not conforming to SABS 098 and what can the A.M.E.U. do towards the implementation of these recommendations and secondly, to what extent can or have the manufacturers of streetlighting fittings and fixtures in South Africa contributed towards a solution of these problems. Mr. Palser would like to comment on this?

Mr. D.C. Palser (Cape Town): Mr Chairman, I don't know what the position is in other municipalities but I do know that in the Cape Province we have a Municipal Ordinance which quite clearly states that there is no legal obligation on the part of the Council to install street lighting. The Ordinance merely states that the Council may install street lighting, the operative word being 'may'. So I don't think that there is any legal responsibility on the part of the Council to install street lighting. I think that if there is any obligation or responsibility it is purely a moral or social one and that if the Council does elect to install street lighting then it should ensure that any street lighting installed should be to the highest standard. I would submit that this standard should be the SABS. I consider then that it is up to the electrical engineers themselves to ensure that any street lighting installed complies with the requirements of the SABS. As far as the allocation of responsibility is concerned, I don't know whether it would be possible to incorporate this aspect in the Factories Act. Thank you.

Mr. A.J. van den Berg (Krugersdorp): Mnr Vraesteller, sover my kennis strek word straatligting geïnstalleer uit belastingfondse. As 'n mens nou so deur die verskillende dorpsgebiede ry daar in Pretoria omgewing en ander plekke, dan kry jy baie moderne dorpsgebiede wat geen straatligting het nie. Die rede daarvoor is skybaar dat die belastingfondse nie daardie onkoste kan dra nie. Met alle nuwe dorpsgebiede in Krugersdorp, sluit ons die straatligting netwerk otomatiese in die retikulasieksoen in. Ek glo dit is reg want u sal met my saamstem dat om 'n latere geleenthede straatligting te installeer baie ongerief kan voorsien. Volgens SABS 098 - 1967 kode moet die straatverligting voldoen aan die vereiste vir 'n klas B pad wat bepaal dat die egaleidingsverhouding B maksimum tot B minimum 6 tot 1 moet wees. Ons manne gebruik van 125 W SEMI-afsnyn tippe kwikkand lamperts wat 45 m uitkomsaam is en 6,57 m boekant die pad se ryvylak gemonteer is. Die pad wydte is 7,3 m, straatligting is 1,64 m lank en die paal is 0,61 meter randstaete geplaat. Hierdie rangskikking is vir estetiese redes gekies. Op die oog af wil dit voorkom van ons straatverligting oordoen is. Volgens berekening is die B maksimum tot B minimum verhouding vir hierdie rangskikking 17,6 tot 1 waar dit eintlik 6 tot 1 moet wees, wat baie swak vergelyk met die SABS kode. Indien die spaasering van die pale + 35 m moet wees om te voldoen aan die kode sal die koste vir die straatverligting ongeveer 18% hoër wees. Wat my betref is die SABS kode te hoog vir die woongebiede. Ek meen dat daar voorvoering gemaak is vir lampes wat minder doeltreffend raak

met die tyd asook lense wat vuil word. Dit hang natuurlik ook af of straatligting vir die woongebiede daar gestel is om die paase te verlig of om die belastingbetalers se eiendomme te verlig. Indien ons gister geluister het na mnr. van Wyk, wat betref ons beskikbare energie bronse dan dink ek is dit 'n geleë tyd om weer hierdie SABS kode in heroorweging te neem. Baie dankie.

Mnr. P.J. Botes (Roopepoort): Mnr. Vraesteller, dit wil my voor kom asof die verskafers, die Buro vir Staandaarde en ander instansies soos die Automobiel-Assosiasie, onder die indruk verkeer dat binne 'n kort tydperk, alle straatverligting aan die vereiste van die kode moet voldoen. As egter die volgende feite in ag geneem word, dink ek tog dat oor die algemeen wel vordering gemaak is, maar waar die verligting gedoen is voor die publikasie van die kode, of selfs onmidellik daarna moet u onthou dat daardie straatbeligting armature se leeftyd nog nie verstreke is nie. Om nou daardie armature af te haal, is 'n duur praktyk. Soos u reeds sien kom dit uit die belastingsfonds van die Raad en straat verligtinginstallasie is 'n baie groot koste. Hierdie installasies wat voldoen aan die kode sal oor 'n aantal jare moet geskik, en 'n hele aantal jare. Dit kan nie sommer eenklaps geskik nie, alhoewel ons nou alreeds die kode vir 'n aantal jare het. Ek sien orals, in ander dorp dat nuwe installasies voldoen aan die kode. Ek kan nie sien waarom ons hierdie kritiek altyd op die hals haal nie. Ek wil net saam stem met my kollega van Krugersdorp. U sal onthou, mnr. Vraesteller dat reeds by die tegniese vergadering te Kempton Park het ek melding gemaak van die feit dat hierdie vereistes vir groep B straatbeligting ver te hoog is. Die ekonomiese. Daar nie ekonomiese regverdig nie en ek het destyds reeds beroep gedoen op die Buro vir Staandaarde en ander instansies om daardie spesifikasie te hersien, maar niemand stel blykbaar belang in ons probleme nie. Ek is baie ontevreden over daardie vereistes en 'n hele klomp ingenieurs stem saam met my, maar blykbaar stel niemand belang om ons saak ret te stel me. Dankie.

Mnr. H.C. Dreyer (Paarl): Mnr. Vraesteller, wanneer ons padveiligheid koppel aan straat beligting of vis-a-versa, dan is daar ook ander faktore wat in ag geneem moet word, anders as net beligtingvlak en maksimum en minima soos in die kode bepaal word. Dit is my ondervinding in die Kaap dat ons met ons lang winters en die lang ty wat daar reënval en bewolking is soms tot 14 dae aanmaake, (ek wil nou nie die menslike skrik terug in die Kaap wil kom kuier nie,) maar u weet self dat ons reënval het wat somtyds vir 14 dae aanmaake kan hou, dan het 'n mens 'n nat teerpad en sy het motorkarre wat van voor kom in die donker, in die winters is die aande taamlik lank en 'n baie groot hydraadrele faktor tot jou hoek ongeluksyser, is dikwels die feit dat die motoris nie in staat is om te kan onderskei tussen die koplampe van motors wat na hulle toe aankom en byv. straatligting wat gereelteek word in 'n swart nat teerpad nie. Ek dink dit is hoofsaaklik waarmaar die persoon wat die vraag opgestel het verwys. U sien nie 'n swier belangteek wat nie voldoende nie. Die motoris, uit 'n enige oogpunt beskou, moet kan onderskei tussen 'n werkantste lig uit die pad en die lig van die aankommende verkeer, indien hy self staan dan is daar gewoonlik nie 'n probleem nie want die lig van die aankommende voertuig beweg en die straatlig se weerkaating staan stil. Maar my ondervinding is as jy self in 'n voertuig sit wat ry dan kan daar verwarring ontstaan, dit kan baie maklike gebeur dat daar so baie weerkaatings is dat die motoris, nie dan dat die aankommende verkeer is voor hom nie. U weet dat 'n donker nat pad is baie verwarrende ding en veral as daar dan nog voetgangers tussen by die kom, weet 'n mens self nie wat aangaan nie, en om daardie rede is my ondervinding dat 'n mens moet weg bly van straatlig wat 'n kleur weergawe het nabij aan die van motorkoplampie. Die beste tipe beligting wat ek nog daar ondervind het om 'n goedkeuring rendement te gee, is die meer warm lig soos wat 'n mens kry met veral die hoe druk natuurlike lampe. Dankie.

Raadslid J.C.K. Erasmus (Port Elizabeth): Mnr. Vraesteller, Ek sien die A.A. stel hier sekere vereistes, ek neem aan hulle praat namens die motoriste, maar kan hulle verklarings gee waarom daar die eienaardige, sterk magnetiese aantrekkragslag is van 'n lampaal vir 'n motoris? As jy 'n lampaal in die middel van die pad sit, en ons in PE het altyd mooi weer, nie soos in die Kaap nie, dan kan jy maar sekere wees, een 'n week word ongerig. Nou se hulle hier in punt 3 hulje begeer, 'n soort paal wat van rubber of jellie gemaak is en wat sal padgee wanneer die motoris teen hout bops. U sal verbaas wees hoeveel ons elke jaar moet afskywe vir paal wat deer onbekende motoriste gebreek is.

In die oue dae van die tremmataakkappye het hulle, totdat hulle uitgevind is, yster pale binne die konkrete gesit, gelukkig was daar nie baie motorkarre daardie dae nie. U kan u voorstel wat ingeval van bot-sing sou gebeur het. Maar in alle erns, is daar al iets uitgevind soos hierdie 'breakaway' soort paal wat in geval van 'n botsing nie 'n gevare sal wees vir almal betrokke nie. Onthou, dat nie net die motoris wat sy nek breek nie, maar die drade hang daar en allerhande dinge gebreek is. Is daar al so 'n paal ontwerp? Ek twyfel, maar dit lyk vir my dit is wat verway word.

Mr. H. Wood (Cape Town): Mr Quizmaster, I am quite surprised to hear that PE also has a pole graveyard the same as Cape Town. If I may just go through the points one at a time, very shortly. Glare from street lights. Whilst it is true that many existing installations are glaring mainly due to the excessive candelas in the 80°

- 90° zone but this problem will resolve itself when users specify luminaires, strictly in accordance with the recommendations contained in the SABS Code of Practice. This is a point I would like to emphasise, that users must purchase luminaires in accordance with the SABS which limits the light output in the glare zone to those internationally acceptable by the CIE. There is of course the argument put up by the British experts in relation to glare restrictions, contained in BS 1788 for the raising of the 1.2 intensity ratio from 78° - 82°, from the downward vertical for the semi cut off distribution, which would have the effect of increasing road luminance much faster than the increase in the incidents of glare, in effect this causing an apparent reduction in glare. However, this argument still has to be proven in practice and it would be safer at this stage to use luminaires complying with the internationally accepted standards. Every endeavour should be made by local manufacturers to comply with these standards and for users to specify these standards. Statistical data regarding effects of street lighting in the reduction of accident and crime rate in South Africa are very rare. The most comprehensive being that contained in the AA report. To be useful, analyses of this type have to be undertaken over a lengthy period during which conditions regarding the number of vehicles speed limits and other variables tends to confuse the final result. The general consensus of opinion though, where research of this type is being carried out, is that good street lighting can reduce the number of night accidents by as much as 30% and in Cape Town it has been confirmed by the police that improved street lighting, particularly in some of the non-European areas, has reduced the crime rate, a very important point, by as much as 50%. Break-away devices, much research has been carried out in both Britain and the USA on this matter. Whilst it is agreed that break-away devices can considerably reduce the impact strength of the pole, and so reduce the number of fatal or serious accidents due to collisions with poles, the possibility of a pole falling on an innocent victim cannot be overlooked. In fact the tendency today in the USA is not the break-away devices but rather to positioning poles further away from the carriageway, in fact they mentioned a figure of 10 metres away from the carriageway, but they don't also mention that they are only obtaining an average of 6 - 10 lux on the road. In regard to the final 3 questions if I can just summarise these quickly, in Cape Town, the Cape Province capitalises the cost of lighting the main roads and motorways. The question asked is where the municipalities cannot afford to install the acceptable standard, can the cost be subsidised by the Provincial Authority. This is fine, the Provincial Authority may subsidise the capital cost, but they don't subsidise the maintenance cost, which can in many instances be anything up to 3 or 4 times the amount required for say the 20% of capital cost which the smaller municipality has to provide and very careful investigation must be made into maintenance costs before proceeding with any scheme. Undertakings, including the smaller ones, although they can obtain the subsidy they must very carefully consider the maintenance costs. It is essential therefore, when assessing the costs to assess all the costs involved including capital cost, energy charges, and the cost of maintenance. The use of high efficiency light sources which would reduce the energy cost is most important today. As in all other engineering disciplines it will often be found far more economic overall, to accept a scheme having a higher initial capital cost after due consideration has been given to all the other factors involved.

Mnr. J.W. Smit (Pretoria): Mnr die Vraesteller, dis 'n bietjie moeilik vir my om op sommige van die vrae te antwoord, veral met betrekking tot die eerste vraag. Skittering of blikkering. Voor ons nou kritiseer saam met die AA voel ek moet ons eers 'n bietjie komplimenteer. Ek sien daagliks meer en meer installasies wat voldoen aan die kode en wat so ver as wat blikkering aangaan, glad nie kritisearbaar is nie, tensy mens nou regtig wil snanks wees.

Nou dat ek dit gesé het, voek ek dat indien daar kritiek teen die kode is van daar ek dit liewers anders stel, indien daar kritiek is eerstens teen die Munisipalteite omdat hulle dan nou nie die kode sal toepas nie, moet ons nou vra of indien straatverlichting installasies kortsik is die rede daarvoer te vind eerstens dat die Munisipalteite nie die kode kan toepas nie, of is dit omdat dit so gestel is as gevolg van die kode of ten spyte van die kode. Nou voek ek dat die kode het 'n groot hydra geïmaak tot goeie straatverlichting. Ek is cortoung daarvan ten spyte van mnr. Botes se kritiek. Ek wil mnr. Botes tot 'n mate gelyk gee dat groep B verligting is misken 'n bietjie swaar vir kleiner Munisipalteite maar ek voel tog 'n mens moet maar liewer minder verlig en berig verlig tot dat jy alles oordentlik verlig het. Ons sal wel kritiek kry. Hier het ons reeds kritiek, dat dit die vereistes van die kode is, waaraan nie voldoen word nie. Nou gaan ons hom nog laer maak dan het ons die kritiek, die vereistes is nie goed genoeg nie, ons moet eintlik kies wat ons wil hé. As far as glare is concerned internationally, I can tell you that the whole situation is in quite a state of flux. There is hope that they will settle on recommendations at the forthcoming London session, which is I believe next year sometime. I shudder to think of the effects of this if we would like to introduce it in S.A. We have had so much complaints about our simple glare system, that if I look at this international one, I really fears. I don't think it will be applied. Gentlemen having said that, I think there is one more thing. Mr. van der Berg is quite correct in criticising the maximum to minimum ... ratios, I think they are excessive. We propose to amend those to maximum or minimum to average. I think that one can get acceptable, result with this.

Mr. W. Barnard (Johannesburg): I agree that the code should not be criticised, because I think it has been drawn up by experts in order to provide an ideal street lighting system. I do not agree that one cannot compromise. I think, today, probably every local authority in the republic is compromising. We in Johannesburg certainly are compromising and I cannot see us achieving the standards laid down in the code within the next 20 years. This applies particularly to secondary roads; we have a number of townships in Johannesburg, where the consumers and the residents have said quite explicitly they want no street lighting at all and want to retain the rural atmosphere. I think the motorists probably drive a lot slower in those areas.

For information, on the point of break-away poles, some years ago we installed concrete poles for aesthetic reasons. This caused havoc amongst the motorists. Whenever there was a collision we had extensive damage. These have now been replaced by high tensile sectional poles which have proved to have a number of advantages. First of all the accidents are far less serious, the damage is less, and we find that even the damage to the pole is considerably reduced.

Mnr. N.S. Botha (Bloemfontein): Punt nr. 4 is vir my besonder interessant, naamlik die moonlight subsidiering deur 'n Provinciale Administrasie. Soos in die geval van Krugersdorp, poog Bloemfontein die afgelede tyd om straatverligting ten opsigte van nuwe woongebiede uit die ewe fonds te finansier. Ek moet se ons was tot dusver nog nie ontvouwing genoeg nie, ons kon dus nog nie daarin slag nie, maar nogtans, mnr. Vraesteller, het die Provinciale Administrasie van die OVS verlaat jaar aan Bloemfontein toestemming verleen om bestaande straatverligting en ek ondersteun bestaande straatverligting om 'n groot som geld uit die ewe fonds te onttrek om hierdie verligting te verbeter, en ek voel dat die Provinciale owerhede is bewus van die probleem, en dat ons kan hulle maar net nader, moonlight kan die Provinciale Owerhede vir ons help.

Mnr. F.J. Botes (Roodepoort): Ek wil net graag my saak baie duidelik stel. Ek het gevrees dat die sekondêre straatbeligting, nie van die hoofweg straatbeligting nie. Ek is tevreden met die kode en ek probeer om te voldoen aan die vereistes van die kode. Dit is net die Groep B straatbeligting - dit is daardie B maksimums verhouding wat uit verband is sover dit my betref. Om dit uit te voer, sal sekondêre straatligting installasies jou baie duur kos. Mr. Chairman, I just want to mention that very recently I called for tenders for luminaires to conform to the requirements of the code for certain installations and I received one tender only. One of the other manufacturers claimed that they can't see that any other manufacturer can manufacture luminaires that conform to the requirements of the code for a certain installation. They can't guarantee it. Thank you.

Mr. A.H.L. Fortmann (Boksburg): I would just like to refer to this crime rate story we heard. In Boksburg we have quite a large coloured area which was very badly lit and had a very big murder rate. Subsequently, we have installed some high-mast lighting and the murder rate dropped drastically and this is really proof that good lighting helps to combat crime. I must add though that the rape rate went up drastically. Then, of course, with regard to this problem Mr. Hofmann had in Vereeniging, we have the same thin in Boksburg. I think most municipalities are plagued with trees and this is a real problem. I think this is probably the biggest problem in residential areas. We actually tackle the problem there, together with the Parks Department, and our request is that they plant smaller trees rather than big trees. Big trees have to be trimmed anyway. Where they are over lines they are trimmed and cut to ribbons and that costs money. So rather ask the Parks Department to plant smaller shrubs and trees.

Mnr. E.E. de Villiers (Rustenburg): Ek wil net 'n paar woorde sê oor straatverligting oor die algemeen en dit is eintlik, ek wonder of ons werklik straatverligting nodig het. Dis nou 'n klip in die bos. U weet Randburg in die Transvaal digby Johannesburg het nie straatverligting nie. Hulle is doodgelegk en hulle het baie minder probleme as ons. Ons grootste probleem myns insiens is straatverligting instandhouing. Nie alleenlik die koste nie, dit kan aansienlik wees, maar om 'n metode te kry om mense te vind om daardie diens effektiief te doen. Want u weet geen straatverligting is tog beter as straatverligting met swak instandhouing, met ander woorde, niks is beter as swak. So ek dink dat ons moet hewer 'n bietjie terugdink in die verlede en probeer om liewer maar rudimentêre straatverligting te doen en nie volgens die kode vir ouer dinge gaan nie. Ek wenn iemand kan vir my 'n onfeilbare metode van instandhouing binne redelike ekonomiese perke aan die hand doen, dit wil sê hoe om straatverligting instandhouing goed te kan doen. Ek het in die verlede, dié klopjies jare wat ek as Munisipale Ingenieur praktiseer, seker minstens 10 verskillende metodes al probeer. Sommige met 'n bietjie sukses, sommige niet. 'n mens moet 'n bietjie meer, maar nie 'n enkele wat 'n mens graag sal wil doen nie. So ek dink ons moet hewer maar straatverligting heetlike oortoord gooi. Dankie."

Mnr. J.K. von Ahlfen (Springs): Kan ek net 'n registrering maak. Hierdie bevinding is deur mnr. Yates van die Johannesburgse Munisipaliteit in 1974 gedoen waar hy spesifiek verwys na nuwe straatligting installasies 7 jaar na die Kode se inbraukneming, dat daar nog installasies is met 'n hoë blikkering. Dit is die probleem, m.s.w. die kode

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word nie toegepas nie en daar word nou beweer dat die kode te drasties is. Ek kan nie heeltemal saam stem nie, maar die Voorsitter, want die kode stel net standaard vereistes en ek dink wat hier eintlik gevind word is dat nuwe straatligtingssysteme op hoofpaadjies nie altyd volgens die kode geïnstalleer word nie.

Mnr. J.A. Loubsler (Benoni): Mnr. die Vraesteller, ek dink ons het 'n opllossing vir die probleem. U weet elke keer as daar nog vir my gevra word, voldoen ons in Benoni aan die SABS kode kan ek antwoord, ja. Ek moet dit ook sê want, wat hoofweë betref, probeer ons om werklik daarby te hou. Maar hier is 'n lot belangstellers hier vandaag teenwoordig en hier is boonop ook 'n hoop Raadslede teenwoordig. As u dink wat dit ons belangstellers gaan los om in gewone woongebiede aan die SABS kode te voldoen, dan gaan daar onmiddellik besware van die Raadslede afkom, want dit sal 'n verhoging van sekuriteitsbetekeeningsbring. Daar is geen twyfel daaromtrent nie. Gevolglik, voel ek daar is miskien plek van aanvraag vir 'n nuwe kode genaamde sekuriteitsverlighingskode, want ons het nie straatverlighing in woongebiede nie, ons het sekuriteitsverlighing. Die gewone belangstellers stel in twee dingte belang! Hy wil sy straatligting en hy wil sy belasting so laag as moontlik hê. En sy straatligting moet daar wees, dit maak nie saak waar hy staan nie, maar ny moet daar wees. Gevolglik, word daar nie nooit gesê: 'ek moet kan sien as daar 'n muie oor die pad hardloop nie', maar hy wil net daardie lig hê as sekuriteitsverlighing. Ek dink daar is dus plek vir 'n kode vir sekuriteitsverlighing in dorpsgebiede.

Mr. W. Bozyczko (Estcourt): Mr. Quizmaster, We are talking about improving street lighting, especially on the main roads, to reduce the accident rate and I am in full agreement with that. But who benefits by this? Largely the Insurance Companies who would pay out substantial sums until the case is eliminated or at least illuminated effectively. Would it not be possible to obtain the co-operation of these insurance companies to contribute towards the street lighting research with a view to a reduction in accident rate. Thank you.

Mr. J.W. Smit (SABS): Mr. Quizmaster, just one question please. I proposed for residential lighting that we are considering to lower the requirement for uniformity by specifying B minimum to B average. I would like to ask Mr. Loubsler whether this would solve some of his problems, and then as far as Mr. de Villiers is concerned, I want to remind him, before he throws street lighting out of the window, of the very easy way to show the following. One can say that nothing is better than a Rolls Royce, you can also say that a Volkswagen is better than nothing and consequently, you can conclude that a Volkswagen is better than a Rolls Royce. I would like him to think about that before he chuck's streetlighting out of the window.

Mr. J.A. Loubsler (Benoni): Mnr. Vraesteller, in antwoord op die vraag van mnr. Smit, nie, die sal nie die oplossing wees vir die probleem nie, want in gewone woongebiede doen ons nie straatverlighing nie. Die algemene vraag is: „My man werk oortyd of hy werk naaglieds, ek moet 'n lig hê vir sekuriteit!“ Dis nie straatverlighing daardie nie, sekuriteitsverlighing. Ek dink nie die oplossing wat mnr. Smit aan die hand gedoen het is 'n oplossing vir die probleem nie, want dit is nie straatverlighing nie!

Mr. R.C. Calburn (Johannesburg): Mr. President, in the course of this discussion, someone spoke of the drop in the crime rate where there is street lighting. Before I say a few words on that by way of a plea to the AMEU, such an influential body, may I thank you Mr. President, for allowing me to be present at your conference and say how deeply impressed I am by the size of this gathering and by the obvious importance which it has in the life of the local government. I am most grateful to be here and I am most grateful for all the kindness which I have received from everybody. Mr. Question Master, and also Mr. President:

We are road-mad in this country. We are motorcar-mad. I personally am motorcar-mad, but I don't think the authorities should be motorcar-mad. This country spends millions building vast wide roads from nowhere to somewhere still less. I can give you examples, but it might cause offence. Everywhere, these wonderful roads, some of them very useful; but some of them quite relatively useless, with money so short and fuel running out, yet it goes on. The motorist is always pampered. We spend a lot of time talking about one fitting being more dazzling to motorists than another. The motorist should never get dazzled by any kind of fitting in a road: he should simply drive according to what his head lights reveal. If he cannot see very well, he must simply drive a bit slower. Are the AMEU and local governments generally, not losing sight of something that is much more important than any of this traffic lighting talk? Are we getting our priorities right?

Every town clerk, every city or town electrical engineer, ought surely to ask himself: is there any part of my municipal area that is without social (or security) street lighting? Whether it be in a Coloured, Bantu or a White area, it does not matter: great hardship is caused during the hours of darkness by mugging, robbery and all sorts of crime in areas which have no street lighting. This surely is the great priority, not the efficient lighting of highways so that the motorist can drive a bit faster. I remember how this was brought home to me when I had occasion to publish a description of a fine system of street lighting in a

Non-European township. (I have since been reminded that Bulawayo City Council was the pioneer in question. Witbank was, I believe, the first town to install such a system in South Africa.) You have widely-spaced fall standards, casting a shower of white light over a large area; and so, for a relatively small cost, a whole township could be lit and made safer at night.

Is that not very much more important than is being realised? Is the AMEU lending its great weight to urging all local authorities to see that it has no residential areas without street lighting. It seems to me that this is the great priority. It is more important than these accident preoccupations, where after all, the motorist can look after himself: if he drives according to what he can see, glare won't cause any accident. If affected by glare, he can always take the appropriate action.

But these poor people going home at night into unlit residential areas, especially with their wagons on Friday nights, they are at the mercy of every 'tuots' and other criminal that happens to be near. It seems to me that this is the most important street-lighting question. It is attention to that that I venture to urge upon the AMEU. One of the most important things in all local government, is adequate lighting for residential areas. I think with great respect Mr. Question Master, that that is as important as anything that has been mentioned in this most interesting technical discussion at which I am so pleased to have been privileged to be present.

Mr. J.W. Smit (SABS): That's quite correct Mr. Questionmaster, I think that it does hand in glove, one can't deny it. A lot has been done about car lighting, we are at the moment busy with a specification for motor vehicle headlights. I think it is a very necessary thing. I have to agree with you, it is necessary to look at them both.

Raadslid D.C.J. Hofman (Vereeniging): Mnr. die Vraesteller, alles in ag geneem en al hierdie vereistes wat gestel word en aan voldoen moet word ten opsigte van straatbeligting, het ek een probleem en dit is verwys nie dat nie ou meer gevisteerde dorpe en gebiede. Die heel eerste artikel of implement wat ingestel word by 'nuwe dorpsbeligting is natuurlik die straatverlighing en dan daarna kom die Parke afdeling en hulle plant boomopies daaronder en hulle is klein boompies en naderhand word hulle 'n groot boom en uitendelik verrig daardien straatlig wat daar staan absoluut geen doel nie. Daardie bome word so groot dat daardie ou liggle daar versterk is en dit is vir my wesenlike probleem en ek wonder of hierdie Vereeniging nie in so 'n manier kan 'n vereiste neerlaai waar en hoe vir die lampaap geplant moet word en waar en hoe vir 'n boom geplant moet word nie. Want op die wyse wat ons die mooisheid van straat beligting heeltemal weg met die plant van die groot bome. Dankie.

Mr. A.H.L. Fortmann (Boksburg): Mnr. Vraesteller, ek wil darem net se eenk om die vereistes van die kode handhaaf. Basiese is dit 'n goek kode, die wetenskaplik opgestel, en as die SABS dink hulle kan die „verhouding“ miskien verlang wat die sekondêre paasbeveiliging is. Dit is later verbeter met die koms van die motorkar toe dit nodig geword het om die padopbrekers te belig vir die motoris. Om die hele storie kort te knip, het die hulle deelbae oorgegaan na prestige beligting. Dit lyk vir my asof prestige beligting deesdae moet sekuriteitsbeligting verwarr word in die toepassing van die beligting van Bantoe woongebiede. Ek wil samestel dat die blikkering indeks 'n groot probleem is. Ek kom van die Bantoe woongebiede af en as die blikkering hoog is sien hy 'n Bantoe glad nie raak nie. Jay moet liever die regte tipe beligting gebruik en sekuriteit in ag neem. As jou inkostgroep hoër is kan jy gaan vir die hoër beligting vlak. As jy 'n laer prestige woongebied het dan kan jy gaan vir die lager vlak. Dit is min of meer daarom ek die hele straatbeligting, as 'n mens dit so wil noem, sien. Ek beskou dit nie enlaat as straatbeligting nie maar as sekuriteitsbeligting primier, en daarna gaan die oor na prestige beligting toe. Dit hand af of u aan sport wil deelneem op straat of nie, Dankie.

Mnr. R.J. Fulls (Oos-Randse Bantoe-administrasiederaad): Mnr. Vraesteller, ek wil graag by mnr. Loubsler aansluit. Ek ondersteun hom heeltemal. Laat ons kyk na die geskeidenis van woongebiede beligting. Eerstens is dit gebruik geweens om net 'n gaslampe in die straat te plaas vir sekuriteit, net om te kan sien as daar 'n skaduwee beweeg. Dit is later verbeter met die koms van die motorkar toe dit nodig geword het om die padopbrekers te belig vir die motoris. Om die hele storie kort te knip, het die hulle deelbae oorgegaan na prestige beligting. Dit lyk vir my asof prestige beligting deesdae moet sekuriteitsbeligting verwarr word in die toepassing van die beligting van Bantoe woongebiede. Ek wil samestel dat die blikkering indeks 'n groot probleem is. Ek kom van die Bantoe woongebiede af en as die blikkering hoog is sien hy 'n Bantoe glad nie raak nie. Jay moet liever die regte tipe beligting gebruik en sekuriteit in ag neem. As jou inkostgroep hoër is kan jy gaan vir die hoër beligting vlak. As jy 'n laer prestige woongebied het dan kan jy gaan vir die lager vlak. Dit is min of meer daarom ek die hele straatbeligting, as 'n mens dit so wil noem, sien. Ek beskou dit nie enlaat as straatbeligting nie maar as sekuriteitsbeligting primier, en daarna gaan die oor na prestige beligting toe. Dit hand af of u aan sport wil deelneem op straat of nie, Dankie.

Mnr. K.J. Murphy (Somerset-Wes): Mnr. Vraesteller, ek praat nou hier al is ek nie die een wat die vraag voorgestel het nie. Die gedagte is tog dat persone wat nie in 'n posisie is ons Konvensies by te woon nie, nie hul stem kan uitbring by die verkiezing van lede om op die Uitvoerende Raad te dien nie. In ander organisasies, soortgelyk aan die VMEO, word die probleem opgelos by wyse van possemissie. Ons in die Kaap, voel dat die huidige stelsel onregverdig is teenoor die lede en daar is baie van hulle, wat nie noodwendig altyd Konvensies kan bywoon nie, en wat tog stemgeregtig is. Die Kaap sal natuurlik die Konvensies se bestuif moet aanvaar. Dankie.

Raadslid P.G. Joyst (Tzaneen): Mnr President, ek sou my graag wou skaar by die kamp wat sê die lede wat teenwoordig is moet alleenlik stem. As u 'n organisasie wil afbreuk dan moet ons probeer om ons

lede weg te hou. Hulle moet so entoesiasties wees dat daar geen rede is waarom die plaaslike owerheid van die gesaghebbendes hulle nie sa no 'n konvensie stuur nie. Dit is die enigste manier. Dit last my dink aan die Koöperatiewe Wet van 1929 toe die Minister wat destyds in beheer was, mnr Paul Sauer, gesê het niemand mag met 'n posstembrieftjie stuur nie. Jy sal dit verdeel. En hier moet u dieselfde doen, dit is die enigste strafmaatreel wat u fuses het om te sorg dat die manne hier kom dat hulle hier hulle sake bresk. Baie dankie.

Vraesteller mnr J.K. von Ahlfoten: Enige verdere bespreking op hierdie vraag? Ek denk Raadslid Joyst het dan baie goed opgesoen. Dit is die demokratiese reg van plaaslike besture, dit is eintlik hulle pleg om waar hulle kan afvaardigings te stuur na Konvensies. Dit is net elke 2 jaar.

Mnr. Murphy ek kan net vir u inligting noem dat wat posstembme betref, uit onverdiening deur die Instituut van Elektrotegniese Ingenieurs gegee is dat die stempersansasiale baie lang is, laer as 30%. Wat die V.M.E.O betref is 80% van die lede wel teenwoordig en kan hulle hul stemreg uitsoefen. Ek neem aan dat vandaag by hierdie Konvensie ook tenminste 80% van alle ondernemings teenwoordig is. Of vol u dit is nog nie die oplossing nie?

QUESTION NO 1. HOW FAR MUST ENGINEERS GO IN TAKING AESTHETICS OF TRANSMISSION LINES INTO ACCOUNT?

Mr. M.P.P. Clarke (Newcastle): First of all, on behalf of the Natal Branch, let me offer you a belated welcome on the bananaland. The belated submission of questions we apologise for; this has been ascribed to Natal fever - of the pie-sang-palzy, as it is sometimes referred to - on the other hand we prefer to think that it is our gentlemanly breeding and upbringing that holds us back a little to allow the others to get in first! With that may I also place on record the congratulations of the Branch to you, Mr. President and the incoming President-elect. Now the question has not anything to do with aesthetics; it has everything to do with aerodynamics. There is a paper to be read later which talks about distribution problems and developments with the supplies of electricity in townships. We are concerned with the appearance of distribution schemes. We are concerned with how the street lighting looks, we are concerned with how they all operate. But we are equally concerned with the cost of providing these facilities. We pose the question - how far should we go. How do we draw up guidelines and, in particular, how can we make a good case? We can justify on the lower distribution voltages spending fairly reasonable amounts of money to meet the aesthetic problem. How do we go with extra high voltage? Do we go to cables and where do we draw the line and what help can we get from the meeting in this particular respect? Thank you

Mr. C.E. Adams (Port Elizabeth): Mr. Chairman I don't think there can be an answer to this problem because each individual case will have to be treated on its merits. For instance we have just had an occasion to build an overhead line round Port Elizabeth, which gave rise to large outcries in the Press. But there the question of cable was just economically out of the question. We are now looking at another installation where the difference in cost is not so great. So I think each case has to be treated on its merits and one has to take into account the particular circumstances of the undertaking at the time, whether the capital is available or not, and although its a problem which bebeats us everyday I think each individual engineer will just have to handle this as best as he can.

Mr. Pat Middlecote (Quizmaster): Thank you. Mr Adams you have given him the answer. I think its a valid point. Lets summarise the answer in this - YES - all of the engineers here should consider this question of aesthetics because if you don't take your responsibilities to improve the environment to prevent the pollution of atmosphere seriously. You'll get all the councillors and the other engineers and everyone else taking over your responsibility and cleaning up the looks and saying that you engineers are no good. I think the answer is you must consider aesthetics.

Mr. K.J. Murphy (Somerset West): Television aerials aesthetics may not be related to the aesthetics of power lines now under discussion. But recently, with the introduction of television and the adoption of the relevant bylaws by our councils, the town engineer and I were consulted in regard to their advisability and implementation. I know that the tendency has been to avoid the television aerial question like the plague and to leave it to the town engineer. But, we are requested to investigate the matter and I thought it wise to discuss the aesthetics problem with the television experts and suppliers. It transpired that loft type aerials can be as efficient as the outdoor type. We have thus added a rider to the aerial bylaw for Somerset West which stipulates that: "outdoor aerials are only accepted where loft type aerials cannot meet the requirements of the Bureau of Standards". We find that the experts installing aerials, are very happy with this ruling, and assure us that the owner is in fact getting an aerial which requires less maintenance is cheaper and does not, of course, detract from the beauty of the towns stately homes. Thank you.

Mr. R.C. Calburn (Johannesburg): I have had for some time the privilege of being the secretary, to the Johannesburg City Council's Advisory Committee for Aesthetic Control. Johannesburg has had such a committee for many years. Not so long ago our clerk of the council received a letter from East London asking exactly how we ran this committee and a fairly full letter was sent in reply. It has not stopped there. A section in the Ministry for the Environment has written to

Johannesburg for details of how it runs its aesthetics committee, because it is proposed to establish aesthetics committees in all local authorities, in other words, to follow widely this example of Johannesburg. The aesthetics committee at Johannesburg which is now renamed the Environmental Impact Committee, is a committee to which, putting it generally, all matters whatsoever have to be referred which affect the visual scene. Indicently, our aesthetics committee has formed contact with the Design Institute of the S.A.B.S. This is a valuable contact. But the point I am trying to make is that the Central Government, the people at the actual centre have taken note of the importance of aesthetic control and want it instituted by all local authorities. Johannesburg's aesthetics committee has in the last two years under the stimulus of one of our senior councillors become a much more active thing. A wide variety of matters are referred to it, from the location of a telecommunications mast or some item of street furniture to something so big as a proposed restaurant endangering the natural beauty of a dam, literally everything affecting the visual scene. Of course when it comes to something so big as whether an electricity cable should go overhead or the aesthetics people cannot say much because that is so much a matter of cost. All I have asked for is the microphone for is to inform anyone here who does not know it, that the aesthetic control aspect is very much on the up and up.

The fact that a body in the Ministry for the Environment has asked Johannesburg how it runs its aesthetics with a view to the establishment of an aesthetics committee of some sort, or another by every local authority in order to preserve and protect the visual scene is a fact of great importance of which, Mr. Question Master, delegates may like to be informed.

Cir. A.H. Honikman (Cape Town): Mr. Chairman, one who has given a life time to the question of design and having been responsible only in recent months, (after a struggle of some three years) in establishing an environmental and aesthetics control Advisory Board in Cape Town as approved by the City Council, may I say that there is a tremendous amount of confusion between the various references that have been made this morning - confusion between the terms Aesthetics, Utility and Economics. In point of fact, they are very much interrelated. Mr. Chairman, if I may explain, aesthetics cannot ignore economics, aesthetics cannot ignore utility, in fact it is regarded as being aesthetically bad, if an object contains unnecessary embellishments or meaningless adornments. They are, by their very nature, in conflict with economy. In other words, there is a considerable amount of compatibility between a aesthetics, economy and utility. This of course, does not mean that one must ignore good form, that is good design. On the contrary, good design is vital. It is a speciality in itself. Where other specialities such as electrical specialities have slipped up perhaps in respect of aesthetics, is that they have failed at times to acknowledge the specialised aspects of good design. And in that respect your appeal Sir, should not be understood to mean that good design is to be considered to the exclusion of the economic and the utility aspects, they are inter related. The purpose of my remarks is to emphasise that there is a tremendous amount of compatibility between good design economics and utility. Thank you.

Mr. Pat Middlecote (Quizmaster): Thank you very much Mr. Honikman, that was a very nice exposition; That was what I would have liked to have said. I did not want to take up all time. I think you put the problem fairly and squarely to all. I think seriously we should retain our position as forward looking engineers. We are far ahead of the other branches, and as electrical engineers its your duty to bear in mind the aesthetics to prevent our efforts creating a problem as regards the environment. Thank you.

Mr. M.P.P. Clarke (Newcastle): Sorry, but the point has really been missed. It is much broader than this. We of course did emphasise that we are gentlemen in Natal and honesty has been accepted part of life, and so in the use of the environment, we understand that if towers are going to be built they are both economic and good looking as far as towers go. But where do you use them, where do you change over to underground and where do you place them and what is the use of the environment in the total context?

QUESTION 2: DOES THE FORUM CONSIDER THAT A DEEP FREEZE CAN BE REGARDED AS A FIXED APPLIANCE AND CONNECTED TO THE SYSTEM BY A COOKER TYPE PLUG TO REMOVE FROM THE E.L PROTECTED CIRCUITS.

Mr. M.P.P. Clarke (Newcastle): Mr. Quizmaster, at our last meeting the Natal Branch discussed this at a great length. The problem is one I think that everyone of you have experienced which is simply that people with deepfreezes do run into difficulties with earthleakage circuitbreakers. It is not so much the deepfreeze that gives the trouble causing the earth leakage but the other parts of the installation. We felt that a possible solution would be if deepfreezes and this might be extended to a double door unit refrigerator, could be wired onto a special type of plug. We suggest here possibly a cooker type plug which could then be removed from the earthleakage sphere of protection. This would help everybody. Thank you.

Mr. C.E. Adams (Port Elizabeth): Mr. Chairman, we also consider this question and we considered this very solution but unfortunately the latest amendment to the standard regulations for wiring of premises does not permit this, because it says you can exclude a cooker plug which is specifically intended for the connection of a cooker. You

cannot then use it for connection of a deepfreeze. So I think the amendments should be further amended.

Mr. A.A. Middlecote (Quizmaster): Yes, Mr. Adams, when I said we are considering it I think the whole thing depends upon getting a good reference to a plug and socket which could not be carelessly used, that you can plug anything in. The spirit is to follow what you say and at the moment the answer is if you are seriously worried you can have your deepfreeze permanently wired. Then it can come off the earthleakage. It's not nice but as I say that is one solution, but the other is to be looked at. And that's all I can say. The point is taken, and I shall report back. I take it that there is great support here for this suggestion.

Mr. J.R.N. Mackay (Provincial Administration, Cape): I think there is a tremendous danger here in just going, every time there is a bit of a problem with earthleakage, to some sort of hidden regulation or something like that. It is high time that people like yourselves and ourselves realise that we are dealing with the fixed installation and other people are connecting things to that installation over which we have no control. We should now realise that we have taken cookers off earthleakage purely because people don't make a cooker which is good enough, shall we say, to operate on an earthleakage system. We are now going to take deepfreeze units off and start thinking of taking refrigerators off. The next thing will be kettles, then heaters, and so on. There has already been talk of taking luminaires off because there is problems with certain ballasts and so on. Either you accept that you have a fixed installation and you stop there and you then expect everybody else to come up to the standard that you have now set or else you scrap your fixed installation idea and forget about all your earthleakages and their advantages. So lets not be too hasty in just pandering to any manufacturer who comes along with a poor quality product and who can't come up to the standards that we have set.

Mr. Pat Middlecote (Quizmaster): Thank you Mr. McKay. Mr. McKay there is a difference here. I agree with your philosophy but I think the deepfreeze is not the same argument as for a stove. The deepfreeze unfortunately, when you are away for a weekend and shall we say a stroke of lightning or something like that pulls out your earthleakage you come back not only to a about ninety Rand to a hundred rand worth of meat which your wife has bought, half an ox or something which has not only gone off but you also have a deepfreeze which is never right, you can never irradiate the smell, its a terrible problem. And I think any one who has had the deepfreeze go off whilst they have been away for a weekend or for a week or something like that realises this is very difficult problem. Its not the same. I agree with your philosophy and that is why we have gone so very quickly and so slowly about this. We want to make sure that if we relax on the freezer rule it is so tight that it can't be used for a proliferation of purposes. It is hoped between you and I that there will be a standard specification for such a plug and socket, demanding special earthing and security as required.

Mr. Pat Middlecote (Quizmaster): Could I just answer Question 1 received from Mr. Adams without going any further. Because I think we have not got any information and that it is no longer handled by the Institute they have handed it over the the SABS. And we have in fact got a new draft that will just be edited and which will be sent out for discussion. There will be amendments; there will be a period for discussion and comments, and I think this has answered the question so we could go on to Question No. 2 of Mr. Adams.

Mr. C.E. Adams (Port Elizabeth): Mr. Quizmaster, we have just placed our first order for hermetically field transformers and this question was basically just to get some feedback from other undertakings who might have used them either successfully or unsuccessfully. We would like positive or negative information. Thank you.

Mr. H.C. Dreyer (Paarl): Mnr. Vraesteller, as ek reg onthou, is verseide transmatoare ongeveer 20 jaar gelede reeds in gebruik geneem deur Pretoria Stadsraad. Hulle het die tip transmatoare gebruik wat in porselein houers geneemter was en wat toepaslik in die buitestedelike gebiede gebruik was. Ek is seker dat mnr Boyack meer oor hierdie saak kan vertel.

Mr. L.F. Boyack (Pretoria): It is quite correct, Mr Quizmaster, we have used these on the rural system for at least 20 years and have found no problems at all. (10 kVA sizes are of course no longer used). In the distribution system in townships we have used both the free breathing and the sealed types and have had no problems with either type. Of course we have rather a good climate in the Pretoria area so we don't have quite the same problems as the coastal people have, and possibly Durban could expand on the problems in coastal areas. In accordance with the recent decision by the SABS committee we will be using the sealed type up to 315 kVA and the free breathing type above this rating.

Mr. D.H. Fraser (Durban): The Durban Corporation has installed a large number of sealed transformers and the service experience has been satisfactory. Where major faults which could possibly have posed danger to personnel have occurred, the circumstances have been such that the incidents would have also happened had free breathing transformers been installed. From a safety aspect there would appear to be little difference between sealed transformers and free breathing

transformers but the advantages of a sealed unit under the climatic conditions encountered in Durban outweighs any disadvantages. Free breathing units without dehydrating devices have proved unacceptable and failure due to water ingress has occurred after a service life of months rather than years. Examination of earlier sealed units has indicated, in certain cases, some corrosion obviously due to restricted breathing through the cover gasket. The use of more resilient gasketing material appears to have reduced this to acceptable levels and it is considered that the extra cost of having transformers with the gasket below oil level is not justified. Summarising Mr. Chairman, our experience is that sealed distribution transformers are satisfactory and necessary in the Durban area, while the free breathing type definitely is not. Thank you.

Mr. W. Barnard (Johannesburg): We are probably fortunate in Johannesburg with our climatic conditions. Our experience over the years has been that the free breathing transformers are entirely satisfactory. We have free breathing transformers that have had more than 30 years service without any maintenance whatsoever. We therefore feel that to use hermetically sealed transformers will not provide any additional facility but we have nevertheless installed a number on a trial basis. Where there is a gradual build up of pressure in a transformer because of a minor fault, this has resulted in an explosive condition. The tank burst and there was burning oil all over the pavements. I think that a better application for the hermetically sealed transformer is possibly for rural distribution.

Mr. Pat Middlecote (Quizmaster): Mr. Barnard, I think that the suburb of Johannesburg will soon be following its main City, Pretoria. I would like to read out for your information the fact that Johannesburg is being very helpful in this regard, and Mr van Alphen of the Bureau has asked me to read this message here: "At a recent joint meeting of the SABS Committee for Distribution transformers and miniature substations, it was agreed that miniature substation transformers shall be sealed with a flat bolted cover and have an expansion space of 20% in the cold oil volume. Tests are being carried in a joint programme with the Johannesburg Electricity Department and the Bureau to determine whether a 14% expansion space which has been until recently used by many manufacturers can in fact be acceptable." So Johannesburg is investigating this matter and we are sure they are able to give us quite a lot of valuable information. Do we agree that generally no one has had trouble with sealed transformers and the only reason for not using them is that the prices are not worth it.

We have two authorities with vast experience who quite categorically say they are excellent or that they have given good service. It's just Johannesburg who is a little suspicious. But they are experimenting. Now I think that is sufficient guide for all of you. Thank you.

Mr. H.P. Alexander: Escom (Natal): Mr. Quizmaster, the problem of difference in interpretations of regulations and difference in applications of regulations is not something that is peculiar between municipalities and Escom. We have noticed within the Natal Undertaking that there was a danger of differences in interpretation in different portions of the Natal Undertaking between one Installation Inspector and another Installation Inspector. And we were very grateful to Mr. Simpson, at that time the City Electrical Engineer of Durban, who invited us to join meetings that he had arranged with the electrical contractors in Natal and with the larger Supply Authorities. Now although the Natal Undertakings is spread over a larger area, the number of consumers that we have and consequently the number of premises that are wired, are small compared with the number of premises, the number of consumers of a municipality like Durban, or a municipality like Pietermaritzburg. Consequently we were very glad to be able to join in the discussions with the municipalities and the contractors. To ensure that there was a uniformity of applications of the regulations between the municipalities and Escom (which was mainly confined to the rural areas and in those small towns where Escom carried on the reticulation of electricity) we instituted a system of periodical circulars to contractors which also had the benefit that these were sent to all our own Installation Inspectors laying down exactly what was the policy of Escom in regard to the wiring of premises - in many cases the regulations do leave it to the discretion of the engineer. This is a point that I touched on yesterday appealing that the approval committee of new commodities and products should give a definite ruling and not leave it so much to the individual Supply Authority or the individual engineer because in the bundu of Natal "the Engineer" virtually becomes the installation inspector and they take upon themselves the right to rule and to introduce all sorts of regulations on their own and in order to avoid this the circulars to all these contractors operating within the area of the Natal Undertaking do let them know what Escom's policy is and this has been done in consultation with the larger municipalities and by this means I recommend to all the local authorities the municipalities throughout the country that this method of discussion is a wonderful way of sorting out any of these difficulties that form the subject of this question that is been raised today.

Mnr. H.C. Dreyer (Paarl): Mnr. Alexander het hier vir ons nou 'n verduidelikking gegee wat hulle in Natal gedoen het. Ons probleem in die Kaap is ietwaar verskillend. Ek glo nie dis 'n sakk van interpretasie van regulasies nie. Ons probleem is dat ons dikwels gesé word deur 'n kontrakteur dat Evkom dwing hierdie regulasie of daardie regulasies nie af. Dit was aan my persoonlik gestel deur 'n paar kontrakteurs

dat Evkom in Kaapland nie eens meer verwag van 'n kontrakteur om 'n aanvangsgevorder in te sit nie. Nou hoe kan 'n mens regulasies afdwing as hy nie eens 'n aanvangsformulae hoef in te sit nie. Hulle hoof siegs die voltooiing vorms in te sit en daarna word die installasies geïnspekteer. Nou die enlikeel doel van die vrang mnr. die voorstuurter is, dat ons graag eenvormigheid wil hê; dat daar nie een voorseenisgeverwerker opgespel kan word teenoor 'n ander nie. Dis standaarde wat gehandhaaf word. Of ondernemyn daardie dat 'n kontrakteur in staat is om vir jou te kom soos maar 'n groter overheid as jy verwag dit nie van ons hoe kan jy dit verwag, maar tog is dit 'n vereiste uit die blou boek. Meneer Alexander se wenk dink ek is 'n goeie een. Ek dink die Goeie Hoop tak sal by ons eie vergaderings die saak weer opper en dan kan ek vra dat ons dan samesprakis met ons plaaslike Evkom bestuurster en hulle inspektors voer. Dankie meneer die vrasteller.

Mr. Pat Middlecote (Quizmaster): I would like to say that the spirit of the approach in this case was to work through the model building regulations and have them promulgated as almost part of the building by-laws in each province or municipality according to how you work your legislation but the intent was to get this done by the City Engineer and not the City Electrical Engineer. I think that is the spirit and I think one must accept that. When we did discuss this we thought at one stage of suggesting to the authorities that it be done along with the standard building regulations but this was not found possible. It was not a proposition and the easiest way was found to issue a model building regulation, which it is hoped, that the provinces or the municipalities will declare as by-laws. Thank you.

Mr. J.K. von Ahlfen (Quizmaster): I think we will take the question on page 5: "Non-metallic Conduit manufactured to SABS 968 has been used in South Africa for approximately 5 years. We are anxious to know whether such conduit has created any installation problems and whether you have any reservations on its use. Do you consider that the existing quality level is acceptable or is the specification in need of revision?"

This question is posed by the S.A. Bureau of Standards. Could we have discussion on this item?

Mr. M. Frankle (Affiliate): Mr. Quizmaster, in reply to Mr. Adams question regarding the breaking away of joints. This was not the solvent. This was due to the contractors obviously not using the expansion couplings and the sliding saddles that are provided. The biggest problem when using a non metallic conduit system is that when using it in open roofs on trusses they try and scimp, and they do not use the correct materials. The Bureau of Standards did a test on the amount of pull that would be required to break away a piece of conduit that had been joined correctly to a coupling, the actual test provided that even after they had attached a grapping iron to each end of the conduit and tried to part the joint at 1 000 pounds per sq. inch, the conduit fractured leaving the joint intact. Regarding the other question the 85% of municipalities who have approved the use is in actual fact a very conservative figure. And of the 85% mentioned, I would say that at least 70% to 80% of those are allowing it in concrete walls and in deckings. Regarding interference the only installation that we know of where we would not recommend the use of PVC conduit unless the power cables were screened in hospital walls where ECG or any other sensitive electronic equipment is used, including X-ray equipment. A very interesting installation was done in Randburg at the Institute of Metallurgy, the entire decking and most of the scaffolding at the new institute used PVC conduit and there were no problems at all as far as mechanical damage to the decking was concerned. The electrical contractors installed the conduit after the steelifiers had completed their work. So consequently no problems arose and no conduits were damaged. Thank you.

Mr. W. Bozycko (Estcourt): I am particularly affected by this question in that in building my house I used just this product. I found that this type of conduit is ideal from both the practical and economical point of view. I found however, that the plastic boxes – plug boxes, switch boxes are useless. They are too flexible and when the bricklayers incase these in mortar tend to put these boxes out of shape, and to put a cover on becomes quite a problem and often one must make special arrangements. As regards the use of this product on surface, we have permitted this conduit to be used in our Indian housing scheme and have had excellent results both from appearance and technical point of view. The fact that one has to draw the earth wire through the conduit present no problem. In decking we will certainly recommend the use of PVC conduit. It is often said that if the building contractor is careless the fracture of conduit at the point of exit from the concrete can occur. This is so, but with little chipping and a slip-on-coupling repairs are quickly carried out. Thank you.

Mr. W.P. Rattey (Strand): I am obliged to stand up and say my piece with respect to this type of conduit because I have been a sort of personal antagonist towards its use, possibly because I am getting old. I believe that a conductor should be incased by a conductive material, so that in the event of any damage being done to the casing the instrument which is used in damaging this casing is effectively earthed by the casing. We always resorted to this way of protecting cables and over the years this has proved to be a very safe method to employ. In

the Cape when PVC conduit was first considered, we resolved to restrict the use of this type of conduit to surface work and we would only permit its installation in a wall if it passed directly through the wall. I have noticed that this resolution of the local branch is not receiving the support that it did initially and there seems to be a weakening of resolve but I continue to feel very strongly about this just as I felt about a certain type of cable which was put on the market a year or 2 ago which was similarly unprotected. All live conductors should be protected by metallic covering which is earthed. Thank you.

Mr. H.C. Dreyer (Paarl): Meneer die vrasteller, wat mnr. Rattey nou hier genem het, nogal 'n baie interessante vraag by my laat opkom. En ek sou baie bly wees as mnr. Middlecote vir ons 'n antwoord hierop kan gee. U weet dat met die kons van televisie is steurings 'n baie groter probleem as wat ons tot dusver gehad het met ons radio ontvangs. Waar die geleiers in 'n huis of in 'n installasie dan nie meer outomatiese skerming het nie, is daar miskien reeds toetse gedoen om vas te stel wat sou die geuringseffek wees as al die geleiers onderdaarde bebaarde huis is? Dankie.

Mr. Pat Middlecote (Quizmaster): Yes, Mr. Dreyer, I think it's clear that it's not a problem. Your point is for electro-magnetic shielding on the cable but the problem due to interference can be easily dealt with in another way. I don't think one needs fear that too much. But coming back to the use of PVC conduit, we have to move with the times. I always say that if you get a young graduate and the brighter he is the better he is. Just give him a franchise to find out the faults with everything and he will use nothing on that installation. He will find something wrong because he is bright. So I think we must get away from this. We South Africans not only are very fine outdoor people but we have the habit of going around knocking nails in the walls more than anyone else. Because I can assure you the Continent is not worried about this and they have no accidents. If you will stick to the rule of running the conduit either vertically or horizontally you can more or less judge where they are if you want to knock nails into the wall. Then there is a further point that we are really talking about new installations and on new installations we have to put in sensitive earth leakage protection and I think this deals with the slight possibility that you might knock a nail into the conduit. Should there be accidental contact the earth leakage will come out. But I think we must move with the times or else you won't be able to take advantage of productivity and lowering of costs or getting an easier and quicker job or using, shall we say, less trained labour.

Mr. D.C. Palser (Cape Town): Mr. Quizmaster, the first speaker mentioned that 85% of municipalities are now using PVC conduit. I wonder if he could indicate whether these municipalities are using conduits purely on the surface, in the roof spaces or are they also using this embedded in walls and roof slabs. There is a danger if we embed the conduit in concrete, for instance, when shuttering is carelessly assembled there is the possibility of nails being driven into the conduit at this stage. Would the first speaker care to comment on this point. Mr. Middlecote mentioned earlier the question of earth leakage rays. Perhaps this is the answer and will enable us to relax our requirements in this regard. We in Cape Town have not permitted the embedding of PVC conduit walls or roof slabs, yet, its use being restricted to surface mounting and installation in ceiling spaces. Thank you.

Mr. V. Cohen (Affiliate): An interesting point which has come up from the use of these plastic conduits is related to installations in hospitals where ungrounded supplies are used. This has been very important since the metallic conduit causes problems due to capacitive coupling to ground. This problem is greatly reduced by the use of the non metallic conduit. Thank you.

Mr. D.F. Kneale (Affiliate): Mr. Quizmaster, I would like to suggest that Mr. Bozycko must have cast his own concrete because he thought that the conduits were not damaged. I would say PVC conduit is better than putting the wire straight into the concrete but as far as a builder is concerned where he is worried about productivity while tubing the deck, I think the electrical contractors increased productivity will have gone by the board when he comes to wire in conduit that has been damaged by the builder who has been in a hurry. Thank you, Sir.

Mr. C.E. Adams (Port Elizabeth): Mr. Chairman, I think I might give a couple of answers to the question that was actually posed. In P.E. this conduit is used extensively and the only problems that we have come across are where it has been used in roof spaces. We find that over a period of time with contraction and expansion of the conduit it pulls loose at the joints and from the boxes. The problem appears to be that the adhesive was not properly applied or not sufficient adhesive was used. As far as decking is concerned, it's used very successfully, in P.E. we actually do a large amount of work ourselves in municipal buildings and we are currently using this plastic conduit on a contract for 1800 houses which are being built by the precast slab construction method, where all the conduit is embedded in the precast slabs. So it does prove very successful for decking work. Another problem that we came across recently, when the oil crises hit us, was that conduit of a

bad batch or bad mix must have been put on the market because this cracked very easily. It did not deform at all and tended to crack and split. So I think the standard for the mix and manufacture must be very stringent. But I can say from our experience that it has proved very successful and we are using it extensively. Thank you.

Mr. M. Franke (Affiliate): Mr. President, Mr. Chairman, Gentlemen, with respect not to be mistaken with my more famous brother from GEC. I have been connected with the manufacture of non-metallic conduit systems since its inception in 1971, and whilst at the moment more than 85% of municipalities have approved them use, I would very much like to hear from any authority who might have had any problems. We have found when conductors many lecture tours throughout the country with which I personally have been involved have found that basically there is nothing wrong with the product. The problem lies with the local authority in not implementing manufacturers recommendations for installation. As one company involved very much in this manufacture we would like to make ourselves available to any authority in the country who are experiencing any installation problems, by offering our services to them, in the correct techniques of installation for non-metallic conduit. Thank you gentlemen.

Mr. D.C. Palser (Cape Town): Mr. Chairman, we in Cape Town have had frequent complaints from consultants and others that, because of the wide variety of tariffs adopted by municipal electricity undertakings throughout the country, they find great difficulty in interpreting them and relating costs of supply under various tariff rates.

I realise that this subject has been debated before at a number of previous Conventions. The President referred to it yesterday. I think this was one of the very first subjects they considered 60 odd years ago at the first Convention. I would stress that I am referring now to standardisation on traffic structures. I am not suggesting that we should standardise on actual monetary rates. Obviously these must vary from one undertaking to another depending on their particular cost structures. The electricity supply industry in South Africa is now well established having a history of some 70 years. Systems of generation, transmission and distribution are reasonably standardised and the commercial principles are well understood. There is accordingly, I submit, no valid reason why electricity tariffs cannot now also be standardised and reduced in number.

Great accuracy in refinement in the formulation of tariff rates is not warranted for several reasons. Firstly, the cost of electricity to any consumer is generally not a significant percentage of his other costs or expenses. Secondly, it is not possible to calculate with great accuracy the true costs of supply at any particular point on the system. Thirdly, the indivisible costs, namely those that are neither demand related nor unit related, can usually be spread, and usually are, in a rather arbitrary or what the traffic-will-bear basis, and finally and perhaps most significantly, once the engineer has decided on what he considers to be the correct tariff rates should be, Council for either politically or financially motivated reasons to balance the budget, perhaps again modifies the tariff in the process. Basically for these reasons, it is considered that possibly three of four basic tariff structures should prove to be adequate. Escom are moving in this direction. A study of the various tariff rates recently published for their nine undertakings indicates a large measure of uniformity. Basically they have a Large Power Users rate, a Small Power Users rate and a Domestic rate. Now if Escom can achieve this degree of uniformity, I do not see why we, the municipal electricity undertakings, cannot also achieve some measure of uniformity here and standardisation. I consider that rationalisation and standardisation will not only make the interpretation and appreciation of tariff structures easier, but possibly more important, will lead to more equitable rates to all consumers and reduce administrative and other allied costs. I consider that positive steps towards such standardisation should be undertaken by a central sub-committee comprising one member from each of the five regions and possibly a representative from Escom. Depending on the general feeling today, I would suggest that active steps should be taken to do something along these lines. Thank you.

Mr. W. Barnard (Johannesburg): I fully endorse what Mr. Palser said but I think that we are inclined to over complicate the issue. Johannesburg has in recent years revised our electricity tariff structure and basically we have got down to 3 tariffs, viz. a domestic block tariff, a commercial block tariff and a demand tariff.

Mr. Pat Middlecoate (Quizmaster): You know a hardy annual always shows there is good reason for worrying about something and normally a hardy annual means we are running away from a problem. You know the IEC was formed in 1907 and the first problem they set themselves was to standardise voltages. Since then they have standardised everything but they have not standardised voltages because they kept on running away from it. So we have 200, 220, 230, 240, 250. You name it, we've got it. Now this requires positive action - I think Mr. Palser's point is right. You've got to get someone who is going to put out a draft. And I think if you form a committee and find the willing horse to draft some basic form of model tariffs, Johannesburg's tariffs could form the basis.

Mr. A.H.L. Fortman (Boksburg): Just a brief note if this is to be done, then I suggest that the committee collects tariffs from umpteen municipalities/local authorities for reference. Thank you.

Mr. W. Barnard (Johannesburg): First of all, could I ask for a correction to the question on the 5th line of the Administrators Notice, 1956, the word 'both' should be deleted. I am concerned about how we in this country are going to deal with the installation of television aerials systems and who is going to carry out the inspection. As far as I know, the only legislation is in the Transvaal. We have discussed this legislation in Johannesburg with our Civil Engineering Department and also with the legal Department. The way we see the problem is that firstly, any television aerial that is installed, may not be installed without prior approval, and I want to emphasise the word prior, if the television aerial system extends or projects more than 3 metres above the highest point of the building. Our contention is that the motivation is firstly to be satisfied with the aesthetics and secondly, with the structural strength. We consider there is no need to test or approve the electrical installation as such. The second part of this legislation requires notification of completion within fourteen days of any aerial system and the issue to the local authority and the purchaser of a warranty. This bears out my first point that if we are only to get notification within fourteen days, it will in any event be too late to test the installation as there are certain earthing requirements which would require physical measurement to confirm compliance with the code of practice. The local authority must keep a record of all installations and this must be opened for inspection. I feel that both of these requirements should be enforced by the Civil Engineering Department and In Johannesburg we have in fact come to such an agreement. The Electricity Department would only be involved, if a dispute arises at a later date and we are in such circumstances prepared to act as the arbitrator and to inspect the installation. I think a certain amount of confusion has arisen because the particular Provincial Notice gives the local authority the right to enter the premises and inspect such aerial systems. Our legal advisors are satisfied that this does not impose a liability on the local authority to inspect, it only gives them the right. Thank you.

Mr. D.C. Palser (Cape Town): In Cape Town we had a similar problem. When we first saw the Transvaal draft Ordinance when it was forwarded to us for consideration we could see the dangers in adopting it as it stood. Adoption of it as it stood would probably have placed the onus squarely on the electrical engineer. So we discussed this with Province and as a result amendments were made and a Standard Bylaw was promulgated in the Cape in February this year. When I say "me" I mean the Cape of Good Hope Branch collectively. We inserted the word "structural" before "safety" to quite clearly emphasise that this was a structural problem, not an electrical problem. Although this Bylaw was promulgated in February it does not mean that municipalities automatically follow it; it has to be formally adopted by each individual Council. So I can only suggest that as far as the Transvaal is concerned they should amend their Ordinance and "pass the buck" to the City Engineer. Thank you.

Mr. E. Trautmann (Ladysmith, Natal): Mr. Quizmaster, I had this ironed out with our colleague civil engineer and I was winning, but they had a very strong argument that in certain bylaws (and we have got one of them in Ladysmith) the electrical department is responsible for the inspection of aerials. This is an old timer and it was very likely the intention of this bylaw to ensure that high structure aerials of the old days would not interfere with overhead wires along the properties. I explained to my colleague that this has nothing to do with television aerials where we have only one problem which is lightning and earthing and our department has never had any connection with lightning spikes or lightning protection of houses. So this is just a warning that if these gentlemen come with such an idea, it is something different. Thank you.

Mnr. E.E. de Villiers (Rustenburg): Mnr. die vraesteller, hierdie probleem dink ek maak ons baie groter as wat dit werlik is. U weet die dag van televisie het so skielik oor ons gekom en die wetgewing wat die Transvaalse provinsie uitgebring het nie ook ewe skielik oor ons gekom. Ons stadsraad het gevrees ons mag nie agterby nie en dit was onmiddellik besluit dat die elektrotegniese ingenieur moet die saak onder hande neem. Ek het tot dusver nog nie eintlik probleme ondervind nie. U weet wanneer daar bouplanne ingedien word van groot geboue en dies meer dan kom die bouplanne tot oog altyd by die elektrotegniese ingenieur om daardie bouverordening moet goedgekeur word deur die stadsingenieur of deur sy bousafdeling. Nou voek ek dit waar ons moet uiteindelik tog vir begroting toets en moet toets vir kanale wat aan met elektriese kanale in groot geboue geïnstalleer word, dat daardie dinge basies die verantwoordelikheid van die elektrotegniese ingenieur is. Waar in die kleinere dorpe die elektrotegniese ingenieur in die meeste gevalle ook die meganiese seksie behartig en hanter moet die sterkeste van sodanige strukture tog sekerlik ook onder hom val. Dit sal miskien nie in Johannesburg en in groot stede die gevall wees nie. Waar ons dan voel dat dit nodig mag wees dat die stadsingenieur moet intree, dan verwys ons eenvoudig daardie sketse en planne en aansoeke oor ook na hom vir sy kommentaar en goedkeuring. So op hierdie stadium kan ek

noch niks verkeerd daar mee sien dat die kleiner dorpe se elektroteg-niese en meganiese ingenieurs daar die wetgewing moet administrateer nie. Dankie.

Mr. P.v.E. Rautenbach (Affiliate): I would like to deal essentially with parts 2, 3, 4 and 5 of the question. I think that everybody present at this Convention has gathered that the Electrical Contractor's Association is the nigger in the wood pile. We are the people who have called for the commission of inquiry into these various aspects of our industrial legislation and as you heard yesterday this request was not acceded to. Mr. Quizmaster, this matter is very complex. Let us not kid ourselves. And it certainly needs investigation. Whether by means of an official commission of inquiry or not. But we as an Association believe that the time has come that we must put our heads together and try and come up with a reasonable answer. Mr. Quizmaster, it's quite obvious that the question revolves about the Electrical Wiremen's and Contractor's Act. Mr. Quizmaster, I have done a fair amount of research into this act and I want to tell your Convention about a number of interesting things about this Act. This Act first went to Parliament in a bill form in 1938 and debated at very great length. Anybody wanting to go into the background of the intention of the reasons for the Act will find that a Commission of Inquiry that sat in 1935 into all aspects of industrial legislation, found that there was full justification for the registration of various types of artisans in our country. The registration of electricians and plumbers. Now the enactment came into effect in 1939 and our Association believes that the application of the Act was ended by the outbreak of World War II and the very rapid economic development of the country.

The Act was never really effectively applied and it was applied in certain areas of the country only. The result is, Mr. Quizmaster, that we as an industry, and when I speak about the Electrical Contracting Industry, I speak here about the joint enterprise of Electrical Contractors and their employees which has grown to the extent where the industry as such has a gross annual output of R130 million a year. We now find that we are operating under extremely onerous conditions. We would also just like to put it to you that this Act cannot be seen in isolation. It must be seen in relation to the Factories, Machinery and Building Works Act and another Act of Parliament which affects us very much is the Industrial Conciliation Act. Mr. Quizmaster, we find that in the Industrial Conciliation Act, in our application of the Act, it all hinges around the definition of the "Electrical Contracting Industry". We have found some interesting interpretations which have been given to certain definitions in the Act that does not fit in with our requirements under the Industrial Conciliation Act. We are finding it extremely difficult as an industry to regulate our conditions of employment with our employees because we just don't know where we are. Mr. Quizmaster, I could just sum up our question by saying that it's a complex matter and there is no answer. We do not think that we have the answers but at least I could just put it to your Convention that my Association has looked into similar legislation elsewhere. We will be attending an international conference in Paris in a few weeks time where an entire session of the conference will be devoted to legislation of this

nature. We can only appeal to everybody for more liaison. Laat ons by-mekaar kom en oor die saak praat. Dankie.

Mar. J.G. Wannenburg (Departement van Arbeid): Menseer die President, daar is 'n saak wat ek graag onder die aandag van afgevaardigdes wil bring. Ek is ook gevra deur mnr. Gibbs, die President van die Instituut vir Gediplomeerde Werktuigkundige en Elektrotegniese Ingenieurs van Suid-Afrika, om u kortlik oor hierdie saak toe te spreek. Dit gaan oor die misverstand en bedenkings wat daar bestaan oor die moontlikheid dat die Gediplomeerde Ingenieurs, soos ons hulle vandag ken, gaan verdwyn en vervang gaan word deur professionele ingenieurs. Hierdie gedagte is natuurlik geheel en al foutief en ongegrond. Die Wet op Fabriekse, Masjinerie en Bouwerk vereis dat die bedryf, instandhouding, installering, herstel en bediening van masjinerie die verantwoordelikheid van 'n bevoegde persoon moet wees, wat, afhangende van die kraglewing, 'n bevoegde persoon of 'n gediplomeerde ingenieur moet wees. Hierdie persoon is duidelik omskryf in die Wet. (Kyk na Regulasies C1) (1) en C1(6) en ook na die woordomskrywing van bevoegde persoon. Nêrens in hierdie Wet word enige bevoegdheede op verantwoordelikheid aan 'n Professionele Ingenieur toegedien of opgeblaas nie. Al is 'n persoon nou ook 'n honderd keer 'n professionele ingenieur, en al besit hy ook hoeveel doktorsgrade of ander grade in ingenieurswese mag hy nogtans nie die verantwoordelikhede van 'n gediplomeerde ingenieur oorneem nie en kan hy nie as sulks aangelewer word ingevolge die regulasies wat kragtens die Wet op Fabriekse Masjinerie en Bouwerk afgerekondig is nie, tensy hy in die eerste plek in best is van 'n sertifikaat van bevoegdheid as ingenieur nie.

'n Verdere feit is ook dat in die Wet op Professionele Ingenieurs, dit duidelik gestel is dat daardie Wet geen afbreuk sal doen aan die vereistes van die Wet op Fabriekse, Masjinerie en Bouwerk, of die Wet op Myne en Bedrywe nie. Nou gebreel dat dit Munisipale Owerhede dikwels vakature vir ingenieurs adverteer. Die vereistes word dan gestel as dat die applikant eerstens 'n professionele ingenieur moet wees of as sulks aanvaarbaar moet wees, tweedens, 'ngraad in ingenieurswese moet besit, en derdens dat 'n sertifikaat van bevoegdheid 'n aanbeveling sal wees. So 'n advertensie is om die minste te se, totaal van die spoor af. Daar is niks mee verkeerd om eersgenoemde twee kwalifikasies as vereistes te stel nie, en gelukkig is die raad wat 'n persoon kan bekom, maar die primêre vereiste vir aanstelling van 'n ingenieur ingevolge die vereistes van die Wet, is en bly dat hy in besit moet wees van 'n sertifikaat van bevoegdheid, en by hierdie vereiste kan er sal geen plaaslike owerheid by verby kan kom nie. Sien Staatskoerant Nr. 2298, Kennisgewing Nr. R382 d.d. 14 Maart 1969 bladsy 18, aanhangsel A sub D.

Menseer die President, ek vertrou dat ek hiermee vir goed hierdie verkeerde gerus die kop ingeslaan het. Persone wat besig is met hul studies ter verwerving van die sertifikaat van bevoegdheid kan dus met 'n geruste hart voort studeer, hulle toekoms bly onsaagbaar deur die Wet op Professionele Ingenieurs. Ek sal dit ook waardeer as hierdie feite onder die aandag van Plaaslike Owerhede gebring kan word, veral diegene wat vir die opstel van advertensies verantwoordelik is. Dankie.



Kyk hoe ontspanne is die Potchefstromers by die Tropiese Aand-funksie. Eugène Pretorius, Rtd. Charlie de Koch en Burgemeester Schwellnus.

Mr V A Raynal, Assistant City Electrical Engineer (Distribution), Electricity Department, City Council of Johannesburg.

Mr Victor Anton Raynal was born in 1925 in Mozambique and educated in Johannesburg at the Marists Brothers and Witwatersrand Technical Colleges.

He commenced his career with the Electricity Department of the City of Johannesburg as an apprentice in 1942 and after the award of a Council Scholarship graduated from the University of the Witwatersrand in 1946.

Returning to the Council in 1952 from a period of post graduate training in Britain, he held various posts in the Technical Office, Sub-stations Branch, Distribution Construction Branch and the Distribution Division, before being appointed to his present position in 1970.

Mr Raynal has been engaged in the planning, construction, operation, maintenance and extension of the Council's high and low voltage transmission and distribution systems during a period of unprecedented growth.

The distribution network he administers caters for the needs of a high-density area of approximately 500 square kilometres comprising residential, industrial and commercial load with a maximum demand exceeding 1 000 MW.

He is a member of the Council of the South African Institute of Electrical Engineers and is the author of two Institute papers entitled "Cable Fault Location" and "Insulating Oil in Relation to the Maintenance of Power Transformers". He is at present a member of the Co-ordinating Committee engaged in drawing up standards for essential services in new residential townships in the Republic (Nienmaan Commission).

Mr Raynal is the third generation of a family that has been engaged in the electrical supply industry since 1898.



A MODERN APPROACH TO THE RETICULATION OF RESIDENTIAL TOWNSHIPS

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'N MODERNE BENADERING TOT DIE RETIKULERING VAN WOON- GEBIEDE

INHOUD

1. Opsomming
2. Inleiding
3. Geskiedkundig
4. 'n Moderne Benadering
5. Huidige praktyk
6. Algemeen
7. Gevolgtrekking
8. Erkenning
9. Verwysings
- Blyses

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1. OPSOMMING

'n Oorsig word gegee van die ontwikkeling van retikuleringspraktyk vir woongebiede met besondere verwysing na die verspreidingsstelsel van die stad Johannesburg.

Die skrywer beskou bedryfsveiligheid, buigsaamheid en groeivermoë as die belangrikste ontwerp faktore.

2. INLEIDING

Gedurende die afgelope 20 jaar het die leveringsliggame aansienlike ondervinding opgedoen op die gebied van die installering, werking en onderhoud van retikuleringsstelsels in woongebiede.

Van die oorwegend LS-verspreiding in die 1950's is daar in die 1960's geleidelik oorgeskakel na HS-netwerke. Ondanks gestigde toename in de laagdrukte wil dit voorkom of 'n kompromis van die twee stelsels nou egter die moderne benadering is, met die klem op veiligheid, buigsaamheid en groeivermoë.

Omdat die koste om paase, riolering, water en elektrisiteit in nuwe dorpe te verskaf, 'n direkte uitwerking op die verkoopprys van standplaas het, is provinsiale overhede tens begin ons rigoerose vir die verskaffing van hierdie noodsaklike dienste op te stel sodat dit kan dien as 'n middel om die koste te beperk.

Hoewel die ontwerp van die retikuleringsstelsel wat in hierdie referaat beskryf word, nie nuut is nie, is die mening dat die keuse van toerusting vir veiligheid en groepotensiaal sowel rasional as ekonomies is en dus geskik is om as leiding gebruik te word vir die retikulering van nuwe woongebiede.

1. SUMMARY

The Development of Residential Township Reticulation practice is reviewed with particular reference to the City of Johannesburg's distribution system.

The author considers the most important design factors are safety of operation, flexibility and capacity for growth.

2. INTRODUCTION

During the past 20 years, considerable experience has been gained by supply authorities in the installation, operation and maintenance of reticulation systems in residential townships.

From predominantly LV distribution in the 1950's the trend moved towards HV reticulation in the 1960's. In the face of steadily increasing load densities, however, a compromise of the two systems now seems to be the modern approach with emphasis on safety, flexibility and capacity for growth.

Because the cost of providing roads, sewerage, water and electricity in new townships directly influences the selling price of erven, provincial authorities are presently engaged in drawing up guidelines for the provision of these essential services as a means of keeping down costs.

Although the design of reticulation system described in this paper is not novel, the choice of equipment for safety and growth potential is considered to be both rational and economical and hence suitable as a guide in the reticulation of new residential townships.

gedoe). Koöperatiewebestuur geniet nou voorrang in plasslike bestuur in die Verenigde Koninkryk bo die formele proses van program begroting. 'n Verenigde koöperatieweplan, vir die elektrisiteitsvoorsieningswyerheid as 'n geheel is onlangs opgestel en voorgelê aan die Minister vir Energie. Dit bevat 'n lys van objekte vir die industrie, maar die algemene gevoel wat programme begroting betref is dat gedagte aan die relatiewe beperkte bestek van aktiwiteite binne 'n elektrisiteitsraad in vergelyking met die veleuvelige aktiwiteite in 'n plaaslike bestuur kan daar slegs 'n beperkte veld wees waar programme begroting toegestaan kan word.

Aan die ander kant het elektrisiteitsmutsdienste in die V.S.A. elemente van P.P.B. bevat lank voordat sulike beginstelsel vir ander regeringsdienste probeer is. Baie het gedetailleerde koste stelsels wat koste in per-eenhede koste meetings uitbeeld. Vir die inligting oor die V.S.A.-stelsels erken ek die bystand wat ek ontvang het van die Directeur van die Municipal Finance Officers Association of United States and Canada, die Bestuurders van die Departement of Water and Power of the City of Los Angeles, die Utilities Departments of the City of Anaheim, die Department of Lighting of Seattle, die Department of Power and Light of the City of Lubbock en die Tennessee Valley Authority. Van die verskillende programme dokumente wat ontvang is, het ek die inligting van Los Angeles meer gebruik as enige van die ander in die voorbereiding van die programme wat in Aanhangsel A uiteengesit is. Baie van u sal onthou dat die Stad van Los Angeles eerste was op die gebied van prestasie begroting in die V.S.A. onmiddellik na Wêreldoorlog II, hulle was eerste op die gebied van programme begroting. Die Algemene Bestuurder en Hoof Ingenieur van die Departement van Water en Krag berei elke jaar, as 'n byvoeging tot die begrotingstaat, 'n "detail van departement programme" wat 'n onvattende dokument is wat 'n onderverdeling van aktiwiteite toon onder die volgende hoof opskrifte ten opsigte van die kragonderneming:

- (1) Beplanning en Ontwikkeling
- (2) Kapitaal Verbetering en Uithreidning
- (3) Instandhouding en Reparasies
- (4) Bedrywigheid
- (5) Verbruikersdienste
- (6) Tegniese Hulp
- (7) Algemene Administrasie en Hulp
- (8) Andere Hulp
- (9) Kapitaal Delging en Rente

Die sal op prys gestel word dat die programme begroting soos dit die Aanhangsel A uiteengesit is slags een benadering voorstel, wat op bestaande aktiwiteite en bestaande rekeningkundige inligting gebaseer is. Ek moet erken dat ek 'n sterk ondersteuner van hierdie benadering is, wat vanaf bekende inligting na nuwe programme beweeg. In die oorsig wat deur die International Institute of Administrative Sciences uitgevoer is, waarna hiervoer verwys is, is dit gevind dat basie van die organisasies wat programme begroting geïmplementeer het nou terugker toe 'n evaluasie van bestaande programme en aktiwiteite as 'n basis vir die instelling van gefinsteerde stelsels.¹⁷ Dit is duidelik 'n verandering van die vorige zero-basis benadering tot omvattende PPB stelsels wat 'n 'across-the-board' benadering gebruik het van die top-afwaarts waarin meeste departementeel en ingekankerde organisatories patronele verwerp is en nuwe programme geïnstalleer is bloot op 'n basis van stelsel analise. Die Management Services Manager van die Stad van Anaheim Utilities Department, California, het in 'n onlangs brief aan my gemeld "our past experience has shown that efforts to impose a programme or responsibility accounting system from the top has met with very, very little success. In fact, the City of Anaheim some 5 years ago attempted to install a programme budgeting system from the top downwards in which most departmental and entrenched organisational patterns were swept aside and new programmes installed purely on the basis of systems analysis. The Management Services Manager of the City of Anaheim Utilities Department, California, stated in a recent letter to me "our past experience has shown that efforts to impose a programme or responsibility accounting system from the top has met with very, very little success. In fact, the City of Anaheim some 5 years ago attempted to install a programme budgeting system from the top and it failed within about a year. I attribute its failure to a lack of involvement of the first and second level supervisors in the development of the programme. It was essentially conceived and executed by a small group of people at top management levels with very little understanding of lower level management responsibilities and needs."

In ooreenstemming met aanhangsel A, sal die opgesomde totale programme begroting as volg lees:

1974/75 Begroting

	R
1. Bedryf	59 200
2. Stelsel Instandhouding	166 800
3. Kapitaal Verbeterings- en Uithreibingsprogramme	1 134 000
4. Dienste aan Randseisoenom	115 900
5. Tegniese Hulp	70 000
6. Verbruikersdienste	91 800
7. Bestuur	235 800
8. Elektrisiteitsvoorsiening	2 600 000
9. Kapitaal Finansiering	680 000
TOTAAL	5 153 500

Die interessante feit omtrent 'n begroting wat op bogemelde wyse opgestel is, is die feit dat dit die invoer van totale hulpbromme behels. Die totale beraamde uitgawe van R5 153 500 verteenwoordig in monetêre terme die totale hulpbromme beskikbaar aan die Elektrisiese Ingenieur in daardie besondere finansiële jaar. Dit sluit menslike hulpbromme en

dom rather than the formal process of programme budgeting. A unified corporate plan for the electricity supply industry as a whole has recently been prepared and submitted to the Minister for Energy. This contains a list of objectives for the industry, but the general feeling regarding programme budgeting is that in view of the relatively limited range of activities within an electricity board compared with the multiplicity of activities in a local authority there can only be a limited field where programme budgeting might be applied.

On the other hand, the electric utilities in the U.S.A. have had elements of PPB long before such principles were attempted for other governmental operations. Many have detailed costing systems reflecting costs in per-unit cost measurements. For information on U.S.A. systems I acknowledge the assistance I have received from the Director of the Municipal Finance Officers Association of United States and Canada, and the Managers of the Department of Water and Power of the City of Los Angeles, the Utilities Department of the City of Anaheim, the Department of Lighting of Seattle, the Department of Power and Light of the City of Lubbock and the Tennessee Valley Authority. Of the various budget documents furnished, I used the information from Los Angeles to a greater extent than any other in the preparation of the programmes set out in Appendix A. Many of you may recall that the city of Los Angeles was the first in the field of performance budgeting in the U.S.A. immediately after World War II and they were one of the first in the field of programme budgeting. The General Manager and Chief Engineer of the Department of Water and Power prepares every year, as a supplement to the budget statement, a "detail of department programs" which is a comprehensive document setting out a break-down of activities under the following main headings in respect of the power system:

- (1) Planning and Development
- (2) Capital Improvement and Expansion
- (3) Maintenance and Repair
- (4) Operations
- (5) Customer Services
- (6) Technical Support
- (7) General Administration and Support
- (8) Other Support
- (9) Bond Redemption and Interest

It will be appreciated that the approach to programme budgeting set out in Appendix A represents only one approach, based on existing activities and existing accounting information. I must say that I am firm believer in this approach, which proceeds from known information to new programmes. In the survey carried out by the International Institute of Administrative Sciences referred to above, it was discovered that many of the organisations implementing programme budgeting are now returning to an evaluation of existing programmes and activities as a base for the introduction of integrated systems.¹⁷ This is certainly a change from the former zero-base approach to comprehensive PPB systems involving as they did an across-the-board approach from the top downwards in which most departmental and entrenched organisational patterns were swept aside and new programmes installed purely on the basis of systems analysis. The Management Services Manager of the City of Anaheim Utilities Department, California, stated in a recent letter to me "our past experience has shown that efforts to impose a programme or responsibility accounting system from the top has met with very, very little success. In fact, the City of Anaheim some 5 years ago attempted to install a programme budgeting system from the top and it failed within about a year. I attribute its failure to a lack of involvement of the first and second level supervisors in the development of the programme. It was essentially conceived and executed by a small group of people at top management levels with very little understanding of lower level management responsibilities and needs."

In accordance with Appendix A, the summarised aggregate programme budget would read as follows:

1974/75 Budget

	R
1. Operation	59 200
2. System Maintenance	166 800
3. Capital Improvement and Expansion Programme	1 134 000
4. Service to Council Property	115 900
5. Technical Support	70 000
6. Consumer Services	91 800
7. Management	235 800
8. Electricity Supply	2 600 000
9. Capital Finance	680 000
TOTAL	5 153 500

The interesting fact about a budget prepared on the above lines is the fact that it involves the input of total resources. The total estimated expenditure of R5 153 500 represents in monetary terms the total resources available to the Electrical Engineer in that particular financial year. It comprises human resources and material resources. How-

materiale hulpbronne in. Een belangrike doel van 'n program begrotingsstelsel is om nie slegs die invoer van hulpmiddelle in die vorm van personeel en materiaal aan te duie nie maar om albei aan te duie in diezelfde of ander dokumente wat die invoer van die hulpbronne is. In hierdie verband is die openbare dienste verskillend van die private sektor waar die meting van produksie makliker is. Daar is 'n noue verband tussen die invoer van hulpbronne en die uitvoer van 'n fabriek in terme van goedere wat geproduseer is. In die bevrugding van sosiale behoeftes, nogtans, is die meting van uitvoer nie so regstreeks nie.

Nisteernaamende hierdie feit, keer die proponente van 'n begrotingsvervorming al meer en meer tot die standpunt dat die finansiële begroting kan verlig word deur betekenisvolle aanwysers van uitvoer of volume, of kriteriae van doeltreffendheid kan verskaf word. Sommige hiervan is saamgevoeg in Aanhangaal A, en verskaf ten minste 'n mate van inligting wat bereik is met die geld wat bestee is. Die verslag van die Department of Education and Science (V.K.) het hulle as volg uitgegaan oor die meting van produksie: "The key to the objective assessment of performance is thus not necessarily quantification. The first step is the careful identification of objectives; the next is the identification of the type of evidence that is generally agreed to be an indicator of success. This evidence may or may not be quantitative; indeed, naive measurement can be harmful. For example, one of the indicators of success in basic research is the extent to which new discoveries are made, but it would be more illuminating to have expert judgements made about the importance of particular discoveries than to try and devise a numerical scale which in this instance would have no claim to objectivity."¹⁸

Ek wil graag dat Aanhangaal A beskou moet word as 'n uitdaging aan elektriese ingenieurs en tesouriers om iets beter voor te bring, om ook ander aanwysers te bepaal wat 'n effektiwe skakel tussen invoer en produksie kan verskaf, om die programme verder in elemente te verdeel (vervys Aanhangaal C). Die dokument moet as elasties beskou word en elke plaaslike bestuur moet self besluit hoeveel detail voorseen moet word vir besluitneming. Elektrisiteit is slegs een van die menigvuldige plaaslike dienste en die dokumentasie op die basis van Aanhangaal A vir die hele Munisipaliteit sal dus lywig wees.

'n Dokument soos Aanhangaal A is 'n bevredegende afspringsplek vir die instelling van die ander komponente van 'n program begroting stelsel soos analise en lang termyn projeksie. Die ruimte laat nie enige aandag aan hierdie ander komponente nie. Daar is 'n wye veld van evaluasie tegnieke wat vir die verskillende programme aangewend kan word,veral die Kapitaalwerke, en daar is hale maniere om data op 'n langtermyn basis te ekstrapoleer. Ek was gedwing in die ruimte wat beskikbaar is om hoofsaaklik op die toewyselement van program begroting te koncentreer. Kapitale programme en aanbieding van finansiële gestandaardiseerde rekenings sal nog nodig wees omdat ons die Staatstesourie, die Provinciale Ouditeure en die hadvogtige aanvraag van aanwendingsbeginseens ten einde die jaarlike belastinge te hef, het. Ook moet die elektriese ingenieur sy kapitaal- en instandhouingswerk programmeer vir 'n toekomstige tydperk in terme van bekende tegnieke. Program begroting vervang dit nie. Dit wend sleg 'n ernstige poging aan om beplanning en begrotings prosesse te integreer.

8. Slot

Ek was versoek in die voorbereiding van hierdie referaat om te dui in besonder hoe program begroting op die elektrisiteitsdepartemente toegepas kan word. In die voorafgaande seksies het ek een metode aangedui. Hoewel programme in selektiewe gebiede vangstel kan word, beklemt en ek weet dat program begroting as 'n volledige stelsel gesien moet word, hoewel dit oor 'n tydperk ingestel mag word. Sommige sal sê dat 'n elektrisiteitsonderneming nie die uiteenlopendheid van funksies het wat geskik is vir program begroting nie en dat daar in ieder geval minder gesien kan word in verband met die sesig persent van die begroting wat die aankoop van elektrisiteit en kapitale koste behels. Nogtans volstaan ek dat die inligting wat verskaf word vir die gekose verteenwoordiger, die elektriese ingenieur en die tesourier meer insigwendig is as die geval met die begroting soos ons dit vandag ken. Baie nuttige inligting word bewy uit die jaarlike verslag en ingehuis uit die begroting, en in die geval van elektrisiteitsondernemings in besonder is die aanwysers van uitvoer meer betekenisvol as in enige ander plaaslike dienste. Dit is makliker om die doeltreffendheid van 'n elektrisiteitsonderneming te meet as die doeltreffendheid van veekinders.

In die toekoms sal daar van rekeningskundige stelsels verwag word om inligting aan bestuur in plaaslike regering te verskaf op 'n basis wat verskillend is as tot tog toe. Ek weet dat tesouriers gretig is om hierdie behoeftes te vervul ten einde te verseker dat beter waarde verkry word vir die geld wat bestee word en die rekenaar maak hierdie verandering moontlik vanweë sy buitengewone kapasiteit om inligting in baie vorms van 'n enkel rekenkundige inskrywing voort te bring.

VERWYSINGS

1. Tomás O'Coigh, *New Integrated Systems of Planning and Budgeting*, International Institute of Administrative Sciences 1972, Page 48.
2. U.S.A. Commission on the Organisation of the Executive Branch of Government, *Budgeting and Accounting*, Washington D.C. Page 8.
3. Sien byvoorbeeld I.C. Hancock 'The American Experience' in *Pro-*

ever, one important aim of a programme budgeting system is to indicate not only the input of resources in the form of personnel and material but to indicate either in the same or other documents what the output is from the input of resources. In this connection the public services are different from the private sector where the measurement of output is from the input of resources. In this connection the public services and the output of a factory in terms of goods produced. In the satisfaction of social wants, however, the measurement of output is not so straightforward.

Notwithstanding this fact, however, the proponents of budgetary reform are coming more and more to the view that the financial budget can be illumined with meaningful indicators of output or volume, or criteria of effectiveness can be furnished. Some of these are integrated with Appendix A, and provide at least some information of what is achieved for the money spent. The report by the Department of Education and Science (U.K.) had this to say on output measurement:

"The key to the objective assessment of performance is thus not necessarily quantification. The first step is the careful identification of objectives; the next is the identification of the type of evidence that is generally agreed to be an indicator of success. This evidence may or may not be quantitative; indeed, naive measurement can be harmful. For example, one of the indicators of success in basic research is the extent to which new discoveries are made, but it would be more illuminating to have expert judgements made about the importance of particular discoveries than to try and devise a numerical scale which in this instance would have no claim to objectivity."¹⁸

I would like Appendix A to be regarded as a challenge to electrical engineers and treasurers to produce something better, to work out other indicators which could provide an effective link between input and output, and to break down the programmes further into elements (see Appendix C). The document should be regarded as flexible, and each local authority would have to decide for itself how much detail to present for decision-making. Electricity is only one of a multiplicity of local services and the documentation on the basis of Appendix A for the entire municipality would be formidable. In the case of large undertakings much truncation would have to take place.

A document like Appendix A is a satisfactory spring-board for the introduction of the order components of a programme budgeting system such as analysis and long-term projection. Space does not permit any attention to these other components. There is a wide range of evaluation techniques which can be applied to the various programmes, particularly the capital works, and there are many ways of extrapolating data on a long term basis. I have been compelled in the space available to concentrate mainly on the allocational element of programme budgeting. Capital programmes and presentation of financial standardised accounts will still be necessary because we have the State Treasury and the Provincial Auditors and the stern demand of appropriation principles in order to levy the annual rate. Also the Electrical Engineer will still have to programme his capital and maintenance work for a period ahead in terms of known techniques. Programme budgeting does not replace these. It merely makes a serious attempt to integrate the planning and budgeting processes.

8. Conclusion

I was requested in the preparation of this paper to indicate in particular how programme budgeting could be applied in an electricity department. In the preceding sections I have indicated one method. Although programmes can be determined in selective areas, I emphasise again that programme budgeting should be seen as an entire system, even though it may be introduced over a period. Some will say that an electricity undertaking does not have the diversity of functions suitable for programme budgeting and that in any case there is little one can do about sixty percent of the budget comprising the purchase of electricity and capital charges. Yet I submit that the information provided for the elected representative, the electrical engineer and the treasurer is more illuminating than is the case with the budget we it today. Much useful information is rescued from the annual report and integrated with the budget, and in the case of electricity undertakings in particular the indicators of output are more meaningful than in any other local service. It is easier to measure the efficiency of an electricity undertaking than the efficiency of traffic control.

In the future, accounting systems will be called upon to provide information to management in local government on a basis different from hitherto. I know that treasurers are anxious to fulfil this need in order to ensure that greater value is obtained for the money expended and the computer makes possible this change because of its extraordinary capacity to generate information in many forms from a single accounting entry.

REFERENCES

1. Tomás O'Coigh, *New Integrated Systems of Planning and Budgeting*, International Institute of Administrative Sciences 1972, Page 48.
2. U.S.A. Commission on the Organisation of the Executive Branch of Government, *Budgeting and Accounting*, Washington D.C. Page 8.
3. See for instance I.C. Hancock 'The American Experience', in *VMEO KONVENTSIE VERRIGTINGE MEI 1975* 111

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3. GESKIEDKUNDIG

Rekords² van die vroeë Johannesburg duis aan dat sekere dorpsgebiede voor 1900 van pasie, water in pype, rioleringstelsels, gas en telefone voorsien was.

In die meeste gevalle was elektrisiteit die laaste diens wat voorsien is, maar dit het gedurende die afgelope 50 jaar vinniger as alle ander dienste uitgebrei.

Die volgende is 'n kort oorskou³ van die ontwikkeling van woongebied-retikulering in Johannesburg gedurende die afgelope 75 jaar: 1900 – 1975.

Aan die end van die 1900/1-boekjaar was daar 947 gebruikers in Johannesburg. Hulle is gevoer deur middel van ondergrondse laes-spanningskabels wat voorsien is vanaf GS-generators of enkelefas-alternators wat in verskeie dele van die dorp geleë was.

Die neiging om deur middel van ondergrondse kabels te retikuleer, is moontlik veroorsaak deur die algemene praktyk om strate deur middel van ondergrondse hoofgaasseilings te verlig en die elektriese kabels is vermoedelik terselfdertyd gele.

In 1900 was die verbruik van elektrisiteit gemiddeld 20 eenhede/miaand per verbruiker en hul las het hoofsaaklik bestaan uit koolhooglampe. Daar is geen record dat die stelsel ooit oorslae is nie, maar dit is nie verbasend nie want elektrisiteit was toe 60c per eenheid.

1908 – 1914

Hierdie tydvak het die instellings van lampes met metaalgloeidrade en die eerste toestelle soos strykysters, ketels en kookplate ingelui. Die vinnige vervanging van hooglampe deur die doeltreffender metalagloeidraadlampe en die gewildheid van die vroeë toestelle het 'n ongewone waarde vraag na elektrisiteit laat ontstaan en dit het die produksiekoste in so 'n mate verlaag dat die Johannesburgse Gasvoorsienings-, Elektrisiteitsvoorsienings- en Tremwieldepartement eenhede teen ongeveer die helfte van die vroeë prysse kon verkoop.

Gedurende hierdie tydperk het probleme om berolasting en uitbreiding van kragnette opgeduk en die enigste uitweg was om boogrondse leidings op te rig om in die vrang na elektrisiteit te voorsien. Ingenieurs van daardie jare kan nou onthou hoe bykomende krag op 'n Dinodagoggend nodig was om aan die „stryklaas“ te voldoen. Aan die end van die 1914/15-boekjaar was daar 16 091 verbruikers.

1915 – 1924

Die uitbreiding van die verspreidingsstelsel is beperk vanweë die Eerste Wêreldoorlog en daaropvolgende probleme om toerusting te verkry, en die getal verbruikers in 1924 het sedert 1914 met slegs ongeveer 50% vermoeerd.

Dorp retikuleringskemas was hoofsaaklik op die grond omdat kabels ingevoer moes word en dus moeilik bekombaar was.

1925 – 1938

Elektriese stowe en waterverwarmers is vir die eerste keer in 1925 geïnstalleer en tot vandaag toe is dit die toestel wat die meeste krag verbruik in die gemiddelde huishouding.

Die uitwerking wat hierdie instelling op bestaande en nuwe dorpe in die laat 1920's gehad het, was om die vraag na diensaansluitings te vermoeer, en die getal verbruikers in Johannesburg het met 100% oor hierdie tydperk toegeneem. Inwoners van ou gevestigde voorstede soos Parkwood wat in 1925 bestaan het uit meer as 150 huise wat nie vir elektrisiteit bedraad is nie, het daarop aangesig dat die Johannesburgse Stadsraad hulle voortstaan moet retikuleer en hulle van diensaansluitings voorsien.

Daar was gedurende hierdie tydperk weinig twyfel dat bogrondse retikuleringsstelsels die ekonomiese was en die minste probleme opgelewer het om te installeer in 'n verspreidingsnet wat so vinnig uitgebrei het. Pale was nodig vir straatligte en soms, soos in die geval van Parkwood, om bogrondse hoofspanningshoofleidings te dra. Daarbenevendaar is dorpe tot 1938 sonder uitsondering uitgelê volgens „reglynige“ patrone met strate wat mekaar reghoekig kruis. Hierdie konfigurasie was ideal geskik vir die aanlê van bogrondse lyne.

Selfs in daardie dag was die publiek egter bewus van die teenwoordigheid van bogrondse lyne en ontwikkelwaars van prestigevoordele soos Saxonwold en Observatory, was bereid om die bykomende koste van ten volle ondergrondse retikulering te drin. Dit is deur die Raad aanvaar en 'n stelsel wat bestaan het uit ondergrondse LS-verdeelhoeofleidings, LS-gietysterpiplankaste wat die verspreidingsnet in sekserde verdeel het, asook aftakkelaansluitings is gefinstel.

Die huidige inwoners van Saxonwold en Observatory is baie dank verskuiklik aan daardie vroeë ontwikkelwaars vir hulle versiensheid. Die sypaadlys van albei voorstede spog vandag met pragtige plataan- en eikebome wat nie geen of vermink is om plek te maak vir bogrondse lyne nie. 'n Verdere voordeel is dat geen onderbrekings voorgekom het as gevolg van bome wat die bogrondse hoofleidings belemmer het nie.

In 1936 is die eerste Suid-Afrikaanse vervaardigde kabels in Vereeniging geproduus. Dit het die kabelprys mettertyd verlaag en ondergrondse retikuleringsstelsels meer ekonomies gemaak.

Vanaf 1933 was daar 'n aansienlike toenam in die getal motorvoertuie in Johannesburg. Dit het, soos later beskryf word, 'n aannemlike uitwerking op die uitleg van dorpe en gevoldig op elektriese retikulasiepraktyk gehad.

1939 – 1945

Gedurende hierdie tydperk van vyandelikhede was daar 'n ernstige tekort aan sowel ontwikkel- as verspreidingsstoerusting en dit het die

3. HISTORICAL

Records² of early Johannesburg indicate that before 1900, some townships were provided with roads, piped water, sewerage disposal, gas and telephones.

In the majority of cases, electricity was the last service to be provided but has, during the past 50 years, surpassed all other services in its rate of expansion.

The following is a brief survey³ of the development of township reticulation in Johannesburg during the past 75 years:-

1900 – 1907

There were 947 consumers in Johannesburg at the end of the 1900/1 financial year. They were fed by underground low voltage cables supplied from D.C. generators or single phase alternators situated in various parts of the town.

The trend to reticulate by underground cable may have been due to the prevailing practice of lighting streets by underground gas mains and electrical cables were presumably laid simultaneously with them.

In 1900, consumption of electricity averaged 20 units/month per consumer whose load consisted of carbon arc lamps. There appears to be no record of overloads on the system, which is not surprising considering that electricity then cost 60c per unit.

1909 – 1914

This era saw the introduction of metal filament lamps and the first appliances such as electric iron, kettles and hotplates. The rapid replacement of arc lamps with the more efficient metal filament lamps and the popularity of the early appliances created an unprecedented demand for electricity which lowered production costs to the extent that the Johannesburg Gas, Electric supply and Tramways Department was able to sell units at approximately half the earlier price.

During this period overloads and extension of mains problems arose and resort was made to the erection of overhead mains to meet the demand for electricity. Veteran engineers can remember the days when additional generating output was called for on a Tuesday morning to meet the "ironing" load. The number of consumers recorded at the end of the 1914/1915 financial year was 16 091.

1915 – 1924

Because of the First World War and subsequent difficulty in procuring plant, expansion of the distribution system was restricted and the number of consumers in 1924 had only increased by approximately 50% since 1914.

Township reticulation schemes were predominantly overhead because of the difficulty in obtaining cables which were all imported.

1925 – 1938

Electric stoves and water heaters were first installed in 1925 and to this day remain the largest power-consuming appliances in the average domestic household.

The effect this introduction had on existing and new townships in the late 1920's was to boost the demand for service connections and the number of consumers in Johannesburg increased by 100% over this period. Residents of old established suburbs such as Parkwood, which in 1925 had over 150 houses that were not wired for electricity, demanded that the Johannesburg City Council reticulate their suburb and provide them with service connections.

There was little doubt during this period that overhead reticulation systems were the most economical and the least trouble to install in a rapidly expanding distribution network. Poles were needed for street lighting and in some cases to carry high voltage overhead mains as was the case in Parkwood. Furthermore, township layouts up to 1938 were invariably along "rectilinear" lines with streets criss-crossing at right angles. This configuration was ideally suited to overhead line construction.

Even in those days, however, the public was conscious of the presence of overhead lines and developers of prestige suburbs such as Saxonwold and Observatory were prepared to meet the additional expense of fully underground reticulation. This was accepted by the Council and a system comprising underground LV distributors, LV cast iron pillar boxes which sectionalsed the distribution network and "T-off" service connections was installed.

The present residents of Saxonwold and Observatory are indebted to those early developers for their foresight. Today the pavements of both suburbs boast magnificent plane and oak trees that have not been cut or mutilated to make way for overhead lines. A further benefit has been freedom from outages caused by the interference of trees with overhead mains.

In 1936 the first South African manufactured cables were produced in Vereeniging. This had the effect, in the long term, of reducing cable prices and making underground reticulation systems more economical.

From 1933 onwards there was a rapid rise in the number of motor vehicles in Johannesburg. This was to have a significant effect on the layout of townships and consequently on electrical reticulation practice as will be described later.

1939 – 1945

During this period of hostilities there was an acute shortage of both generation and distribution plant which restricted expansion. The

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uitbreiding aansienlik gestrem. Die meteoriese toename in die getal motorvoertuie in die V.S.A. gedurende die 1930's het daaroor gelei dat dorpsbeplanners nuwe dorpe moes uitbou volgens wat beskryf kan word as die „kromlynige patroon“. Die ou „reglynige patroon“ om dorpe uit te lê, is as ongeskik bevind vir die moderne lewenswyse omdat elke straat feitlik 'n „deurpad“ vir voertuigverkeer was, gevvolglik was inwoners van hierdie dorppe blootgestel aan aansienlike lug- en geraasbedoeeling.

Die nuwe „kromlynige patroon“ wat ontwikkel is, het voorstelling gevraak vir korte strate en doordlopende strate aan die een kant en 'n reeks breër strate wat deurverkeer tot besige hoofpaaie beperk het aan die ander kant.

Britse en kontinentale dorpsbeplanners het hierdie ontwikkeling toegegaan by die herbouing van tale van die stede in Europa wat deur bomme verwoes is.

1946 – 1960

Gedurende hierdie tydperk het die getal voertuie in Johannesburg feitlik verdubbel. Dit en die daaropvolgende toename in die getal voertuie in die stad – wat tans op 1 000 voertuie per maand te staan kom – word aangegeto in Figuur 2.

Figuur 1 toon die stygting in die huishoudelike verbruik van elektrisiteit in die stad en is ingesluit vir vergelyking met Figuur 2. Die merkwaardige ooreenkoms tussen die twee krommes diu daarop dat enigeen as 'n barometre van voorspoed beskou kan word.

Die meeste dorpe soos by Roosevelt Park – wat onmiddellik na die oorlog opgerig is, was volgens die „kromlynige patroon“ uitgeleë.

Ongelukkig was dié elektrisiteitsretikuleringspraktyke op daardie tydstip nie voldoende ontwikkel om by die nuwe patroon aan te pas nie en verskeie van hierdie vroeë na-oorlogse dorpe is deur middel van 'n konvensionele stelsel van bograndse hoofleidings benet.

Die resultate is hoogs onvredigend en hierdie voorsteeds het van dag nog die probleem van bograndse lyne wat uit een en twee spanne bestaan en wat met ankers soos staan- en lugankers, vervuil is om die bograndse hoofleidings op krom paaie te steun.

Na 1960

Die eerste OWV-(ondergrondse woonverspreidings-) net in Johannesburg is in 1961 in Montgomery Park⁴ geïnstalleer en is daarvaar gevorder deur ander enkelfasige HS-stelsels in Triomf, Victory Park en Kensington⁵.

Dit is gevind dat enkelfasige HS-retikulerings beperkings het – veral waar die las aansienlik toeneem. Verdere nadelle was 'n toenemende onklaarskrakingstempo en hoér onderhoudkoste wat gepaard gaan met 'n oorheersende HS-net waar tot 10 maal die getal HS-kabeleindepunte nodig was vergeleke met 'n konvensionele LS-retikuleringsstelsel. In 1966 is enkelfasige stelsels vervang deur driefasige OWV-stelsels wat van kompakte HS-skakeltuig en miniatuursubstanties met 'n aanslag van 200 kVA en later 300 kVA gebruik maak.

Gedurende die afgelope dekade is meer as 650 miniatuursubstanties in Johannesburg geïnstalleer en in gebruik gestel.

Die vroeëre driefasige OWV-stelsels is verbeter en ontwikkel om, soos later beskryf sal word, 'n hoë mate van buigsaamheid, bedryfsveiligheid en groeivermoë te verkry.

4. 'N MODERNE BENADERING

Die volgende toestande word as noodsaaklik beskou vir die retikuleringskema van 'n moderne woongebied:

- (1) Die verspreidingsstelsel moet ondergronds wees.
- (2) Bedryfsveiligheid moet die vernamaakte corweging wees.
- (3) Die stelsel moet buigsaam genoeg wees om vir alle tipes dorpsuitleg en toekomstige uitbreiding voorbereiing te maak.
- (4) Die groeivermoë moet voorstelling maak sodat die aanvanklike vermoë van die skema binne die amortiseringstydperk van 25 jaar verdriedubbel kan word.
- (5) Maksimum kontinuiteit van toevervoer moet voorsien word.
- (6) Elektriese toerusting moet kompakt, duursaam en onopsigtelik wees en gespasieerd word waar dit met die omgewing sal saamsmel, maar nie daardeur beïnvloed sal word nie.
- (7) Die finansiële lewensvatbaarheid van die skema moet verseker wees.

5. HUIDIGE PRAKTYK

Figuur 3(a) en (b) toon 'n tipiese moderne OWV-skema vir die retikulering van 'n woongebied in Johannesburg. Figuur 4(a), (b) en (c) gee besonderde uitleg van die HS- en LS-hoofverspreidingsnet en LS-diensnetbeels.

Die volgende opmerkings is 'n uitbreiding van hierdie figure en dui aan hoe die Johannesburgs Elektrisiteitsdepartement geprobeer het om aan die vereiste te voldoen wat hierbo uiteengesit word. Daar moet ook verwees word na Bylae „A“.

(1) Ondergrondse verspreiding

Afgesien van die estetiese corwegings is die vernamaakte faktor wat die gebruik van ondergrondse verspreiding motiveer die aanpassing van alle tipes woongebiedsgebiede. Die gemak waarmee elek-

meteoriese rise in the number of motor vehicles in the U.S.A. during the 1930's led town planners to layout new townships in what can be described as a "curvilinear pattern"³. The old "rectilinear pattern" of township layout was found to be unsuitable for modern living conditions because every street was practically a "through road" for vehicular traffic.

Consequently, residents of these townships were subjected to considerable air and noise pollution.

The new "curvilinear pattern" that evolved provided for short streets and cul-de-sacs on the one hand and a hierarchy of wider roads that confined through traffic to busy highways on the other.

British and continental town planners adopted this development in rebuilding many of the bombed cities of Europe.

1946 – 1960

During this period the number of vehicles registered in Johannesburg nearly doubled. This and the subsequent increase in the number of vehicles in the city – which currently stands at 1 000 vehicles per month – is reflected in Figure 2.

Figure 1 indicates the increase in domestic consumption of electricity in the city and is included for comparison with Figure 2. The remarkable similarity of both curves suggests that either could be taken as a barometer of prosperity.

The majority of townships established immediately after the War – e.g. Roosevelt Park – were laid out in the "curvilinear pattern".

Unfortunately, electrical reticulation practices were not sufficiently developed at that time to fit in with the new pattern and several of these early post-war townships were reticulated with a conventional system of overhead mains.

The results proved highly unsatisfactory and today these suburbs are encumbered with one and two-span overhead lines and a proliferation of stays, including pedestal and flying stays, to support overhead mains in curved roads.

Post 1960

The first URD (underground residential distribution) system in Johannesburg was installed in 1961 in Montgomery Park,⁴ followed by other single phase HV systems in Triomf, Victory Park and Kensington.⁵

Single phase HV reticulation was found to have its limitations – particularly where considerable load growth took place. Further disadvantages were an increased failure rate and higher maintenance costs associated with a predominantly HV network where up to 10 times the number of HV cable terminations were required when compared with a conventional LV reticulation system. In 1966, single phase systems were superseded by three phase URD systems using compact HV switchgear and miniature substations of 200 kVA and later 300 kVA rating. During the past decade over 650 miniature substations have been installed and are operating in Johannesburg.

The early three phase URD systems have been improved and developed to attain a high degree of flexibility, safety of operation and capacity for growth as will be described later.

4. A MODERN APPROACH

The following conditions are considered essential for a modern residential township reticulation scheme:-

- (1) The distribution system should be underground.
- (2) Safety of operation should be paramount.
- (3) The system should be sufficiently flexible to cater for all types of township layout, future expansion and extensions.
- (4) Capacity for growth should provide for the initial capacity of the scheme to be trebled within an amortization period of 25 years.
- (5) Maximum continuity of supply should be provided.
- (6) Electrical equipment should be compact, durable and unobtrusive, and be located where it will blend in with, but be unaffected by, the environment.
- (7) The financial viability of the scheme should be assured.

5. CURRENT PRACTICE

Figuur 3(a), (b) show a typical modern URD scheme for reticulating a residential township in Johannesburg. Figures 4(a), (b), (c) give details of the HV and main LV distribution network and LV service cables.

The following notes are an amplification of these figures and indicate how Johannesburg's Electricity Department has attempted to meet the conditions stipulated above. Reference should also be made to Appendix "A".

(1) Underground Distribution

Apart from aesthetics, the main factor motivating the use of underground distribution is its adaptability to all types of township layout. The ease with which electrical equipment such as cables, LV

triiese toerusting soos kabels, LS-pilare en straatligpale in die gunstige posisies binne 'n moderne kromlynige tipe woongebied aangeleeg geplaas kan word, maak ondergrondse nette baie meer gesik as bograndse nette. Die vroeëre verskil in koste tussen bograndse en ondergrondse nette is nou feitlik uitgeskakel deur die instelleling van URD-stelsels. Trouens, laaggenoemde is meer ekonomies as bograndse stelsels om hoidigheidslas van krag te voorziens.

In Verdere aansporing om ondergrondse verspreidingsstelsel te installeer, is die onlangse verklarende beleid van die Departement van Pos- en Telegraafwese⁶ om alle HPK-dienste in nuwe dorpe ondergronds te plaas waar die koste van die uitgravings met ander dienste gedeel kan word.

Die plasing van elektriese kabels saam met ander dienste in 'n gemeenskaplike voor is onlangs met welslae gedoen in 'n oorheersend rotsgatige gebied in Northcliff en het geleidelik tot 'n aansienlike besparing in die totale uitgravingskoste.

(2) Bedryfsveiligheid

Eenvoud van ontwerp en die uitskakeling van moontlike bedryfsgevare soos parallellekakeling van die hoofleiding is inbegryp in die HS-retikuleringsstelsel wat in Figuur 3(b) aangebeeld word.

Alle HS-toerusting wat in moderne dorpe geïnstalleer word, kan lewendig gewerk word en is met foutsul-losbreekfasilitete aangeslaan vir 250 MVA by 11 kV.

Bedryfsveiligheid is uitgebrei na die LS-net waar driepoolisolators onder las in gevormde kas nou as staandaardtoerusting aan LS-sekeringsborde geïnstalleer word om die vervanging sonder las van sekerings met hoë breekvermoë moontlik te maak.

(3) Buigsaamheid

Die buigsaamheid van enige retikuleringskema kan bepaal word deur die veelsydigheid van sy toepassing aan dorpe van alle vorms en groottes ongeag die woningdigtheid en nabijheid aan natuurlike versperrys in ander dorpe. 'n Retikuleringsontwerp aan hierdie vereistes voldoen ook aan voorrsiening sal mask vir uitbreiding en vergroting is op 'n tipiese driepolegebied toegespies in Figuur 3(a).

Vir maksimum buigsaamheid van ontwerp word voldoende substasiestervitute op standplase by die beplanningstadium gekies om transformatorsubstasies op afstande van 400 m en minibusstasies na vereiste tussen-in te plaas.

Hoewel die verhouding van transformatorsubstasies tot minibusstasies aanvanklik om en by 1:5 is, is die keuse om 'n transformatorsubstasie in die toekoms op enige servituut binne die dorp te bou, 'n besluite voordeel.

Daar sal uit Fig. 3(a) bemeerk word dat 'n minibusstasie op die roete van die HS-hoofverdeeldeleiding geïnstalleer word waarsubsverspreidings nie nodig is nie, d.w.s. deur ligbelaste gebiede, in plas daarvan om 'n transformatorsubstasie deur 'n aftakkingsfoufondskakelaar met sekerings te gebruik.

Insiglyk word 'n HS-verspreidingspilaar geïnstalleer waarin die hoofverdeeldeleiding gelus word om 'n voedingstak na die verbruiker te voor in gevalle waar 'n geïsoleerde HS-verbruiker ver van die HS-hoofverdeeldeleiding geleë is. Die skema voldoen dus aan die vereistes van maksimum buigsaamheid.

(4) Groeivermoë

Statistiek toon dat daar oor die afgelope 30 jaar 'n toename in die las in ten volle ontwikkelde woongebiede in Johannesburg van ongeveer 4% per jaar was. As daar in aanmerking geneem word dat die gekapitaliseerde lewensduur van elektriese menseinerie en toerusting gewoonlik 25 jaar is, sal 'n saamgestelde vermeerdering van 4% per jaar in die las daarleei dat die aanvanklike geïnstalleerde vermoe van 'n dorp na 28 jaar sal verdriedubbel.

Die sal dus verstandig wees om te beplan vir 'n verdriedubbeling van aanvanklike vermoe teen 'n minimum koste en ontrwigting van toevoer.

Die grootste enkele uitgawe-item in 'n dorpsverspreidingskema is die aankoop en installering van HS-kabels. Die grootte van die HS-kabels in 'n subverspreidingsring word gewoonlik bepaal deur die stelsel se MVA-breekvermoë wat weer deur die bybehorende HS-skakeltuig aangegeven word.

Veronderstel dat die bestaande stelsel se foutvermoë teen die huidige hul volgehou word, dan behoort die bestaande subverspreidingskabel (50 mm x 3 koperkern, PLSTC) sonder versterking voldoende te wees vir die laste wat na 'n dienstydyperk van 25 jaar verwag word.

LS-verspreidingspilares is ontwerp om voorrsiening te maak vir drie maal hul aanvanklike las. Dit word bewerksterlik deur 'n afsonderingskakelaar en leistamme te installeer wat aangeslaan is om 400 ampere per fase te dra. Die bykomende koste is om en by 10%. Al wat dus nodig sal wees om 'n dorp se verspreidingskema hoër aan te slaan, is om meer minibusstasies op bestaande verspreidingsringe te installeer. Die uitendeelende skema wat in die vooruitigheid gestel word, kan een minibusstasie vir elke bestaande LS-verspreidingspilaar wees.

pillars and street lighting poles can be located in optimum positions within a modern curvilinear type of township layout makes underground reticulation vastly superior to overhead. The previous disparity in costs between overhead and underground reticulation has now been virtually eliminated by the introduction of URD systems, the latter being, incidentally, more economical than overhead systems for supplying high density loads.

A further incentive for installing underground distribution systems is the recently declared policy of the Department of Posts and Telegraphs⁶ to underground all GPO services in new townships where the costs of excavation work can be shared with other services.

The accommodation of electrical cables with other services in a common trench was successfully carried out in a predominantly rocky area in Northcliff recently and resulted in a considerable saving in overall excavation costs.

(2) Safety of Operation

Simplicity of design and the elimination of possible operational hazards such as paralleling of the main distributor, has been embodied in the HV reticulation system indicated in Figure 3(b).

All HV equipment installed in modern townships may be operated alive and is rated for 250 MVA at 11 kV with fault-make load-break capabilities.

Operational safety has been extended to the LV network where on-load triple-pole moulded-case isolators are now fitted as standard equipment on LV fuse boards to permit off-load replacement of HRC fuses.

(3) Flexibility

The flexibility of any reticulation scheme can be gauged by the versatility of its application to all shapes and sizes of townships, regardless of housing density, proximity to natural barriers and other townships. A reticulation design which will meet these requirements and which will also provide for expansion and extensions has been applied to a typical township in Figure 3(a).

For maximum flexibility of design sufficient substation servitudes or erven are chosen at the planning stage to accommodate transformer substations at 400 m intervals, with minibus interposed as required.

Although the ratio of transformer substations to minibus is initially of the order of 1 : 5, the option to build a transformer substation on any servitude within the township at some future date is a decided advantage.

It will be noted from Fig. 3(a) that where sub-distribution rings are not required, i.e. through lightly-loaded areas, a minibus is installed on the route of the main HV distributor instead of a transformer substation, using a fused T-off ring main isolator.

Likewise where an isolated HV consumer is situated some distance from the main HV distributor, an HV distribution pillar is installed into which the main distributor is looped to provide a 'spur' feed to the consumer. The scheme therefore meets the requirements of maximum flexibility.

(4) Capacity for Growth

Statistics indicate that over the past 30 years there has been a load growth in fully developed residential townships in Johannesburg of the order of 4% per annum. Taking into consideration that the capitalised life of electrical plant and equipment is generally 25 years, a compounded 4% per annum increase in load will result in the initial installed capacity of a township being trebled after 28 years.

It would therefore seem prudent to plan for a trebling of initial capacity at minimum cost and disruption of supply.

The largest single item of expenditure in a township reticulation scheme is the purchase and installation of HV cables. Usually the size of HV cables in a sub-distribution ring is dictated by the system MVA rupturing capacity which in turn is matched by the associated HV switchgear.

Presuming that the existing system fault capacity is likely to be maintained at its present level, then the existing size of subdistribution cable (50 mm x 3 copper core, PLSTC) should cater, without reinforcement, for the loads expected after 25 years of service.

LV distribution pillars have been designed to cater for three times their initial load. This was accomplished by installing an isolator and bushbars rated to carry 400 amperes per phase. The additional cost was of the order of 10%.

The only alteration to upgrade a township reticulation scheme will therefore be the installation of more minibus on existing distribution rings. The ultimate scheme visualized could be one minibus per existing LV distribution pillar.

(5) Kontinuiteit van toevoer

Die toenemende afhanklikheid van huishoudelike verbruikers van 'n deurlopende toevoer - bv. vir vrieskaste - plaas 'n bykomende verantwoordelikheid op leveringsliggame om 'n hoe betroubaarheidstaarder te handhaaf. Daar kan nie altyd staatgemaak word op die beskikbaarheid van personeel om foute in OWV-stelsels op te spoed en te herstel nie. Dit is dus wenlik om soveel substasies moontlik op ringtoesigte te plaas.

Die gebruik van HS-kabels op subverspreidingsringe wat kleiner is as dié vir die HS-hoofkriekleiding maak dit moontlik dat goedkoop ringtoesigte verskaf kan word.

Die gebruik van kernbalansiese aardfoulywyzers is 'n groot hulp om fouteiese sekssies HS-kabels te lokaliseer. Hierdie goedkoop toestelle word gewerf vanaf splitstroomtransformators wat aan HS-kabels onmiddellik onder hul afgregtings geïnstalleer word en toon die deurgang van 'n deurfoutstroom aan.

Daar sal bemerk word dat die aangeheide ontwerp van die retikulasieksemata wat in Figuur 3(b) aangegetoon word, voorseenis miskien vir die automatiese uitlaaiing van fouteiese subverspreidingsringe sonder om die HS-hoofverdeeldeleiding uit te klink. Hierdie rangskikking verbeter die kontinuiteit van toevoer en verminder die getal automatiese skakelpunte in die stelsel.

Die aandag word ook gevësteig op die afwesigheid van sekeringsskakeling in minisubstasies wat geïnstalleer word in die subverspreidingsringe waar die koste om HS-sekeringsuit te verskaf as ongeregverdig beskou word.

(6) Elektriese Toerusting

Die neiging tot hoër aanslae en kleiner eenhede het dit moontlik gemaak dat drafiese OWV-toerusting onopsigtelik in moderne dorpsaanlæe geplaas kan word.

Die buiteafmetings van minisubstasies in Johannesburg het nie in die afgelope dekade verander nie en is moontlik dat kleinste vir hul vermoë in die Republiek. 'n Minisubstasie op sy fondamentplaat is laer as 'n gemiddelde tuinmuur - 'n feit wat in 'n groot mate gehelp het om huiseienaars te pas in bestaande voorsteade waar dit dikwels nodig geword het om minisubstasies op sypaadjes te installeer.

Die eertydige gebruik om meters in sypaadjiekkaste te groeper is nou gestaak vanweë ruimtebeperkings.

Minisubstasie, HS- en LS-verspreidingspilare word binnek 150 mm van die standplaatsgrens op sypaadje geïnstalleer om voetgangerverkeer so min moontlik te belemmer en om so ver moontlik van voertuigverkeer af te wees. Minisubstasies word nie op afgestompte hoeke geplaas waar die uitsig van verkeer belemmer kan word nie en daar word ook gesorg dat minisubstasies of pilare nie geïnstalleer word waar hulle deur boomwortels of stromwater beïnvloed mag word nie.

Geboë straatligpale word nou minstens 2 000 mm van die kant van die pad af geïnstalleer om skade aan voertuie te voorkom.

(7) Standarde en Finansiering van Doprretikuleringsakemas

Voortvloeiende uit die Verslag van die Niemand-kommissie⁶, het die Administrateur van die Transvala 'n Besturingskomitee aangestel om standaard riglyne vir die voorsiening van essensiële dienste in woongebiede te voorstien.

Die Besturingskomitee het verskillende onderkomitees aangestel, een waarvan doenig was met elektriese dienste, waarop die VMEO, Hoëveldtak verteenwoordig was. Die Sub-komitee vir Elektriese Dienste het riglyne opgestel vir beide die voorsiening en die finansiering van elektriese dienste in woongebiede soortgelyk aan die aangehegte Bylae 'A' en 'B'.

Hierdie riglyne voorsien onder andere vir die volgende:-

- (i) Algemene standaarde van ontwerp en toerusting. Algemene parameters is neengel dat geleentheid bied vir individuele ontwerp van retikuleringsstelsels en keuse van toerusting maar tot rationalisasië bereik, in besonder van plasplast vervaardigde toerusting.
- (ii) In die finansiering van elektriese dienste sal van die Dorpsgebied-ontwikkelaar vereis word om die koste om toevoer van 'n vervaaglike bron na die dorpsgebied se grens te bring, te dra asook alle buitengewone koste om 'n interne retikulasiestelsel te voorstien. Hierdie buitengewone koste kan, onder ander, in verband staan met topografie, grondtoestande of dorpsgebiedaanleg.
- (iii) Om die voorsieningsowerheid teen onderbenutting van die beëlle kapitaal te beveilig, kan voorsiening gemaak word vir erf-eienaars, hetso privaat of Dorpsgebiedontwikkelaars, om 'n beskikbaarheidsaanslag te betaal per erf totdat dit ontwikkel is en 'n elektriesiteit verbruik word.

(5) Continuity of Supply

The increasing dependence of domestic consumers on a continuous supply - e.g. for deep-freeze refrigerators - places an added responsibility on supply authorities to maintain a high standard of reliability. The availability of staff to locate and repair faults in URD systems cannot always be depended upon. It is therefore desirable to supply as many substations as possible by means of ring feeds.

The use on sub-distribution rings of HV cable of smaller size than the main HV distributor enables less costly ring-supplies to be provided.

Of considerable assistance in localising faulty sections of HV cable is the use of core-balance type earth-fault indicators. These inexpensive devices are operated from split current transformers fitted to HV cables immediately below their terminations and flag the passage of a through fault-current.

It will be noted that the overall design of the reticulation scheme indicated in Figure 3(b) allows for automatic switching-out of faulty sub-distribution rings without tripping the main HV distributor. This arrangement improves continuity of supply and reduces the number of automatic switching points on the system.

Attention is also drawn to the absence of fused switchgear in minisubstasies installed on sub-distribution rings where the expense of providing HV fusegear was found to be unwarranted.

(6) Electrical Equipment

The trend towards higher ratings and smaller units has enabled three phase URD equipment to be unobtrusively located in modern township layouts.

The exterior dimensions of minisubs in Johannesburg have not altered in the past decade and are probably the smallest for their capacity in the Republic. The height of a minisub on its bedplate is less than the height of an average garden wall - a fact which has helped immeasurably in placating home owners in existing suburbs where it is often necessary to install minisubs on sidewalks. Because of space limitations, the early practice of grouping meters in sidewalk cabinets has now been discontinued.

In order to cause minimum obstruction to pedestrian traffic and to keep a maximum distance from vehicular traffic, minisubs, HV and LV distribution pillars on sidewalks are installed within 150 mm of the even boundary. Minisubs are not located on splayed corners where traffic vision may be obstructed and care is taken not to install minisubs or pillars where they may be affected by tree roots or storm water.

Curved street lighting poles are now being installed at least 2 000 mm back from the edge of a road to avoid damage from vehicles.

(7) Standards and Financing of Township Reticulation

Resulting from the Report of the Niemand Commission⁶, the Administrator of the Transvaal appointed a Steering Committee to provide standard guidelines for the provision of essential services in residential townships.

The Steering Committee appointed several sub-committees, one of which dealt with electrical services on which the AMEU Highveld Branch was represented⁷. The Electrical Services Sub-Committee has drafted guidelines for both the provision and financing of electrical services in residential townships along the lines indicated in the attached Appendices 'A' and 'B'.

These guidelines provide inter alia for the following:-

- (i) General standards of design and equipment. General parameters have been laid down which allows scope for individual design of reticulation systems and selection of equipment but nevertheless achieves rationalisation, more particularly in locally manufactured equipment.
- (ii) In the financing of electrical services, the township developer will be required to meet the cost of bringing supply from a remote source to the township boundary and also any abnormal costs of providing an internal reticulation system. This abnormal cost can, amongst others, relate to topography, soil conditions or township layout.
- (iii) In order to protect the supply authority against under-utilization of invested capital, provision can be made for owners of erven, whether private or township developers, to pay an availability charge per erven until this is developed and electricity is consumed.



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6. ALGEMEEN

Die voorgaande het uitslaand gehandel oor die retikulering van nuwe dorpsgebiede. Die aanvulling en herwinning van verspreidstelsels in ou gevestigde dorpsgebiede is net so belangrik en sal kortslik hier bespreek word.

Die retikulasiestelsel in Saxonwold is onlangs vernuwe omdat dit ernstig oorbels en verouder geraak het. 'n Skema soortgelyk aan die wat in hierdie referaat beskryf word, is geinstalleer en het uitstekende resultate gelewer. Die volledige vernuwing van 'n groot retikulasiestelsel sou dus dié van Johannesburg waar daar meer as 1 600 km bogrondse kragnette en 90 000 huishoudelike verbruikers is, sal egter 'n duur en tydrovende taak wees. Daar moet begryp word dat 'n woonstelblok of 'n kantoorblok van watter grootte ook al, in Johannesburg as 'n verbruiker geklassifiseer word.

Die invoeging van meer as 500 minisubstasies in bestaande voorstele het die beverdigend geblyk te wees om te voldoen aan die toenemende laste en om die spanning beter te reg. Die vermaakte probleem is egter die samebestaan tussen bogrondse kragnette en die duisende groot bome op die sypaadies van Johannesburg. Dit is letterlik en figuurlik 'n "groeiende" probleem.

Ongeveer 10% van die bogrondse LS-kragnet in Johannesburg word belemmer deur bome en toevoversries – veral gedurende windstorms is verantwoordelik vir meer as 90% van alle LS-onderbrekings. Om hierdie probleem op te los, sal ongeveer 160 km van die bogrondse kragnette teen 'n geramende koste van R5 miljoen ondergrond geplaas moet word.

'n Alternatiewe voorstel is om bogrondse kragnette te vervang deur 'n bogrondse kabel wat spesial ontwerp is om kontak met bome te kan weerstaan. Die bogrondse kabel sal op bestaande pale gestuur word en die toeroer na bestaande dienskabels oorneem met die minste ongerief aan verbruikers.

Dit sal ook 'n geleenheid wees om die vermoë van die kragnette te verdubbel en om verswakte aansluitings te vervang. Die bogenoemde skema sal, vanweë die afwesigheid van uitgrawings, na raming die helfte kos as 'n gelykwaardige ten volle ondergrondse skema.

Die „bogrondse kabel“-projek word tans in Johannesburg op die proef gestel.

7. GEVOLGTREKKING

Dit wil voorkoms van die metode wat in hierdie referaat beskryf word om dorpsgebiede te retikuleer, aan al die vereistes voldoen vir:-

- 'n veilige en betroubare tovoer;
- aanpassing by enige tipe nuwe of bestaande dorp;
- ekonomies, sowel wat betrek aan vangskoste as daaropvolgende uitbreiding;
- estetiese voorkoms.

Die retikuleringsmetode en die ontwerpparameters wat hierin genoem word, vorm deel van die voorgestelde „Gids vir die Voorsiening van Elektrisiteitsdienste in Nuwe Woongebiede“ vir gebruik in Transvaal.

Die aanbieding van hierdie referaat by die 44ste Konvensie van die VMEO is dus tydig en daar word vertrou dat dit sal lei tot die opstelling van gedoseerde gebruik op 'n nasionale basis.

8. ERKENNINGS

Ek wil graag my oopregte dank betuig aan die Elektrotegniese Stadsingenieur van Johannesburg vir toestemming om hierdie referaat aan te bied, en aan die personeel van die Stadsraad van Johannesburg vir hulle waardevolle hulp.

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6. GENERAL

The foregoing has dealt almost exclusively with the reticulation of new townships. The augmentation and renewal of distribution systems in old established townships is equally important and will be dealt with briefly here.

The reticulation system in Saxonwold was recently renewed because of serious overloading and obsolescence. A scheme similar to the one described in this paper was installed with excellent results. However, the complete renewal of a large reticulation system such as Johannesburg's where there are over 1 600 km of overhead mains and 90 000 domestic consumers, would be a costly and time consuming task. It should be noted that in Johannesburg a block of flats or an office block of whatever size is classed as one consumer.

The interposition of over 500 minisubs in existing suburbs has provided satisfactory in meeting load growth and improving voltage regulation. The main difficulty, however, is a problem of co-existence between overhead mains and the thousands of large trees on the sidewalks of Johannesburg. This is literally and figuratively a "growing" problem.

Approximately 10% of the LV overhead mains network in Johannesburg is impeded by trees and loss of supply – particularly during wind storms – accounts for over 90% of all LV failures. To overcome this problem it would be necessary to underground about 160 km of overhead mains at an estimated cost of R5 million.

An alternative proposition is to replace overhead mains with an aerial cable specially designed to withstand contact with trees. The aerial cable would be supported on existing poles and take over supply to existing service cables at minimum inconvenience to consumers. The opportunity will be given to double the capacity of the mains and replace deteriorated connections. Because of the absence of excavation work, the above scheme is estimated to be half the cost of an equivalent fully underground scheme.

The "aerial cable" project is at present in a trial stage in Johannesburg.

7. CONCLUSION

The method of reticulating townships described in this paper appears to meet all the requirements for:-

- a safe and secure supply;
- adaptation to any type of new or existing township;
- economic, both in first cost and subsequent expansion;
- esthetic appearance.

This method of reticulation and the design parameters stated herein form part of the proposed "Guidelines for the Provision of Electrical Services in New Residential Townships" for use in the Transvaal.

The presentation of this paper to the 44th Convention of the AMEU is therefore timely and, it is hoped, will lead to the compilation of guidelines for use on a national basis.

8. ACKNOWLEDGEMENTS

I wish to acknowledge my indebtedness to the City Electrical Engineer of Johannesburg for permission to present this paper, and to the Staff of the City Council of Johannesburg for their invaluable assistance.

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BYLAE „A“

ONDERGRONDSE WOONVERSPREIDING ONTWERPPARAMEETERS EN ALGEMENE SPESIFIKASIE

1. Lasbepaling

Kategorie	Tipe behuising	(Maksimum vraag na verspreiding)
A	Luks	8 - 12 kVA per verbruiker
B	Standaard	5 - 8 kVA per verbruiker
C	Goedkoop	5 kVA per verbruiker

2. Algemene Beginsels

HS-hoofverspreidingskabel deur dorp geleë - onderweg in transformatorsubstasies, miniatuursubstasies (Minisubs) en HS-verspreidingspilare gelus.

Oop HS-subverspreidingsgrange neem toevervoer van transformatorsubstasies na plasislike minisubs en HS-verbruikers. Minisubs verskaf tot vier LS-verspreidingspilare.

3. Substasies

(1) Substasiessierwitte

Straatvoortnant van 7 m x 6 m diep + boulynbeperkings moet op standplaas in nuwe dorpe of afstande van ongeveer 400 m verkry word.

(2) Transformatorsubstasies

Stoomkamers om HS-ringhoofskakelbord, HS-afsonderskakelaarborg vir plasislike HS-subverspreiding, 500 kVA-transformator, LS-sekeringbord en beheerdeel vir straatligte huise.

(3) Minisubs

Moeet tot vier LS-verspreidingspilare voorsien.

Standardaanslag : 315 kVA.

Totale afmetings : 1 300 hoog x 760 breed x 2 540 lank.

HS-kompartement toegerus met kompakte afsonderskakeltuig met 'n aanslag van 250 MVA by 11 kV. Net minisubs op hoofverspreidingskabels is toegerus met HS-sekeringsafskakeltuig.

LS-kompartement toegerus met 'n drifase 300 ampere-vierkringsekeringbord met hōe breukvermoë.

(4) HS- en LS-verspreidingspilare en LS-dienspilare.

(a) Blokgemonteerde HS-pilare huise metaalomhulde of giethartbeel HS-ringhoofleidingafskakeltuig.

(b) Blokgemonteerde LS-pilare huiseen in drifase 400 ampere-afsonderskakelaar onder las en 27 MBS's (9 per fase) van 100 ampere. Toevervoer vir 16 enkelfasige of 9 drifase dienssanaanuitings.

(c) LS-dienspilare kan drifasegige metorborg huisves.

5. Geleiergroottes

(1) Hoofspanningsverspreiding

(a) Hoofverspreidingskabels - 185 mm² x driekeinkoper PLSTC of gelykwaardig om te pas by HS-akakelbord van 400 ampere.

(b) Subverspreidingskabels - 50 mm² x driekeinkoper PLSTC koperkernkabel of gelykwaardig om te pas by foutevermoë van die stelsel by toevervoernt, nl. 250 MVA at 11 kV.

(2) Laespanningsverspreiding

(a) LS-hoofverspreidingskabels vanaf transformatorsubstasies of minisubs na LS-pilare.

182 mm² x 4 soledie aluminiumkern (SAK) strookaluminiumpantserkabel. Maksimum spanningsgval onder volle las = 2%.

(b) Dienstkabels vanaf LS-pilare na dienspilare:

(i) Tot 60 m - 16 mm² PVC SWA koperkern enkelfasige of drifasekabels met kopernardkontinuiteitsgeleier.

(ii) Tot 120 m - 25 mm² - enkelfasige of drifasegige koperkabels met kopernardkontinuiteitsgeleier.

(iii) Tot 180 m - 70 mm² Al of 35 mm² Cu enkelfasige of drifasekabels.

(c) Straatverligtingeskabels:

(i) Beheerkabel vanaf transformatorsubstasie na minisubs : 2,5 mm² x 3 koperkoperkabel

(ii) Toevoerkabel na straatverligtingspale: 16 mm² enkelfasige koperkabel. (Maksimum lengte : 600 m)

(3) Aardgelleiers

'n Onbekende galvaniseerde staalgelleier van 7/4, 1 mm word geleë met alle HS- en LS-hoofkabels om die nadistawte van alle transformatorsubstasies, minisubs en LS-verspreidingspilare onderling te verbind terwyl 'n voorrade terselfdertydig voorstaan word.

6. Kabelroete-identifikasie

'n Geboosdeelde, oranjekleurige plastiekmerkerband 150 mm breed x 0,1 mm dik word in 'n deurlopende strook op 'n diepte van ongeveer 300 in alle HS- en LShoofkabelvrome geleë.

BYLAE „B“

RIGSNOERE VIR DIE FINANSIERING VAN ELEKTRIESE DIENSTE IN WOONGEBIEDE

(1) 'n Groot gedeelte van die koste wat aangegaan word om elektriese dienste na nuwe verbruikers uit te brei, kan nie geredelik deur middel van die elektrisiteitstarief verhale word sonder om 'n ongerygorde las op bestaande verbruikers te plaas nie. Elke verbruiker moet deur

APPENDIX "A"

UNDERGROUND RESIDENTIAL DISTRIBUTION DESIGN PARAMETERS AND GENERAL SPECIFICATION

1. Land Assessment

Category	Type of Housing	ADMO (After diversity maximum demand)
A	Luxury	8 - 12 kVA per consumer
B	Standard	5 - 8 kVA per consumer
C	Low Cost	5 kVA per consumer

2. General Principles

Main HV distribution cable laid through township - en route looped into transformer substations, miniature substations (minisubs) and HV distribution pillars.

Open HV sub-distribution rings take supply from transformer substations to local minisubs and HV consumers. Minisubs supply up to 4 LV distribution pillars.

3. Substations

(1) Substation Servitudes

7 m street frontage x 6 m deep + building line restriction to be obtained on even in new townships at approximately 400 m intervals.

(2) Transformer Substations

Brick chamber to accommodate HV ring-main switchboard, HV isolator board for local HV sub-distribution, 500 kVA transformer, LV fuse board, street lighting control panel.

(3) Minisubs

Required to supply up to four LV distribution pillars.

Standard rating : 315 kVA.

Overall dimensions : 1 300 high x 760 wide x 2 540 long.

HV compartment equipped with compact isolating switchgear rated 250 MVA at 11 kV. Only minisubs on main distribution cables are equipped with HV fused T-off switchgear.

LV compartment equipped with a four-circuit three phase 300 ampere HRC Fuse Board.

4. HV and LV Distribution Pillars and LV Service Pillars

(a) Pad mounted HV pillars accommodate HV metalclad or cast-resin type ring main isolating switchgear.

(b) Pad mounted LV pillars accommodate one 400 amp three phase on-load isolator and 27 - 100 amp MCB's (9 per phase). Supply for 16 single phase of 9 three phase service connections.

(c) LV service pillar, can accommodate three phase meter board.

5. Conductor Sizes

(1) High Voltage Distribution

(a) Main distribution cables - 185 mm² x 3 core copper PLSTC or equivalent to match 400 amp HV switchgear.

(b) Sub-distribution cables - 50 mm² x 3 core PLSTC copper cored cable or equivalent to match fault capacity of the system at point of supply, viz. 250 MVA at 11 kV.

(2) Low Voltage Distribution

(a) Main LV distribution cables from transformer substations or minisubs to LV pillars:

185 mm² x 4 solid aluminium cored (SAC) strip Al armoured cable

Minimum full-load drop = 2%.

(b) Service cables from LV pillars to consumer's service pillars:

(i) Up to 60 m - 16 mm² PVC SWA Cu cored single phase or three phase cable with Cu earth continuity conductor.

(ii) Up to 120 m - 25 mm² Cu single phase or three phase cables with Cu earth continuity conductor.

(iii) Up to 180 m - 70 mm² Al or 35 mm²

(iii) Up to 180 m - 70 mm² Al or 35 mm² single phase or three phase cables.

(c) Street Lighting Cables:

(i) Control cable from transformer substation to minisub: 2,5 mm² x 3 core Cu cable.

(ii) Supply cable to street lighting poles : 16 mm² single phase Cu cable. (Maximum length : 600 m).

(3) Earth Conductors

A bare galvanized steel 7/4,1 mm conductor is laid with all HV and main LV cables to interconnect the earth bars of all transformer substations, minisubs and LV distribution pillars simultaneously with providing a trench earth.

6. Cable Route Identification

An embossed, orange-coloured plastic marker tape 150 mm wide x 0,1 mm thick is laid in a continuous strip at a depth of approximately 300 mm in all HV and main LV cable trenches.

APPENDIX "B"

GUIDE LINES FOR THE FINANCING OF ELECTRICAL SERVICES IN RESIDENTIAL TOWNSHIPS

(1) Many of the costs incurred in extending electrical services to new consumers cannot readily be recovered through the electricity tariff without imposing an unjustifiable burden on existing consumers. Each consumer must, through the electricity tariff, bear a pro rata share of

middel van die elektrisiteitstarief 'n pro rata-aandeel van die koste van elektrisiteit en grootmaatsverbreiding na groot substasies dra. Die koste van die verspreiding van elektrisiteit na en binne die dorpsgebied wissel egter aansienlik volgens die feit of die dorpsgebied langs 'n bestaande ontwikkeling of afgesonder is, die aard van die grond waarop die dorpsgebied ontwikkel is, die kategorie van die bewoning wat voorseen word en die ontwikkelingstempo van die dorpsgebied. Hierdie verspreidingskoste kan nie deur middel van die tarief verhaal word nie en moet dus regstreks van die ontwikkelaars en standplasseienaars van nuwe dorpsgebiede verhaal word.

(2) Die ontwikkelaar van 'n nuwe woongebied moet verantwoordelik wees vir slepe abnormale koste wat toegeloof is by die voorsiening van elektrisiteit. Abnormale koste bestaan uit:

- (a) Die koste om die toevoer na die dorpsgebied te bring oor onontwikkelde gebiede. Vir 'n dorpsgebied wat langs 'n bestaande retikuleringskema is, sal daar geen koste onder hierdie hoof wees nie.
- (b) Buitengewone koste wat ontstaan uit die geaardheid van die grond, die topografie van die terrein en enige spesiale vereistes wat deur die dorpsontwikkelaar van plaaslike overheid versoek word.

Die bedrag onder (a) en (b) sal deur die plaaslike overheid bepaal word en sal nie onderwerp wees aan aanswering wanneer die werk klaar is nie. 'n Sertifikaat vir die verskaffing van elektrisiteitsdiensdele sal slegs deur die plaaslike overheid gegee word na ontvangen van 'n waarsborg deur die ontwikkelaar vir alle abnormale koste.

(3) Wanneer elektrisiteit by enige standplaas in die dorpsgebied beskikbaar is, moet die standplasseienaars 'n beskikbaarheidskoste betaal om die jaarlikse koste te dek wat die plaaslike overheid moet saangaan wanneer elektrisiteit vir 'n dorpsgebied voorsien word. Hierdie koste word nie verhaal voordat die standplaas bewoon en elektrisiteit verbruik word nie. Dit bestaan uit:

- (i) Kapitaalleningenkoste
- (ii) Herstel- en onderhoudkoste.
- (iii) 'n Bydrae tot algemene administratiewe koste.

Die beskikbaarheidskoste wat die eienaars van elke standplaas moet betaal, moet bereken word teen % per jaar (kyk voetnota) van die plaaslike overheid se aandeel van die interne retikuleringskoste verdeel deur die totale getal standplaas in die dorpsgebied. Die standplaasienaars moet hierdie koste betaal op alle standplaas wat nie verkoopt is op die tydstip toer 'n elektrisiteitstoever beskikbaar geword het nie. Individuele standplasseienaars moet verantwoordelik wees vir die betaling van die beskikbaarheidskoste vanaf die datum tot hulle oordrag van hulle grond geneem het totdat hulle 'n cooreenkoms met die plaaslike overheid aangegaan het vir 'n elektrisiteitstoever.

(4) Wanneer die koste bereken word wat die ontwikkelaar en standplasseienaars ingeval die bogenoemde moet betaal, moet die leveransier die koste uitskakel van enige toerusting wat nie nodig was om aan die vereiste las van die dorpsgebied te voldoen nie. Veral die bykomende koste om groter kabels en transformators te installeer as wat nodig is om aan die bersameerde las te voldoen, moet uitgesluit word.

* Die persentasie moet deur elke leveransier ingeval word volgens die koste wat van toepassing is op sy eie onderneming. Dit mag van tyt tot tyd wissel.

the cost of electricity and bulk distribution to major substations. However, the cost of electricity distribution to and within townships varies considerably according to whether the township adjoins an existing development or is remotely situated, the nature of the ground on which the township is built, the category of housing being provided for the rate of development of the township. These distribution costs cannot be recovered through the tariff and must, therefore, be recovered directly from developers and stand owners of new townships.

(2) The developer of a new residential township should be responsible only for any abnormal costs involved in providing electricity supply.

(a) Abnormal costs consist of:
i. The cost of bringing supply to the township across undeveloped areas. For a township adjoining an existing reticulated area, there would be no cost under this heading.

(b) Exceptional costs arising from the nature of the ground, the topography of the terrain and any special requirements requested by the township developer or local authority.

The amount under (a) and (b) will be determined by the local authority and will not be subject to adjustment when the work is completed. A certificate for the supply of electrical services will only be granted by the local authority on receipt of a guarantee from the developer for all abnormal costs.

(3) When electricity supply is available to any stands in the township, the stand owner should be required to pay an availability charge to cover the annual costs to which a local authority is committed when providing electricity for a township. These costs are not recovered until stands are occupied and electricity is being consumed. They comprise:

- (i) Capital loan charges.
- (ii) Repair and maintenance costs.
- (iii) A contribution to general administrative charges.

The availability charge payable by the owner of each stand should be calculated at % per annum (see footnote) of the local authority's share of the internal reticulation cost divided by the total number of stands in the township. The township owner should bear this charge on all stands not sold at the date when electricity supply is available. Individual stand owners should be responsible for paying the availability charge from the time of taking transfer of their properties up to the time they enter into an agreement with the local authority for an electricity supply.

(4) In calculating charges to be made to developer and stand owner as described above, the supplier should exclude the cost of any equipment not required for meeting the estimated load of the township. In particular, the additional cost of installing larger cables and transformers than are required to meet the estimated load should be excluded.

* The percentage is to be inserted by each supplier according to the costs applicable in his own undertaking and may vary from time to time.

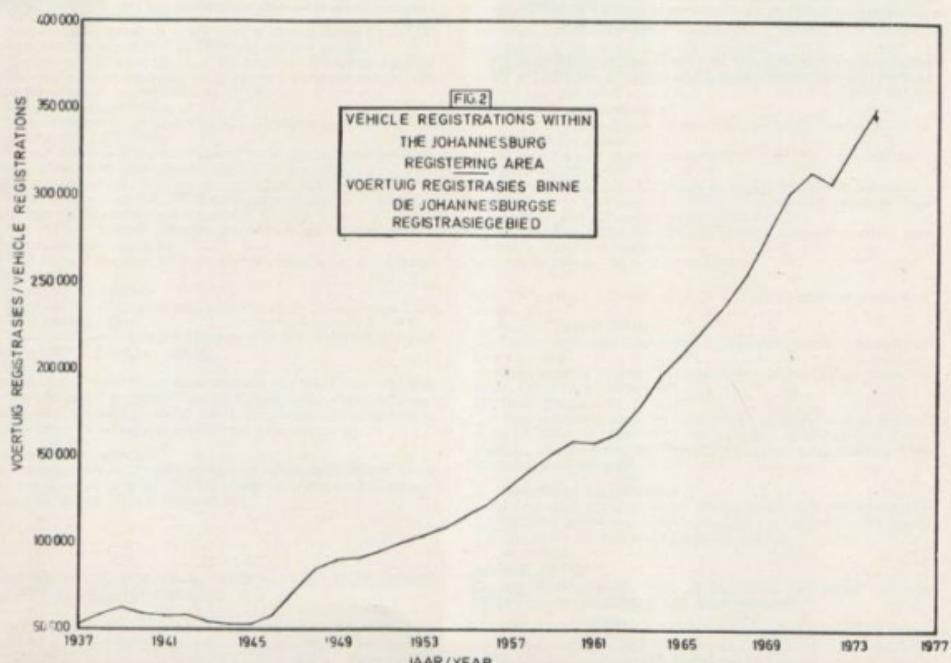
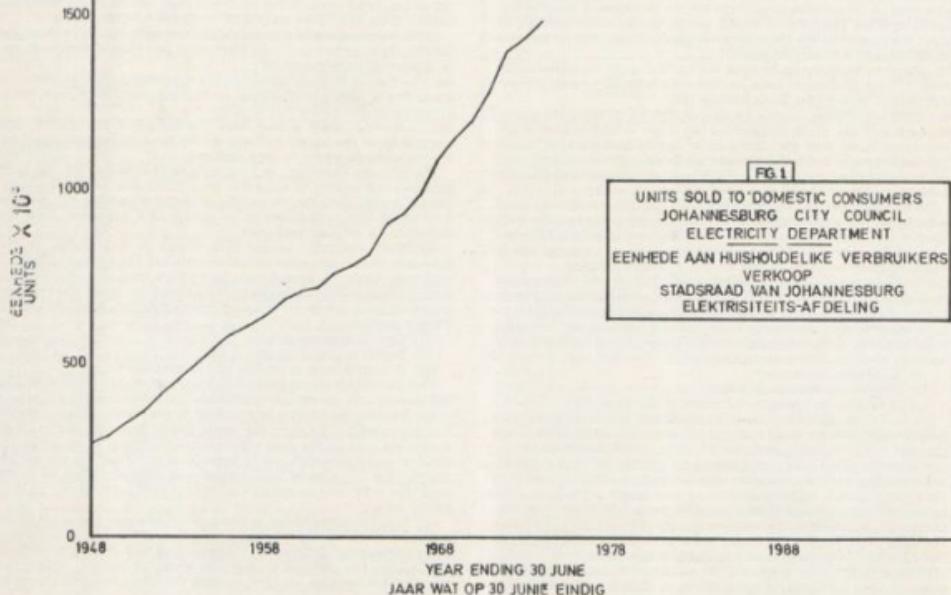


FIG 3a

MAIN HV DISTRIBUTION CABLE, SUB-DISTRIBUTION RINGS & SPUR FEEDS

HOOF HS VERSPREIDINGSKABEL, SUB VERSPREIDINGSRINGE EN VOEDINGSTAKKE.

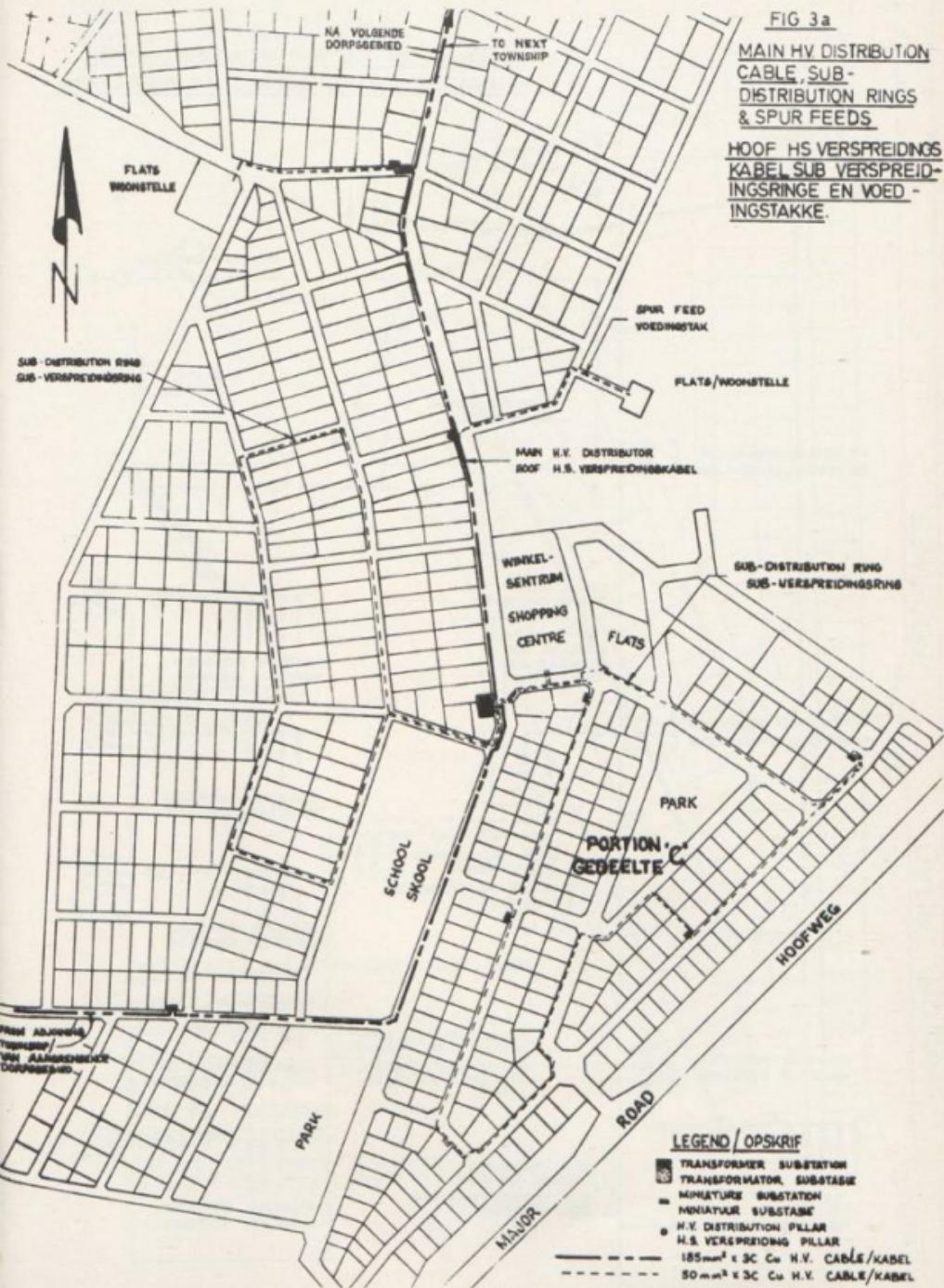


FIG 3 b

SCHEMATIC OF TOWNSHIP H.V. RETICULATION
SKEMATIES VAN DORPSGEBIED H.S. RETIKULERING

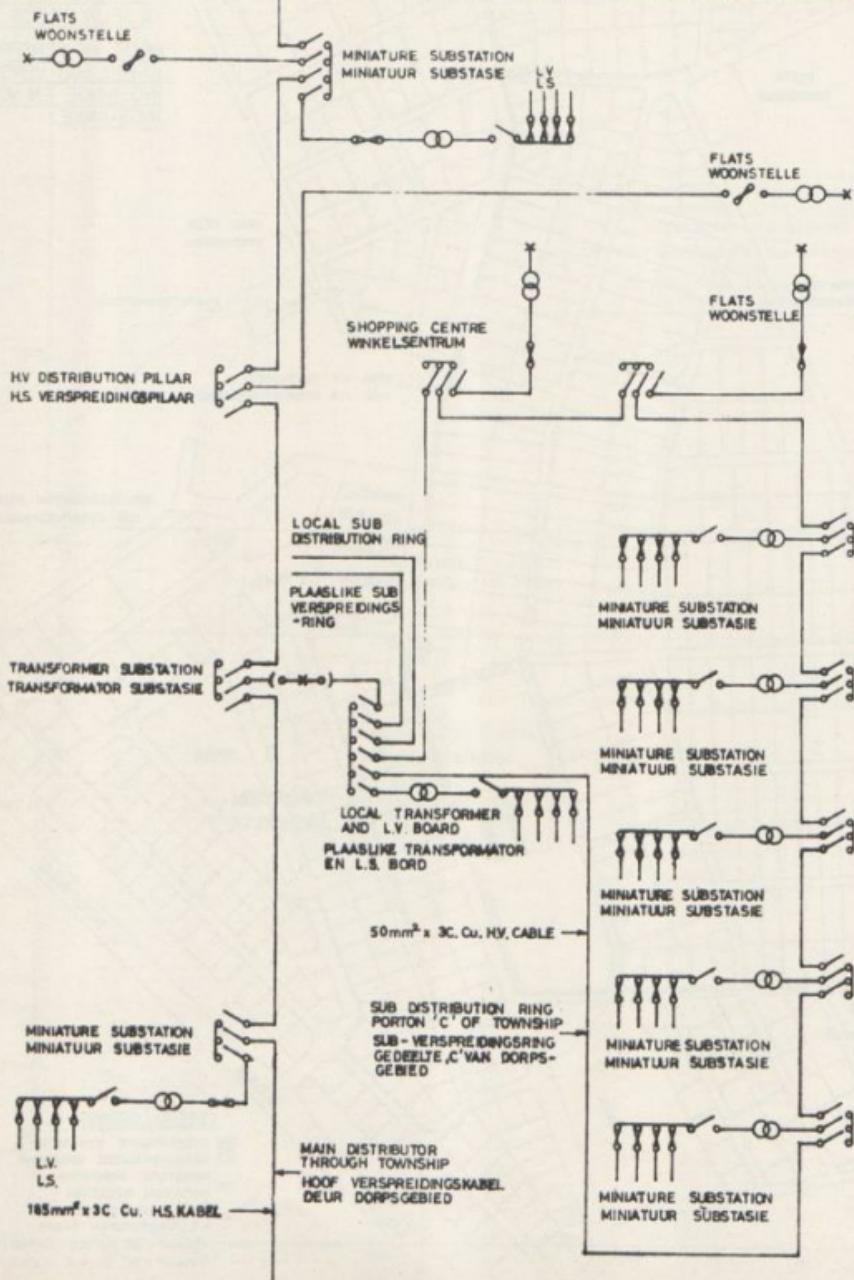


FIG 4a

PORTION 'C' OF TOWNSHIP
GODEELTE 'C' VAN DORPSGEBIED

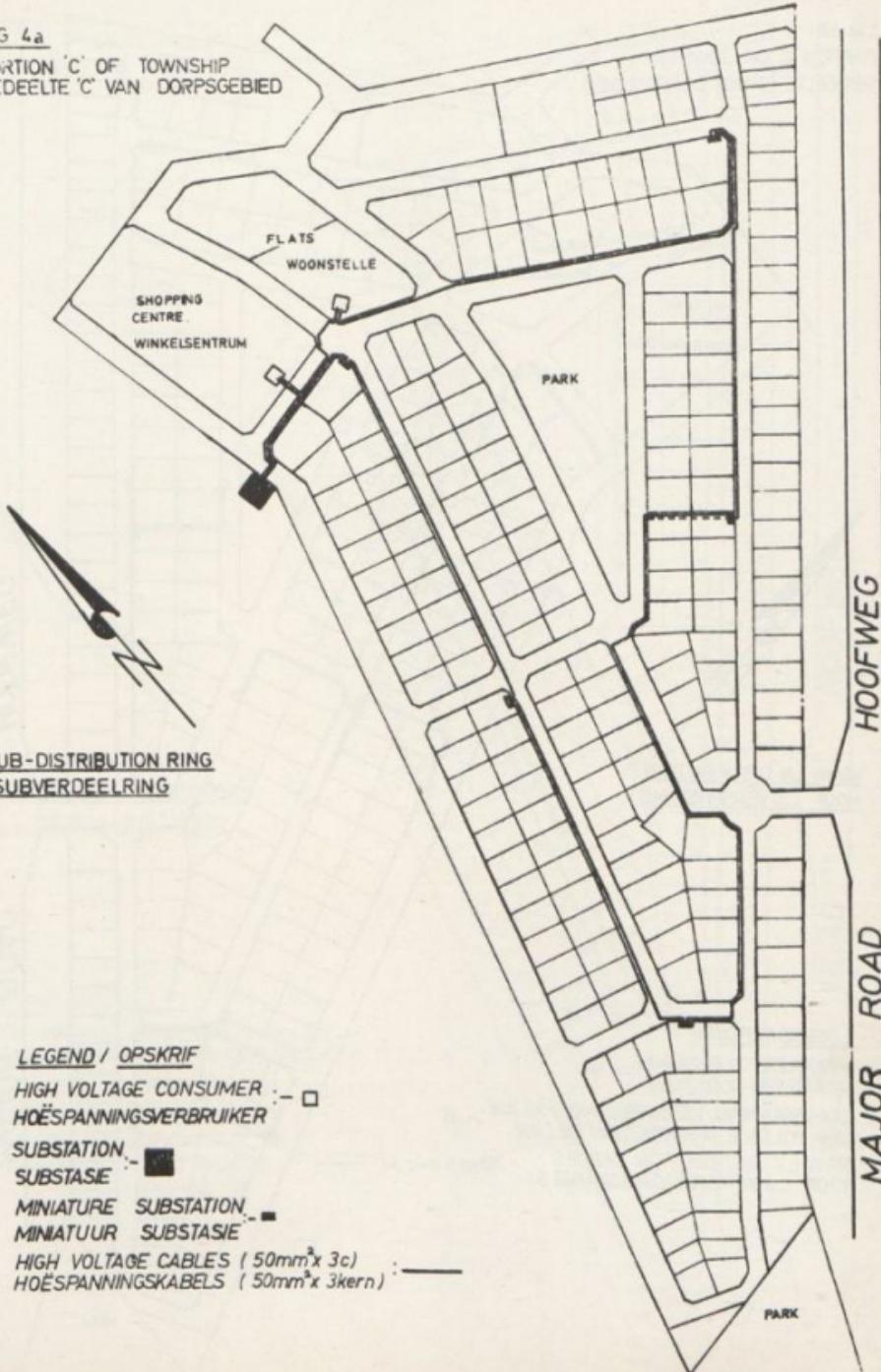


FIG 4b

PORTION 'C' OF TOWNSHIP
GEDEELTE 'C' VAN DORPSGEBIED

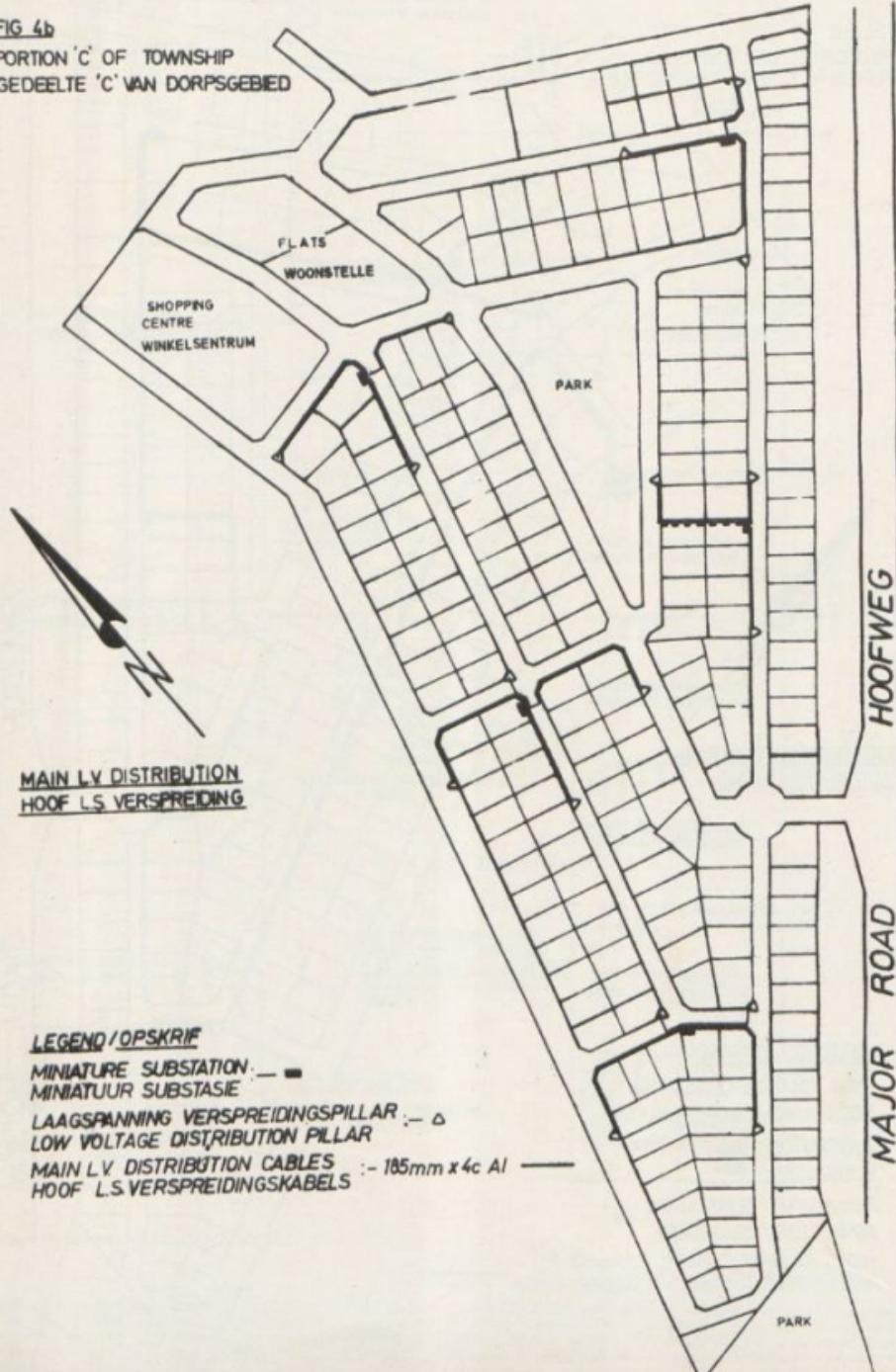
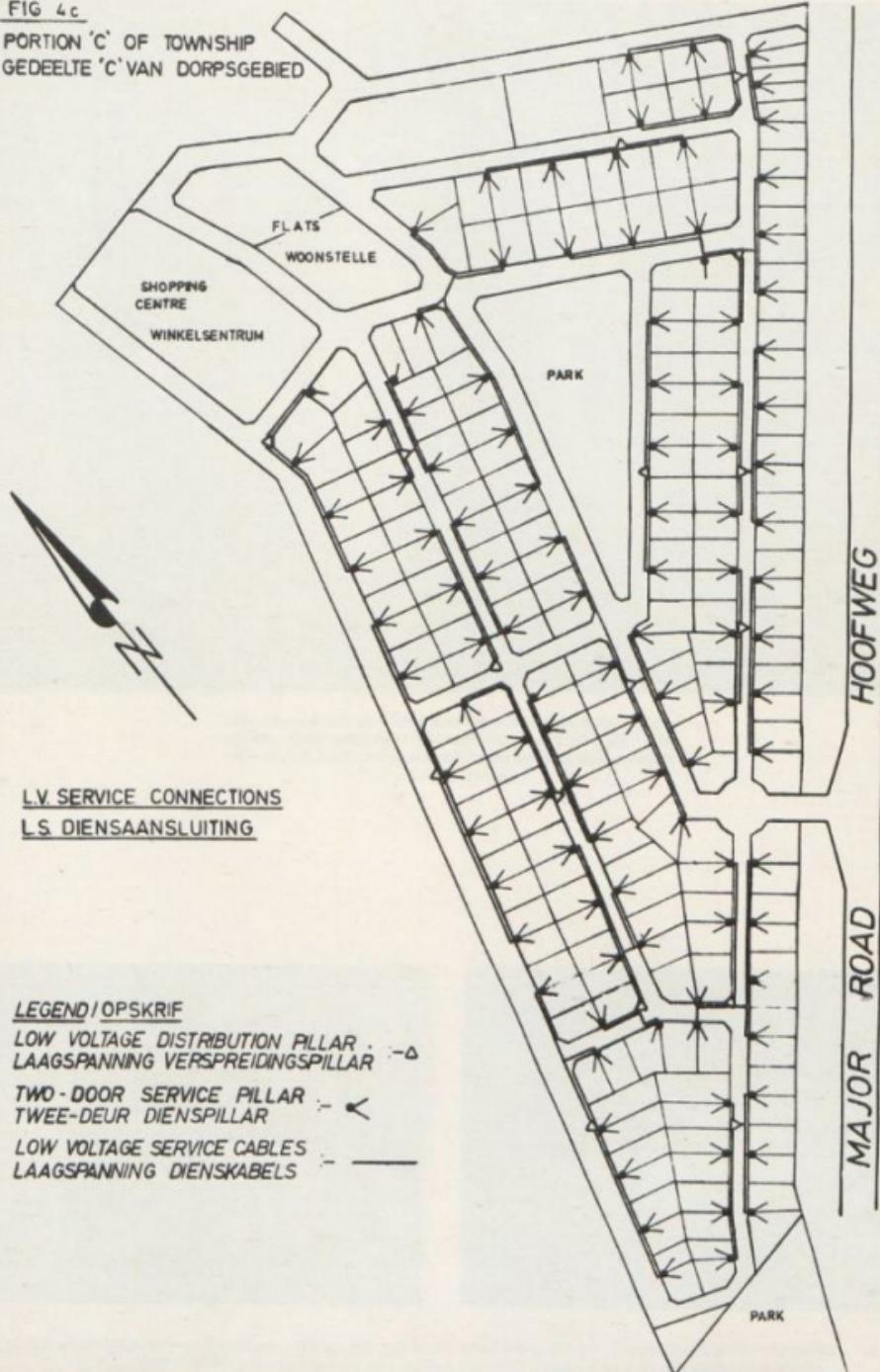


FIG 4c

PORTION 'C' OF TOWNSHIP
GEDEELTE 'C' VAN DORPSGEBIED





Delegates are received by Mr. and Mrs. Dennis Fraser, Mr. and Mrs. Eugene Pretorius and Mr. and Mrs. A.D. Adams (Mayoral Couple) at the Civic Function given by the City Council of Durban.



Mr. Ken Robson, President Elect, enjoying a chat at the Civic Function.



Jules von Ahlfen in geselskap met afgevaardigdes by die Burgelikeonthaal.



Mnr. Bennie van der Walt, (Sekretaris) saam met Mev. Joyce Linley, Annatjie van der Walt en Mnr. Tom Linley (Direkteur van Parke, Durban) by geleenthed van die Burgelikeonthaal.



Delegates relaxing at the Tropical Evening function sponsored by Messrs. Carst and Walker, Industrial Materials; Fuchs Electrical Industries; G.E.C. Power Distribution; Heinemann Electric; Hulets Aluminium and Scottish Cables.

Mr. D.R. HILL (Durban): Mr. President, Mr. Raynal, Gentlemen, I would first like to congratulate Mr. Raynal on his paper on a subject of great interest to all Engineers in the Electricity Supply Industry. I must also congratulate the Johannesburg Electricity Department on its enterprise over the years, in the field of Township reticulation and the manner in which its experiences have been made available for the benefit of others.

Although development in this field has been relatively slow, it has nevertheless been significant and can readily be appreciated by driving through a modern township with a "URD" reticulation where the absence of mutilated trees, numerous poles, stays and overhead wires is most striking.

In addition to the adoption by town planners of the "curvilinear layout pattern" referred to by Mr. Raynal, development of underground reticulation has been encouraged by technological developments in switchgear and cables, growth in the A.D.M.D. of domestic consumers and the need for supply authorities in this day and age to maintain an aesthetic standard in keeping with the standard of roads, houses and general standard of living found in the average modern township.

Routine maintenance required by an underground system is negligible when compared with an overhead system, particularly in a corrosive coastal atmosphere. However, underground cable faults usually take considerably longer to repair than overhead line faults and it is essential to cater for this when designing an underground system, if prolonged supply interruptions to consumers are to be avoided. The degree of reliability and security aimed at in the supply of electricity has a direct influence on the capital requirements and an increase of fifty percent to one hundred percent in the capital requirements of the primary distribution system has to be accepted to achieve what is considered to be adequate in this respect. Mr. Raynal has dealt with this aspect, but the importance of building in adequate reliability and security is demonstrated by the 735 faults on 11 kV, 6,6 kV and low voltage mains and service cables in the Durban City Council's area of supply during 1974.

The following analysis of these faults will probably be of interest from a design, installation and operating point of view:-

Of the 735 failures -

125 or 17 percent occurred on 6,6 kV or 11 kV Cables
151 or 21 percent occurred on low voltage mains
459 or 62 percent occurred on consumers' service cables
60 percent of the failures were positively associated with excavation activities.

With regard to the location of the faults -

643 or 87 percent occurred in the length of the cable
16 or 2 percent occurred in through joints
76 or 11 percent occurred in the terminations.

The large number of cable failures must obviously be viewed in the correct perspective, bearing in mind the size of the undertaking and the fact that on average, 50 km of additional cable is laid in the ground each month. Nevertheless, an annual repair bill of over R100 000 is involved and this and the effect on reliability of supply must obviously be taken into account when designing a reticulation system.

Arising from these considerations, and referring to details supplied in his written paper, I am prompted to ask Mr. Raynal to amplify or comment on the following aspects in connection with the underground system described in his paper:-

1. What electrical protection is provided on the main HV distribution cable laid through the township?

The fault capacity on this 185 mm² copper P.L.S.T.A. cable is likely to be fairly high but presumably a fast acting balance type of protection, such as Solkor is not used in view of the number of Transformer Substations, HV Distribution Pillars and Mini-substations along the length of the cable. On the other hand, the use of I.D.M.T. protective relays with slower clearing time in the event of a fault, would mean greater stress on the system and greater damage than is desirable at the site of the fault.

2. It appears that two HV sub-distributors are ringed back to each transformer substation and controlled by a single breaker. This arrangement economises in the use of breakers but, in the event of a cable fault occurring, supply is lost to both rings and the local transformer. This would appear to be a disadvantage and Mr. Raynal's comments on operating experience in this respect would be of interest.

3. It is noted that consumers' meters are contained in LV Service Pillars located on plot boundaries. Could Mr. Raynal indicate who provides and installs the cable between the LV Service Pillar and the consumer's house and who is responsible for any subsequent maintenance or repair to this cable?

4. Mr. Raynal mentions that an embossed orange coloured plastic marker tape is laid in all HV and main LV cable trenches for identification purposes. This tape also serves as an early warning to persons excavating over a cable and I would like to ask Mr. Raynal whether there has been any significant reduction in the incidence of mechanical damage to cables since the adoption of this practice?

5. What has been the experience with damage to LV and Service Pillars by grass fires and motore vehicles? In Durban for example,

street poles are a favourite target for motorists and the collision rate averages 1½ per day.

Mr. J.A. Loubsier (Benoni): Mn. President, Mn. Raynal het vir ons hier vanmiddag 'n baie interessante referaat gelewer. So geskrewe referaat is eintlik vir my nog meer interessant. Onder anderde het hy daar 'n paar beweerings gemaak wat miskenning aanveegbaar is, soos o.a. in sy inleiding, dat die prys van erwe afhanklik is van die elektriese retikulasie. Ek weet nou nie of ek alleen praat nie, maar vir my is dit nie korek nie. Die Niemand-kommissie sal sokerlik nie met my saamstem nie, maar wat my betref, is die prys van erwe alleenlik afhanklik van die markprys. En as ons hierdie elektriese retikulasie kost moet verminder, gaan ons vir onself net meer probleme maak, goedkooper retikulasie inisit en die dorpsenlaan gaan in werklikheid nog dieselfde prys kry vir die erf wat hy oorspronklik bedoel het. Dit was vir my interessant om in mn. Raynal se referaat te lees dat Johannesburg oorspronklik begin het met ondergrondse kabels. Ek hoop nou dat plekke soos Potchefstroom en Springs luister daarna en hulle kan ook soos ons in Engels sedi die 'tip' weng van een ander tyd begin met ondergrondse kabels tot bogrondse lyne en weer na ondergrondse kabels. Dit het in my hoop gevgestig dat die Mini ook weer sal terugkom.

Ek sien mn. Raynal noem ook daar van enkelfasige hoogspannings wat gebruik word in sekere gebiede. Ek moet sê ek het ook onderskeid daarvan gehad en as daar nou een manier is wat 'n mens 'n onbalaans op jou hoogspanningskema kan skep, dan is dit om van enkelfasige mini-subs gebruik te maak. In 'n sekere dorp waar ek was is dit so dat die dorpsgebied oorspronklik beplan was in 3 dele, 2 dele daarvan het heel vinnig ontwikkel maar die derde een is op dié oomblik nog steeds op die rak. So is daar 'n vreeslike onbalans geskep. Twee van die fasies is goed belas en die 3de een het glad nie las op nie.

Mr. Raynal mentioned in his paper about the accommodation of services in the same trench. We are using this method in Benoni where we have got very rocky areas, but you do have different design, you do have longer cables because you have to suit with Town Engineer's department with the laying of the cables, and it does have certain disadvantages, eg. repairing faults on water pipes may cause some more faults on electrical cables. The use of that orange tape is perhaps a thing that should be incorporated in the standards recommended by the Niemand commission not only high voltage cables but for all cables. This is really something worthwhile, if this tape is buried about 3m above the electrical cable, anybody should notice it in time. Mr. Raynal also recommended the use of 5 mini-subs per secondary ring. This does not utilise the full capacity of the cable. I think his reasoning is that this will make provision for future expansions. This is wise but it also creates a problem that the present ratepayers have to pay for future electricity use. I also wanted to ask the same question that Mr. Hill asked about the protection on the Primary high voltage ring main, I am not sure, in the drawing it looks like it is almost non-protected, having isolators on the ring main. Perhaps I am wrong, but I am not sure about that one.

I must admit that Benoni has copied from Johannesburg as far as this connections of the service connections on the front boundary is concerned. This I really think is the answer to our problems. Most of our low voltage cable faults happen inside the stand boundaries and is usually caused by the owner of the stand itself. When he starts digging for a swimming pool or a sunken garden etc.. If the meter pillar is on the corner of the stand the connection inside should be the owners problem, not the Council's. The other matter which I can mention is the following: It is noted that Mr. Raynal does not make use of servitudes in designing and planning of his new reticulation systems. Nowadays, it is modern practice that the council has the right of a two meter wide servitude on any 2 or 3 boundaries, not facing the street. In Benoni we make use of these servitudes. We reduce the length of cables considerably by making use of it. It is also noticed that Mr. Raynal placed his low voltage distribution pillars on the splayed corners which we try to avoid, being a bit of a traffic hazard. I would also like to know from Mr. Raynal, do they use fibre glass distribution pillars or is it only cast iron boxes. I am asking this, because lately we are experiencing problems with fibre glass boxes.

'n Verder baie interessante ontwikkeling wat deur Johannesburg begin is, is die Kermabangs aardiek fotoposporing, ek persoonlik gebruik dit nog nie, maar dit lyk vir my asof dit groot voordele inhou en ek dink Johannesburg moet daarmee gekompromeisseer word. Johannesburg gebruik ook verder 'n sekere standaard van 'n maksimum groote vir mini-subs ek sal graag oek net wil weet, stent dit corseen met die grootte soos neergelê in die SABS spesifikasie, of is dit kleiner?

Mr. Raynal also mentioned street light poles being 2 000 m from the road. I notice in the slides shown that most of those pavements are not 2 000 mm wide! I would like to know what he would do in a case like that. This is a general problem in Benoni that the trees are growing much too big and we really have no street lighting system, although, we may call it a security lighting system. I personally prefer to have the street light poles only about half a metre from the kerb, although I must admit that the Niemand Commission also recommended that these poles must be placed 2 m away from the kerb. Mr. President, Mr. Raynal also mentioned smokeless zones; the maximum demands, rather A.D.M.D.'s, recommended by the Niemand Commission, does that include for smokeless zones? Already in Benoni the smokeless Zoning has caused some serious problems in regard to the availability of power. This availability charge Mr. Raynal mentioned, is that legal?

May we do it or do you have to get a special law passed or ordinance changed for that purpose? Mr. President, I would like to thank you and Mr. Raynal for this very stimulating paper.

Rdl. P.G. Joynt (Tzaneen): Mr. President, ek wil nie oor die tegniese deel van die referaat praat nie maar oor die administratiewe deel. U weet dat in die Witskrif is Tzaneen aangewys in die 21ste plek van alle groei punte in die Republiek. Gevolglik vind daar 'n gewilde ontwikkeling plaas en hier spel die Ingenieur 'n baie groot rol. My Kollegas, Raadslede wat hier is, ek wil nou nie mnr. Raynal sanval nie, maar ek wil hom verdedig omdat hy op die Niemand Kommissie gehilf het. In die Transvaal het ons die bestuurkomiteestelsel wat natuurlik vir die werk doen, gevolglik is my kollegas in die Transvaal redelik op hoogte omdat die sakk wat ek van praat sorteer onder administrasie, naalmik dit Stadsklerk. In die Transvaal word die prys van erwe bepaal deur die toevoeging van koste van dienste alvorens dorpspanting kan plaasvind. Die dienste is elektrisiteit, riol, water. Gevolglik word die elektrisiteitskoste reeds by die prys van die erf gevoeg alvorens die erf verkoop word. Die gevolg is dat wanneer u begin bou en die erf needs verkoop het, dan staan jy nie die belastingbedaars aan nie maar wel die man wat die huis gaan bou, omdat daar reeds voorstiening vir die dienste gemaak is. Ons moenie illusies hê dat dit nie reg is wat mnr. Raynal gesê het nie. Mnr. Laubscher sien die sak seur die bril van 'n elektrisiteitsman. Mnr. President, dit is 'n tragedie. Ek was nou net die assistent van die Heer wat die referaat gelewer het. U het gesien ek was die operateur van sy masjinerie, so ek voeg my by hem. Dit is 'n dringende dag as ons moet kyk hoe ons die bombe vermietig. Dit laat my dink aan die geweldadige onlog in Vietnam waar 'n man se arm afgeskei is, en hy moet nog beweeg. Dit laat my vermoed dat ons moderne tyd, mnr. President, is daar swak ko-ordinasie tussen die verskillende departemente van Munisipaliteit. Die Verkeersman wil die boom hê waar die belastinghetelar sy kar kan parkeer en die elektrisiteitsman sê, kap 'n stuk af. Ek denk die tyd het aangebreek dat die Superintendant van Parke, moderne dorpsbeplanning moet doen, naalmik om die tipe boom te plant wat net in 'n sekere tyd tot 'n sekere hoogte sal groei. Dis wat ons nou in Tzaneen doen in ons strate. Ons plant die boom wat heeltemal hoer gaan as die elektriese paal, of die boompiek wat slegs vir versiering is en nie dien vir parkering nie. Mnr. President, ek wil nie langer hieroor praat nie, maar dit is net 'n regstelling wat ek graag sou vrou maak omdat ek sien mnr. Raynal loop erg deur op die administratiewe vlak. Tegniek wil ek nie oor elektrisiteit praat nie, want dit is skokkend net om daaroor te dink.

Mr. A.H.L. Fortmann (Boksburg): Mnr President, eerstens wil ek mnr. Raynal gelukwens met sy goed voorbereide referaat, waarna hy geweldig baie tyd en moeite besteed het. In Ingenieurswese van hiedie aard, naalmik, retikulasie van dorpsgebiede, waar menige metodes gebruik kan word om dieselfde doel te bereik, is ek die mening toegedaan dat algelike uniforme reëls nooiit heeltemal toegelaat kan word nie, ten spye van die feit dat riglyne vir hiedie doel bestaan en waarna in die referaat verwys word. Ek ag dit belangrik dat Ingenieurs toegelaat word om hulle eie inisiatief te gebruik in hiedie opsig. However, it is also important, that we have guidelines and take careful note of what others say. Especially people like Mr. Raynal who has had vast experience in this field. With regard to the single phase HV reticulation, on page 5 of Mr. Raynal's paper, I would like to say that in Boksburg we have a single phase HV scheme in operation, commissioned just about the same... time as Johannesburg and I agree with what has been said about the limitations but we have had an exceptionally low failure rate and maintenance costs, as opposed to the very high cost and failure rate referred to by Mr. Raynal. This has not taken place in Boksburg. This system is certainly not advocated, mainly because of its limitations, and then under "Essential Conditions" further on, this is item 4 on page 5, and item 6(4) page 7. Here I would like to ask Mr. Raynal if he considers that the load rate will maintain the same level over the next 25 year period as it has done over the past 25 year period. Does he not think that there is a possibility of a marked reduction in the rate of load growth, although I must agree that it would be wise to plan for trebling of initial capacity. This is, of course, not achieved without the future addition of equipment and additional costs. Page 6 "Safety of Operation", we in Boksburg use 250 MVA, 11 kV, non-extensible ring-main units consisting of two isolators and tee-off fuse switch unit on the HV side and Tripole pole moulded case air circuit breakers on the LV side and this method has proved very satisfactory. You have seen Mr. Raynal's diagrams and they use the 1 circuit breaker and a series of HRC fuses, system.

This does have the disadvantage that if you want to replace an HRC fuse, you have to switch off the total LV supply. With regard to flexibility, top of page 7, it should be noted that the disadvantage of cutting in on the main HV distributor is that balanced feeder protection cannot be used, also referred to by Mr. Hill.

Mr. D.C. Palser (Cape Town): Mr. President, Our system in Cape Town is generally very similar to that described by Mr. Raynal with one or two exceptions. Firstly, we have not yet adopted mini-subs, primarily because of cost; secondly because of their height. They have come down in size now and are compatible therefore in respect of fence height. We are now seriously considering them. The other aspect where we appear to differ is in centralised metering. I noticed that you adopted them initially but have now discarded this system because of space

limitations. I don't appreciate this point. Perhaps you could elaborate on this point. As far as the LV reticulation is concerned, I also note that you have a ring feed. Have you considered tapering the LV cable sections to economise on costs, starting off at either end with a larger section and tapering towards the centre with a smaller section. The previous speaker also mentioned a 4% per annum compound load growth over a 25 to 30 year period. I also intended mentioning this point as well. Such a growth rate might have been the rate over the past 30 years as the utilisation of electricity was developing. I do think, however, that we are tending towards saturation now and perhaps a lower figure would be more realistic, perhaps 2% per annum. As far as the overhead mains are concerned we are actively and progressively undergrounding existing overhead mains also because of this problem with trees and having to prune them drastically and actually set aside a fixed sum each year for this specific purpose. We found that this is not really expensive because you cut down on your maintenance costs. Maintenance costs on underground systems being considerably lower than on overhead mains which does tend to offset the higher capital cost. In diagram 3 of the paper, I notice that not all the transformers have fused T offs. Could you perhaps mention why that is so. Thank you, Mr. President.

Mr. Murray Coutts-Trotter (Affiliate): I would like to add our congratulations to those of the previous commentators.

Mr. Raynal suggests that H.V. fuse protection can be omitted from MiniSubs in subsidiary distribution rings and that it only need be applied to units connected to the main distributors. As transformer failures at this voltage are fairly infrequent, we agree with this. We believe, however, that careful consideration should be given to the specification of the H.V. switchgear in MiniSubs and the minimum requirements are:

1. The switching should be 3 phase, particularly in respect of the ring switches. Under certain conditions of cable length and transformer sizes, investigations overseas have shown that serious over voltages can occur when switching single phase.
2. All switches should be fault making and load breaking and should be rated to carry the fault current of the system for a period of at least one second.
3. Integral earthing facilities should be provided. The safety of the operator is of utmost importance and the provision of integral earthing facilities on transformer and ring switches will, with correct operating procedure, ensure this.
4. All switch mechanisms should be spring operated or spring assisted to ensure rapid opening and closing.

It is unfortunate that the dimensions proposed by Mr. Raynal are in fact smaller than those adopted for the proposed S.A.H.S. standard. At the last Meeting of the Committee to consider this standard, it was agreed that all MiniSubs would be of the sealed type with a minimum expansion space above the oil equivalent to 20% of the oil volume. It would not be possible to achieve this within the dimensions presently utilised by Johannesburg Municipality. These very small dimensions also lead to an extremely restricted low voltage compartment, which would be insufficient to accommodate the equipment specified by most other Municipalities.

Mr. Chairman, I would like to take this opportunity of appealing to the members of the A.M.E.U. for their wholehearted co-operation in the implementation of the standard specification for Miniature Substations. After many years of painstaking work by the South African Bureau of Standards, the users and the manufacturers, this specification will be published shortly. Our statistics show that over two thousand Miniature Substations will be manufactured in South Africa in the next twelve months and approximately three quarters of these will be delivered to members of the A.M.E.U. The success of this standard depends therefore, on yourselves.

I will not take up your time with details, but would use just one aspect to illustrate the problems which will arise if we do not get your wholehearted co-operation. The specification calls for sealed transformers which, of course will have no provision on the tank end for a breather pipe and silica gel breather. Should some users insist on being provided with breasting type units, it will mean either modifications to the tanks during assembly or the manufacture of special tanks for their contracts. It might appear that an extra price for the additional equipment would solve this, but in fact, the position is very much more complicated. The main gain from standardisation is a reduction in the labour content, both in terms of actual labour and in the level of skill required. At the present time, there is a desperate need to increase the rate of manufacture of MiniSubs, and the major hinderance is the lack of labour. Therefore, any standardisation which reduces the labour content will increase the volume of output. The same criteria will apply to a number of other facets of the standard and I, therefore, repeat my appeal for you to confirm with the requirements of this specification.

The basic MiniSub has now been standardised, but this is not enough. The biggest single factor causing extensive delays and the utilisation of vast amounts of skilled labour, is the complete lack of common approach to the low voltage equipment, both in terms of types and layout. We intend to propose to the Bureau of Standards that a code of practice be drawn up in respect of low voltage equipment for MiniSubs and I would earnestly request the full support of the A.M.E.U. in this endeavour.

Mr. Chairman, thank you for this opportunity of commenting on Mr. Raynal's very interesting paper.

Mr. R.J. Fulls (East Rand Bantu Affairs): Mr. President, allow me to congratulate Mr. Raynal on an excellent paper. In general, what he has given us in his paper is very helpful to me as your Engineer, although I already used some of the practices.

Die Bantoe-sake-Administrasie het nie die voordeel van die Munisipaliteite dat ons netwerk-koste by die koste van die standplaas gevog kan word nie. Onmiddelik ons dus moet sorg dat ons netwerke ekonomies geregverdig is, sal ek graag wil weet wat die koste per standplaas vir ondergrondse verspreiding is en wat die inkomste per standplaas moet wees om gelyk te breek teen huidige EVKOM tariewe.

Mr. E. Trautmann (Ladysmith, Natal): I would like to assure Mr. Raynal that his paper will obtain a selected place in the library of many municipalities for its excellent coverage of our problems connected to township reticulations.

Still, there is one statement where I disagree and which surely derives from the difference of Mr. Reynolds Johannesburg and my Ladysmith.

I disagree with his Guide Lines for Financing of Electrical Services. Not in theory but in practice. It will just not be possible for a smaller town to finance the internal reticulation of a new township from our means.

It will still be necessary for a private township developer to finance the whole reticulation plus link services and to carry the risk until say 50% of all consumers are connected and the whole area is developed. This is also important in view of some very costly designs of Consulting Engineers which these developers often employ.

Such a township at the outskirts of Ladysmith was recently developed in this way for the cost of about R900.00 per domestic plot against R350.00 per plot developed departmentally under same conditions at the same time.

I feel therefore, that the risk must remain in the court of the developer when he is permitted to set standards and that has to finance his own development until the risk diminishes. Thank you.

Mr. B.G. Russel (Bedfordview): Mr. President, the reticulation system described by Mr. Raynal for Johannesburg is an almost identical system to that used in Bedfordview and is, therefore, undoubtedly a good one. I would, however, like to put one question to Mr. Raynal – it concerns load control. I think that every Municipal Engineer's nightmare often occurs in March or September when, throughout the month warm weather prevails and towards the end of the month just when the load factor for the municipality is looking good, a freeze up occurs. Over a period of a couple of hours the maximum demand suddenly runs up, perhaps 20 or 30% above the maximum figure for the rest of the month. What does Mr. Raynal feel is the remedy in such a case after every other remedy, including such techniques as ripple control, have been invoked? What about blocking out an outlying residential area for an hour or so and thereby saving considerable cost to the Municipality as a whole? After all, the cost ultimately does go back to the consumer and if there is a means of avoiding this extra expense, should this unorthodox system not be used as a last resort. I have an idea that Johannesburg very commendably does black out occasionally although the brief power failures that occur on cold evenings may be incidental.

Mr. G.C. Theron (Vanderbijlpark): I must congratulate the author on a concise and very useful treatise on the underground reticulation practice in residential townships in Johannesburg. I would like to confine my contribution to a number of general remarks.

Underground Distribution: It is now four years since the Code of Practice for the installation of electrical and telecommunication services in common trenches was accepted by the Association of Municipal Electricity Undertakings with the blessing of the UME. Except for the passing remark in Section 1, the paper is quiet on the co-operation between the GPO and Johannesburg Electricity Department. The author refers in the next paragraph to considerable saving in overall excavation costs in an inter-departmental scheme in Northcliff. Why the lack of co-operation between the GPO even on a pilot scheme?

Growth: In Section 4 the author states, quote, "that the load growth in the fully developed residential township in Johannesburg is of the order of 4%". Does this growth refer to townships with all-electric houses as they were connected, or does it include a gradual change-over to electricity for cooking, water and space heating? We at Vanderbijlpark certainly cannot boast such a load growth in fully developed townships but then every house erected in our town since 1948, except for a few exceptions, are all-electric.

Elektriese Toerusting: In Seksie 6 word gemeld dat weens ruimte beperkings, word die eerste gebruik om meters in sypandje kaste te groeper, nie meer toegelaai nie. Blykbaar word die meters nou op die gruns van elke persel aangebring. Is dit nie 'n geval dat bespoediging van meterleesing vir voorkoms opgeoffer word nie?

Kontinuitet van Toevoer: Die skrywer plaas kontinuitéit as een van die primêre vereistes maar meld in Seksie 3 van 'n hoogspanning verbruiker wat op 'n voedingstak aangesluit is. 'n Verbruiker met voldeende las om hoogspranning te regverdig kan seker op 'n kringleiding aanspraak maak.

Algemeen: Die voorstel om 'n bogondse kabel te gebruik klink interessant, maar daar word nie gemeld of dit hoogspranning of laagspanning sal wees nie. Sal die skuur van die kabel teen die bone en takke in windtoestande nie onderbrekings veroorsaak nie? Weens die sukses wat volgens die skrywer met ondergrondse stelsels behaal is en sekere beaan kan word lyk die voorgestelde basterskema as kort-sigtig aangesien die beswaar van onooglikheid ook nog aanwezig is.

Finansiële besonderhede van die tipiese benuttingstelsel beskrywe, sou die referaat nagevolg het alhoewel ek terdeel besef dat die syfer weens inflasie net vir 'n bepaalde tydvlak geldig sal wees. I want to thank the author for a valuable contribution to our proceedings.

Mr. W. Bozeczek (Estcourt): I would like to compliment Mr. Raynal on his paper indeed. There is one thing he has not dealt with and this is the tree root problem. He has spoken of overheads and a lot of tree chopping but he has not said anything about cables being damaged by roots. I wonder if he can elaborate in this regard.

Mr. C. E. Adams (Port Elizabeth): Mr. Chairman, I would like to congratulate Mr. Raynal on his paper as well. I think that the benefit that one derives from conferences such as this, is to discuss this type of paper, because this is the sort of paper that makes one think about one's own practices. Just 1 or 2 little points regarding the paper, in the diagrams Mr. Raynal provided, he shows an HV sub-ring supplying the mini-subs and from each mini-sub there is a low voltage cable to a street pillar and then a service cable from that to the house. Now this does not look a very economical set-up to me, because the LV cable runs let's say to the right from the mini-sub, and then the service cable runs back along the same route to supply the house next to the mini-sub. To my mind this is duplication of cables in the same trench. Also he shows on his diagrams the service cables on both sides of the street, to my mind this is extravagant in excavation, which is quite a heavy cost item, and I think it would be more economical to use more road crossings and to run up 1 side of the street, instead of up both sides. Also I would like to ask why he used a separate earth conductor because he is using armoured cables. Lastly, a little point mentioned by two previous speakers, where they refer to ratepayers, I think it would be far better if we referred to electricity consumers and not ratepayers because that encourages the Council to take money for relief of rates.

Mr. H. E. Wohlberg (Escom Natal): Mr. President, there are two questions I would like to pose to Mr. Raynal after his very excellent paper. The first one is his choice of cable. I have noticed in the paper that only copper cable is used, except for the main LV distribution cable, where aluminium is specified. Is there any specific reason why this has been done? The second one has already been touched on by a previous speaker and that is the mounting of meters at the house. This is our standard practice, but we are very seriously considering using pavement-mounted meter pillars because of the meter reader's problem with dogs. Is there a solution which Mr. Raynal has come across, which nobody of us knows here? We have tried cattle prodders but consumers usually think that their dogs are very docile and should not be antagonised.

Mr. C. Lombard (Germiston): Mnr. die President, mag ek ook my kwota van dank aan Mnr. Raynal rig vir sy baie interessante referaat. Mnr. President, ek wil graag verwys na bl. 14 bylae B, "Rigoureuse van die finansiering van elektriese dienste in woongebiede". Nou volgens die 2^{de} sat dat ontwikkelaar van nuwe woongebiede verantwoordelik wees vir slegs abnormale koste wat betrekking is by die voorseeing van elektriesiteit. Abnormale koste bestaan uit die koste om dit toevoer die dorpgebied wat langs 'n bestaande retikulerings skema is sal daar geen koste onder hierdie hooftes nie. Nou wat my bekommern hieroor, Mnr. die Vooritter, is dat dit moontlik oor die hoof gesien is dat daar gevare mag wees waar die hoofkragt kabels na bestaande dorpgebiede alred美 ten volle beset of bespeek is, in die gevolg dat nuwe kabels van die hoofbron, baie verder terug aangesluit moet word na die nuwe aangrensende dorpgebied. Ek wonder of hierdie saak nie weer verder ondersoek moet word nie, want ek meen dat dit onregverdig teenoor 'n stadsraad sal wees as hy in so 'n gevall die koste van die kabels verder terug na die hoof bron toe moet dra. Mr. President I was also very interested to note that Mr. Raynal contemplates aerial cable to replace some of his low voltage overhead line conductors. We have a similar problem in Germiston concerning our high voltage overhead line conductors.

We have always contemplated placing most of these underground, but we never seem to be able to get around to it. We are now, as a matter of interest, to the Convention, installing high voltage aerial cable, his cable is laid up in a figure 8 configuration complete with catenary wire. From the appearance point of view it is a very neat construction and is time saving and also money saving as installation is concerned. As you yourself know high tension overhead lines, give you a lot of problems, and this is our way of overcoming these problems. Thank you.

Mr. D. A. Gardner (Affiliate): Mr. President, I would like to join in congratulations to Mr. Raynal for a very excellent paper and obviously from the discussions that have come along, it is going to be a very good guide for us in the future. The question I would like to pose is with specific reference to earthing. I note that it is proposed to use solid aluminium core strip aluminium armoured cable and presumably the strip aluminium is to be used as the earth conductor. I would like to pose the question, is this now the universally accepted form of earthing conductor and also, is this type of cable now manufactured in this country? Also, what provision, if any, is made for the earthing of the street lighting standards?

Mr. W. Barnard (Johannesburg): I would like to add my congratulations to Mr. Raynal for the presentation of what I consider to be a very excellent paper. I would go further in saying that I have absolutely no criticisms of his proposals. It puts forward the ideal in

township reticulation. Mr. Chairman, I would like to deal very briefly with the financial aspects.

We are going to have to accept that sooner or later the township developer will no longer pay for the reticulation of a new domestic township. Whether we like it or not, whether we can afford it or not, there is provision in the Niemand report to borrow money from a township developer. There is, however, certain action which the Local Authority can take to ensure it does not suffer a loss. Before the Township Board will agree to the establishment of a new township, the local authority will have to provide a certificate to say that all essential services viz water, sewerage disposal and electricity supply will be available. If you are of the opinion that the proposed township is not going to be a viable proposition, you have the right to withhold the certificate, and it means that the development will not go forward. It therefore, naturally is in the township developer's own interest to make sure that he does not develop townships in areas which are not suitable. There were some questions asked about recovery of costs incurred because of under-utilisation of the reticulation system which is provided. The provincial authorities have indicated that they agree that there are certain costs that we can recover. The application of an under-utilisation charge to the owner of a stand is not provided for in the Transvaal Provincial Ordinance. There is provision for recovering the cost of under-utilisation of water supply but not electricity. Nevertheless, the Director of local government has assured us that he will support an application for an amendment. The other point of bringing supply to the township; only the cost of the main distributor across undeveloped land may be recovered. I would say that in Mr. Lombard's case, he is already getting an adequate return on cables which are fully loaded and therefore the local authority must accept that where they are expanding their system, they must meet the additional capital cost. Reference has also been made to abnormal costs. Although the Niemand recommendation makes it very clear that the local authority will meet all internal reticulation costs, the Province have accepted that where a township developer decides to develop say on a very hilly terrain, or where there are any other features which makes the reticulation abnormally expensive the township developer will be required to pay the difference between the cost normally incurred. I hope we will in the near future arrive at standard costs.

Mr. A. F. Turnbull (Vereeniging): I was going to ask the question which Mr. Barnard answered about the development and costs of supplying townships remote from any services. There is a problem which Mr. Barnard partly answered and that is the question of where you get a township comprising entirely of rock where you have to blast. I was wondering if you have any of these problems in Johannesburg and if there are townships where you have to blast to lay services, especially when they are the consumer house services. Is the consumer liable for that portion up to his property or only inside his property or does the municipality have to undertake such excavation. In a rezoned township that is the older townships where blocks of flats suddenly appear in what was purely a residential area. Do you supply these consumers from a mini sub or do you require the consumer to provide a transformer room. The transformer room is difficult always to assess especially when you are not sure what type of development they are going to on a particular site. I was wondering if you had guidelines for a consumer over a certain kV installed capacity whether you required a transformer room or whether you went for a mini substation and if you did supply a mini substation, do you require the consumer as indicated in your photograph to make a special area for this mini sub, clear of the sidewalk.

Mr. E. de Villiers (Rustenburg): Mnr. die President, ja u het sommer nou 'n teer punt aangerook toe u praat van home, ek moet dan sommer dadelik in die vergadering sê ons is ook daar vankuidig vir die hulp, na ons groot stoms in Desember en Januarie. Mnr. die President, ek dink ek moet 'n bietjie terugval in jare in die verlede so omstreeks 1960, toe was ek die ingenieur van die 'stads' Carletonville, Mensee Frakkie van der Merve is ook vandag hier en ek dink hy is trots op sy stad wat ek gehelp het sodat hert sedert dit 'n munisipaliteit geword het in 1959, op 1 Junie om presies te wees. In daardie jare het ons buordorp Krugersdorp ook 'n jong ingenieur gehad en dit is mensee Hennie Dreyer. Hy sit vandaag ook hierso en is nou al 'n klompie jare die ingenieur van Paarl. Op 'n dag het mensee Dreyer my gesakelei en vir my gesê "man jy weet, ek het nou gehoor van 'n nuwe idee van sekondêre hoogspanning verspreiding met klein transformatorstelsels hier en daar en orals versprei. Ek dink ons moet 'n bietjie gesels oor die aangeleentheid." Ek dink Mnr. Dreyer sal nou goed die dag ontbow wat ons blykbaar gekom het, ek het hom gaan besoek ons het begin met die stelsel van hierdie tipe verspreiding. Hy het dit begin toepas in Krugersdorp en ek het dit begin toepas in Carletonville. Nou, ons het destyds nog maar getas in die donker maar ek dink ons het kaallogies ver gekom en dit was nie baie jare danra nie tot ons het ons kaallogies op verskeie ander plekke (miskenaar voor ons of gelyktydig of na ons) op dieselfde idee gekom. En dit is waar ons vandaag al so ver is dat die grootste stad in een land, Johannesburg, vandag deur Mnr. Raynal vir ons hierdie baie interessante lesing gevier het op 'n baie verbeterende stelsel maar gebou en geskoei op ons pogings van vroeë jare. Ek moet darem sê ek dink dat daardie pogings nie te swak was nie, want ek het nog nie enlik gehoor dat mnr. van der Merve teen my gekla het oor Carletonville se mini-subinstallasies nie; ek het nog nie klages gehoor van Bloemfontein se ingenieur van die pogings wat ons daar aangewend het nie, en ek dink mensee Dreyer het nog nie baie klages gehoor van Krugersdorp se ingenieur mensee van den Berg nie. Dit is

nou maar 'n stukkie geskiedenis en dit is vir my nou vreeslike interessant dat ons nou hierdie lesing gehad het van een van Johannesburg se senior ingenieurs. Mensee die President, ek wil net darem 'n sakie regstel, want dit lyk vir my sommige van ons is 'n bietjie in 'n dwsel. Ek was nog altyd onder die indruk dat die koste van verspreidingsnetwerke word geheef en al finansier uit aparte lenings wat die stadsraad aangan; eksterne of interne lenings; maar nie noodwendig sy belastingfonds nie. Behalwe as die interne lenings bedoel word as uit die belastingfonds gefinansier te wees. Dit is misken 'n sakie wat ons moet regstel. Die enigste geval wat ek tot dusver teengeskou het dat ons uit die koste van benutting nie uit die verkoop van erwe verhaal het, is die grensverwyderingbedielp wat ons in Rustenburg nou het en daaruit word die dienste se koste alles verhaal uit die koste van die erwe. Dit is misken 'n sakie wat ons 'n bietjie weer moet ordink. Dankie.

Mnr. P. J. Botes (Roodepoort): Mnr. die President, ek wil graag mnr. Raynal ook gelukwens met hierdie referaat wat hy gelewer het, ek het baie interesserant gevind.

Ons in Roodepoort gebruik amper dieselfde tip retikulasiestelsel behalwe dat party van die kabels wat hy gebruik 'n bietjie aan die groot kant is. Ek wil net graag noem i.v.m. uitgravering van stols, by ons in Roodepoort, natuurlik is dit daar op die rantjies waar ons meestentwikkeling plaasvind, en dit in die klap. Daar moet geskiest word feitlikoor die hele lengte van die stols. En dit lewer heelwat probleme op maar ons lê die kabels met die waterpype, en ons spaar heelwat koste. Daar is 'n reëling getref jare gelede ek weet dit seker die enigste plek waar so 'n reëling is, dat wie ookal verantwoordelik is vir die installeer van water die slate moet grawe, die waterpype is, waarna elektriesiteit comeen. Ons installeer ons kabels en ons van die slate in, en nou dit instand. Nogal heelwat voordeel. Die kwessie van die kabel vanaf die grens tot by die huis, die ek lankal reeds besluit en dit word algemeen so gedoen, in Roodepoort, dat die huiseienaars daarvoor moet sorg. U weet in daardie klappe is daar ook mooi rotse wat die mense rotsteene mee wil maak, asook baie proteas. As jy dus 'n elektriese stuur om 'n kabel te installeer word die rotse en proteas stukkend gekap wat probleme oplewer. Gevolglik laat ek hulle hul eie proteas en die rotse stukkend kap. Daar is nog 'n vraag wat ek graag wil vra, en dit is nogal 'n probleem wat ek het, en dit is i.v.m. hierdie mense wat ondervloede verhitting gebruik. Ons kry ook van hierdie luukse woonhuise wat ondervloede verhitting installeer waarvan die aanvraag bo 100 kva per aansluiting is. Dit lewer heelwat probleme op en ek sê graag wil weet op watter basis word die aansluitingskoste van so 'n eenheid bere算 en of daar 'n spesiale miniatuur substasie vir sulke persone ge-instaal word. Baie dankie.

Mr. K. J. Murphy (Somerset West): Mr. President, I would just like to ask Mr. Raynal as far as the paper is concerned, are these suggested guidelines only? To what extent could they possibly in future become standard and enforceable methods of reticulation? Much of it is to be quite frank with you, is of course well known and we are doing this for years though we have been going about certain aspect of URD in slightly different ways. But if we are all going to be forced to do our reticulation in absolutely the same way then I hope we will all give the opportunity of submitting, in writing, our own ideas and criticisms thereof. The other question is with regard to availability charges. This is payable in the Cape Province now for certain number of years, municipalities that do want to levy it do so on open stands. With regard to the placing of services underground to avoid further problems with trees I notice from the slides that judging from the sizes of the trees, you would still have the problems with your street lighting, although you have gone underground. Thank you Mr. Raynal for a most stimulating paper. Thank you.

Mr. J. K. Von Ahlfen (Springs): Just a few brief questions to Mr. Raynal. On page 6, where he talks about the cost difference that has virtually been eliminated, could Mr. Raynal give us actual figures, of the cost of overhead distribution against underground distribution. We in Springs find there is a 25% difference which is quite a heavy capital expenditure. Then on page 7, capacity for future growth, Mr. Raynal, has any consideration been given to load control to keep the load growth down or to improve your load factor? Thirdly the question of aluminium armour on your cables. Do you visualise any problems as far as corrosion is concerned? We are interested in what your experience has been in this case. Thank you.

Mr. V.A. Raynal (Johannesburg): Gentlemen, Thank you very much, for your contributions, of which there have been more than 20. I am very gratified at the interest shown in this paper. I'll attempt to answer some of the technical questions starting with Mr. Hill.

Protection of our 185 mm² x 3 main distribution cables is by means of inverse time overcurrent and earth fault protection relays at the main substation. Where these cables are tapped at the substation shown in my drawings, protection of sub-rings is by means of series tripping with time-lag fuses for overcurrent and instantaneous earth faults.

The question that has cropped up quite a few times is about centralised metering. I think this is a very contentious subject that has been argued before in the AMEU. From our point of view, provision of centralised metering on pavements requires quite a big cabinet which is extra street furniture that can be hit by vehicles and needs maintenance. Our meter readers only come around once every three months so we have decided that since consumers are required to take supply at their erf boundary, it is more satisfactory for the meters to be at the point of entry on their property. Further, we want the consumer to be

responsible for the cable from the erf boundary to his house. We have had so many cases where, as a result of gardening, digging or swimming pools or planting trees, the service cable has been damaged; and if the meter is on the erf boundary then the service cable is consumer's property and we are relieved of the responsibility for its upkeep. We have got something like 85 000 houses in Johannesburg with service cables so that it becomes quite a headache maintaining them. As for cable marker tape, it is difficult to say whether it has been effective in preventing damage to our cables. An indication that it is effective may be gained by a marked reduction in the number of reports of cable damage from excavations which reached an all time high of one per day during the construction period of the Motorways.

Mr. Laubser of Benoni, Mr. Barnard answered your question about availability charges not yet being legal. Regarding the ADMD of consumers in smokeless zones, I know this has raised a query about whether the figure of 8 kVA for an ordinary dwelling takes in smokeless zones or does not. What we find is that where smokeless zones are in force now, servants' quarters especially are affected. Previously they had some kind of coal stove, but now alternative heating is required and oil is out of the question, anthracite or gas is expensive, so a lot of people have been installing electrical heaters for their servants and we are getting a natural increase from that source. We also found it strange that existing townships have a steady increase of 4% per annum. I have shown in a graph that it is authentic, but it can be explained by the variety of appliances that are today on the market. We expect that if battery vehicles come in there will be a steep rise in consumption. But I agree the day must come when we may approach saturation. But it does not seem to be in the foreseeable future. In regard to tingle phase URD systems, apparently they are good, but we are having trouble with overload and are no longer installing this system. What does one do when the consumer wants more than 80 amps? Do you install a second minisub?

We have had cases where we have given them two and three single phase cables, to try and meet their load. So if you have laid two core HV cables for your single phase cable reticulation then you are in trouble, because you may have to go back one day and replace it with three core HV cables.

Another question was raised about earthing and strip aluminium armoured cables. These are manufactured in this country. Why we don't rely on the strip aluminium armouring as the only main earth is that we are doing ourselves a favour running a galvanized stranded steel conductor with each main cable because it acts as a trench earth. The current carrying capacity of this conductor is equivalent to 16 mm² copper. Laid in terrain that may comprise a mixture of rocky ground and good ground, it acts as a trench earth as well as a main earth coupling between earth bars at supply and receiving points. The cost of this conductor is negligible.

In regard to pillars on splayed corners, we certainly don't put minisubs on such corners, but the pillars that you saw on the photograph are roughly 400 mm square and we don't consider them a traffic hazard. Someone asked why we use such compact minisubs. It's a point of honour, if you like, with us. When minisubs were first introduced in the city, the City Engineer was appalled. He could not imagine these minisubs in large numbers on the pavements. We already had pillar boxes, post office boxes, postal collection boxes, rubbish boxes, etc. on the pavements, so he reluctantly agreed to the installation of minisubs on pavements provided their dimensions did not exceed 100° long x 45° high x 24° wide. So manufacturers have suffered under this burden for many years having to comply with this size. There is no good reason why we can't enlarge them slightly, but we feel that manufacturers can produce the sizes we want. There are five minisubs per sub-distribution ring. The two HV cable sizes that we have standardized on are 50 mm² and 185 mm². The 50 mm² has a capacity of three megawatts. The five minisubs of 300 kVA take half the capacity of the total load that was on one cable. But now we run with open rings, so initially each 50 mm² cable is normally only one quarter loaded and there is sufficient capacity for a trebling in load by the end of the century. The maximum is five minisubs per ring chosen with that in mind.

Servitudes on properties: I think if you look at my drawings of a township in Figure 4(a), we have used a servitude through two erven. We are not against it, but wherever possible we avoid laying our HV and main LV cables across private property. This is because it is difficult to prevent householders from planting trees or erecting fences along erf boundaries where cable servitudes are usually situated and consequently our cables can be interfered with.

The question was asked about roots in trenches. When a trench is opened in hard ground, it is backfilled with sifted soil around the cables. This provides a soft moist passage along which roots can travel but we have had little interference. There was one case some years ago where an HV cable was literally "squeezed to death" by a large root which grew around it, but generally roots have not been a problem on our cable network.

The question has been asked about tapering distribution cables. Because it is advisable to provide overload discrimination for smaller cables, the economic benefits of tapering cable sizes are offset by increased costs of switchgear. In the interests of standardisation, we have only two sizes of HV cable: 185 and 50 mm². If Cape Town are finding their rate of increase in load is two per cent per annum, it will most probably be maintained until the advent of electric vehicles. The annual provision of R100 000 in Cape Town for the undergrounding of over-

head mains is one way of gradually eliminating the conflict between trees and overhead lines.

Somebody asked about the cost of stands compared to the cost of supply. This is a very interesting question. Going back 40 to 50 years in the early townships, who will take a township like Parkwood; you could buy a stand for £100. The cost of reticulating was £35. So it was nearly one third of the cost of the stand that had to be spent on reticulation. Today in a modern township you pay anything up to R14 000 for a stand in Johannesburg and it would cost about R700 per stand for reticulation, which is 5%. Now when engineers plead that capital is scarce and advocate a low standard of reticulation, one must remember that reticulation costs have come down in relation to property values and we should stand up for the maintenance of a high standard of reticulation.

Someone asked about load control; I think it was Springs. We have load control in one of our large townships and it is working efficiently - I can highly recommend it for the application for which it was installed in Johannesburg. It will have paid for itself within 2 years of operation. In regard to corrosion of aluminium strip armour on SAC cables, we have found very little on the Highveld. I cannot, however, speak for the coastal districts.

Mr. Trotter spoke about transformers in minisubs and the provision of expansion space. We have made a minisub available to the Bureau of Standards for experimentation and fourteen per cent was definitely found to be too small for expansion volume. The internal pressures on 50% overload exceeded the safe tank pressures. So the figure of 20% expansion space is a rational one, although it means that our minisubs may have to be bigger as a result. Johannesburg nevertheless still favours a pressure relief valve on all sealed transformers.

Mr. Theron of Vanderbijlpark raised a question of operating with the Post Office on shared services. The idea is an excellent one, although we have found that the Post Office's requirements as far as providing rigid pipes tends more towards water reticulation than electricity. We have so far shared services with the GPO in Northcliff but progress in general has been slow and further consideration should be given to the GPO co-operating with water services.

Also the question was raised about all-electric houses. Our 4% annual increase in domestic load includes suburbs that are converting from slow combustion to electric water heating. So perhaps in an all-electric town like Vanderbijlpark you would not have such a high annual increase in your domestic loads.

Mr. Adams of Port Elizabeth raised the question about wastage of cable, if you have to go from the minisub to pillar and then come back again to feed the house right next to the minisub, and also about cables on both sides of the road. I'm afraid it would be difficult to find a perfect reticulation system where all waste would be eliminated. To provide the house next to the minisub with a more direct supply than from a pillar 200 feet away would mean providing more LV pillars at an increase in cost. We run service cables on both sides of the road to reduce the number of road crossings.

Escom Natal asked a question of why we still use copper cable for high voltage. This is a very good question. For years we tried to find an effective way of crimping stranded aluminium cable. This could be the subject of another paper for the AMEU. But British practice is not yet to crimp stranded aluminium cable, but to solder. We have been successfully crimping copper cables for at least 15 years and we are looking to start training our staff in such skills as soldering stranded aluminium. We are successfully crimping solid aluminium cables which are mainly LV, but at the moment there is no high voltage cable made with solid aluminium cores. Another point as well, on the economical side, where we have had long runs of high voltage cables and we have considered using aluminium, we found that to keep within the size of drum we can conveniently handle one would have to order shorter lengths of aluminium cable because of its larger cross-sectional area. This would lead to more joints and the cost difference would become something like only 10% in favour of aluminium.

I'm glad to see that we have got a neighbouring town, Germiston, interested in aerial cable. On this point Mr Holt of African Cables has done some splendid work for us. The idea is that we remove the existing LV copper overhead mains which are mostly 70 mm² and replace them with an aerial cable with twice the current carrying capacity of the original lines. Revenue from the sale of the scrapped copper mains will practically pay for the labour involved in the change-over. The aerial cable is roughly 3" in diameter and it contains 3 x 185 mm² round aluminium PEX insulated cores, a 70 mm² stranded copper neutral conductor, a 50 mm² earth conductor, street lighting and robot cores, all arranged symmetrically around a 7/41 galvanized steel catenary. The question was asked about how do we overcome the problem in rocky townships. Mr. Turnbull of Vereeniging asked this one and I think Mr. Hotes answered that we do co-operate with people laying water and sewerage mains. We have one trench and water, electricity and telephone services are installed at fixed distances from each other.

I agree with Mr. Murphy of Somerset West that the reticulation scheme I described was "Old Hat" - I said in my paper that it was not novel, but an attempt to achieve some degree of standardisation. The problems of street lights also being interfered with by trees is one that can be overcome by an underground reticulation scheme where street lighting poles can be located at a reasonable distance from trees.

The question was asked about the rezoning of townships. In Johannesburg we have a township like Turffontein for instance or Belle-

view where practically all the stands are built on. Somebody obtains a rezoning and starts putting up small flats or maisonettes. Now the question is "How do you supply these people" because obviously on a small stand, let's say $\frac{1}{2}$ acre or $\frac{1}{3}$ acre, you haven't the space to provide a high voltage chamber. So the policy we have adopted is that if a minisub could be accommodated on the property, like the photograph I showed you, just off the pavement because often the streets have been widened and the pavements are only about 2 m wide, then we give the consumer what we call "a special low voltage connection" up to 100 kVA and the remaining capacity we use for augmenting the local overhead or underground distribution. We can do that because in most cases, we have then a mixture of maisonettes, small flats and houses. If this continues, then I can foresee a reticulation scheme being necessa-

ry like the one I have shown you where there will be minisubs at 1 200 ft intervals or less.

Someone, I think Mr. Loubsen, was asking about our guide lines indicating that street lighting poles should be set back 2 m from the kerb. In the new type of township, the kerbing is sloped to allow people to park on pavements. It is a "mountable kerb". The poles are set back 2 m to allow people more parking space, but the photograph I showed you was of an old township, Saxonwold, and maybe it was our fault, we should have set these poles back, when we modernised the reticulation recently, but we didn't.

I can't think of any other question I can answer right away, Mr. President. Thank you.

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(ii) Is daar dalk versteekte finansiële koste wat my rentekoers verminder?

(iii) Word my rekening maandeliks met die rente gekrediteer – of net een keer per jaar? (As u maandeliks gekrediteer word

soos by Nedbank, verdien u spaargeld saamgestelde rente, en u belegging groei soveel vinniger.)

(iv) Word ek beskerm teen 'n skielike daling in rentekoerse – en gaan ek baat as die koerse weer klim?

(v) Kan ek geld trek as ek wil?

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DR. J.W. COWDEN

Born and educated in Durban and commenced his career in the City Treasurer of Port Elizabeth from 1964 to 1960. Town Treasurer of Springs from 1951 to 1964 and Chief Financial Officer of Springs from 1964 to date. Holds the qualifications B.A., M.Com., Ph.D., F.I.M.T.A.

Has served on the Council of the Institute of Municipal Treasurers and Accountants for 20 years and has had two terms as President. Has written numerous papers for conferences and is author of *Holmes Local Government Finance in South Africa*. (Second Edition.)

PROGRAM BEGROTING Deur Dr. J. W. Cowden

1. INLEIDING

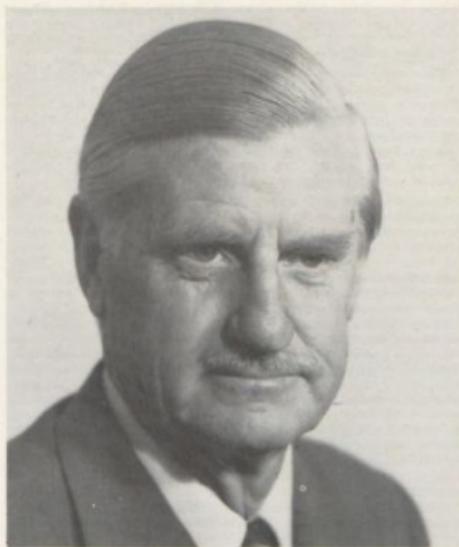
Die hoofdoel van hierdie referaat is om in algemene termen die aard en betekenis van program begroting aan te dui, en 'n metode voor te stel vir die implementering in elektrisiteitsondernemings. Dit is egter wenslik om aan die begin te meld dat program begroting nie 'n tegniek is nie, maar eerder 'n bestuurssproses wat die hele organisasie dek, wat in die geval van die huidige referaat, 'n munisipaliteit is. 'n Munisipaliteit is 'n universitas wat gevorm word deur die assosiasie van verskillende persone vir 'n gemeenskaplike doel, 'n juridiese eenheid wat afsonderlik is van die individue binne die groep. Met die oorweging van enige voorgestelde begrotingsformate vir elektrisiteitsondernemings, is dit dus belangrik om sityd die belangrike feit in gedagte te hou dat program begroting 'n omvattende stelsel is wat baie wyer in omvang is as finansiële begroting. Dit het as hoeksteen die ontdekking van breë gemeenskaps doelwitte en die implementering van plante en programme wat aandag sal vestig op sulke doelwitte. Die objek van 'n elektrisiteitsonderneming is nie om elektrisiteit te versprei nie. Dit is om, in samewerking met ander dele van die munisipale onderneming, gemeenskaplike ontwikkeling te bevorder en 'n hoër lewensstaard aan die mense te bring.

Die beklemtoning van hoër objekte laat die vraag ontstaan van die uitdrukking "program begroting" gebruik moet word eerder as sommige van die ander uitdrukkinge soos P.P.B.S., bestuur deur objekte, uitvoer begroting of multi-doel begroting. Kritiekusse van die gebruik van die uitdrukking program begroting glo dat dit eerder die begroting bekommet as die beplanningsaspek. Niemand, word die uitdrukking "program begroting" in Groot Brittanje op groot skaal gebruik, deur Novick die bekende autoriteit op hierdie onderwerp, en deur die Franssen-kommissie in Suid-Afrika. Dit maak nie veel saak watter uitdrukking gebruik word nie, solank dit verstaan word dat beplanning, programmeer, begroting en stelselanalise almal in die stelsel saamgeweef is. Die mening is uitgespreek dat die letters P.P.B.S. vervang sal word deur 'n uitdrukking wat 'n beter aanduiding sal gee watter vordering onlangs gemaak is tot die integrasie van beplanning en begroting.

Die uitgebreide aard van die onderwerp vereis 'n groot mate van konsensus in 'n konferensie referaat,veral in sover dit die begripsoort betref, en op hierdie aspek sal uitgebrei word wanneer die referaat werklik gelewer word. Slegs 'n paar gellustrerde formate vergesel hierdie referaat, ander sal vertoon word as visuele hulpmiddel by die konferensie.

2. Die Ontwikkeling van Program Begroting

Program begroting, soos dit vandag bekend staan en soos dit deur verskeie staatsliggame dwarsoor die wêreld geïmplimenteer word, is 'n betreklike onlangse ontwikkeling in die geskiedenis van begroting. Dit is 'n produk van die jare negentien sesig, hoewel sy begriposoor-



PROGRAMME BUDGETING By Dr. J. W. Cowden

1. Introduction

The main purpose of this paper is to indicate in general terms the nature and significance of programme budgeting, and to suggest a method of implementation in electricity undertakings. It is desirable to state at the outset, however, that programme budgeting is not a technique but rather a management process involving the whole organisation which in the context of the present paper is the municipality. A municipality is a *universitas* formed by the association of several persons for a common purpose, a juristic entity separate from the individuals within the group. In considering any proposed budgetary formats for electricity undertakings, it is therefore important to keep always in view the vital fact that programme budgeting is a comprehensive system much wider in scope than financial budgeting. It has as its cornerstone the discovery of broad community goals and the implementation of plans and programmes which will focus alteration on such goals. The objective of an electricity undertaking is not to distribute electricity. It is, in association with other fields of municipal enterprise, to promote community development and bring a higher standard of living to the people.

Emphasis on higher objectives raises the question whether the term 'programme budgeting' should be used rather than some of the other terms like P.P.B.S., management by objectives, output budgeting or multi-purpose budgeting. Critics of the use of the term programme budgeting believe that it emphasizes the budgeting rather than the planning aspect. However, the term 'programme budgeting' is used extensively in Great Britain, by Novick the well known authority on the subject, and by the Franssen Commission in South Africa. It matters little what term is used provided it is understood that planning, programming, budgeting, and systems analysis are all woven into the system. The opinion has been expressed that the initials P.P.B.S. will be superseded by a term which better indicates the recent advances made towards the integration of planning and budgeting.

The extensive nature of the subject necessitates a great deal of condensation in a conference paper, especially as far as the conceptual framework is concerned, and this aspect will be elaborated when the paper is actually delivered. Furthermore, only a few illustrative formats accompany this paper. Others will be exhibited as visual aids at the conference.

2. The Rise of Programme Budgeting

Programme budgeting, as it is known today and as it being implemented by various governmental bodies throughout the world, is a comparatively recent development in the history of budgeting. It is a product of the nineteen sixties, although its conceptual origins go back

spring terug dateer na die verskeie bewegings tot funksionele begroting in die jare negentig twintig en dertig. Dit is egter voldoende om vir die doelwitte van hierdie referaat, slegs op die na-Wereldoorlog II tydperk te koncentreer.

Met die beëindiging van die Wereldoorlog II in 1945 was die V.S.A. vermoed dat groot militêre uitgawe op 'n globale basis. Hoevel publieke uitgawes in meeste lande buitegewoon groot getoen het vanaf 1900 as gevolg van ontwikkelings in onderwys, sosiale dienste en openbare gesondheid, is dit nie net in vergelyking met uitgawe deur die V.S.A. Federale Regering, wat in 1949 72,2 persent van totale Federal Uitgawe tot verdieningsuitgawe alleen toegewys het (gewapende magte, hulp vir oorstryders, rente op oorlogskuld, buitenlandse hulp).

Dit was dus nie verrassend dat die eerste belangrikste veldtoog vir begrotingsvervorming in die V.S.A. plaasgevind het nie en wel in Sy Departement van Verdediging. Die nodige aanmoediging was verskaf deur die National Security Act 1949 wat onder andere voorseeing gemaak het vir 'n verbetering in die masjienerie van begroting en finansiële beheer. Program begroting vir die leer was in 1949 ingestel en dit was die eerste keer dat enige werklike poging aangewend was om 'n skakel tussen die opkakte in die finansiële begroting en die programme van uitgawe te skep. Verdere aanmoediging was verskaf deur die verslag van die Hoover-kommissie in 1949, wat aanbeveel het dat "the whole budgetary concept of the Federal Government should be refashioned by the adoption of a budget based upon functions, activities and projects . . . such approach would focus attention upon the general character and relative importance of the work to be done, or upon the service to be rendered, rather than upon the things to be acquired, such as personal services, supplies, equipment and so on."² Nog verdere stukrag was verskaf deur die begrotings-naarwerkswerk wat deur die RAND Corporation ondernem is, wat die kern probleem as een van voorkeur gesien het. Die ingebrukname van programmebegroting is verhaas toe Robert M. MacNamara, 'n deskundige in program begroting tegnieke, Sekretaris van Verdediging in 1961 geword het. Die verdieningsbegroting was geformuleer in terme van hoof-programme en wapenselsels, en het noue skakels met die aanwendingsbegroting ingehuis.

Die belangrikheid van hierdie eksperimente in die Departement van Verdediging mag gesien word uit die feit dat hulle 'n model geword het waarop beplanning, programmeer en begroting-struktuur opgestel is op ander regeringstrukture, en in ander lande. In 'n verklaring in 1965 het President Johnson na die stelsel op luisterryke wyse verwys, en gesê dat dit na alle Federale Departemente uitgebrei sal word. Baie skrywers beskuif President Johnson se verklaring as die begin van die program begroting. Ongelukkig, is die plan van implementering in Federale Departemente 'n te groot skaal onderneming, en vandag is daar 'n groot terugker vanaf die oorspronklike skemas. Die hoofrede vir mislukking was die gebrek aan toepvlak ondersteuning, 'n onrealisiese tydtafel vir implementering, gebrek aan personeel, 'n saamgestelde tydspaas van 'n selektiewe benadering, onvoldoende aandag aan ekonomiese analise en die gebrek aan inskakeling met die rekening-kundige stelsels.³

Nietemin, was die Amerikaanse ondervinding belangrik omdat stukrag vereis is aan eksperimentering op ander gebiede, veral plaaslike bestuur. Die bekendste eksperiment op hierdie gebied was die een wat deur die George Washington Universiteit ondernem was in medewerking met vyf stede, vyf 'counties' en vyf state, wat bekend geword het as die 5-5-5 projek.⁴ Die doel was om die praktiese aanwending van program begroting tot state en plaaslike besture te evalueren; sedertdien het verskeie liggame die stelsel in verskillende mate aanvaar. Dit word ook staalgan in die Regerings Departemente van België ingestel. Die Franse Nasionale Regering het 'n derglike stelsel aanvaar (La Rationalisation des Choix Budgétaires) waarna beklentoning verleent word aan 'n deeglike studie en voorlegging van alternatiewe plante sodat die besluiteun beter ingelig is oor die keuses wat vir hom beskikbaar is. Die stelsel is tot 'n minder mate ingestel in sommige Regeringsdepartemente in Groot-Brittanje en in sommige plaaslike besture. Dit is intensief bestudeer deur verskeie institusies soos die Chartered Institute of Public Finance and Accountancy. Daar blyk 'n afname te wees van die oorspronklike entoesiasme vir program begroting ten gunste van 'n minder formele benadering tot verenigde bestuur.⁵

In Suid-Afrika is 'n formele stelsel van P.P.B.S. in 1967 met die hoof beklentoning op begrotingsvervorming; die ander elemente van die stelsel soos programanalise en beplanning word mettertyd ingestel. Kanada het die stelsel in 1964 ingestel met die hoof beklentoning op koste-analise, en minder aandag aan die studie van alternatiewe en program beplanning. In Suid-Afrika het die Departement van Verdediging 'n stelsel van P.P.B. ingestel met sy 1969-70 begroting tesame met 'n vyfjaar projeksie. Die Franszen-kommissie (1970) het die instelling van 'n programmebegrotingstelsel in sentrale regerings departemente en die provinsies sterk aanbeveel en regerings amptenaare is besig met implementering daarvan op sekere terreine. Op die gebied van plaaslike bestuur het die Sandton Stadsraad in 1972 besluit om die stelsel in te stel, en die 1973/74 begroting het 'n analise bevat van uitgawe op funksies, programme en programmelemente met passende skakels met die finansiële begroting. Die Institut van Stadsklerke en die Institut van Munisipale Tesouriers en Rekenmeesters het 'n komitee aangestel om die metodes van implementering te bestudeer. As gevolg van beperkte ruimte kan verdere aandag nie aan die historiese sy van die saak gegee word nie.

to the various moves towards functional budgeting in the nineteen-twenties and thirties. It is sufficient for the purpose of this paper, however, to concentrate only on the post World War II period.

The cessation of hostilities in 1945 found the U.S.A. committed to large military expenditure on a global basis. Although public expenditure in most countries showed extraordinary growth from 1900 onwards due to developments in education, the social services and public health, this paled into insignificance when compared with expenditure by the U.S.A. Federal Government which in 1949 committed 72,2 percent of total Federal Expenditure to defence expenditure alone (armed forces, veterans aid, interest on war debt, foreign aid).

It was not surprising, therefore, that the first major crusade for budgetary reform took place in the U.S.A., and in its Department of Defence. The necessary impetus was provided by the National Security Act 1949 which made provision, among other things, for an improvement in the machinery of budgeting and financial control. A programme budget for the army was introduced in 1949, and this was the first time that any real attempt was made to forge a link between the headings in the financial budget and the programmes of expenditure. Further impetus was provided by the report of the Hoover Commission in 1949, which recommended that "the whole budgetary concept of the Federal Government should be refashioned by the adoption of a budget based upon functions, activities and projects . . . such approach would focus attention upon the general character and relative importance of the work to be done, or upon the service to be rendered, rather than upon the things to be acquired, such as personal services, supplies, equipment and so on."² Still further impetus was provided by the budget research work conducted by the RAND Corporation who saw the main problem as one of choice. Introduction of programme budgeting was accelerated when Robert M. McNamara, an expert in programme budgeting techniques, became Secretary of Defence in 1961. The defence budget was formulated in terms of major programmes and weapon systems, and included close links with the appropriation budget.

The importance of these experiments in the Department of Defence lay in the fact that they became a model on which planning, programming and budgeting structures were established at other governmental levels, and in other countries. In a pronouncement in 1965 President Johnson referred to the system in glowing terms, stating that it would be extended to all Federal Departments. Many writers see in President Johnson's pronouncement the beginning of the programme budgeting era. Unfortunately, the plan of implementation in Federal Departments was undertaken on too ambitious a scale, and today there have been major retreats from the original schemes. The main reasons for failure were lack of top level support, an unrealistic timetable for implementation, inadequate staff, a comprehensive instead of selective approach, insufficient attention to economic analysis and the absence of links with accounting systems.³

Nevertheless, the American experience has been important because an impetus was given to experimentation in other fields, particularly local government. The best known experiment in this area was that conducted by the George Washington University in co-operation with five cities, five counties and five states, which became known as the 5-5-5 project. 'The object was to evaluate the practical applicability of programme budgeting to states and local authorities; since then several have adopted the system in varying degrees. It is also being introduced slowly in the Government Departments of Belgium. The French National Government has adopted a similar system (*La Rationalisation des Choix Budgétaires*) in which emphasis is laid on a proper study and exposure of alternative plans so the decision-maker can be better informed on the choices available to him. The system has to a limited extent been introduced in some Government Departments in Great Britain and in some local authorities, and it has been studied in depth by several institutions such as the Chartered Institute of Public Finance and Accountancy. There appears to be a retreat from the original enthusiasm for programme budgeting in favour of a less formalised approach to corporate management.⁴ In Sweden, a formal system of P.P.B.S. was introduced in 1967 with the main emphasis on budgetary reform; the other elements of the system such as programme analysis and planning are gradually being introduced. Canada introduced the system in 1964 with its main emphasis on cost analysis, and less attention to the study of alternatives and programme planning. In South Africa the Department of Defence introduced a P.P.B. system of its 1969-70 budget together with a five year projection. The Franszen Commission (1970) strongly recommended the introduction of a programme budgeting system in central government departments and the province and government officials are busy with implementation in certain areas. In the sphere of local government the Sandton town Council decided in 1972 to introduce the system, and the 1973-74 budget contained an analysis of expenditure of functions, programmes and budget contained an analysis of expenditure on functions, programmes and programme elements with appropriate links with the financial budget. The Institute of Town Clerks and the Institute of Municipal Treasurers and Accountants have appointed a committee to study methods of implementation. For reason of space, no further attention can be given to the historical side.

3. Die Redes vir Verandering

Die buitengewone groei van openbare besteding in die twintigste eeu was die vermaatlike oorsaak van bewegings tot begrotingsvervorming. Dit het aanvanklik begin met eksperimente in 'n meer funksionele vorm van begroting in die jare negentig, twintig en dertig, gevvolg deur prerasie en program begroting in die na-Wêreldoorlog II era.

Die geskeidstelling van begroting gaan terug na die begin van geskiedenis. Ou Griekeland en Rome het begrotings gehad, maar dit was een-voudige dokumente. Dit was nie tot 1688 dat die eerste nasionale begroting in Brittanje voorberei is nie. Die woord begroting kom van die Franse "bougette" wat 'n klein sak beteken waarin die Minister sy finansiële voorstelle gedra het. Die woord was later tot die begrotingsvoorstelle self toegepas.

Die vroeë nasionale begroting was essensieel finansiële begrotingsgewes, en hulle het tot stand gekom as gevolg van 'n gemeenskaplike eis vir konstitusionele beheer oor openbare finansies om te verseker dat geen finansiële las aan die mense opgeval kan word alvorens hulle toestemming gegen het, soos dit deur die parlement uitgespreek is. Beheer oor openbare uitgawe was dus oorheersend, en klassifikasiestelsels om uitgawe aan te teken het hierdie doel verseker. Subjektiewe of lyn-item stelsels het tot stand gekom. Hulle het sorgvuldig in groot detail die items aangeteken waarop geld bestek was by: salarisse, skryfbehoeftes, instandhouding van toerusting, telefoon. Die stelsel het vereis dat geld opsy gesit is vir hierdie items slegs op sulke items bestek word en dat die bedrade nie oorskry mag word nie.

Vir twee eeue na 1688 was daar weinig aansporing tot begrotingsvervorming omdat die politieke filosofie van laissez faire. Regerings was veronderstel om nie slegs openbare uitgawe te beheer nie, maar daar was ook verwag dat hulle so min as moontlik moet bestee. Vrye ondernemings was die algemene aanvaarde praktyk; die regering wat die minste bestee was die beste. Adam Smith, John Stuart Mill en andere het definitiewe perke op regeringsaktiwiteit gestel. Dit was dus nie verbaasd dat daar algemene tevredenheid met die lyn-item stelsel van begroting was nie.

Teen die einde van die negentiende eeu het vermeerderde openbare uitgawe onvermydelik geword as gevolg van nywerheidsontwikkeling en openbare gesondheidstaandaarde. Dit is gevolg in die twintigste eeu deur die druk van oorlog en groot uitgawe op sosiale welsyn. Regerings vandag, met die volle toestemming van die mense, wys van twintig tot veertig persent van die nasionale inkomste toe aan die bevrediging van sosiale behoeftes, in vergelyking met minder as tien persent aan die begin van die eeu. Daar was groot besorgheid met hierdie groei in openbare besteding. Ekonomiese hulp aan die arme was nie meer die enige redelike besteding meer, maar daar was aandag gevestig op die **samestelling** openbare besteding. Een van die eerste skoot wat in hierdie rigting afgefuur was, was deur V. O. Key in 1940, wat gevra het "on what basis shall it be decided to allocate X dollars to Activity A instead of activity B".

Dit is waar program begroting op die toneel verskyn. Dit was algemeen aanvaard dat die tradisionele finansiële begroting, gebaseer soos dit was op dinge wat gekoop moes word, wel korrektheid in besteding kan verseker, maar dit kon nie aandui of die geld cordeelkundig bestee is of dat daar alternatiewe beter maniere was om die beskikbare hulpbronne toe te deel nie.

Die begroting was goed vir beheer maar onverdigend vir analise en besluitneming. Bewegings tot program begroting het ten doel gehad om 'n stelsel in te stel waar beplanning en begroting geïntegreer kon word.

4. Wat Program Begroting Behels

Program begroting bestaan uit vier aparte komponente as volg:

- Die identifikasie en definisie van die fundamentele objekte van 'n plasslike bestuur, en die vaststelling van programme wat hierdie objekte sal bereik. Dit vereis die samestelling van 'n programstruktur.
- Die vaststelling van die koste van programme en die kriteria van doeltreffendheid. Dit vereis die beraming van kapitaal en lopende koste, en meting van produktiwiteit waar dit van toepassing is.
- Die analise van die programkoste en die doeltreffendheid van alternatiewe maniere om hierdie objekte te bereik. Dit vereis die gebruik van talyklike evaluasie tegnieke.
- Die projeksie van programme vir 'n aantal jare vooruit. Dit vereis die voorbereiding van multi-jaar finansiële en opbrengs plante.

Bogemelde vier komponente is van drie aparte bronne gekondenseer.³ Daar is groot diversiteit in program begrotingsstelsels met betrekking beide tot die rangorde waarin die dele van die stelsel gefimplimenteer word, en die beklemtoning wat op die onderlinge belangrikheid van elk komponent geplaas word. Novick en die George Washington Universiteit, byvoorbeeld, beskou die stelselmatige identifikasie en analise van alternatiewes, as die hoeksteen van program begroting.⁴ Andere is geneig om die belangrikheid van die basiese raamwerk van programme te beklemton en dit uit te brei op 'n multi-jaar basis voor dat daar op resultaat-meting en analise gekonsentreer word.⁵ 'n Saaklike beskrywing sal nou van die vier komponente wat hierbo uiteengetrek is, gegee word:

(a) Die programstruktuur:

Die samestelling van 'n programstruktuur is die sleutel tot 'n goeie program begrotingsstelsel. Die program struktuur is niks meer as 'n

3. The reasons for change

The extraordinary growth of public expenditure in the twentieth century has been the main cause of movements towards budgetary reform. These began firstly with experiments in a more functional form of budgeting in the nineteen twenties and thirties, followed by performance and programme budgeting in the post World War II era.

The history of budgeting goes back to the dawn of history. Ancient Greece and Rome had their budgets, but they were simple documents. It was not until 1688 that the first national budget was prepared in Britain. The word budget comes from the French "bougette" meaning a small bag in which the Minister carried his financial proposals. The word was later applied to the budget proposals themselves.

The earlier national budgets were essentially financial budgets, and they came into being as a result of a popular demand for constitutional control over public monies, whereby no financial burden was to be imposed on the people without their consent as expressed by parliament. Control over public expenditure thus became paramount, and classification systems for recording expenditure secured this aim. Subjective or line-items systems came into being. These carefully recorded in great detail the items on which money was spent e.g. salaries, stationery, maintenance of equipment, telephones. The system required that money set aside for these items was spent only on such items, and the amounts could not be exceeded.

For two centuries after 1688 there was little incentive to budgetary reform because of the political philosophy of laissez faire. Not only was the government expected to control public expenditure, but it was also expected to spend as little as possible. Free enterprise was the order of the day; that government was best which governed least. Adam Smith, John Stuart Mill and others set definite limitations on governmental activity. It was not surprising, therefore, that there was general satisfaction with the line-item system of budgeting.

Towards the end of the nineteenth century great increased public expenditure became inevitable as a result of industrial development and public health standards, followed in the twentieth century by the impact of war and large expenditure on social welfare. Governments today, with the full approval of the people, are committing from twenty to forty percent of the national income to the satisfaction of social wants, compared with under ten percent at the beginning of the century. There has been great concern with this growth of public expenditure. Economists turned their attention firstly to the growth of total public expenditure compared with growth of private sector spending but later attention was directed to the composition of public expenditure. One of the first shots fired in this direction was by V.O. Key in 1940 who asked "on what basis shall it be decided to allocate X dollars to Activity A instead of activity B".

This is where programme budgeting enters the scene. It became generally accepted that the traditional financial budget, based as it was on things to be bought, could well secure rectitude in spending, but it could not indicate if the money had been spent wisely or whether there were alternative better ways of allocating the resources available. The budget was good for control but poor for analysis and decision-making. Movements towards programme budgeting aimed at presenting a system in which planning and budgeting could be integrated.

4. What programme budgeting is

Programme budgeting is made up of four separate components thus:

- The identification and definition of the fundamental objectives of a local authority, and the determination of programmes which will achieve these objectives. This requires the compilation of a programme structure.
 - The ascertaining of the costs of programmes and the criteria of effectiveness. This requires the estimation of capital and current costs, and measurement of output where applicable.
 - The analysis of the programme costs and the effectiveness of alternative ways of achieving the objectives. This requires the use of numerous evaluation techniques.
 - The projection of programmes for a number of years ahead. This requires the preparation of multi-year and financial output plans.
- The above four components have been condensed from three separate sources.⁷ There is a great diversity in programme budgeting systems with regard both to the order in which the parts of the system are implemented, and the emphasis placed on the relative importance of each component. Novick and the George Washington University, for example, regard the systematic identification and analysis of alternatives as the cornerstone of programme budgeting.⁸ Others have tended to stress the importance of developing the basic framework of programmes and extending these on a multi-year basis before concentrating on output measures and analysis.⁹ Brief comment will now be given on the four components set out above:
- The programme structure:** The compilation of a programme structure is the key to a good programme budgeting system. The programme structure is nothing more than a broad, formal statement of the objectives of a local authority yet it takes much time to prepare and is subject to a great deal of amendment. Legislators,

breë, formele staat van die objekte van 'n plaaslike bestuur maar dit neem heelwat tyd om voor te berei en is aan 'n groot mate van wynaad onderwerp. Wetgewers, amptenare en stelselontleders span saam in hierdie oeseling, en besprekings oor objekte sal omvattende wees. Ek moet, noogs, 'n kortpad neem en 'n programstruktur toon, insluitende die eerste en tweede vlak kategorie, wat met aanpassing geskik sal wees vir Suid-Afrikaanse plaaslike besture. Dit word hieronder uiteengesit, tesseemet 'n verklaring van die objekte lêer gevul.

I Gemeenskaplike Veiligheid

Objek: Om besering aan persone en verlies van eiendom uit onverwagte gebeure tot 'n minimum te beperk:

- A Brandbeskerming
- B Burgerlike verdediging
- C Bourregulasië
- D Beber van verkeer (verwys V, A)
- E Beskerming teen ander gevare

II Gemeenskaplike Gesondheid

Objek: Om mense teen siekte en plase te beskerm:

- A Ongewingsgesondheid
- B Persoonlike gesondheid

III Gemeenskapomgewing

Objek: Om 'n bevredigende fisiese omgewing te verskaf vir die opgrting van huise, handel en nywerheid:

- A Gemeenskapbeplanning
- B Behuisung
- C Watervoorsiening
- D Elektriesiteitvoorsiening
- E Vuallis verwydering
- F Riool opruiming
- G Straatbeligting
- H Verfraaing
- I Paale (verwys V, A)

IV Ontspanningsgeleenthede

Objek: Om ontspanningstyd geleenthede aan burgers te verskaf:

- A Buite muurse ontspanningsgeleenthede
- B Kulturele geleenthede

V Vervoer

Objek: Om geleenthed te verskaf vir die beweging van persone en goedere binne die munisipale gebied so vinnig, veilig en doeltreffend as moontlik:

- A Die beweging van verkeer op snelweë
- B Stedelike vervoerondernemings

VI Bestuur

Objek: Om al die bestuurs- en hulp-aktiwiteite te verskaf wat nodig is om die plaaslike bestuur se objekte te bereik:

- A Algemene administrasie en bestuur
- B Finansiële administrasie

Die programstruktur moet nooit as oneleasies beskou word nie en dit mag onder die druk van verdere program analise verander word. Dit is nodig om te onderskei tussen doelwitte op die eerstevlak, en die meer spesifieke laer vlak objekte. Byvoorbeeld, die uiteindelike objek van 'n vervoer doelwit is nie om paase te bou of verkeer te beheer nie, maar om mense te vervoer. Wanneer 'n programstruktur saamgestel word moet die laer vlak objekte soos as moontlik vastgestel word om die meting van resultate te vergemaklik, omdat programme begroting produksie-georiënteerd is. Die objekte wat in 'n programstruktur uiteengesit word, sal nie noodwendig ooreenkoms met departementele grense nie. Dit maak nie saak nie, want programme begrotingsstelsels hoeft nie in te meng met bestaande organisatoriese patronne nie. Nietemin, die inwerkstelling van die stelsel sal nooddug mettertelyk lei tot 'n verandering in organisasie.

Die programstruktur is 'n uiters belangrike deel van 'n programmebegroting. Dit is die raamwerk waarop ander state (byvoorbeeld multi-jaar programme) gebou word. Daar kan soms nie verstaan word nie hoe die formele samestelling van 'n programmestruktur met bestaande departementele patronne en rekenkundige konsepte geassosieer kan word. Noogs is hierdie skakels uitgewerf. Die formele identifikasie van projekte as 'n eerste stap beklemtoon die bo-tot-onder karakteristiek van besluitneming, in vergelyking met die van-onder-tot-bo karakteristiek van tradisionele begroting-opstelling waar baie besluite in klein departementele kantore gemaak word, en ingegrawe word as hulle opwaarts versamel word, en verminder die terrein van werkelike besluitneming aan die top.

(b) Ontleding van die programmestruktur

Slegs die eerste en tweede vlak kategorie word in die programmestruktur hieroor uiteengesit. Op latere stadiums word die programme verdeel in derde-, vierde-, vyfde en selfs verdere vlakke. Die objekte word ook uitgebrei, duidelik gedefinieer en bespreek.

As 'n eenvoudige voorbeeld van verdere verdeling, neem ek die eerste vlak objek van gemeenskaplike veiligheid. Verskeie tweede vlak kategorie word in die programmestruktur hieroor uiteengesit, een waarvan brandbeskerming is. One verdeel dit in derde-vlak

officers and systems experts all participate in this exercise, and discussions on objectives will be lengthy. I must, however, take a short cut and present a programme structure, taken to the first and second level categories, which would with local adaptation be suitable for South African local authorities. This is set out below, together with a statement of the objective in each case.

I Community Safety

Objective: To minimise injury to persons and loss of property from unexpected events:

- A Fire Protection
- B Civil Defence
- C Building Regulation
- D Control of Traffic (See V, A)
- E Protection against other hazards

II Community Health

Objective: To protect people from illness and disease:

- A Environmental Health
- B Personal Health

III Community Environment

Objective: To provide satisfactory physical environment for the establishment of homes, trades and industry:

- A Community Planning
- B Housing
- C Water supply
- D Electricity Supply
- E Refuse Removal
- F Sewage Disposal
- G Streetlighting
- H Beautification
- I Roads (See V, A)

IV Leisure Time Opportunities

Objective: To provide leisure-time opportunities for citizens:

- A Outdoor Recreational Opportunities
- B Cultural Opportunities

V Transportation

Objective: To enable the movement of persons and goods within the municipal area as quickly, safely and efficiently as possible:

- A Movement of Traffic on Highways
- B Urban Transport Undertakings

VI Management

Objective: To provide all management and support activities necessary to achieve the authority's objectives:

- A General Administration and Management
- B Financial Administration

The programme structure should never be regarded as inflexible and it may be changed under the impact of further programme analysis. It is necessary to distinguish between ultimate goals in the first level, and the more specific lower level objectives. For example, the ultimate objective of the transport goal is not building roads or traffic control or the running of passenger transportation systems, but transporting people. In preparing a programme structure, the lower level objectives should be established as far as possible to facilitate the measurement of output, because programme budgeting is output-oriented. The objectives set out in a programme structure do not necessarily coincide with departmental boundaries. This does not matter, for programme budgeting systems need not interfere with established organisational patterns. Nevertheless, the introduction of the system is bound to lead in time to a change in organisation.

The programme structure is a vital part of programme budgeting for it is the framework on which other statements (e.g. multi-year programmes) are built. Many have failed to comprehend how the formal setting up of a programme structure can be associated with existing departmental patterns and accounting concepts. Yet these links have been forged. The formal identification of objectives as a first step emphasises the top-to-bottom characteristic of decision-making, compared with the bottom-to-top characteristic of traditional budget making where so many decisions are made in small departmental offices, become entrenched as they are aggregated upward, and reduce the area of real decision-making at the top.

(b) **Dissecting the programme structure:** Only the first and second level categories are set out in the programme structure above. In later stages the programmes are broken down further into third, fourth, fifth and even further levels. The objectives are also elaborated, clearly defined and argued on.

As a simple example of the further breakdown, I take the first-level objective of community safety. Several second-level categories are set out in the programme structure above, one of which is fire protection. This we divide into third-level categories such as

kategorieë soos voorkoming van brande en blus van brande. Op die vierdevlak verdeel ons die voorkoming van brande in inspeksie en instandhouing van private brandtoerusting, ondersoek van waterdruk, inligting ensvoorts. Op die vyfdevlak speisefiseer ons die aktiwiteit onder inspeksie en instandhouing van brandtoerusting byvoorbeeld inspeksies, hervulling van blusser, toets van sprinkelstelsels. Ek gee nog 'n voorbeeld. In die bogemelde programstruktuur is vervoer 'n hoof-objek. In die tweedevlak kategorie word die beweging van verkeer op snelwé en munisipale vervoerstelsels ingesluit. In die derdevlak kategorie onder beweging van verkeer op snelwé word die konstruksie en instandhouing van snelwé ingesluit, verkeersbeheer, ensvoorts. Onder die hoof van verkeersbeheer sal daar ingesluit wees 'n hele reeks van vierdevlak aktiwiteite wat tot die uiteindelike objek bydra soos die fisiese beheer van verkeer, die beheer van spoed, die verskeuring van voertuig padwaardigheid, ensvoorts. Dit sal tot die vyfdevlak geneem word en die aktiwiteit insluit soos die toets van voertuig, die uitreiking van sertifikate, ensvoorts. Ten alle tyd sal daar in gedagte gehou word dat, van die hoof-objek afwaarts en van die laagste aktiwiteit opwaarts, moet daar 'n bewustheid van 'n gemeenskappele doel wees.

(c) Bepaling van die Koste van Programme

Wanneer die programmestruktuur onderverdeel is, soos hierbo, word 'n wye veld daargestel vir 'n waartoe hulle hydra tot die finale doel en 'n ondersoek van alternatiewe maniere om objekte te bereik. Ten einde hierdie dinge te doen, moet koste toegewys word. Daar is 'n meningverskil betrekende die mate waar toe gedetailleerde analyse deel moet vorm van die begrotingsproses. Skrywers soos Anthony is oortuig dat die belangrike analise wat by strategiese beplanning betrokke is moet nie as deel van die begrotingsproses plaasvind nie, vanweë die druk van tyd gedurende 'n begrotingsklus.¹² Brillante en skeppende maatreëls vir verbetering, se hy, verrys nie uit roetine prosedures nie maar uit intensiewe ad hoc studies. Wanneer 'n mens die vertakkings van baie analistiese tegnieke betrug, sook kostevoerdeerde analise, koste-effektiewe analise, lineêre programmeer, voorkeur afsprake, regressie analise, is daar heelwat te sê ten gunste van Anthony se standpunt, veral as 'n mens aan die kompleksiteit van baie kapitale projekte dink. Daar is nie nou tyd om hierdie tegnieke hier te bespreek nie en ek moet my bepaal tot die vasstelling van koste van een venvoudige model ter wille van duidelikheid.

Die mag met die eerste oogopslag 'n onbegonne taak skyn te wees nadat die aktiwiteit tot die laagstevlak vangestel is, omdat die koste van sulke aktiwiteite vanaf bekibbare data te bepaal. Dit word nie geredelik beseif nie maar tog voorstaan bestaande rekenkundige stelsels wel 'n groot mate van ontligting vir hierdie doel. Terwyl dit waars is dat die jaarlike begroting en jaarlike rekenings in hulle huidige vorm ongeskik is om die koste data wat vir programmebegroting benodig is direk te verskaf bestaan die inligting wel en moet slegs geherringskod word en op 'n ander wyse voorgelê word. Die rekenaar het dit 'n eenvoudig taak gemaak. Baie van u is bewus dat bo en behalwe die gewone opskrifte soos ons dit in die jaarlike begrotings en finale rekenings ken is daar ingewikkeldes salaris-kedules, eenheidskoste en ander hulpselte wat die aspringspriele vir verdere analise is. Daar is na my mening twee fundamentele stappe wat geneem kan word teen eindie die koste van aktiwiteite en programme te bepaal:

- Hersiening van die formaat van die bestaande jaarlike begrotings of die voorbereiding van 'n intermediêre staat tussen die begroting (in subjektiewe vorm) en die program begroting.
- Die voorbereiding van 'n vol werk-distribusie skedule wat inderaad 'n matrikul is wat die werklike aktiwiteit wat in 'n departement uitgevoer word, toon en tyd wat individueel in die departement op sulke aktiwiteit bestee.

'n Interessante feit wat teenvoor gekom het was plaaslike besture oorgaan het tot program begroting of slegs die moontlikheid bestudeer het, is die groot massa van data wat bestaan en wat tot dusver nie gebruik is nie omdat dit nie opgedis is in 'n verteerbare vorm nie. 'n Groot mate van tesouriekoste data is ongebruik gelaat, sowel as die menigvuldige statistiek wat deur die departemente voorberei is. Hulle het slegs aan die lig gekom in samegestelde vorm in die jaarlike verslae van departemente maar hulle is nogtans onmisbaar in die voorbereiding van produksie data.

Noudat hy dus in 'n posisie geplaas is om die koste van aktiwiteit te stel en om hierdie koste opwaarts saam te vat deur programme tot finale objekte, is 'n besluiteunner in 'n beter posisie om voorkeure toe te deel as wat hy dit sou moes doen op die basis van bestaande klassifikasies. Hy geniet ook die voordeel om inkomste en kapitaal besteding in een plek te sien.

(d) Langtermyn Projeksie

Beplanning het te make met die toekoms, en een van die algemeenste kritiek teen tradisionele begroting is sy beperking tot een jaar. Ten spye van die feit dat baie vordering gemaak is om langer termyn begrotings in te stel, verei kapitaal begrotings, is die vordering op hierdie gebied nie aansienlik gevrees nie. Daar is dikwels trantheid om langtermyn begrotings voor te berei en veral om dit te publiseer. Wetgewers skyn teesinnig te wees om hulself te verbind aan langtermyn beplanning op grond dat dit polities beter

the prevention of fires and extinguishing of fires. At the fourth level we divide the prevention of fires into inspection and maintenance of private fire equipment, investigation of water pressures, education and so on. At the fifth level we specify the activities under inspection and maintenance of fire equipment e.g. inspections, refilling extinguishers, testing sprinkler systems. I give another example. In the above programme structure transportation is a major objective. In the second-level categories are included the movement of traffic on highways and municipal transport systems. In the third level category, under movement of traffic on highways are included the construction and maintenance of highways, traffic control, etc. Under the heading of traffic control there would be included a whole range of fourth-level activities which contribute to the ultimate objective such as the physical control of traffic, the control of speed, the ensuring of vehicle roadworthiness, etc. These would be taken to a fifth level and embrace activities such as testing vehicles, issuing certificates and so on. At all times one would bear in mind that, from the major objective downwards and from the lowest activity upwards, there should be a consciousness of common purpose.

(c) **Determining the cost of programmes:** When the programme structure has been broken down as above, a vast field is opened up for an analysis of the various activities, a study of the extent to which these contribute towards the final goal and an investigation of alternative ways of fulfilling the objectives. In order to do these things costs must be assigned. There is a difference of opinion regarding the extent to which detailed analysis should form part of the budgetary process. Writers like Anthony are convinced that the important analysis connected with strategic planning should not take place as part of the budgetary process because of the pressure of time during a budget cycle.¹³ Brilliant and creative measures for improvement, he says, do not arise from routine procedures but from ad hoc intensive studies. When one contemplates the ramifications of the many analytical techniques like cost benefit analysis, cost effective analysis, linear programming, queuing, regression analysis there is much to be said for Anthony's view, especially if one thinks of the complexity of many capital projects. There is no time to discuss these techniques here and I shall have to confine the establishment of costs to one simple model for the sake of clarity.

It may at first glance appear to be a formidable task, having once established the activities down to the lowest level, to determine the cost of such activities from existing data. It is not commonly realized, however, that existing accounting systems do in fact provide a great deal of information for this purpose. While it is true that the annual estimates and annual accounts in their existing form are unsuitable for a direct furnishing of the cost data needed for programme budgeting, the information does in fact exist and only has to be reformed and submitted in a different way. The computer has made this a straightforward task. Many of you will be aware that in addition to the ordinary headings as we know them in the annual estimates and final accounts, there are intricate salary schedules, unit costs, and other supporting statements which are the springboard for further analysis. There are in my opinion two fundamental steps which can be taken in order to determine the cost of activities and programmes:

- A revision of the format of the existing annual estimates or the preparation of an intermediary statement between the estimates (in subjective form) and the programme budget.
- The preparation of a full work-distribution schedule which is in effect a matrix showing the actual activities performed in a department and the time spent by individuals in the department on such activities.

One interesting fact which has emerged where local authorities have gone over to programme budgeting or merely studied feasibility is the vast amount of data which does exist and which had not hitherto been used because it had not been served in digestible form. A great deal of treasury cost data has remained unused, as well as multifarious statistics prepared by departments. These have seen the light of day only in aggregate form in the annual reports of departments, yet they are invaluable in the preparation of output data.

Having thus been placed in a position to establish the cost of activities and to aggregate these costs upwards through programmes to final objectives, a decision-maker would be in a better position to allocate priorities than if he were to do this on the basis of existing classifications. He also enjoys the advantage of seeing revenue and capital expenditure in one place.

(d) **Long term projection:** Planning has to do with the future, and one of the commonest criticisms against traditional budgeting is its limitation to one year. In spite of the fact that much progress has been made towards establishing longer term budgets, especially capital budgets, progress in this field has not been spectacular. There is often a reluctance to prepare and especially to publish long term budgets. Legislators seem to have a reluctance to commit themselves to long term plans on the grounds that politically it is better to live from year to year than to reveal long term plans.

is om van jaar tot jaar te leef as om langtermyn plannie bekend te stel. Nogtans is die wese van program begroting die samesmelting van beplanning en begroting en daar is geen sin in om slegs vir een jaar te beplan nie. Die mees gewilde langtermyn tydperk is vyf jaar (begrotingsjaar plus vier). Dit het gelei tot die voorbereiding van vyfjaar finansiële en uitvoer plannie as deel van die program begrotingsstelsel.

Baie welsuidargde skemas vir langtermyn plannie het ten gronde gegaan vanwêe aanstuings dat projekses vir meer as die begrotingsjaar nie akkuraat is nie. Dit is 'n kortsigte beskouing omdat die projekses nie akkuraat hoeft te wees nie. Die eerste jaar moet bestendig wees; die tweede jaar moet bestendig wees met voorbereiding vir beleidswyande, die derde jaar moet voorlopig wees en die vierde en vyfde jaare moet slegs tentatief wees. Elke jaar verwys die eerste kolom en 'n nuwe kolom word bygevoeg en die syfers word hersien. Wanneer 'n langtermyn plan eers ingestel is, word weinig moeilikheid ondervind om wysings van jaar tot jaar aan te bring. Vir diogene wat ernstig omtrent beplanning is, is dit ondenkbaar dat enige tydperk van minder as 'n vyfjaar projeksie van benodigde en hulpmiddelle corweeg moet word. Op die vierde stadium word besonderhede van inkomste bygevoeg om die gehele te voltooи.

Die vier fases van implimentering is baie eenvoudig gestel met die doel om 'n algemene oorsig van programbegroting te gee. Dit is 'n aanvaarding vereis dat koste-analise in al sy vorms plaasvind, dat produksemetting gebruik word en dat passende rekonsiliassies (crosswalks) met die finansiële begroting uitgewerk kan word. Ek het enige verwysing na procedure probleme van implimentering wegelaai, dit is die modus operandi van taak magte, implimenteerseenhede en konsultte, wat die voorbereiding van uitreikingskrifte op programmamemoranda behels.

5. Sy verband op die gebied van openbare nutsdienste

Die kort beskrywing van program begroting wat hierbo uiteengesit is dus aan dat dit 'n bestuurpers is wat baie meer as begroting behels soos ons dit in die verlede geken het. Dit is 'n omvattende stelsel wat totale hulpronnebehefs; dit is bestuur van die algehele munisipale onderneming. Dit is dus pertinent om te vra, Hoe pas die sogenaamde nutsdienste van ondernemingsdepartemente in die algemene, en elektrisiteitsondernemings in besonder, in die beeld? 'n Studie van die program struktuur wat hierbo uiteengesit is mag met die eerste oogopslag daarop dui dat die elektrisiteitsvoorsiening 'n relatiewe kleint rooi speel.

Nietemin vorm hierdie wanvoorstelling primêr deel van die diversiteit van plaaslike gemeenskaplike behoeftes wat 'n plaaslike bestuur moet bevredig. 'n Program struktuur as sulks gevien aanduiding van die relatiewe belangrikheid van elke doelwit nie, nogtans is dit een van die voordele van die stelsels as 'n geheel gesien dat die bedraaf van elke munisipale diens tot die verweeseling van gemeenskaplike doelels duidelik getoond word. Die rol wat elektrisiteit speel in ons voortdurende stygende lewenstandaard is aansienlik en welbekend. Sommige van die hoof-doelwitte van 'n plaaslike gemeenskap kan nie daarsonner bereik word nie. Vir die elektriese ingenieur, meld Kelf-Cohen, is die verspreiding van elektrisiteit sinoniem met die verspreiding van beskawing.¹¹ Ek dink dat daar baie min in die gehoor is wat nie met hierdie beskouing sal saamstem nie.

Elektrisiteit bring nie slegs 'n hoër lewenstandaard mee nie, maar 'n lewendiger en skoner omgewing. So groei is 'n ekonomiese faktor van fundamentele belangrikheid in ontwikkelende en ontwikkelende lande, en sy groei baan die weg vir groei in die bruto binelandse produk. Dit is een van die steunpilare van 'n land se infrastruktur. Sy uitende-like gebruik in wonings, woonhuise en fabriekte, bring plaaslike besture in die voorste linie wat infrakturele dienste betref.

In Suid-Afrika het ons die posisie waar die verspreiding van elektrisiteit in stedelike gebiede hoofsaaklik deur plaaslike besture onderneem word. Verskeie plaaslike besture wek ook elektrisiteit op, maar die neiging vir die toekoms is om nasionale op te wek en plaaslik te versprei. Ek huldig die mening dat dit 'n terugwaartse stap sal wees om verspreiding te nasionaliseer of op 'n streeksbasis te doen. Die saak vir verspreiding deur plaaslike besture is baie sterk, en in Engeland het verbruikers tot hulle konto gevind dat hulle met twaalf groot Streetskads moet handel wat 'n groot en onpersoonlike organisasie is.¹²

Elektrisiteit gaan elke woning binne en het 'n noue verband met alle ander plaaslike dienste. Dit sal moeilik wees om 'n program struktuur daarsonner voor te stel. Dit speel ook 'n ontsaglike rol in die finansiële begrotings van plaaslike besture. Verlede jaar het ek 'n funksionele verdeling van bruto plaaslike uitgawe saamgestel wat gebaseer was op die 1973/74 begroting van die 20 grootste plaaslike besture in Suid-Afrika, plus Salisbury en Windhoek. Die gemiddelde van al die besture het getoont dat die grootste enkele item in die bruto uitgawe verreweg die van die elektrisiteitsondernemings was met 32,8% van die totale uitgawe maak het (hoogste 51,3 laagste 24,5%). Dit was in grootte gevvolg deur Openbare Werke, 11,8%, water 11,0%, administrasie 8,5%, parke 6,3%, riolering 5,9% en die ander dienste met elkeen minder as 5%.

Plaaslike Elektrisiteit voorsiening is 'n sterk, stil, kapitaal-intensieve dienst waarvan die uitgangs-groei gewoonlik teen 'n hoër koers is as enige ander diens, maar waar winste gedurig vir die voordeel van die burgers gemaak word. Ten spye van die feit dat dit finansiële die belangrikste enkele diens in die begroting is, gebeur dit dikwels dat minder tyd aan die elektrisiteitsbegroting besteed word as aan die pasie van programme begrotings, byvoordeel. Hierdie klaarblyklike twee-anomolie

Yet the essence of programme budgeting is the fusion of planning and budgeting and it makes no sense to plan for one year only. The most popular longterm period is five years (budget year plus four). This has led to the preparation of five year financial and output plans as part of the programme budgeting system.

Many well-conceived schemes for long term plans have founded on allegations that projections beyond the budget year are inaccurate. This is a shortsighted view because the projections do not have to be accurate. The first year should be firm, the second year should be firm with provision for policy changes, the third year should be provisional and the fourth and fifth years need be only tentative. Every year the first column falls away and a new column is added and the figures revised. When a long term plan has once been established, little difficulty is experienced in making revisions from year to year. To those who are serious about planning, it is inconceivable that anything short of a five year projection of needs and resources should be contemplated.

At the fourth stage details of income are brought in to complete the picture.

The four phases of implementation have been oversimplified with the object of giving a birds-eye view of programme budgeting. This has required an assumption that cost analysis in all its forms takes place, that output measurement is used and that appropriate reconciliation (crosswalks) with the financial budget can be worked out. I have had to omit any reference to procedural problems of implementation i.e. the modus operandi of task forces, implementation units and consultants, involving the preparation of issue papers or programme memoranda.

5. Its relevance in the field of public utilities

The brief description of programme budgeting set out above indicates that it is a management process embracing far more than budgeting as we have known it in the past. It is a comprehensive system involving total resources; it is management of the whole municipal enterprise. It is therefore pertinent to ask, How do the so called public utilities in general and electricity undertakings in particular fit into the picture? A study of the programme structure set out above may suggest at first glance, that electricity supply plays a relatively minor role.

However, this misconception is due primarily to the diversity of local communal wants which a local authority must satisfy. A programme structure as such gives no indication of the relative importance of each objective, yet it is one of the advantages of the system seen as a whole that the contribution of each municipal service towards the fulfilment of community goals is clearly revealed. The part that electricity plays in our continually rising standard of living is considerable and well-known. Some of the major objectives of a local community could not be realised without it. To the electrical engineer, states Kelf-Cohen, the spread of electricity is synonymous with the spread of civilisation.¹¹ I think there are a few in the audience who will disagree with that view.

Electricity brings with it not only a higher standard of living, but a brighter and cleaner environment. Its growth is an economic factor of prime importance in developed and developing countries, and its growth paves the way for growth in the gross domestic product. It is one of the mainstays of a country's infrastructure. It's terminal use in houses, shops and factories, brings local authorities into the front line of providing infrastructural services.

In South Africa we have the position where the distribution of electricity in urban areas is undertaken primarily by local authorities. Several local authorities also generate electricity, but the tendency for the future will be to generate nationally and distribute locally. I think it would be a retrograde step to nationalise or regionalise distribution. The case for distribution by local authorities is strong indeed, and in England consumers have found to their cost that they have to deal with 12 large Area Boards, vast and impersonal organisations.¹²

Electricity enters every home and has a close relationship with all other local services. It is difficult to conceive a programme structure without it. It also plays a formidable part in the financial budgets of local authorities. last year I compiled a functional breakdown of gross current local expenditure based on the 1973/74 budgets of 20 major local authorities in South Africa, plus Salisbury and Windhoek. The average of all the authorities showed that by far the largest single item in the gross expenditure budget was by the electricity undertaking, which accounted for 32,8% of the total (highest 51,3%, lowest 24,5%). This was followed in magnitude by Public Works, 11,8%, water 11,0%, administration 8,5%, parks 6,3%, sewerage 5,9%, and a host of other services each below 5%.

Local electricity supply is a strong, silent, capital intensive service whose expenditure growth is usually at a higher rate than any other service, but where profits are continually made for the benefit of the citizens. In spite of the fact that it is financially the most important single service in the budget, it often happens that less time is spent on the electricity budget than on the roads or parks budgets, for instance. This apparent dichotomy is explicable in terms of such factors as the highly technical nature of electricity, the general acceptance of its indispensability, the existence of concrete growth figures based on con-

word verduidelik in sulke faktore soos die hoë tegniese aard van elektrisiteit, die algemene aanvaarding van sy onontbeerlikheid, die bestaan van werklike groei-syfers gebaseer op 'n konstante vermoeidering in aanvraag vir die produk en die winsgewendheid van die ondernemings as gevolg van die vaststelling van ekonomiese tariewe.

Elektrisiteitsondernemings was byna altyd as handelsonderneemings deur plaaslike besture geklassifiseer, en hierdie kenmerk is ingewrege in die rekenkundige klassifikasiebeginsels in plaaslike bestuur.¹² Die Departement van Statistiek verwys na die sogenaamde handelsafdelings as "ondernemings departemente". Daar is nie plek in 'n referaat van hierdie aard vir bespreking oor die beleid om winste na die belastingfondasie te plaas nie. Verskeie deskundiges, kommissies en skrywers het hierdie onderwerp gedek maak daarom dat in Aanhengsel B 'n analise uiteengesit van die winste wat in die finansiële jare wat in 1972 gefindig het gemaak is, soos deur die Departement van Statistieke verskaf. Die enigste verband wat hierdie besondere aspek in die huidige referaat het is die verwantskap tot 'n neiging in sommige kringe om winsgewendheid as die hoofdoel van 'n elektrisiteitsonderneming te sien, met verbruiker-toevredenheid en doeltreffende diens as laer-vlaak voorkeure. In enige elektrisiteitsvoorsieningsdiens is daar die moontlikheid om doelwitte op so 'n wyse te toon dat verbruikers, amptenare en verkose verteenwoordigers 'n dieper insig kan kry oor 'n getrouwe beeld van dié werklike werk wat uitgevoer word om die hoofdoelwitte van samelewing te bereik. Dit sal verkeerd wees om te veronderstel dat ek, 'n finansiël beaampte, nie die wins wat op elektrisiteit gemaak word as 'n belangrike doelwit beskou nie. Oor 'n lang tydperk, jaar in en jaar uit, was die elektriese ingenieur een van my beste vriende met begrotingstryd, ten spyte van sy amper onversadigbare etusus wanner dit by die kapitaal programme kom!

Nogtans het my studie van program begroting my tot die standpunt gelei dat begroting en rekenkundige beginsels mag swig in die belang van analise en besluitneming, en verder, dat die aanvaarding van die basiese beginsels van program begroting, wat ek hierbo oomlyk het, mag lei tot 'n verbeterde vorm van koöperatiewebestuur. Ek sal dus die res van die referaat wy aan 'n metodiek om program begroting in 'n elektrisiteitsonderneming in te stel.

6. Programme vir elektrisiteitsondernemings

In voorafgaande paragraafe het ek een metode aangedui hoe 'n program begrotingsstelsel in 'n plaaslike bestuur in die algemeen ingestel kan word. Deur die toepassing van die beginsels wat daarin verkondig is, het ek 'n onderverdeling van 'n elektrisiteitsvoorsieningsdiens onderneming, wat deel vorm van die hoof-objek "gemeenskapsomgewing" in die programstruktuur soos vroer aangedui.

Dit is nie moontlik in die beskikbare tyd om al die stappe aan te dui wat nodig is om die hoofobjekte in programme en aktiwiteite te verdeel nie, maar die eindresultaat word in Aanhengsel A uiteengezet.

Hoewel daar 'n "gemeenskaplike eenheid van doel in elektrisiteitsonderneming is, om energie aan die verbruiker te bring in 'n geskikte vorm en so goedkoop as moontlik, is daar aansienlike verskeidenheid in die begrotingsformate wat die verdeling in funksies betref. Ek het die funksionele verdeling van twee-en-twintig plaaslike besture wat op bladsy 15 genoemd word gelys en was gadelik getref deur die verskil in benadering, wat hoofsaaklik gebaseer was op verskillende organisatoriese rellings in elke munisipaliteit. Nie een van twee was dieselfde nie. In die geval van daardie plaaslike besture wat elektrisiteit oplewer, was die algemeen verdeeling in opwekking, verspreiding en administrasie. In die geval van dié wat slegs versprei is, 'n algemene verdeeling die aankoop van krag, verspreiding en administrasie. Dit vereen krag aan die standpunt dat die opskrifte slegs gemaklike aanwysers van uitgawekategorie is wat in die departementele werkpatrone pas, en nie beoefent nie. Dit is om 'n skakel tussen uitgawe en aktiwiteit te verskaaf nie.

Daar is nogtans niks verkeerd met plaaslike afwykings nie en selfs al word program begroting ingestel sal daar aansienlike uiteenlopendheid in plaaslike programstrukturaanpakke wees want dit is die wese van enige nuwe plaaslike stelsel dat die ingevalle plaaslike behoeftes geameet moet word en nie ingestel word ooreenkomsdig sekere teoretiese begrotings- of bestuurbeginsels nie.

Die aanvaarding van die basiese metode om 'n program begroting stelsel in te stel sou hierbo uittegoenig sal tenminste lei tot gemeenskaplike besprekking oor programme en objekte en sal iets dergliks tot gevolg hê soos in die programme wat in Aanhengsel A uiteengesit is. In die voorbereiding van Aanhengsel A was daar gebruik gemaak van verskeie begrotingsstelsels van Suid-Afrikaanse plaaslike besture, en die Springs munisipaliteit is besonder, tog is die syfers hipoteties. Kortlik dus vorm die finansiële inligting wat deur die rekenkundige stelsel voorberei word, tesame met inligting ten opsigte van die take wat werklik in 'n departement uitgevoer word, die basis van 'n programstruktuur en 'n onderverdeling in aktiwiteite. As die take van enige elektrisiteitsonderneming in Suid-Afrika (verspreiding alleenlik) geanalyseer word sal dit gevind word dat ongeveer 50% van die take drie hoof kategorie behefs, naamlik, fisiese instandhouing van die stelsels, werk op nuwe konstruksies en toesig, en die ander 50% behefs 25 ander kategorie soos bestuur, toets, beplanning, inspeksie, tik, ensvoorts.

In die toewysing van uitgawe aan programkategorieë is ek meer deur die Amerikaanse as die Britse ondervinding geleid. In Groot-Brittanje het die elektrisiteitsvoorsieningswerheid, wat twaalf gebiedsrade uitmaak, nog nie program begroting onder so 'n titel ontwikkel nie, maar aansienlike vooruitgang is op die gebied van koöperatiewebepaalming

stantly increasing demand or the product and the profitability of the undertakings due to the fixation of economic tariffs.

Electricity undertakings have nearly always been classified as trading undertakings by local authorities, and this feature has been entrenched in the accounting classification principles in local government.¹³ The Department of Statistics refers to the so called trading undertakings as "enterprise departments". There is no space in a paper of this nature for any discussion on the policy of transferring profits to the rate fund. Numerous experts, commissions and authors have covered this subject, but I have set out in Appendix B an analysis of the profits made in the financial years which ended in 1972, as furnished by the Department of Statistics. The only relevance this particular issue has in the present context is in relation to a tendency in some quarters to see profit-making as the main objective of an electricity undertaking, with consumer satisfaction and efficient service occupying lower-level priorities. In any electricity supply service there lies the possibility of exposing objectives in such a way that consumers, officers and elected representatives may obtain a deeper insight into and a true view of the actual work that is performed in fulfilling the major objectives of society. It would be erroneous to suppose that, a financial officer, do not regard the profit made on electricity as an important objective. Over a long period, year in and year out, the electrical engineer has been one of my best friends at budget time, in spite of his almost insatiable appetite when it comes to the capital programme!

Yet my study of programme budgeting leads me to the view that budgetary and accounting principles may have to bend in the interest of analysis and decision-making, and further, that the adoption of the basic principles of programme budgeting, which I have outlined above, may lead to an improved form of corporate management. I shall therefore devote the rest of this paper to a methodology of introducing programme budgeting in an electricity undertaking.

6. Programmes for electricity undertakings

In preceding paragraphs I have indicated one method whereby a programme budgeting system could be introduced in local government in general. Applying the principles enunciated therein, I carried out a break-down of activities in an electricity supply service, which forms part of the major objective "community environment" in the programme structure set out on page ...

It is not possible in the space available to indicate all the steps necessary in breaking down major objectives into programmes and activities, but the end-result is set out in Appendix A.

Although there is a common unity of purpose in electricity undertakings, to bring energy to the user in convenient form and as cheaply as possible, there is considerable diversity in budgetary formats insofar as the division into functions is concerned. I listed the functional break-down of the twenty two local authorities mentioned earlier and was immediately struck by the difference in approach, based primarily on differing organisational arrangements in each municipality. No two were similar. In the case of those local authorities which generate electricity, the commonest break-down was into generation, distribution and administration. In the case of those which distribute only, a common break-down is purchase of current, distribution and administration. It lends force to the view that the headings are merely convenient indicators of expenditure categories which fit into departmental work-patterns, and are not intended to provide a link between expenditure and activity.

There is nothing wrong with local variance, however, and even if programme budgeting came to be introduced there would also be considerable diversity in local programme structures, for it is of the essence of any new local systems that it must be forged in accordance with local needs and not introduced in subservience to some theoretical budgetary or management principle.

The adoption of the basic methodology for introducing a programme budgeting system set out above will at least lead to mutual discussion on programmes and objectives and result in something similar to the programmes set out in Appendix A. In the preparation of Appendix A use was made of several budgetary statements of South African local authorities, and the Springs municipality in particular. However, the figures are hypothetical. In short, the financial information furnished by the accounting system, together with information regarding the tasks actually performed in a department, form the basis of a programme structure and its break-down into activities. If the tasks performed in any electricity undertaking in South Africa (distribution only) were to be analysed, it would be discovered that approximately 50% of the tasks involve 3 major categories, namely, physical maintenance of the system, work on new construction and supervision, and the other 50% involve up to 25 other categories such as management, testing, planning, inspection, typing, etc.

In the allocation of expenditure to programme categories I have been guided more by American than British experience. In Great Britain the electricity supply industry, comprising 12 area boards, have not developed programme budgeting under such a title, but considerable progress has been made in the field of corporate planning. Corporate management is now being pushed in local government in the United King-

gedoe... Koöperatiewebestuur geniet nou voorrang in plaaslike bestuur in die Verenigde Koninkryk bo die formele proses van program begroting. 'n Verenigde koöperatiewe plan, vir die elektrisiteitsvoorsieningsnywerheid as 'n geheel is oorlangs opgestel en voorgelê aan die Minister vir Energie. Dit bevat 'n lys van objekte vir die industrie, maar die algemene gevoel wat program begroting betref is dat gedagdig aan die relatiewe beperkte bestek van aktiwiteite binne 'n elektrisiteitsraad in vergelyking met die veulvuldige aktiwiteite in 'n plaaslike bestuur kan daar slegs 'n beperkte veld wees waar program begroting toegpas kan word.

Aan die ander kant het elektrisiteitsuitdienste in die V.S.A. elemente van P.P.B. bewerk lank vooraf sukses beginselfs vir ander regeeringsdienste probeer. Baie het gedetailleerde stelsels wat koste in per-eenhede koste meetings uitbrei. Vir die inligting our die V.S.A.-stelsels erken ek die bystand wat ek ontvang het van die Directeur van die Municipal Finance Officers Association of United States and Canada, die Bestuurders van die Department of Water and Power of the City of Los Angeles, die Utilities Departments of the City of Anaheim, die Department of Lighting of Seattle, die Department of Power and Light of the City of Lubbock en die Tennessee Valley Authority. Van die verskillende programme dokumente wat ontvang is, het ek die inligting van Los Angeles meer gebruik om enige van die ander in die voorbereiding van die programme wat in Aanhangsel A uiteengesit is. Baie van u sal onthou dat die Stad van Los Angeles eerste was op die gebied van prestaties begroting in die V.S.A. onmiddellik na Wereldoorlog II, hulle was eerste op die gebied van program begroting. Die Algemene Bestuurder en Hoof Ingenieur van die Departement van Water en Krag berei elke jaar, as 'n byvoeging tot die begrotingstaat, 'n "detail van departement programme" voor wat 'n omvattende dokument is wat 'n onverdeeling van aktiwiteite toon onder die volgende hoof opskrifte ten opsigte van die kragonderneming:

- (1) Beplanning en Ontwikkeling
- (2) Kapitaal Verbetering en Uitbreiding
- (3) Instandhouding en Reparasies
- (4) Bedrywighede
- (5) Verbruikersdienste
- (6) Tegniese Hulp
- (7) Algemene Administrasie en Hulp
- (8) Ander Hulp
- (9) Kapitaal Delging en Rente

Die sal op prys gestel word dat die program begroting soos dit die Aanhangsel A uiteengesit is slegs een benadering voorstel, wat op bestaande aktiwiteite en bestaande rekeningkundige inligting gebaseer is. Ek moet erken dat ek 'n sterk ondersteuner van hierdie benadering is, wat vanaf bekende inligting na nuwe programme beweeg. In die oorsig wat deur die International Institute of Administrative Sciences uitgevoer is, waarna hieroor verwys is, is dit gevind dat baie van die organisasies wat programme begroting geïmplementeer het nou terugker tot 'n evaluasie van bestaande programme en aktiwiteite as 'n basis vir die instelling van geïntegreerde stelsels.¹⁷ Dit is duidelik 'n verandering van die vorige zero-base benadering tot omvattende PPB stelsels wat 'n "across-the-board" benadering gebruik het van die top-afwaarts waarin meeste departemente en ingekankerde organisatoriese patronne verwerp is en nuwe programme geïnstalleer is bloot op 'n basis van stelsel analise. Die Management Services Manager van die Stad van Anaheim Utilities Department, California, het in 'n onlangse brief aan my gemeld "our past experience has shown that efforts to impose a programme or responsibility accounting system from the top has met with very, very little success. In fact, the City of Anaheim some 5 years ago attempted to install a programme budgeting system from the top and it failed within about a year. I attribute its failure to a lack of involvement of the first and second level supervisors in the development of the programme. It was essentially conceived and executed by a small group of people at top management levels with very little understanding of lower level management responsibilities and needs."

In ooreenstemming met aanhangsel A, sal die opgesomde totale program begroting as volg lees:

1974/75 Begroting

R

1. Bedryf	59 200
2. Stelsel Instandhouding	166 800
3. Kapitaal Verbeterings- en Uitbreidingsprogramme	1 134 000
4. Dienste aan Raadsleidom	115 900
5. Tegniese Hulp	70 000
6. Verbruikersdienste	91 800
7. Bestuur	235 800
8. Elektrisiteitsvoorsiening	2 600 000
9. Kapitaal Finansiering	680 000
TOTAAL	5 153 500

Die interessante feit omtrent 'n begroting wat op bogemelde wyse opgestel is, is die feit dat dit die invoer van **totale** hulpronne beheer. Die totale beramende uitgawe van R5 153 500 verteenwoordig in monetêre termie die totale hulpronne beskikbaar aan die Elektriese Ingenieur in daardie besondere finansiële jaar. Dit sluit menslike hulpronne en

dome rather than the formal process of programme budgeting. A unified corporate plan for the electricity supply industry as a whole has recently been prepared and submitted to the Minister for Energy. This contains a list of objectives for the industry, but the general feeling regarding programme budgeting is that in view of the relatively limited range of activities within an electricity board compared with the multiplicity of activities in a local authority there can only be a limited field where programme budgeting might be applied.

On the other hand, the electric utilities in the U.S.A. have had elements of PPB long before such principles were attempted for other governmental operations. Many have detailed costing systems reflecting costs in per-unit cost measurements. For information on U.S.A. systems I acknowledge the assistance I have received from the Director of the Municipal Finance Officers Association of United States and Canada, and the Managers of the Department of Water and Power of the City of Los Angeles, the Utilities Department of the City of Anaheim, the Department of Lighting of Seattle, the Department of Power and Light of the City of Lubbock and the Tennessee Valley Authority. Of the various budget documents furnished, I used the information from Los Angeles to a greater extent than any other in the preparation of the programmes set out in Appendix A. Many of you may recall that the city of Los Angeles was the first in the field of performance budgeting in the U.S.A. immediately after World War II and they were one of the first in the field of programme budgeting. The General Manager and Chief Engineer of the Department of Water and Power prepares every year, as a supplement to the budget statement, a "detail of department programs" which is a comprehensive document setting out a breakdown of activities under the following main headings in respect of the power system:

- (1) Planning and Development
- (2) Capital Improvement and Expansion
- (3) Maintenance and Repair
- (4) Operations
- (5) Customer Services
- (6) Technical Support
- (7) General Administration and Support
- (8) Other Support
- (9) Bond Redemption and Interest.

It will be appreciated that the approach to programme budgeting set out in Appendix A represents only one approach, based on existing activities and existing accounting information. I must say that I am firm believer in this approach, which proceeds from known information to new programmes. In the survey carried out by the International Institute of Administrative Sciences referred to above, it was discovered that many of the organisations implementing programme budgeting are now returning to an evaluation of existing programmes and activities as a base for the introduction of integrated systems.¹⁷ This is certainly a change from the former zero-base approach to comprehensive PPB systems involving as they did an across-the-board approach from the top downwards in which most departmental and entrenched organisational patterns were swept aside and new programmes installed purely on the basis of systems analysis. The Management Services Manager of the City of Anaheim Utilities Department, California, stated in a recent letter to me "our past experience has shown that efforts to impose a programme or responsibility accounting system from the top has met with very, very little success. In fact, the City of Anaheim some 5 years ago attempted to install a programme budgeting system from the top and it failed within about a year. I attribute its failure to a lack of involvement of the first and second level supervisors in the development of the programme. It was essentially conceived and executed by a small group of people at top management levels with very little understanding of lower level management responsibilities and needs."

In accordance with Appendix A, the summarised aggregate programme budget would read as follows:

1974/75 Budget

R

1. Operation	59 200
2. System Maintenance	166 800
3. Capital Improvement and Expansion Programme	1 134 000
4. Service to Council Property	115 900
5. Technical Support	70 000
6. Consumer Services	91 800
7. Management	235 800
8. Electricity Supply	2 600 000
9. Capital Finance	680 000
TOTAL	5 153 500

The interesting fact about a budget prepared on the above lines is the fact that it involves the input of **total** resources. The total estimated expenditure of R5 153 500 represents in monetary terms the total resources available to the Electrical Engineer in that particular financial year. It comprises human resources and material resources. How-

materiale hulpbronne in. Een belangrike doel van 'n program begrotingsstelsel is om nie slegs die invoer van hulpmiddelle in die vorm van personeel en materiaal aan te duif nie maar om albei aan te duif in diezelfde of ander dokumente wat die invoer van die hulpmiddele is. In hierdie verband is die openbare dienste verskillend van die private sektor waar die meting van produksie makliker is. Daar is 'n noue verband tussen die invoer van hulpbronne en die uitvoer van 'n fabriek in terme van goedere wat geproduceer is. In die bevrediging van sosiale behoeftes, noogsins, is die meting van uitvoer nie so regstreks nie.

Nieteenstaande hierdie feit, keer die proponente van 'n begrotingsverhervorming al meer en meer tot die standpunt dat die finansiële begroting kan weergawe word deur betekenisvolle aanwyseers van uitvoer of volume, of kriteria van doeltreffendheid kan verskaf word. Sommige hiervan is saamgevoeg in Aanhangaal A, en verskaf ten minste 'n mate van inligting van wat bereik is met die geld wat bestee is. Die verslag van die Department of Education and Science (V.K.) het hulle as volg uitgelaat oor die meting van produksie: "The key to the objective assessment of performance is thus not necessarily quantification. The first step is the careful identification of objectives; the next is the identification of the type of evidence that is generally agreed to be an indicator of success. This evidence may or may not be quantitative; indeed, naive measurement can be harmful. For example, one of the indicators of success in basic research is the extent to which new discoveries are made, but it would be more illuminating to have expert judgements made about the importance of particular discoveries than to try and devise a numerical scale which in this instance would have no claim to objectivity."¹⁸

Ek wil graag dat Aanhangaal A beskou moet word as 'n uitdaging aan elektriese ingenieurs en tesouriers om iets beter voor te bring, om ook ander aanwyseers te bepaal wat 'n effektiewe skakel tussen invoer en produksie kan verskaf, om die programme verder in elemente te verdeel (vervys Aanhangaal C). Die dokument moet as elasties beskou word en elke plaaslike bestuur moet self besluit hoeveel detail voorseen moet word vir besluitnemming. Elektrisiteit is slegs een van die meningsvuldige plaaslike dienste en die dokumentasie op die basis van Aanhangaal A vir die hele Munisipaliteit sal dus lywig wees.

'n Dokument soos Aanhangaal A is 'n bevredegende afspringsplek vir die instelling van die ander komponente van 'n program begroting stelsel soos analise en lang termyn projeksie. Die ruimte laat nie enige aandag aan hierdie ander komponente nie. Daar is 'n wye veld van evaluasie tegnieke wat vir die verskillende programme aangewys kan word, veral die Kapitaalwerke, en dan in baie maniere om data op 'n langtermyn basis te ekstrapoleer. Ek was gedwing in die ruimte wat beskikbaar is om hoofsaaklik op die toewysegaam van programme van program begroting te koncentreer. Kapitaal programme en aanbieding van finansiële gestandaardiseerde rekenings sal nog nodig wees omdat ons die Staatssekretaris, die Provinciale Ouditeure en die hadvorigte aanvraag van aanwendingsbeginnels ten einde die jaarlikse belasting te het, het. Ook moet die elektriese ingenieur sy kapitaal- en instandhoudingswerk programmeer vir 'n toekomstige tydperk in terme van bekende tegnieke. Program begroting vervang dit nie. Dit wend slegaars 'n ernstige poging aan om beplanning en begrotingsprosesse te integreer.

8. Slot

Ek was verset in die voorbereiding van hierdie referaat om aan te duur in besonder hoe program begroting op die elektrisiteitsdepartemente toegepas kan word. In die voorafgaande seksies het ek een metode aangedui. Hoewel programme in selektiewe gebiede vastegeest kan word, beklemtou ek weer dat programme begroting as 'n volledige stelsel gesien moet word, hoewel dit oor 'n tydperk ingestel mag word. Sommige sal sê dat 'n elektrisiteitsonderneming nie die uiteenlopendheid van funksies het wat geskik is vir program begroting nie en dat daar in ieder geval min gedeel kan word in verband met die sostig persent van die begroting wat die aankope van elektrisiteit en kapitale koste behels. Nogtans volstaan ek dat die inligting wat verskaf word vir die gekose verteenwoordiger, die elektriese ingenieur en die tesourier meer insiggewend is as die geval met die begroting soos ons dit vandag ken. Baie nuttige inligting word bevry uit die jaarlikse verslag en ingestel by die begroting, en in die geval van elektrisiteitsondernemings in besonder is die aanwyseers van uitvoer meer betekenisvol as in enige ander plaaslike diens. Dit is makliker om die doeltreffendheid van 'n elektrisiteitsonderneming te meet as die doeltreffendheid van verskeie funksies.

In die toekoms sal daar van rekeningskundige stelsels verwag word om inligting en bestuur in plaaslike regering te verskaf op 'n basis wat verskillend is as tot nog toe. Ek weet dat tesouriers gretig is om hierdie behoeftes te vervul ten einde te verseker dat beter waarde verkry word vir die geld wat bestee word en die rekenaar mask hierdie verandering moontlik vanweë sy buitengewone kapasiteit om inligting in baie vorms van 'n enkel rekenkundige inskrywing voort te bring.

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1. Tomás O'Cofaigh, **New Integrated Systems of Planning and Budgeting**, International Institute of Administrative Sciences 1972. Page 48.
2. U.S.A. Commission on the Organisation of the Executive Branch of Government, **Budgeting and Accounting**, Washington D.C. Page 8.
3. Sien byvoorbeeld I.C. Hancock 'The American Experience' in *Pro-*

ever, one important aim of a programme budgeting system is to indicate not only the input of resources in the form of personnel and materials but to indicate either in the same or other documents what the output is from the input of resources. In this connection the public services are different from the private sector where the measurement of output is from the input of resources. In this connection the public services and the output of a factory in terms of goods produced. In the satisfaction of social wants, however, the measurement of output is not so straightforward.

Notwithstanding this fact, however, the proponents of budgetary reform are coming more and more to the view that the financial budget can be illuminated with meaningful indicators of output or volume, or criteria of effectiveness can be furnished. Some of these are integrated with Appendix A, and provide at least some information of what is achieved for the money spent. The report by the Department of Education and Science (U.K.) had this to say on output measurement:

"The key to the objective assessment of performance is thus not necessarily quantification. The first step is the careful identification of objectives; the next is the identification of the type of evidence that is generally agreed to be an indicator of success. This evidence may or may not be quantitative; indeed, naive measurement can be harmful. For example, one of the indicators of success in basic research is the extent to which new discoveries are made, but it would be more illuminating to have expert judgements made about the importance of particular discoveries than to try and devise a numerical scale which in this instance would have no claim to objectivity."¹⁸

I would like Appendix A to be regarded as a challenge to electrical engineers and treasurers to produce something better, to work out other indicators which could provide an effective link between input and output, and to break down the programmes further into elements (see Appendix C). The document should be regarded as flexible, and each local authority would have to decide for itself how much detail to present for decision-making. Electricity is only one of a multiplicity of local services and the documentation on the basis of Appendix A for the entire municipality would be formidable. In the case of large undertakings much truncation would have to take place.

A document like Appendix A is a satisfactory spring-board for the introduction of the order components of a programme budgeting system such as analysis and long-term projection. Space does not permit any attention to these other components. There is a wide range of evaluation techniques which can be applied to the various programmes, particularly the capital works, and there are many ways of extrapolating data on a long term basis. I have been compelled in the space available to concentrate mainly on the allocational element of programme budgeting. Capital programmes and presentation of financial standardised accounts will still be necessary because we have the State Treasury and the Provincial Auditors and the stern demand of appropriation principles in order to levy the annual rate. Also the Electrical Engineer will still have to programme his capital and maintenance work for a period ahead in terms of known techniques. Programme budgeting does not replace these. It merely makes a serious attempt to integrate the planning and budgeting processes.

8. Conclusion

I was requested in the preparation of this paper to indicate in particular how programme budgeting could be applied in an electricity department. In the preceding sections I have indicated one method. Although programmes can be determined in selective areas, I emphasise again that programme budgeting should be seen as an entire system, even though it may be introduced over a period. Some will say that an electricity undertaking does not have the diversity of functions suitable for programme budgeting and that in any case there is little one can do about sixty percent of the budget comprising the purchase of electricity and capital charges. Yet I submit that the information provided for the elected representative, the electrical engineer and the treasurer is more illuminating than is the case with the budget we it today. Much useful information is rescued from the annual report and integrated with the budget, and in the case of electricity undertakings in particular the indicators of output are more meaningful than in any other local service. It is easier to measure the efficiency of an electricity undertaking than the efficiency of traffic control.

In the future, accounting systems will be called upon to provide information to management in local government on a basis different from hitherto. I know that treasurers are anxious to fulfil this need in order to ensure that greater value is obtained for the money expended and the computer makes possible this change because of its extraordinary capacity to generate information in many forms from a single accounting entry.

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3. See for instance I.C. Hancock 'The American Experience', in *Pro-*

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AANHANGSEL A

PROGRAM INLITING 1. BEDRYF

A. Program beskrywing:

Verseker die bevredigende geleiding van elektrisiteit van punt van toevor tot verbruikerssentrum ten einde dat die elektriese behoeftes van verbruikers voldoende bevredig word teen die laagste moontlike koste in ooreenstemming met betroubaarheid van diens.

B. Program Objek:

Om die fasiliteite van die elektriese stelsel op so 'n wyse te bestuur dat voldoende voorstelling van elektrisiteit aan verbruikers beskikbaar gestel word met betroubaarheid en ekonomies.

C. Invoer van Hulpronne:

	Koste per jaar		
	1972-3	1973-4	1974-5
1 Superintendent	6 800	7 500	8 000
1 Voorman	5 900	6 400	7 000
3 Elektriese (R6 000)	14 500	16 000	18 000
2 Vakleerlinge (R2 500)	4 100	4 500	5 000
7 Bantoe (R900)	5 100	5 800	6 300
4 Lige voertuie (R1 100)	3 600	3 900	4 400
1 Swa voertuig(R1 500)	1 300	1 400	1 500
Materiale en voorrade	7 600	8 100	9 000
	48 900	53 600	59 200

D. Aanwysers van opbrengs, volume of doeltreffendheid:

	Koste per jaar		
	1972-3	1973-4	1974-5
Eenhede aangekoop (miljoene)	330	360	395
Eenhede verkoop (miljoene)	316	340	378
Persentasie verlies in verspreiding	4,1	5,5	4,3
Jaarlikse ladingsfaktor	52,5	53,0	52,8
Maksimum saanvraag (KW - 000)	73,0	77,2	82,0
Eenhede verkoop per jaar per verbruiker	1 550	1 500	1 520

2. STELSEL ONDERHOUD

A. Program beskrywing:

Hou alle sektors van die stelsel in stand aan vereiste standaarde en voer reparasies uit en doen nodige hernewings.

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APPENDIX A

PROGRAMME INFORMATION

I. OPERATION

A. Programme Description:

Ensure the satisfactory transmission of electricity from points of supply to consumer centres in order that the electrical needs of consumers may be adequately served at the lowest cost possible, consistent with reliability of service.

B. Programme Objective:

To operate the facilities of the electricity system in such a manner that adequate supplies of electricity are made available to consumers with reliability and economy.

C. Input of Resources:

	Cost per annum		
	1972-3	1973-4	1974-5
1 Superintendent	6 800	7 500	8 000
1 Foreman	5 900	6 400	7 000
3 Electricians (R6 000)	14 500	16 000	18 000
2 Apprentices (R2 500)	4 100	4 500	5 000
7 Bantu (R900)	5 100	5 800	6 300
4 Light Vehicles (R1 100)	3 600	3 900	4 400
1 Heavy Vehicle R1 500	1 300	1 400	1 500
Materials and Stores	7 600	8 100	9 000
	48 900	53 600	59 200

D. Indicators of output, volume or effectiveness:

	1972-3	1973-4	1974-5
Units purchased (millions)	330	360	395
Units sold (millions)	316	340	378
Percentage loss in distribution	4,1	5,5	4,3
Annual load factor	52,5	53,0	52,8
Maximum demand (KW - 000)	73,0	77,2	82,0
Units sold per annum per consumer	1 550	1 500	1 520

A. Programme description:

Maintain all sectors of the system to required standards and carry out repairs and effect replacements where necessary.

Substasies toegerig	3	4	7
H.S. Skakeltuig geïnstalleer	20	15	25
Verspreidingskaste opgerig	22	25	40
Verspreidings B.G. drade verwyder (Km)	1,5	1,2	2,1

E. Uitvoer deur funksies:

	1972-3	1973-4	1974-5
	R	R	R
1. Uitbreiding aan 22 Kv netwerk	200 000	500 000	450 000
2. Algemene H.S., LS uitbreidings aansetsel	150 000	180 000	200 000
3. Nuwe dorpe verspreiding	140 000	150 000	180 000
4. Oorname van private verspreidingsstelsels	60 000	50 000	220 000
5. Straatlige	30 000	40 000	50 000
6. Vervanging van toerusting	90 000	150 000	100 000
	670 000	1 070 000	1 200 000

Vir 'n geografiese plassing van dienste en ander besonderhede moet verwysing na die Kapitaalprogram gemaak word.

Substations equipped	3	4	7
H.T. Switchgear installed	20	15	25
Distribution boxes erected	22	25	40
Distribution O.H. lines removed (Km)	1,5	1,2	2,1

E. Output by function:

	1972-3	1973-4	1974-5
	R	R	R
1. Extensions to 22 Kv grid	200 000	500 000	450 000
2. General H.T. LT Extensions to system	150 000	180 000	200 000
3. New Townships reticulation	140 000	150 000	180 000
4. Take-over of private reticulation systems	60 000	50 000	220 000
5. Streetlighting	30 000	40 000	50 000
6. Replacement of equipment	90 000	150 000	100 000
	670 000	1 070 000	1 200 000

For a geographical location of services and other detail, reference must be made to the Capital Programme.

4. DIENS AAN RAAD SE EIENDOM

A. Program beskrywing:

Om 'n instandhouings en vervaardigende diens te lever aan ander sekties van die departement en ander departemente van die munisipaliteit insluitende die bestuur van 'n elektriese werswinkel.

B. Program objek:

Om die instandhouding van die Raad se installasies te vergemaklik en om die gebruik van buite-agentskappe te verminder.

C. Invoer van hulpbronne:

	Koste per jaar		
	1972-3	1973-4	1974-5
1 Superintendant	6 800	7 500	8 000
2 Voormanne (R7 000)	11 800	12 800	14 000
10 Elektriciëns (R6 000)	49 000	54 000	60 000
2 Vakkleerders (R2 500)	4 100	4 500	4 000
11 Bantuë (R900)	8 500	9 000	9 900
5 Ligte voertuie (R1 100)	3 400	4 800	5 500
Elektrisiteit en water	1 200	1 300	1 500
Materiale en voorrade	12 000	14 000	13 000
	96 800	107 900	115 900

D. Aanwyzers van volume, uitvoer of doeltreffendheid:

	1972-3	1973-4	1974-5
Vloeroppervlakte van geboue instand gehou	2 800 m ²	3 000 m ²	3 000 m ²
Manure per jaar (werkswinkels)	11 800	12 000	12 000
Manure per jaar (Raad se geboue)	15 000	14 000	16 000
Manure per jaar (Bantuë)	23 000	21 000	22 000
Vervaardigde take voltooi	700	800	700

D. Indicators of Volume, output or effectiveness:

	1972-3	1973-4	1974-5
Floor area of buildings maintained	2 800 m ²	3 000 m ²	3 000 m ²
Manhours per annum (workshop)	11 800	12 000	12 000
Manhours per annum (Council's buildings)	15 000	14 000	16 000
Manhours per annum (Bantu)	23 000	21 000	22 000
Fabrication jobs completed	700	800	700

5. TEGNIESE HULP

A. Program beskrywing:

Voorsien tegniese hulp vir die stelsel insluitende voorbereiding en instandhouding van tegniese karte, planne en tekeninge en die toets van toerusting en materiaal.

B. Program objek:

Om die nodige tegniese hulp te versaf vir die daaglikse en ordery operation van die stelsel.

5. TECHNICAL SUPPORT

A. Programme description:

Provide technical support for the system including preparation and maintenance of technical maps, plans and drawings and the testing of equipment and materials.

B. Programme objective:

To provide the necessary technical support for the daily and orderly operation of the system.

C. Invoer van hulpronne:

	Koste per jaar		
	1972-3	1973-4	1974-5
1 Superintendent	6 800	7 500	8 000
3 Ingenieurs Assistentes (R9 000)	23 500	25 000	27 000
1 Toets Tegnikus	5 500	6 300	7 000
3 Elektrisiëns (R6 000)	14 500	16 200	18 000
2 Bantoes (R900)	1 400	1 600	1 800
2 Ligte voertuie (R1 100)	1 800	2 000	2 200
Materiale en voorrade	2 400	4 000	5 000
Tekenkantoor benodigdheede	800	800	1 000
	56 700	63 400	70 000

C. Input of resources:

	Cost per annum		
	1972-3	1973-4	1974-5
1 Superintendent	6 800	7 500	8 000
3 Engineering Assistants (R 000)	23 500	25 000	27 000
1 Test Technician	5 500	6 300	7 000
3 Electricians (R6 000)	14 500	16 200	18 000
2 Bantu (R900)	1 400	1 600	1 800
2 Light vehicles(R1 100)	1 800	2 000	2 200
Materials and stores	2 400	4 000	5 000
Drawing office supplies	800	800	1 000
	56 700	63 400	70 000

D. Aanwysers van volume, uitvoer en doeltreffendheid:

	1972-3	1973-4	1974-5
Bouplanne nagegaan	2 000	2 500	4 000
Aansoek vir voorseeing goedkeur	2 100	2 600	4 100
Planne voorberei en gedruk	6 800	7 000	9 200
Nuwe meters getoets en ge- kalibreer	1 000	1 400	1 450
Kabeltoets uitgevoer	20	35	30
Meterklagte toets	14	20	10

D. Indicators of Volume, output or effectiveness:

	1972-3	1973-4	1974-5
Building plans examined	2 000	2 500	4 000
Applications for supply, approved	2 100	2 600	4 100
Plans prepared and printed	6 800	7 000	9 200
New meters tested and calibrated	1 000	1 400	1 450
Cable tests performed	20	35	30
Meter-complaint Tests	14	20	10

6. VERBRUIKERSDIENSTE

A. Program beskrywing:

Verrig 'n diens aan privaat kontrakteurs en die publiek in die algemeen deur 'n proses van inspeksie, advies, vertolkking van regulasies en die voorseening van aansluitings tussen die Raad se stelsel en private persele.

B. Program objek:

Om kontrakteurs en verbruikers se behoeftes aan die eenkant, en Departemente vereistes aan die anderkant te oorbrug.

C. Invoer van hulpronne:

	Koste per jaar		
	1972-3	1973-4	1974-5
1 Hoof-installasië-inspekteur	6 600	7 200	8 000
4 Installasië-inspektoreurs (R7 500)	24 000	27 000	30 000
1 Ondervoorman	4 500	5 400	6 000
2 Elektrisiëns	9 000	10 800	12 000
4 Bantoes (R900)	2 600	3 000	3 600
Materiale	25 000	27 000	30 000
Ligte voertuie (R1 100)	1 800	2 000	2 200
	73 500	82 400	91 800

6. CONSUMER SERVICES

A. Render a service to private contractors and the public generally by a process of inspection, advice, interpretation of regulations and the provision of connections between the Council's system and private premises.

B. Programme objective:

To provide a bridge between contractors and consumers and their needs on the one hand, and Departmental requirements on the other.

C. Input of Resources:

	Cost per annum		
	1972-3	1973-4	1974-5
1 Chief Installation In- spector	6 600	7 200	8 000
4 Installation inspectors (R7 500)	24 000	27 000	30 000
1 Chargehand	4 500	5 400	6 000
2 Electricians	9 000	10 800	12 000
4 Bantu (R900)	2 600	3 000	3 600
Materials	25 000	27 000	30 000
2 Light vehicles (R1 100)	1 800	2 000	2 200
	73 500	82 400	91 800

D. Aanwysers van uitvoer, volume of doeltreffendheid:

	1972-3	1973-4	1974-5
Aantal routine inspeksies	2 600	2 700	3 000
Aantal finale inspeksies	726	800	750
Kw aanvraag gefinstalleer	2 000	1 800	2 500
Stowe aangesluit	400	290	300
Aantal huisaansluitings	290	300	250
Aantal handelaarsaansluitings	41	43	50
Aantal nywerheidaansluitings	12	16	18
Man-ure gehef teen verbruik- ers	4 300	4 800	5 000

D. Indicators of output, volume or effectiveness:

	1972-3	1973-4	1974-5
Number of routine inspec- tions	2 600	2 700	3 000
Number of Final Inspec- tions	726	800	750
Kw demand installed	2 000	1 800	2 500
Stoves connected	400	290	300
Number of house connec- tions	290	300	250
Number of commercial connections	41	43	50
Number of industrial connec- tions	12	16	18
Manhours charged to con- sumers	4 300	4 800	5 000

7. BESTUUR

A. Program beskrywing:

Voorsien bestuur in al sy aspekte vir die hele stelsel insluitende algehele administrasie, beplanning, finansiering en beheer.

7. MANAGEMENT

A. Programme description:

Provide management in all its aspects for the whole system including overall administration, planning, finance and control.

B. Program objek:

Om genoegsame bestuurshulp te verseker vir die doeltreffende verrigting van die stelsel.

C. Invoer van hulpbronne:

	Koste per jaar		
	1972-3	1973-4	1974-5
1 Bestuurder	12 000	13 000	14 000
1 Adjunk-bestuurder	10 000	11 000	12 000
2 Strekkingenieurs (R10 000)	16 000	18 000	20 000
1 Hoofklerk	6 000	7 000	8 000
4 Dames klerke R3 750)	13 000	14 000	15 000
2 Bantoes (R900)	1 300	1 500	1 800
Versekering	8 000	8 000	8 500
Kantooruitgawe (Elektrisiteit, Water, Licensies, Riolerings, vullis verwydering, skoonmaak materiaal, posgeld, drukwerk en skryfbehoeftes, verswyngingsboeke, telefoons, herstelwerk en onderhoud)	5 800	6 000	6 500
Finansiële administrasie (kontant en debiteure beheer, rekenkundige beheer vir inkomste en uitgawe, begrotingsvoorbereiding, bates beheer, lenings financiering, voorbereiding van finale rekenings)	130 000	145 000	150 000
	202 100	223 500	235 800

D. Aanwyzers van uitvoer, volume of doeltreffendheid:

Geen

B. Programme objective:

To ensure adequate managerial support for the efficient operation of the system.

C. Input of resources:

	Cost per annum		
	1972-3	1973-4	1974-5
1 Manager	12 000	13 000	14 000
1 Deputy Manager	10 000	11 000	12 000
2 Divisional Engineers (R10 000)	16 000	18 000	20 000
1 Chief Clerk	6 000	7 000	8 000
4 Female Clerks (R3 750)	13 000	14 000	15 000
2 Bantu (R900)	1 300	1 500	1 800
Insurance	8 000	8 000	8 500
Office expenses (Electricity, Water, Licences, sewerage refuse removal, cleaning materials, postage, printing & stationery, reference books, telephones, repairs and maintenance)	5 800	6 000	6 500
Financial Administration (cash & debtor control, accounting control for income and expenditure, budgetary, preparation, assets control, loan financing, preparation of final accounts)	130 000	145 000	150 000
	202 100	223 500	235 800

D. Aanwyzers van uitvoer, volume of doeltreffendheid:

Geen

D. Indicators of output, volume or effectiveness:

8. ELEKTRISITEITSVOORSIENING

A. Program beskrywing:

Neem ontvangs van gemeterde toevoer op verskillende punte van voorsiening en maak betaling in ooreenstemming met goedkeurde tariewe.

B. Program objek:

Om te verseker dat maksimum voordeel verkry word van die voorsienier en die Raad se tariewe.

C. Invoer van hulpbronne:

	Koste per jaar		
	1972-3	1973-4	1974-5
Aankoop van EVKOM			
Aanvraagheffing (000\$)	2 000	2 300	2 500
Eenhedsheffing (000\$)	900	1 000	1 100
Afslag	800	900	1 000
Netto betaling	2 100	2 400	2 600
Werk verrig deur bedrywigheids (Verwys afsonderlike programme)			

D. Aanwyzers van uitvoer, volume of doeltreffendheid:

	1972-3	1973-4	1974-5
Maksimum aanvraag (Kw-1 uur)	65 000	68 000	75 000
Totale eenhede aangekoop (000\$)	315 000	330 000	350 000
Spitsstadig geregistreer teen gemiddelde 8,5 Kw	75 000	79 000	85 000
Gemiddelde prys per eenhede aangekoop (sente)	0,48	0,51	0,52
Jaarlike ladingsfaktor	52,1	53,0	52,2
Verspreidingsverlies	4,1	5,5	4,3

8. ELECTRICITY SUPPLY

A. Programme Description:

Take delivery of metered supplies at various points of supply and make payment in accordance with approved tariffs.

B. Programme objective:

To ensure that maximum advantage is obtained from the suppliers' and the Council's tariffs.

C. Input of Resources:

	Cost per annum		
	1972-3	1973-4	1974-5
Purchase from ESCOM			
Demand charge (000\$)	2 000	2 300	2 500
Unit charge (000\$)	900	1 000	1 100
Discounts	800	900	1 000
Net payment	2 100	2 400	2 600
Work performed by operations (See separate programme)			

D. Indicators of output, volume or effectiveness:

	1972-3	1973-4	1974-5
Maximum demand (Kw-1 hour)	65 000	68 000	75 000
Total units purchased (000\$)	315 000	330 000	350 000
Peak load registered against average '85 Kw	75 000	79 000	85 000
Average prys per unit purchased (cents)	0,48	0,51	0,52
Annual load factor	52,1	53,0	52,2
Loss in distribution	4,1	5,5	4,3

9. KAPITAAL FINANSIERING

9. CAPITAL FINANCE

A. Program beskrywing:

Die betaling van rente en delgingskoste op lenings aangegaan vir kapitaal besteding en wakind teen 'n buitensporige druk van leningskuld.

B. Program objek:

Om lenings te deig en rente te betaal wat benodig word vir die kapitaal vereistes van die stelsel en die groei van kapitale koste te beheer.

C. Invoer van hulpbronne:

	Cost per annum				Koste per jaar		
	1972-3	1973-4	1974-5		1972-3	1973-4	1974-5
CAPITAL CHARGES							
Supertension grid	140 000	140 000	150 000		Superspanning netwerk	140 000	140 000
Distribution network	450 000	490 000	520 000		Verspreidingsnetwerk	450 000	490 000
Land and buildings	7 000	9 000	10 000		Grond en Geboue	7 000	9 000
TOTAL	597 000	639 000	680 000		TOTAAL	597 000	639 000

D. Aanwysers van uitvoer, volume of doeltreffendheid:

	1972-3	1973-4	1974-5
Totalle lenings uitstaande (R.M.)	6,0	6,5	7
Jaarlikse leningskoste as persentasie van totale lopende jaarlikse uitgawe	17	19	20
Totale kapitaaluitgawe (m.)	9	9,5	10
Eenhede verkoop per rand van kapitale uitgawe	38,1	37,8	38

A. Programme description:

The payment of interest and redemption charges on loans raised for capital expenditure and guarding against an undue impact from loan debt.

B. Programme objective:

To redeem and pay interest on loans required for the systems capital requirements and control the growth of capital charges.

C. Input of resources:

	Cost per annum		
	1972-3	1973-4	1974-5
KAPITALE KOSTE			
Superspanning netwerk	140 000	140 000	150 000
Verspreidingsnetwerk	450 000	490 000	520 000
Grond en Geboue	7 000	9 000	10 000
TOTAAL	597 000	639 000	680 000

	Cost per annum		
	1972-3	1973-4	1974-5
D. Indicators of output, volume or effectiveness:			
Total loans outstanding (R.M.)	6,0	6,5	7
Annual loan charges as percentage of total current annual expenditure	17	19	20
Total capital expenditure (M.)	9	9,5	10
Units sold per rand of capital expenditure	38,1	37,8	38

MUNICIPAL ELECTRICITY UNDERTAKINGS

Profits as a percentage of total annual expenditure for financial years which ended during 1972.

MUNISIPALE ELEKTRISITEITSONDERNEMINGS

Winste as 'n persentasie van totale jaarlikse uitgawe vir finansiële jare wat gedurende 1972 geëindig het.

Persentasie Wins	Aantal Municipaliteite				Totaal
	Trans-vaal	Natal	Kaap	O.V.S.	
0 - 5	2	4	18	2	26
5 - 10	2	4	14	1	21
10 - 15	0	0	18	3	21
15 - 20	4	1	12	6	23
20 - 25	6	3	19	4	32
25 - 30	3	3	9	6	23
30 - 35	5	2	14	9	30
35 - 40	9	0	9	6	24
40 - 45	5	2	10	0	17
45 - 50	6	-	5	2	13
50 - 55	3	-	4	2	9
55 - 60	4	-	1	5	10
60 - 65	1	-	0	4	5
65 - 70	2	-	1	1	4
70 - 75	3	-	1	0	4
75 - 80	-	-	-	0	0
80 - 85	-	-	-	2	2
85 - 90	-	-	-	2	2
90 - 95	-	-	-	1	1
95 - 100	-	-	-	0	0
100+	-	-	1	3	4
	57	19	136	59	271

Percentage Profit	Number of Municipalities				Total
	Trans-vaal	Natal	Cape	O.F.S.	
0 - 5	2	4	18	2	26
5 - 10	2	4	14	1	21
10 - 15	0	0	18	3	21
15 - 20	4	1	12	6	23
20 - 25	6	3	19	4	32
25 - 30	5	3	9	6	23
30 - 35	5	2	14	9	30
35 - 40	9	0	9	6	24
40 - 45	5	2	10	0	17
45 - 50	6	-	5	2	13
50 - 55	3	-	4	2	9
55 - 60	4	-	1	5	10
60 - 65	1	-	0	4	5
65 - 70	2	-	1	1	4
70 - 75	3	-	1	0	4
75 - 80	-	-	-	0	0
80 - 85	-	-	-	2	2
85 - 90	-	-	-	2	2
90 - 95	-	-	-	1	1
95 - 100	-	-	-	0	0
100+	-	-	1	3	4
	57	19	136	59	271

APPENDIX C
AANHANGSEL C

CITY LIGHT PROGRAM STRUCTURE

COMPONENT	PROGRAM	PROGRAM CATEGORY*	
GENERAL ADMINISTRATION & SERVICES	10	11	Planning & Mgt. Control
	ADMINISTRATION	12	Operational Control
		13	Finance & Budget Admin.
		14	General Expenses
	20	21	Consumer Services & Marketing
	CONSUMER & PROFESSIONAL SERVICES	22	Research & Pre-Design
	30	31	Hydraulic
	POWER GENERATION	32	Steam
		33	Nuclear
		34	Other
PLANT & OPERATIONS	35	Purchased Power & Supply	
	40	41	Power Transmission
	POWER TRANSMISSION & DISTRIBUTION	42	Power Distribution
	50	51	Materiel Mgt. & Shops
	OPERATIONAL SERVICES	52	Camps & Grounds
		53	Recreational Services
CAPITAL IMPROVEMENT PROGRAM	60	60	Generating Plant
	70	70	Transmission Plant
	75	75	Substations
	80	80	Distribution Plant
	90	90	General Plant

CITY OF SEATTLE
POWER PRODUCTION AND DISTRIBUTION SYSTEM

B. Salazar 7/74

* The next level of breakout is the Program Element Level

Mr. J.K. von Ahlfen (Springs): Mr. President, ladies and gentlemen, may I first of all congratulate Dr. Cowden in the manner in which he presented his paper. It was most interesting to listen to his address.

I was not surprised to note that the main objective of a municipal electricity undertaking is not to distribute electricity but to bring a higher standard of living to the people in our towns and cities. We may possibly have overlooked this point in the past at our Conventions and Dr. Cowden is probably quite correct in making this statement in support of a municipal electricity budget which has been set on definite input and output lines.

I must agree with the basic principle underlined in the paper that we must plan, program and analyse the workings of an electricity undertaking to achieve optimum efficiency which can be achieved with P.B. However it would also seem to me, that at this stage, if P.B. is undertaken too ambitiously without realistic works programmes, inadequate staff which seems to be chronic in all the sectors of a local authority, and unless the full support of not only the Town Treasurer but at all levels of management is forthcoming P.B. cannot be implemented effectively.

So primarily as I see it, P.B. will rely to a great extent on the operation it will receive from top and lower levels of management and as pointed out by Dr. Cowden in his paper, the Institute of Town Clerks and the Institute of Municipal Treasurers and Accountants, has appointed a Committee to study methods for its successful implementa-

tion. It will therefore be interesting to have a follow up on P.B. once these Institutes have completed their studies and produced workable guide lines for its implementation.

However coming back to how we as municipal electrical engineers are involved. Basically, P.B. can give us a clear picture on whether the money we have available has been properly spent. After all we manage trading departments and our ultimate aim is to make money despite what has been said in respect of the main objective of a municipal electricity undertaking.

An interesting point emerging from the paper is Dr. Cowden's view, that it would be a retrograde step to nationalise distribution and the fact that the Area Boards in the U.K. had the effect of an impersonal relation between supplier and consumer. I support this view. After all we are the closest to the man in the street regarding his power requirements, not only as a ratepayer but also as a tax payer and as such we can and should therefore guard against a too unrealistic profit margin in electricity supply in order to balance the budget. Dr. Cowden has also pointed out the large variance in profits made by local authorities in their electricity undertakings. In this respect the Borckenhagen Commission came to the following conclusion a few years ago:

"That profits on power for industrial use should be limited but the Committee believes that the feature of profits made by local authorities in their trading departments can be exaggerated."

Whether the Commission would come to the same conclusion today is debatable should the trend increase to call upon municipal electricity undertakings to contribute more and more towards the relief of rates in the absence of other forms of taxation available to local authorities. The argument in financial circles apparently is that the ratepayer has some measure of control over his electricity account. He can decide whether to use more or less electricity to balance his own personal budget whereas his taxes are fixed.

If our main function is to bring a higher standard of living to the people, unrealistic electricity tariffs could in fact have the opposite effect. Here too national distribution authorities should guard against a too drastic rise in the costs of electricity, leaving very little alternative to municipal distribution authorities.

Meneer die President, wat veral insiggevend is in die referaat is die feit dat nie een munisipaliteit op dieselfde patroon begroot nie en dat die verdeeling van begrotings bloot gemik is op 'n maklike aanwyseing tussen die verskillende uitgawe kategorie. Hulle is dus nie bedoel om as 'n skakel te dien tussen die uitgawe en die aktiwiteit ofteval werkverrigting nie.

Ek persoonlik is van mening dat dit juis hier is waar die huidige begrotingspatroon sonder enige program en beplanning nie aan sy doel beantwoord nie, deurdat ons nie presies weet of die fondse vir die aktiwiteit behoorlik benut of selfs behoorlik voorstien word nie. P.B. kan tot 'n baie groot mate hierdie leemte uitstakel en ons poog nou in Springs om in hierdie rigting te beweeg met die opstel van die jongste begroting vir 1975/76. Aanhangsel A toon in beide trekke aan wat in die opeig in Springs se elektrisiteitsonderneming beoog word.

Meneer die President wat veral insiggevend was toe ons die nuwe begroting met die verskillende seksies superintendente bespreek het, was dat vir die eerste keer die doelstelling van elke aktiwiteit bepaal kon word, dit wil sê, die substasie, werkswinkel, toets, distribusie en konstruksie superintendente kon nou presies aandui wat hulle oogmerke was en watter fondse hulle dus vir die oogmerke sou benodig. So kon hulle nou sien wat die uitgawe was aan salarisne, vervoer, materialen, ens., om die doelstelling in hulle onderskeie seksies te bereik. Dit in sigself was 'n groot voorwaarde staap deurdat die uitgawes nie bloot histories en arbitrie begroot word nie maar ook ingestel is om die aktiwiteit so doeltreffendheid of te wel die produksie te kan meet. Dit het ook noodwendig tot gevolg dat die beste gebruik van die beskikbare mannekrag gevind word, 'n probleem waarmee plaaslike besture al hoe meer in toekoms sal worstel.

Meneer die President, ek hoop u sal my toelaat om net kortlik te vertel dat ons die Presidentrede van 1971 te verwys, wat juis gehandel het oor doeltreffendheid in munisipale elektrisiteitsondernemings. Daar is toe pertinent daarop gevys, soos Dr. Cowden ook in sy referaat aansaal, dat alhoewel ons siegs 'n klein gedeelte van die totale bedryfskoste kan beheer, meer as 60% vir die aankoop van elektrisiteit van EVKOM is en 20% vir kapitale koste, is dit nogtans die enigste direkte koste wat ons kan beheer en waarin ons doeltreffendheid kon openbaar en dit is juis hier waar P.B. 'n groot rol kan speel.

Meneer die President, Dr. Cowden het ons vandaag 'n besondere insiggevende prentje van ons finansiële verpligtings getoon en 'n uitdaging aan die elektrotegniese ingenieurs en stadsdesouriers gerig om iets beter voor te bring deur 'n meer effektiwe skakel tussen invoer en produksie te verskaaf. Ek persoonlik is bereid om hierdie uitdaging te aanvaar en ek is seker daarvan, so ook die meeste van die ingenieurs wat vandaag hier teenwoordig is, maar dan wil ek graag deur middel van Dr. Cowden, 'n senior uitvoerende beambte van die Instituut van Munisipale Tesouriers en Rekenmeesters, 'n beroep op ons tesouriers doen om hulle hydrae te lewer want sonder terugvoeling van die verlange rekenkundige inligting sal enige vorm van finansiële en gekoppelde werksoopreggering nie effektiwe toegespas kan word nie.

Meneer die President, ek kan nog verder uitwerf oor die referaat, maar ek is seker daarvan dat baie van u graag ook iets in die verband wil bydra.

Ten slotte wil ek egter daarby volstaan dat ons Dr. Cowden baie dank verskuldig is vir 'n hoogs gespesialiseerde referaat wat as handleiding sal dien vir ons toekomstige begrotings en ek vry u dus om op die gebruikelike wyse ons waardering te betoon vir 'n uiters interessante en leersame referaat wat vandaag hier aan ons voorgedra is. Baie dankie.

Mnr. W. Barnard (Johannesburg): Dit is inderdaad vir my 'n voorreg om kommentaar op Dr Cowden se interessante referaat oor Program Begroting te lewer. Ek kan saamstem dat program begroting 'n omvattende stelsel is wat met voordeel toegespas kan word op 'n elektrisiteitsonderneming, maar nie dat die stelsel die hele munisipale vlak kan dek nie.

I consider it both unwise and illogical that essential services such as electricity supply, water supply and sewerage disposal should be integrated into a municipal programme budget to the extent that they are competing for funds with other public projects considered either necessary or desirable such as parks, libraries, art galleries and even roads.

I cannot accept Dr. Cowden's submission that the objective of an electricity undertaking is, and I quote "in association with other fields of municipal enterprise, to promote community development and bringing a higher standard of living to the people". In contrast I would say that the common objective of all essential services is "to provide a service for the survival of a modern sophisticated urban society" and before I am accused of being melodramatic let me add that by survival I

mean real physical survival not moral or cultural survival as the author proposes.

Some of us will recall that in 1965 a major power failure in the United States left the whole state of New York extending over 80 sq miles blacked out for between 5 and 24 hours. The following are some of the features of this major catastrophe:

- (1) Aircraft had to be diverted from all airports.
- (2) 885 Hospitals had to operate on emergency supplies and 75 out of 150 hospitals in New York City, where there was no emergency supply, had to be evacuated.
- (3) 800 000 People were stuck in the underground railway subway.
- (4) Many industries suffered losses amounting to millions of dollars. Machine tool breakages was extensive, Dunlop Tyres lost 17 000 tyres, bakers lost 2 000 loaves of bread and an oil refinery lost 10 000 barrels of oil.
- (5) Banking and the stock exchange came to a standstill.
- (6) Police used flares to control traffic.
- (7) Barber shops were popular and 30 million people slept on stairways.

I shudder to think what chaos would result from loss of electricity supply to a major modern city for say 3 months.

Society and probably also the treasury officials have taken the provision of electricity supply, which is always available at the drop of a hat, very much for granted in the past, but in fact security of supply requires long term planning and the assurance of continuing adequate financial resources.

Even though Councils may be able to weigh essential services against non-essential services, investment criteria for electricity supplies are fundamentally distinct from those of other public services and consequently require special consideration and in fact this is the present trend in Johannesburg – to consider the long term Budget for essential services separately. Provision of electricity has supply and demand characteristics, it cannot be stored, it has stringent statutory obligations in regard to availability, voltage variation and others, and requires large capital investment and considerable forward planning. The problem of financing municipal electricity utilities has also been complicated by a tendency to amass an increasing surplus for the subsidisation of non-essential services. At the present time when Government imposes an overall ceiling on municipal expenditure essential services must co-operate by postponing capital works where possible. But it is must be appreciated that there is a limit as to the extent that local government authorities can reduce investment in the development and reinforcement of electricity services without endangering their stability and forcing electricity utilities to the point where they cannot meet their statutory obligations. In fact reduction of investment beyond a certain point can be counter productive if industry is to be faced with delays in obtaining power and an unreliable and unsatisfactory electricity service. Electricity undertakings throughout the world have a common duty, which is usually statutory, that is to make available electricity supplies to all persons. Such a simple sounding obligation requires however, long term forecasting and planning, budgeting and programming and accordingly electricity supply engineers have of necessity always had to adopt a type of PPBS approach, certainly to their major projects.

In Johannesburg such techniques have been extended into the everyday operations of planned maintenance and planned project budgets and I would agree that a budgetary format on a functional basis would assist here; you are then budgeting for what requires to be done, rather than dividing up the financial cake. However, in this respect, the setting of functional objectives within an electricity department, the allocation of funds and the assessment of performance must be a management responsibility. Councils are not equipped to deal with such matters and should concentrate on overall results and the performance of management which can be compared with the results of other undertakings such as

- (a) the rate of return on net assets employed taking the level of tariffs into account,
- (b) customer reaction to cost and quality of supply, consumer service etc.

This view as to the segregation of responsibilities between Council and management is justified to some extent by an examination of Dr. Cowden's Appendix "A" in relation to his selection of Programme Objectives and Indicators of Output or Effectiveness – without going into these in detail however, I think they illustrate the hazards that can be encountered in such an analysis being attempted by other than electricity supply engineers.

Dealing with typical municipal budgeting and accounting systems I certainly consider they should be developed towards the needs of individual departments and away from the current line item bookkeeping system. This system, derived from earliest methods does not provide any logical grouping or classification of expenditure which is necessary for the proper structuring of tariffs. Likewise there is no basis for economic analysis and no convenient yardsticks for comparison with other undertakings.

It is argued that even at this time, by re-allocation of salaries and wages, materials etc. into functional classifications, all necessary information can be provided, but this is not immediately available and

there must be some doubt as to the validity of such re-allocations, generally done on an arbitrary basis.

To summarise, I do not believe electricity undertakings should form part of an overall Municipal Programme Budgeting system; such departments already, to a greater extent than any other, plan, programme and budget on a long term basis and this should be extended on more formal lines. I do, however, support the author's proposal to modify the municipal budgeting and accounting system in order to give a greater functional classification to provide for better planned spending.

Thank you Dr. Cowden for a most stimulating address.

Mr. G.C. Theron (Vanderbijlpark): Die spreker moet gelukgewens word met die inhoud en aanbieding van die referaat.

Daar was altyd gesê dat ingenieurs gebore word met 'n rekenlaiaan in die mond - nou natuurlik vervang met die elektroniese rekenaar - maar nietemin is beplanning 'n belangrike deel van 'n ingenieur se opleiding en daagliks werk. Die beginsel van PROGRAM BEGROTING is dus nie vir 'n ingenieur vreemd nie en sal sekerlik geen elektrotegniese ingenieur afskrik nie.

En is egter van mening dat dit geen skade sal doen as Dr. Cowden die referaat by 'n kongres vir Stadsbestuurers sou voordra nie. Solank ons met die verouderende finansiële regulasies opgesaal is, sal ons nie veel voordele wry nie!

'n Besparing van R20 op 'n pos soos drukwerk mag nie aangewend word om 'n tekort van sE R1 op 'n aanverwante pos van skryfbehoeftes aan te stuiwer nie. Nee, daar moet eers verslag gedoen word vir die Stadsraad se besluit en u mag maar self raai wat dit alles kos.

Dit doen dus die hart goed om te verneem van die skrywer se pleidooi vir corhoofse beplanning en beheer. Misken sal die ingenieurs van die toekoms vertroet word om op departementele vielsel detail te beheer. Minder gejag na winste uit die elektrisiteitsvoorsienings-departement sal moontlik daartoe bydra.

Die spreker meld verskeie male dat PROGRAM BEGROTING baie tyd in beslag neem. Dit is ongetwyfeld so want voordat daar selfs met ramings begin kan word moet lang termyn projeksiës gemaak word en daarvoor is nodig feite wat eerder verkyf moet word en sons nie maklik beskikbaar is of gestel word nie.

Vooruit beplanning is ongetwyfeld noodsaaklike maar behoorlike tyd verg dit ook voldoende personeel van gehalte en ons weet almal hoe voog hulle vandag in die munisipale sektor is!

Die spreker be-eogg die beplanning oor 'n typerk van 5 jaar met jaarlike aanspassings aan die eerste en laaste kolomme. Net na 'n munisipale verkiezing behoort so 'n beplanning gedoen te word, maar ek kan voorstellen dat na die volgende verkiezing meer as net 'n aanspassing nodig sal wees anders is dit maar weer 'n gevval dat beweegruimte vir besluitneming beperk word.

Ons op Vanderbijlpark het probeer om na Munisipale verkiesings tariefbeplanning so te doen dat die tariewe vir die Raadstermynd redelik stabiel sou bly. EVKOM tuiet vernhogings en inflasie-druk het so 'n idealer egter spesig uitgewis.

Moontlik sal Springs onder Dr. Cowden se versione leiding meer suksesvol wees.

Mr. T. C. Stoffberg (Escom): The main value of programme budgeting arises in situations where there is a need to exercise a choice between alternatives. Dr. Cowden has for instance referred briefly to the situation in the fire department where the funds which can be allocated to this department must be apportioned between fire prevention and fire fighting respectively. Such a choice between alternatives, does not exist to the same extent in an electricity undertaking. The nature and extent of the activities of the consumers served and the decision making is largely in the collective hands of these consumers. The undertaking management cannot decide the volume of its activities. This is determined for the undertaking by the needs of the consumers served by its network. Would Dr. Cowden concede that programme budgeting has less to offer in these circumstances peculiar to electricity undertakings. Thank you.

Mr. E. Trautmann (Ladysmith, Natal): I agree with most of Dr. Cowden's very stimulating thoughts on programming and planning. Unfortunately, computer trouble and staff difficulties prevent often a timeously supply of data from Treasury. Proxus is different from Theory.

I disagree with the statement of Dr. Cowden, that the objective of an Electricity Undertaking is not to distribute electricity. I have got the same feeling that with the term: "Promotion of community development" an excuse is found to milk the healthy cow named "Electricity Undertaking" and the justification to take the cream off for un-economic purposes.

Dr. Cowden knows, that both the Electricity Act as well as the Provincial Ordinances state clearly, that electric energy should only be sold to cover costs. If profits are made, tariffs should be decreased to the benefit of the electricity consumer. We should remain fair. When I buy a loaf of bread, I do not like to contribute for the development of game reserves. Taxes should look after that.

Profits in electricity undertakings should be used entirely to finance electricity projects - but what often is done is to channel these moneys away and to replace the missing capital by costly loans, burdening the Electricity Fund unnecessarily high.

Salary structures of Electricity Undertakings should not be linked at all to salaries of Departments of Administration for clerks and accountants. They are different - since the budgeting of Electricity Undertakings are linked to a product: the essential service of providing

energy in form of electricity - although the Provincial Administration still does not include Electricity into the same category of essential services like Roads and Water.

The operation of Electricity Departments must be highly efficient to guarantee firm supply and to trouble shoot and repair equipment in a minimum of time. This can only be done by highly qualified and experienced staff which are not obtainable if their salary structure is linked to administrative departments.

Dr Cowden compares British and American systems. He should be aware that the Continent as well has regional boards for the supply of electricity which have nothing to do with municipalities and which do not contribute to the so called: Re-inave of taxes.

They are selfsufficient like ESCOM here and their financial and administrative needs are met by qualified staff within their organisation in a highly efficient way.

The analysis of "Input of Resources" and "Indicators of Output" will only be of value, if compared with other undertakings which is difficult due to the lack of an accepted yardstick common to all.

I feel, that Dr. Cowden should not have left the "Input of Resources" foggy in respect of the financial administration under the heading: Management in his example, but should have disclosed the breakdown of R150 000.00 - for the financial administration of an Electricity Undertaking.

According to these figures some 65% of the management of an Electricity Undertaking is done by the Treasury, and I wonder, if the monies claimed by the Town Clerks Department would be disclosed as well, what small 20% would be left to indicate the managerial value of the Electrical Engineer, who is supposed to be in charge of his department. Thank you.

Clr. B.G. Russell (Bedfordview): Mr. President, I think Dr. Cowden has highlighted the fact that any municipality that does not use forward planning is indeed behind the times. The point that I would like to make is one which I feel Dr. Cowden has possibly omitted from his paper. It is an important and difficult one, but an essential aspect of any forward planning programme - the problem of forward cash flows. With today's high inflation and interest rates, in planning ahead for 5 years, one obviously has to anticipate inflation rates to enable estimates of equipment costs and labour to be calculated 5 years ahead for any particular electrical undertaking. It seems to me that there are 2 ways of doing this; either one plans ahead in real currency terms updating annually and ignoring inflation completely, allowing any one who wishes to study the forward plan to apply their own figures for inflation or, alternatively, one can of course incorporate inflation and revise the plan at the end of each year. I wonder if Dr. Cowden could comment on this point and give us his ideas on how one should handle this extremely difficult aspect of forward planning.

Dr. J.W. Cowden (Springs): Mr President, with regard to your comment on confusion, I would like to tell this story. When I was overseas, I had a discussion with the then City Treasurer of Liverpool, and he said he described programme budgeting to his Chairman of Finance Committee, who said that he was a little bit confused about the subject. After the City Treasurer had described the process to him, he asked the Chairman what he thought. He replied: "I am still confused, but I feel I am now confused in a very much higher level!"

Wat Mn. von Ahlfen se kommentaar aanbref, wil ek sE baie dankie vir daardie opmerkings. Met die samewerking van Jules von Ahlfen en Mn. van Rooyen, die Stadsbestuurier en ekself, misken kan ons in die toekoms 'n beter en doeltreffender bydrae lewer by 'n konferensie soos hierdie. As far as Mr. Barnard is concerned, there were no direct questions, but he seemed to object to the integration of electricity with the other major objectives for programme budgeting purposes, but of course this is a matter of policy. At present it is integrated as far as the ordinary budgetary processes are concerned. It is integrated with the finances of the local authorities, and some of you may say regrettably, because of the profits which are taken to rate fund, but the fact is that that is a policy matter, I think it would be unfortunate if we carried the argument about the independence of public utilities to the point where they were so independent that a central or regional body took over the distributive process. Local authorities would no longer have contact with consumers. I gave you the example of the lack of contact of the consumers in England with anybody in area boards who could help them with electricity problems. I believe a local community should carry on with providing these essential services, and although some city electrical engineers like Mr. Barnard may not like this integration, and would like a certain amount of independence, I believe this would be a retrograde step, and I appeal to all of you to stick with us, and preserve local services and local objectives instead of undergoing the risk that essential services may be taken over by higher tiered bodies. Mr. Barnard raised the question of objectives as well, and how they are determined but I did stress that there would be endless discussion on what objectives are. Mr. Barnard thought the objective of the electrical service should be survival, therefore we should transfer electricity away from environment and put it under protection with fire and other protective services. That is a matter for argument, so I leave it there, because I could talk a great deal on the actual framing of objectives, yet I think programme budgeting within a department can also make a major contribution for officials irrespective of the arguments whether electricity should be here or there in the sphere of major objectives. He also criticised the preparation of output data by a non-technical man. I accept this criticism, although the information I obtained was both from overseas sources and from local technical people.

ple, but I did say that the appendix was a challenge to produce something better, and I accept entirely that output data could be the subject of argument and can be improved. I hope that something better will emerge in the future. He also mentioned profits on electricity as did other speakers, and I shall deal with that later. Mr. Storberg asked whether programme budgeting has less to offer in the electricity department than in others - I think he is correct as far as the decision-making process is concerned. I think it probably serves the purpose of the electrical engineer better, that it does the decisionmakers, because after all, can the lay-representatives of the people come along to you and say - "Don't you think you are spending too much on technical support, and not enough on maintenance?"

I have also analysed traffic expenditure, and there could be a lot of argument, whether you should spend more on traffic education and less on the control of speed. Because of the highly technical nature of electricity, there is less to offer from the point of view of overall decision-making by the layman. Mr. Trautman also dealt with the problem of higher objectives, but I stress again that there is room for great diversity here.

He also raised the question of profits. I believe that, strictly speaking and from the point of view of both finance and technicality, the ideal would be to plough your profits back into the electricity undertaking and generate capital in that way. But this is a matter of high policy and the community as a whole have found no objection to this. It has been highly criticised in the past, as being a form of concealed taxation for instance by the Social and Economic Planning Council, but the Borckenhausen Committee said there is nothing wrong with the policy. If there are no other sources of revenue for local government then use electricity. This is such a vast subject Mr. President, that I must simply leave it there. I could speak for another hour on this subject.

Mr. Palser also dealt with this question of profits and asked me if I knew which local authority it was which made over 100%. I haven't the information right here. The analysis was prepared by the Department of Statistics. I have the information in Springs, however. He said the average was 25%. Whether it should be higher or lower, is a matter of local policy. On the one hand a local authority may say the profits made on electricity should go back to the undertaking, because in this era of capital shortage we are going to have to generate more capital from electricity income. An electrical engineer will then not have to cut and suffer the cuts under the general capital programme, but that is a matter of Council policy. When it comes to the question of increasing rates or taking more from an electricity undertaking, we simply have to rely on the decisions of the representatives of the people. Mr. Russell asked about forward cash flows. We have this in Springs on a

limited scale, that is cash flow on every single item of income. When you come to project this on a 5 year basis, it becomes very interesting but then you come back ultimately to income and expenditure account. Of course, the discounted cash flow is simply another technique of analysis, like CBA and so on. His question on the rate of inflation is a very interesting one. What we have discovered in dealing with inflation, that if you have a long term programme, it really becomes unwise to leave every single department to their own devices as far as projecting the rate of inflation over 5 years. An accepted principle now is to extrapolate your growth figures, purely on existing work-load, and apply overall to a particular department a general growth rate for inflation, maybe 10% or whatever the index shows in that particular period. Otherwise you simply have pencil budgeting and not proper budgeting. So what I suggest is that you should estimate on the basis of existing activity and apply separate figures for inflation by a central organisation like the treasury. Mr. President, there are no further direct questions and that is all I have to say in reply. I conclude by thanking you for the very good reception which everybody has given this paper.

Mr. K.G. Robson (East London): Mnr. President, Ek wil Dr. Cowden hartlik gelukwens met sy belangrike referaat wat hy by hierdie Konvensie gelewer het vannoor. Mr. President, our lives as electrical engineers are inextricably bound up with City and Town Treasurers and I am quite sure that there are many days that Dr. Cowden feels exactly the same way. I am indebted to Prof. Lombard of Pretoria University for a very good story - some of the engineers here have probably heard it, but there are many who will not have heard it and I pass it on to Dr. Cowden. It is said that there are 3 ways of losing money - the first is on horses, the second on women and the third is to appoint an engineer to the staff. The first way is said to be the quickest way of losing money, the second is certainly the most pleasant but the third is most definitely the surest! I hope that Dr. Cowden has not been too overwhelmed by so many Electrical Engineers here this morning - I do believe that we have been particularly honoured to have him address us and to provide what is undoubtedly a stimulus to our thinking, whether or not we agree with his submissions. I would like to suggest to Dr. Cowden that it might be wise for his Institute to invite an Electrical Engineer to their next Conference or Technical Meeting to obtain a fair balance of thinking on this particularly thorny question of the financing of electricity undertakings. With that thought, may I thank you very sincerely Dr. Cowden - we are happy to know that you are spending the whole of the time with us at this Convention and I am sure that the contacts you have made and the new friends that you surely will make, will be of some help to you. May I ask you all to express your appreciation in the usual way.



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CABLE FAULT LOCATION

BY MR. MARTIN BAUR

INTRODUCTION

The most difficult problem with locating faults in cables is that there is no single method, which can be used that will cover the various types of faults. The variety of faults includes open circuit, short circuit and any form of resistance at the fault point. The fault can be either between cores, or core to earth, or both.

The pulse reflection and high frequency methods of fault location give completely misleading results when the fault resistance is in the same order as the line impedance. If there is any possibility of this being the case, it is advisable to use burn down apparatus on the faulty line in order to open-, or short circuit, the fault point. Alternatively some other method of fault location should be used.

The classical bridge method is more suitable for laboratory use than field work due to the order of precision required, the complexity and number of alternative bridge circuits and errors that can occur due to ground water at the fault point.

Surge voltage generators will work for all types of faults but the signal has to be laboriously followed along the surface and if the cable trench suddenly changes depth, this can sometimes be mistaken for the fault point. Another problem can occur when this equipment is used in areas of high noise intensity, e.g. traffic in towns or underground drilling.

It is generally found that the operational disadvantages of the various methods, do not apply to the same fault problem. In other words, where one method does not work due to its limitations then, in all probability, another method can be used to successfully locate the fault.

For this reason it is common practice for large undertakings overseas to use fault locating trucks. These panel vans, in the one ton range, are fitted out as mobile fault locating laboratories with all the equipment necessary for the different methods of fault location as well as high voltage testing.

Here we come to another important consideration, and that is personnel. It is extremely difficult to lay down in writing which types of faults can be traced with the most suitable equipment. As a certain gentleman involved in fault location once said: "This is not a science, but an art". Too true, and, if possible, one reliable man should be trained to use the equipment, as it is very important for the operator to have a feel for the expertise needed.

In the following chapters, we will give a short resume on high tension testing of cables, burn down techniques, some of the various methods of fault location and a short description of a fault locating truck.

CABLE TESTING

We shall now approach an arbitrary cable fault and will lead you through a complete procedure thus introducing instruments for the task. To begin with we wish to explain the testing of a cable with a high tension test generator, which is normally in one of the following voltages: 50 kV, 100 kV, 150 kV, 200 kV and 260 kV DC. A continuous current of 4 mA should be available from each one of these instruments. The connection of the high tension test generator to a cable is shown in figure 1.1.

In Europe the test voltage for high tension cable up to 30 kV is $6 \times U_0$ (U_0 = rated voltage of the cable). A recent VDE issue recommends a test voltage of $8 \times U_0$, the reason for this being that many cables are operated with a higher voltage than originally planned for. During the test procedure it is essential to keep a close watch on the milliammeter. As long as the indication on this instrument is steady it may be assumed that the cable under test is in order. The indicated values of a healthy cable lie between 0.4 and 1 mA.

Should the indication on the milliammeter become unsteady after a short while and show a rising tendency, a fault causing a flash-over at a later stage can be expected. The question always arises whether to leave the cable as it is or to force a flash-over. It is preferred to force the flash-over as the cable is switched off during this test procedure anyway, whereas the occurrence of a flash-over during operation can lead to costly interruptions in the supply network.

FAULT BURNING

The next step would be the determination of the resistance of the fault, for instance by a megger or an ohmmeter. It is assumed that the fault shall be burnt down to a value of approx. 500 ohms or a complete short circuit in order to be able to use the impulse reflection methods for preliminary location of the fault. High tension cables between 20 and 30 kV might have a fault resistance of such a high value, that it is impossible to use the burn out transformer to ignite the fault, because the output of this type of unit in the highest range is only about 14 kV DC. In this case the burn down transformer is used in parallel with the high tension test generator as indicated in figure 1.2.

It must be stressed that both units must have the same output polarity and that the high tension value in parallel operation may not exceed 50 kV. The ignition is initiated by the high tension test generator and as the fault shows lower ohmic values during the burning operation, the current for burning is finally taken over completely by the burning transformer.

FIG 1,1

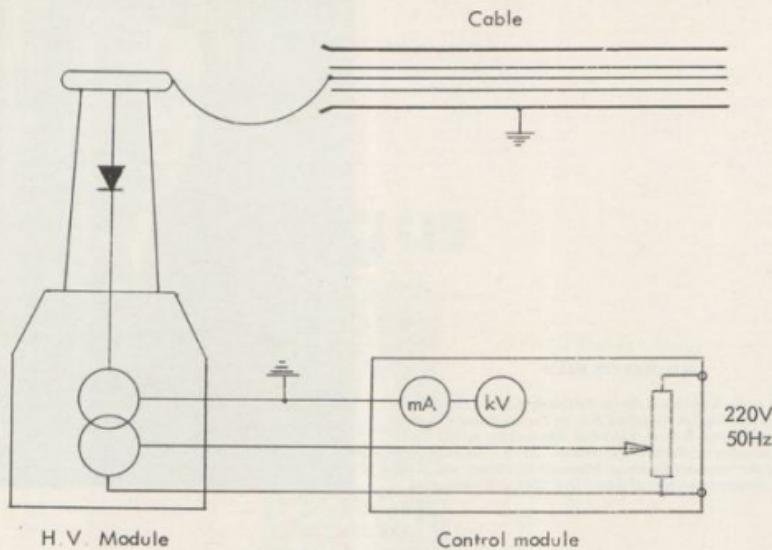
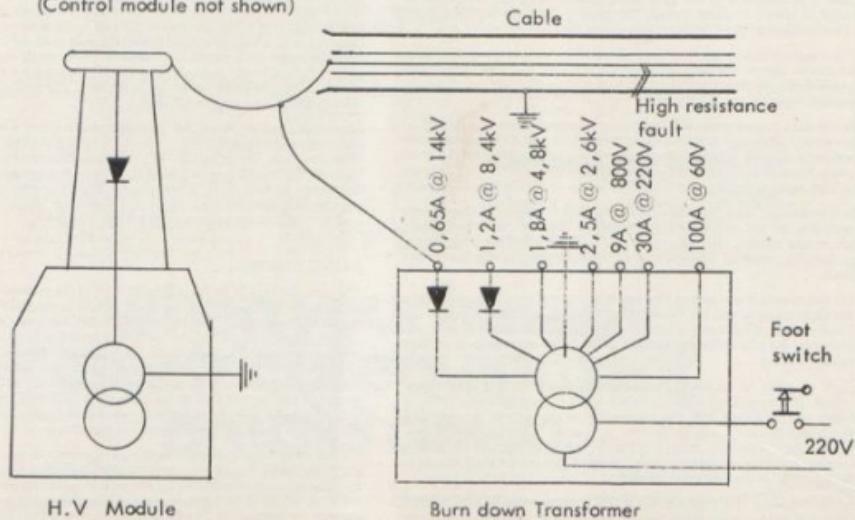


FIG. 1,2 (Control module not shown)



In the pauses, which are necessary for switching over, the resistance value should always be measured in order to determine whether the desired value has already been reached or not. It is of high advantage in this case to use a variac transformer in connection with the burn-out transformer. The burning down of a fault can be compared with electric welding and it is necessary to keep the ignition alive with voltage as low as possible because then the flow of material is most steady. After advantage is that now the exact supervision of the burning procedure is possible by observing the built-in ammeter.

The two highest steps, 14 kV and 8.5 kV DC, are especially suitable for the burning of faults in aluminium cables or in cables of large extension. In these two stages the current is shown as an active component, whereas an AC supply would have a high content of reactive current. Therefore, an exact observation of the burning procedure is possible even in the highest stages and with long cables. In this configuration both units, namely the burn out transformer and the high tension test generator can be operated in parallel until the burning procedure has come to an end.

In case the resistance of the fault remains of a high ohmic value thus making the burning down procedure impossible, a location method using the surge voltage generator should be used. 90% of the high ohmic faults occur in joints which can be found by using the existing cable plants.

FAULT LOCATION

A) The Classical Bridge Method

Equipment in this category is designed mainly for fault location in communication cables. It can, however, be used for fault location in power cables as well.

In addition to fault location, this type of precision bridge is also well suited for testing the quality of cables before and after placing them. The classical measuring circuits for resistance, insulation and capacity also permit successful use of this instrument in laboratories and test areas.

The bridge is balanced by a precision potentiometer, normally of the ten-turn type, with 100 divisions per turn. Thus, the reading accuracy is sufficient to fully exploit the resistance linearity of the slide wire coil of $\pm 0.1\%$.

However, the accuracy of the fault location does not depend exclusively on the accuracy of the slide wire coil. It is affected additionally by the following:

- (i) The nature or the position of the fault,
- (ii) The magnitude of the fault resistance,
- (iii) The induced voltage,
- (iv) The homogeneity of the conductors,
- (v) The magnitude of the loop resistance,
- (vi) The temperature gradient of the ground,
- (vii) The accuracy of the plotting devices,
- (viii) The response sensitivity of the bridge circuit which, in turn, depends on the sensitivity of the null indicator and the magnitude of the resistance of the fault and the loop.

The sensitivity of the null indicator is normally in the order of 0.25 uV/division, with an input resistance of 200 ohms. This high sensitivity is achieved by means of an amplifier. The smaller the loop resistance and the higher the fault resistance, the lower will be the balancing sensitivity. The following data can serve as a basis for determining the balancing sensitivity with other bridge ratios.

When locating a fault with the earth fault loop B according to MURRAY (Fig. 2.1) with a loop resistance of 100 ohm and a fault resistance of 10 M ohm, detuning the bridge by 0.1% (1 scale division on the potentiometer) produces a galvanometer deflection of 1 scale division.

Since a galvanometer deflection of 0.2 scale division is readily visible, the balancing sensitivity in our example is 0.02%. If this value is added to the tolerance of the slide wire coil (0.1%), one obtains a measuring accuracy of 0.12%. Thus, the location of the fault can be determined to within 0.12% of the length of the cable, if the faulty resistance is 10 M ohm and the loop resistance 100 ohms.

If the fault resistance were 50 M ohm, the resultant accuracy would be 0.2%.

In practice the tolerance will be greater because various influencing factors cannot always be eliminated.

In the case of measurements where all conductors are shunted using the double-bridge method according to KUEPFMULLER (fig. 2.2), the measuring accuracy is lower. This method is affected by a methodological error which, if the stated minimum conditions are complied with, is 0.3%. Under these minimum conditions, only one third of the slide wire is exploited. This limitation means further measuring uncertainty of 0.3%, so that the total error of 0.6% must be expected, taking into account the instability of the fault resistance.

Open circuit faults can be measured by using A.C. or square wave bridge supplies. A shunt or an earth connection is found by a resistance ratio measurement, and a broken conductor by a capacitance ratio measurement. In the case of the resistance ratio measurement the resistances of the connecting leads frequently are of the same order as the resistances of the cable conductors. Therefore, it is imperative that satisfactory connections are made.

For locating faults on power cables only those measuring circuits can be used where the measuring result is not falsified by the connecting leads. A feature of these measuring circuits is the separation of current lead and potential lead (fig. 2.3). In order to comply with the requirement two sturdy screw terminals should be attached next to each other on the cable conductor. The one screw terminal is used for the current lead and the other for connecting the potential lead (see fig. 2.4).

It is inadmissible to connect the current lead and the potential lead to the same terminal.

B) THE HIGH-FREQUENCY METHOD

By this measuring method, a high-frequency voltage whose frequency is manually set (fig. 3), is applied to the cable. The input impedance of the cable which is without load (break) or short-circuited at the cable end or at the fault location will change its sign, i.e. the type of its reactive impedance, in a periodic sequence, dependent on the frequency applied. The change points from resonance spots, alternately series resonances and parallel resonances, which produce the voltage curve shown in fig. 3 in relation to the frequency f in a voltmeter which is connected at the cable input.

According to the laws of cable theory, the frequency interval Δf between two successive resonance frequencies is as follows in the short-circuited cable as well as the open cable (maximum values at the voltmeter in fig. 3):

$$\Delta f = \frac{v}{2} \cdot \frac{1}{l};$$

It follows from this that

$$l = \frac{v}{2} \cdot \frac{1}{\Delta f^2}$$

In these equations,

l is the length of the cable to the end of the cable or to the point where the fault exists,
 f is the frequency used,
 v is the velocity of propagation of the waves in the cable.

When the value of Δf_X has been found in a fault location, the length of the cable to the fault location is obtained from the formula:

$$l_X = \frac{v}{2} \cdot \frac{1}{\Delta f_X}.$$

The length of the cable in meters is obtained by inserting an average value of $1.64 \cdot 10^5$ km/s for v , or the actual value for the cable if it is known, and by inserting Δf_X in kc.

To be precise, the following equation is obtained from the telegraphic equations for the case $R = \omega L$ and $G = \omega C$, that is, for higher frequencies:

$$v = \sqrt{\frac{c}{\mu}}$$

where $c = 3.10^8$ m/s the speed of light, ξ is the relative dielectric constant of the cable, and μ the relative permeability of the cable which must always be assessed as 1. As is known, ξ depends only on the dielectric used which is, however, selected identically for all types of cables with the same test voltage. Furthermore, variations of ξ have an effect with the root only so that v can be considered as a constant within wide limits so that quite accurate results are obtained, even in cables of various cross sections. If it is possible to measure from both cable ends, the measurement, while dispensing with v , becomes a ratio measurement and will be more exact if the total length l_0 of the cable to be measured is known precisely.

In a measurement from both sides, l_X is calculated from the following formula if Δf_X is obtained from one side and Δf_Y from the other side:

$$l_X = l_0 \cdot \frac{\Delta f_Y}{\Delta f_X + \Delta f_Y}$$

If a sound core is available, the l_X of the faulty cable is determined from a measuring location to the fault location, as is the l_f of the sound conductor. Again dispensing with v , the following equation will apply:

$$l_X = l_0 \cdot \frac{\Delta f_0}{\Delta f_X}$$

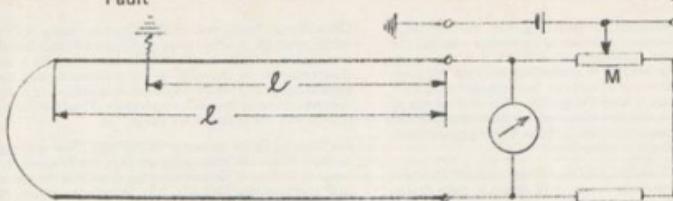


FIG. 2,1

$$\ell_x = \ell \frac{Mk}{1000}$$

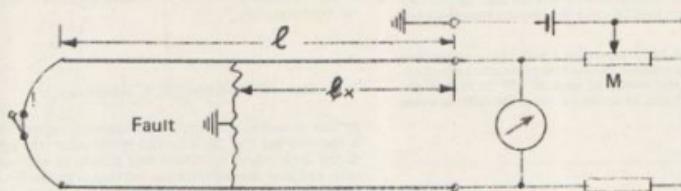


FIG. 2,2

$$\ell_x = \frac{Mk - ML}{1000} \frac{ML}{ML}$$

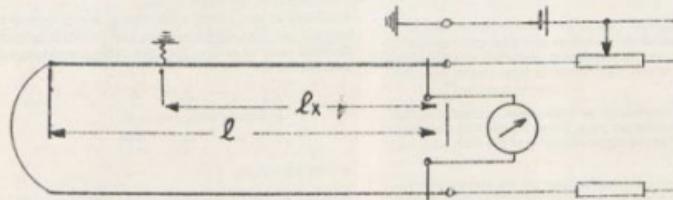


FIG. 2,3

Potential Lead

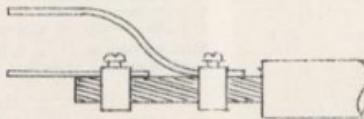
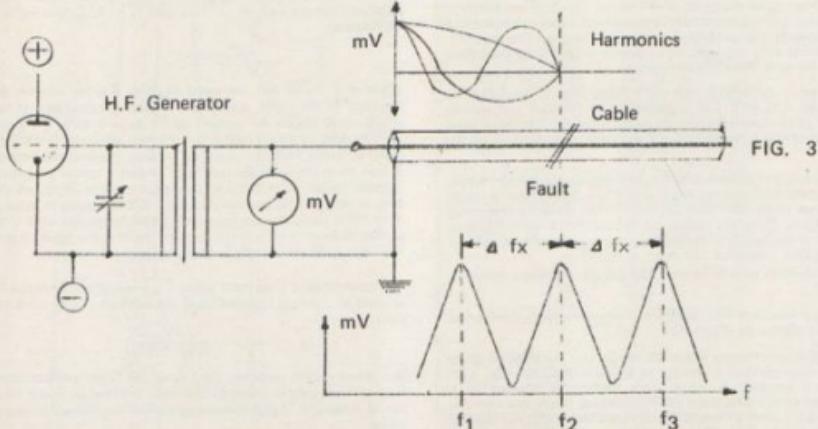


FIG. 2,4



Development of the voltage in relation to frequency

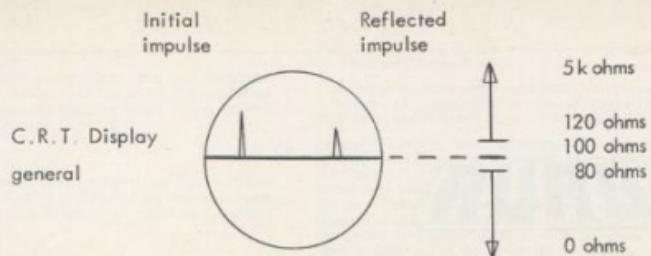


FIG 4,0

Open
circuit
fault

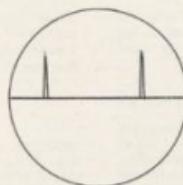


FIG 4,1

Short
circuit
fault

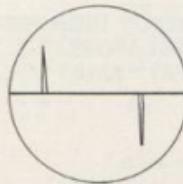


FIG. 4,2

Cable
joint
box

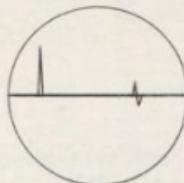


FIG 4,3



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BURN DOWN TRANSFORMERS
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Resistance at the fault location:

The desired resonance phenomena at the cable occur only if the cable is open or short-circuited at the fault location. In case of breaks at the fault location, any existing parallel resistance is not critical unless it corresponds to the surge impedance of the cable.

$$Z = \sqrt{\frac{1}{C}}$$

(approximately 10 to 60 ohm in power cables). If the conductor continues, the fault impedance must be smaller than the surge impedance; if necessary the impedance must be saturation-burned by means of a burning device.

Joint boxes:

The joint boxes represent an inhomogeneity and an additional damping for the high frequency, especially since the lead jackets are usually connected with one another by a wire only. Depending on whether the joint box happens to be at a current loop or node - these travel in dependence of the frequency -, small variations in the f values will be noted which may amount to as much as 10% in short cable length. Since it is, however, always possible to determine several f values, up to 10 and even more, and to average them out, the result will be much more accurate. The deviation from the average value will also permit an additional evaluation of the accuracy of the measurement. It is precisely because of the passage of the lead jacket by way of the joint boxes (which is an imperfect arrangement as far as high frequency is concerned) that the measurement between two conductors will often produce better results.

Design of the measuring unit:

A typical unit consists of a completely shielded high frequency generator of small power which covers the band from 32 to 10 000 kc in seven ranges in a continuously adjustable manner. An amplifier tube is intercalated for preventing cable feedback to the oscillator. This requirement results in the arrangement of two synchronized tuning circuits for each frequency range.

The cable is connected via a high-frequency transformer which adapts the cable to the second circuit of the unit. The voltage is measured directly at the connection terminals, that is practically at the beginning of the cable. The switch elements for the voltmeter were designed in such a manner that its sensitivity to technical AC current is smaller by decimal powers than it is to measuring frequencies.

External voltages:

It may happen that there are external voltages on the cable section to be measured. DC voltages up to about 100V are kept out by capacitors. For AC currents of 50 Hz, the resistance at the input terminals of the unit is 3,3 k ohm. The permissible interference voltage is 100 V max. The indicator circuit is about 100 times more insensitive to 50 Hz interference voltages than to the voltages at the lowest measuring frequencies. Interference voltages of technical frequencies which do not exceed 100V do not affect the measuring result.

Cable with two faults:

In addition to the types of faults listed above, the resonance process offers essential advantages if the cable section contains two faults. Using the loop process, a fault location between the actual fault locations will be obtained. The HP process will first determine one fault location from the one side, and then the other location from the other side. If both sections do not add up to the total length, there will be two errors. This check and the possibility of making absolute measurements with an error of no more than 1 or 2%, provide for a high degree of surety in location.

Single-conductor cables:

If the jacket is bridged at the joint boxes, faults in single-conductor cables can always be measured perfectly between the core and the jacket. If the lead jacket in the joint boxes is not bridged, but if there is a test wire, perfect results are obtained from measurements between the test wire and the core.

While the road for taking measurements by means of high frequency on 50Hz power cables was paved initially by special cable faults which could not be detected by way of the classical measuring techniques, - earth connection of all conductors without auxiliary core; break with water penetration at the location of the fault; break in a cable composed of partial sections with different capacities per unit length, the good properties of the resonance process saw to it that the fault location, nowadays, could not do without it.

The advantages of the units available commercially are, the rapidity and simplicity of the measurement, the clarity of the measuring results, the insensitivity to external voltages, the independence of the measuring result from the cable data and the compactness and mains independence of these units.

C) The Oscilloscope Method

This method operates on the same basic principle as the high frequency system, i.e. pulse reflection. The difference lies in the way the propagated and reflected wave is measured.

Basically a double beam oscilloscope is used. A voltage impulse applied to the cable is synchronised with the start of the horizontal trace on the C.R.T. The reflected impulse is amplified and displayed on the same trace. The instrument has an output impedance of about 100 ohms, which is normally in the same order as the cable impedance. The vertical axis equivalent to this value is set to the middle of the screen. Now any fault values above 100 ohms will give a vertical position deflection on the screen, (fig. 4.1); similarly, any faults below 100 ohms are displayed as a vertical negative deflection (Fig 4.2). Any fault value of the same order as the cable impedance will not be shown. In this case the fault must be burnt down or alternative methods must be used. A typical appearance of a cable joint is shown (Fig. 4.3).

The position of the faults can roughly be seen on the C.R.T. A more accurate method is to set the left flank of the starting impulse to a vertical division on the screen, then adjust the horizontal shift with a ten-turn precision potentiometer. The distance will then be the difference reading on the potentiometer multiplied by a factor which allows for the set range and the velocity of propagation.

On the more modern units the velocity of propagation and range values are set on digital or multi-turn potentiometers, so that the fault distance can be read directly.

D) The Pitch Method

A powerful audio frequency generator of approximately 500 W should be used for feeding the cable. Figure 5.1 indicates the connection of the audio frequency generator to the two faulty cores and it is assumed that the fault resistance has been brought down to a value of approximately 2 ohms by previous burn down procedure. By walking along the marked line defining the run of the cable, an intermittent noise characteristic can be heard up to the exact point of the fault, behind which a constant tone will be observed. The intermittent tone characteristic originates from the pitch of the high tension cable, which lies between 50 cm and 1.5m. The greater the depth of the cable and the shorter the pitch, the less accurate the tone characteristic of the cable will be. Therefore, telephone and low tension cables having a comparatively small pitch cannot be measured by this method.

Contrary to the previous fault, Figure 5.2 shows a fault between core and armour and the audio frequency generator is connected to the armour and to a sound core. The other end of the cable is connected to the faulty core. The noise characteristic shows a constant tone up to the position, of the fault behind which an intermittent tone will be heard. By this method, it is claimed, that faults may be determined with an accuracy of ± 10 cm.

It must be stressed that, in order to use this method, the exact route of the cable must be known.

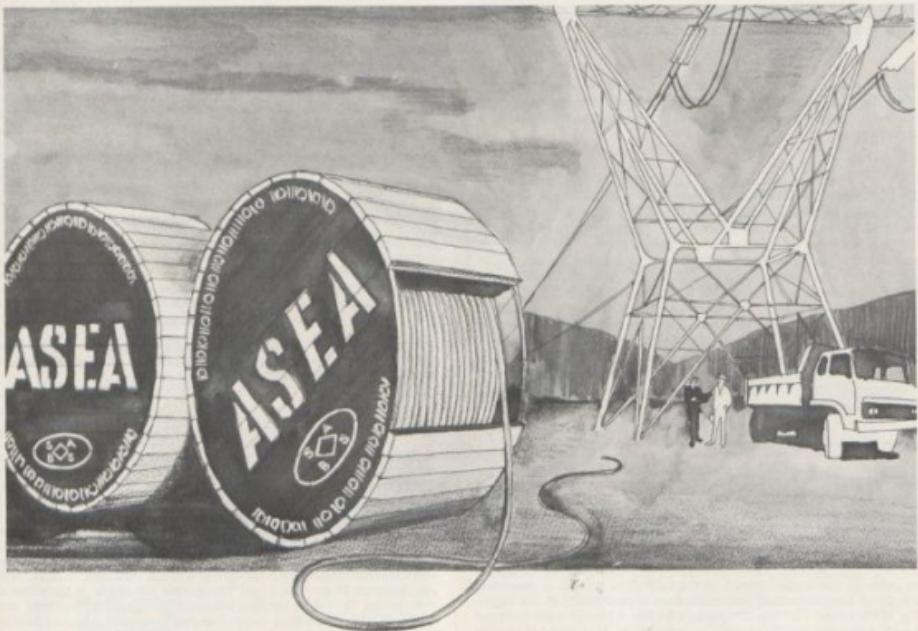
E) The Surge Voltage Generator

This is a fairly recent method originating from the U.S.A. There is a certain amount of controversy regarding this method, as the high voltages discharged into the cable where the fault is to be located can cause breakdowns at other weak points. However, as we have mentioned previously, it is better to break down any borderline fault whilst the cable is out of use.

The unit is, of necessity, quite large (± 100 kg) in order to contain the capacitors needed to discharge up to 24 kV at 800 W/S into the faulty cable. These discharges occur at about two second intervals. The voltage selected for any particular test is up to six times the rated cable voltage. All conductors not in use should be earthed, and at the end of a test, all conductors must be earthed to discharge any stray line capacitance. Further, due to the high voltages and power used, only suitably qualified personnel should operate these units.

Once the surge voltage generator is coupled up and discharging into the faulty core, a portable amplifier is used to follow the induced signal radiated from the cable (Fig. 6), this amplifier is designed for connection to either an inductive search coil or a ground microphone. An indicator on the unit shows the field strength and earphones assist the operator to hear the distinctive "thump-thump-thump" sound even when there is a high ambient noise level, e.g. traffic.

Basically the operator follows the cable using the inductive pickup coil. At the fault area the field strength increases, immediately followed by a drop to a low level past the fault. Pinpointing of the fault is then done by repeating the trace at the fault vicinity with the ground microphone. The audio signal strength is noted at about half metre intervals and in this manner, the fault can be located extremely accurately.



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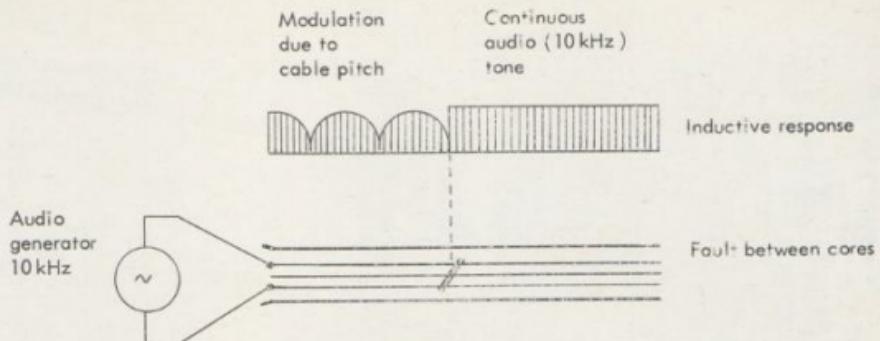


FIG. 5,1

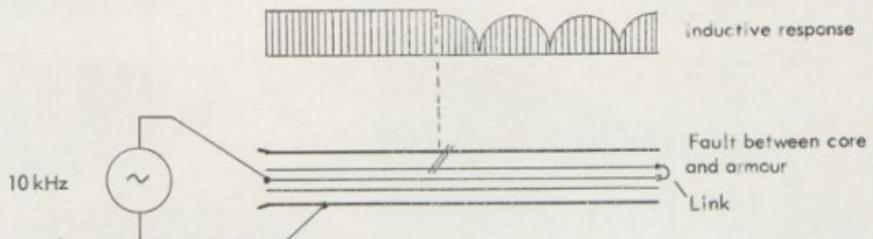


FIG. 5,2

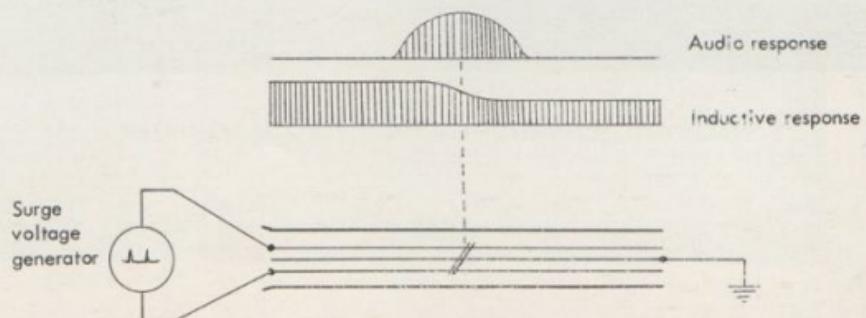
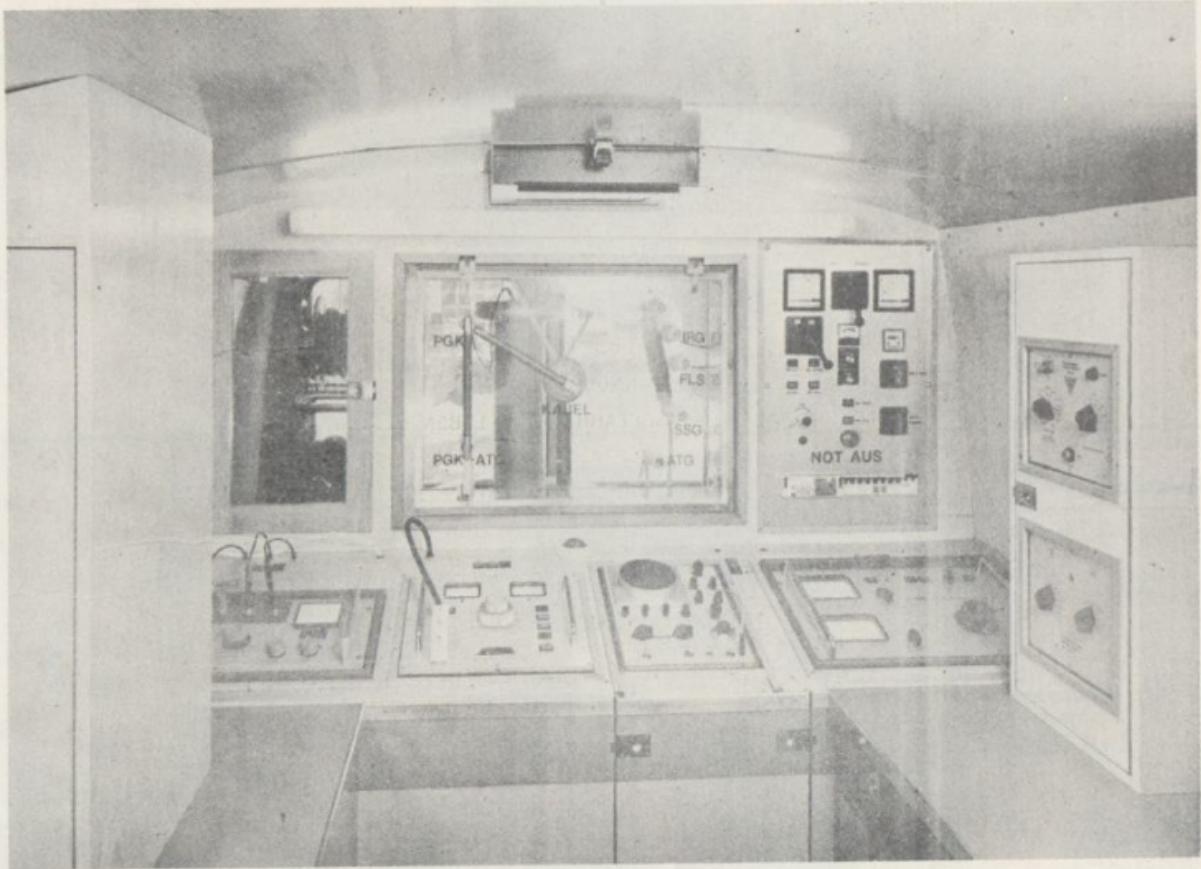


FIG. 6



OPERATIONAL COMPARTMENT - SURGE VOLTAGE GENERATOR



OPERATIONAL COMPARTMENT - AUXILIARY POWER SUPPLY HIGH TENSION TEST GENERATOR AND CABLE FAULT LOCATING EQUIPMENT

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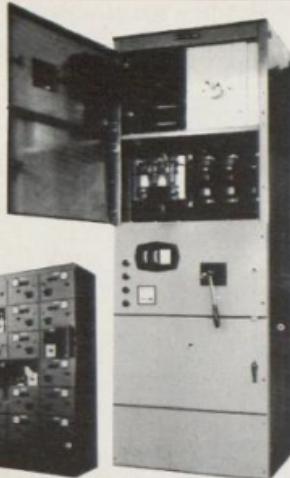
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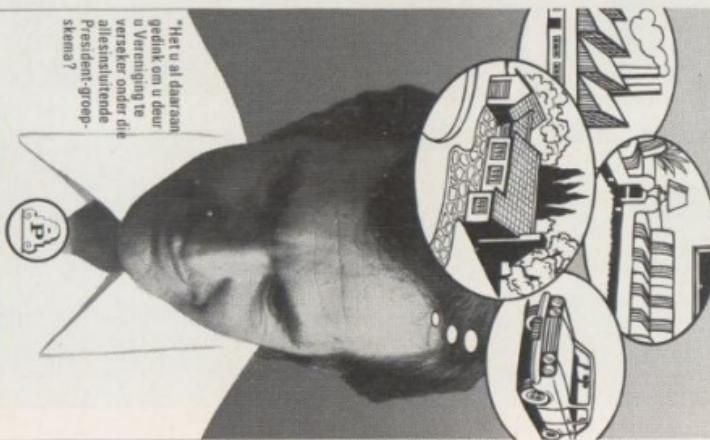
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CABLE FAULT LOCATION TRUCK

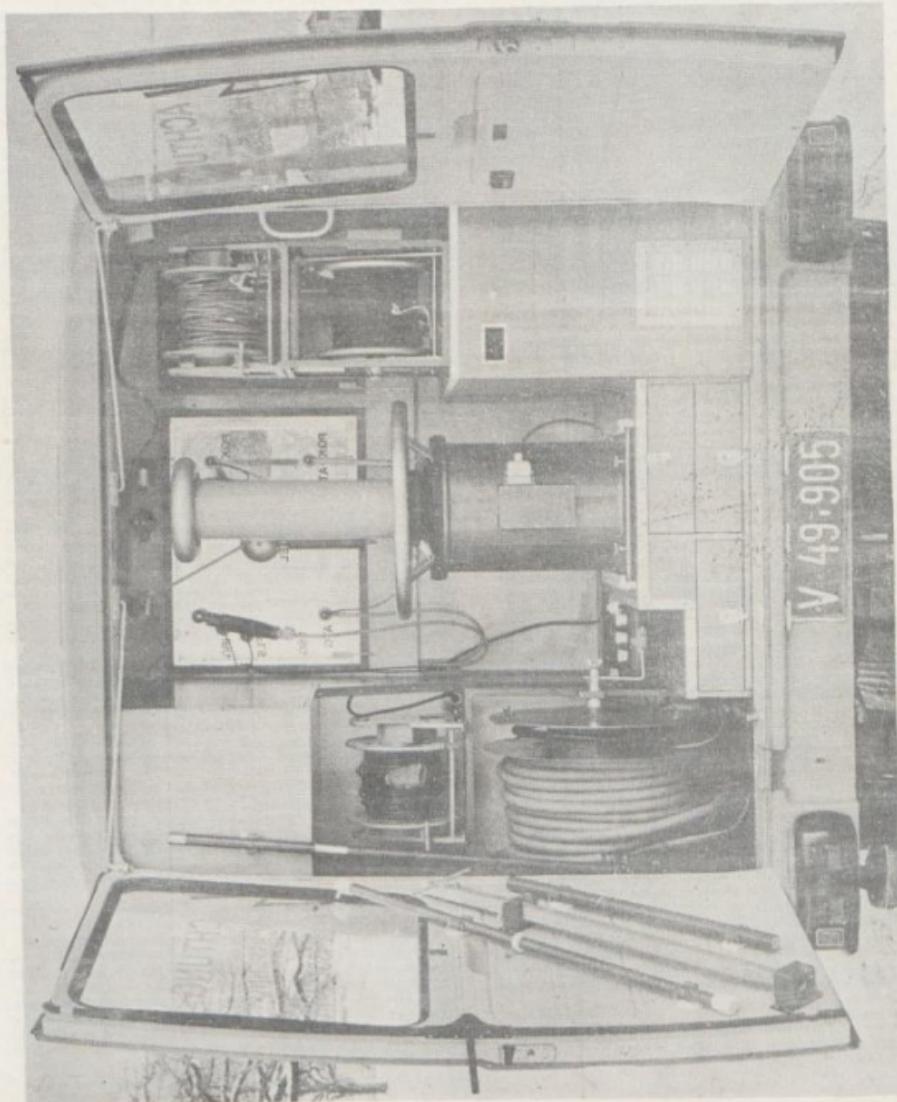
Out of economical consideration it is of the highest interest that the remedy of the cable fault is executed in as short a time as is possible. As the characteristics of the fault is usually not known beforehand, it is necessary to have all cable fault locating equipment at hand.

An answer to this requirement is the design of a vehicle, carrying all necessary equipment for cable testing, cable tracing and cable fault location. The equipment of the vehicle may be varied widely as per specification of the customer. Furthermore, each one of the units can be detached from the vehicle in order to, either replace it, or for work directly in a station. All units built into a vehicle may be operated from the mains, but should these not be available, an emergency stand-by

power supply should be built into the vehicle and all instrumentation can be fed by this.

The vehicle itself must have special safety features for the operating personnel. All high tension equipment is stationed in a compartment which is electrically interlocked. It should only be possible to switch on the mains when the vehicle is connected to the station earth. A combined fault current and fault voltage protection system should be built in. An automatic discharge system, in order to discharge the cable after the test has been conducted, should be a further feature of this equipment.

We trust that the above introduction has given you sufficient information to serve as a basis for the successful solution of cable tracing and fault finding problems.



HIGH TENSION AND CONNECTING CABLE COMPARTMENT

Mnr. P. J. Botes (Roodepoort): Mnr. die President, die aanbieding van 'n referaat van hierdie aard is uiters belangrik vir die Stads-elektrategnieke Ingenieur. Die opsporing van foute in kabels is seker een van ons grootste probleme. Dit onderbrek nie net die tovoer in sekere gevalle nie, maar ontwrig die hele werkverigting van die departement. Afhangende van die grootte van die stelsel kan die algemele mannekrug benodig word met die opsporing van 'n fout en dit kanoor 'n tydperk van dae strek.

Onlangs het een van die twee hoofvoerende kruisgebondde polietilen kabels na die nuwe Konstantia woongebied in Roodepoort op 'n fout uitgesakkel. Die fout kon nie deur enige opsporingsapparaat wat op daardie tydstip beskikbaar was opgespoor word nie, en is daar geopen om die foutweerstand af te brand deur 'n apparaat met 'n vermoe van 11 kV, 400 mA gelystroom.

Die komblik toe die apparaat ontkoppling was, het die weerstand van die fout onmiddellik weer na 'n uiterst hoë waarde teruggekeer. Daarom het ons 'n apparaat vervaardig met 'n vermoe van 1 000 volt 1 amp. Met hierdie apparaat het ons 'n mate van sukses behaal maar die weerstand was nog nie lang genoeg vir die opsporingsapparaat nie. Hierdie is 'n gewone 220 volt w/s tovoer gebruik waarvan die stroom beperk was tot 4 amp en dit vir 'n aantal ure aangewend.

Die fout is opgespoor nadat dit ander uitgesakkel het. Die hele gebied was vir 'n heel aantal ure sonder krag. Die sout of foute is hierdie met die "cure and Test"-metode gevind, en dit is gevind waar die kabels binne die toeverousubstansie perseel aanmekbaar geraak het, die afbrand van die en een die ander beskadig. Die sout moes natuurlik juis net op hierdie een punt plaasgevind het.

Gevolgtlik meen ek dat die aanbieding van so'n referaat gereeld op ons agendas moet verskyn, om ons altyd op hoogte van die jongste tegnologie op hierdie gebied te hou. Dit is om hierdie rede dat ek die opsteller van die referaat, Mnr. Howcroft, en die aanbieder, Ingenieur Baur, moet bedank vir 'n baie interessante referaat.

Die sout was vir my 'n groot bemoediging om hierdie referaat te lees, aangesien ek nou my fouteopsporingsartieste meer bekwaam ag, daar hulle dieselfde frustrasies, wat genoem word in hierdie referaat, ondervind.

Van al die metodes wat beskryf is, is nie 'n sonder beperkings nie, selfs in gevalle op die aanwending van die type sout waaroor die apparaat ontwerp was. Om hierdie rede sien ek nie die nodigheid om 'n voertuig toe te rus met 'n hele serie van fouteopsporingsapparate nie. Ek verkiest om instrumente te gebruik met die mees betroubare enkel metode vir die opsporing van 'n kabelfout. My rede hiervoor is die beperking van die operateur se algemene bekwaamheid en van 'n koste aspek. Missien kan groter munisipaliteite dit wel bekostig, maar die koste van fouteopsporingsapparate is uitsers duur en is gou vereuer.

Mr. President, perhaps it would be a better proposition to analyse what we have available and attempt to reduce the limitations by combining and incorporating two or three methods into one instrument.

From the paper it appears that the success of most of the methods described, is influenced by:

- (a) The fault resistance. And/or
- (b) The physical parameters of the cable (i.e. factors influencing the propagation velocity).

(a) FAULT RESISTANCE:

Although fault burning has been perfected to a fine degree, it does sometimes present problems and is normally time consuming. As stated by Mr. Baur, unless a fault is burnt to a low resistance or open circuited, all pulse reflection methods of location will be unreliable.

At this point I would like to query Mr. Baur's statement, under the sub-heading FAULT BURNING, that the fault burning equipment in the highest range is restricted to only about 14 kV D.C., is it only because of the size of the transformer as mentioned? Is this the general case? Or is it only inherent in the particular unit supplied by Mr. Baur's agents in this country. Also, would Mr. Baur please give some advice on the art of burning down XLPE cables.

(b) Most of the methods dependent on propagation velocities, use instruments which are calibrated to different types of cable by the manufacturers. This is convenient, but does present slight inaccuracies when the instrument is applied to one's own cables in practice. I have noted, however, that the more modern instruments of this type do facilitate calibration on site and can thus be calibrated to accurately known lengths of cable similar to the faulty cable.

Both of the problems I have just mentioned, could be considerably alleviated, if one resorts to the somewhat tedious compilation of the records of details of each cable employed in one's undertaking, i.e. photographs of oscilloscope traces, accurate lengths, etc. and again periodic hertz as mentioned by Mr. Baur.

I feel that this procedure only lends to the complication of the method and introduces elements of human error before the task of locating a fault is even begun.

At this stage, let us consider the prime requirements of a new fault locating method.

I submit that these are:

- (i) Independence of variations in cable parameters.
- (ii) Universal application to all types of cable fault without the necessity for fault conditioning.

- (iii) Minimum of operator skill.
- (iv) Minimum location time.
- (v) Minimum physical size of equipment.
- (vi) Minimum overall cost.

If we return to the methods discussed in the paper we will find that the surge voltage generator method comes closest to satisfying these requirements. Our problem now becomes to eliminate or at least reduce the limitations of this method. These are mainly, I quote –
(i) "The signal has to be laboriously followed along the surface and if the cable trench suddenly changes depth, this can be mistaken for the fault point."

(ii) Use in area of high noise intensity, e.g. business centres, main roads, etc."

The first of these limitations can be reduced if we use some sort of approximate pre-location. The choice of this pre-location is the subject of some argument and I will deal with it in due course.

As far as noise intensity in the location area is concerned, this is something we have to learn to live with, although the facility exists for varying the surge repetition rate which does help. Also variations of this equipment are available with an energy output of 4 000 Watt Seconds, while still being reasonably compact. In practice, we have discovered that this problem does not arise between the hours of 2 am and 6 am on Sundays. On the subject of statistics, Mr. President, other interesting statistics which have come to light are that human beings walk at 6 km/h on weekdays, 8 km/h on Saturday mornings, and courting couples step out at between 16 and 24 km/h on Saturday nights at 10 minutes to midnight, this speed being directly proportional to the mass of the girl's father.

There is no point in choosing a pre-location method which defeats the advantages of the Surge Voltage method, i.e. one that requires fault conditioning, etc. For this reason, some manufacturers have attempted to combine the surge method with the Oscilloscope method by applying the scope to the cable via a suitable HV coupling unit while pulsing the cable at the same time. However, this introduced an inaccuracy due to the fault ionization time which can be many micro-seconds long, thus resulting in inaccuracies equivalent to hundreds of metres of cable.

One manufacturer that I know of has developed a system, combining a surge voltage generator with a new concept of measuring the decaying oscillation following the breakdown of the fault, on the opposite end of the cable to which the surge is applied. This measuring instrument facilitates on site calibration and presents a digital display of the distance to the fault and is thus in itself an accurate and quick method of fault location.

In addition, the system incorporates a line resonance method for locating low resistance faults which do not break down under the application of a high voltage and also for location of open circuit faults.

In conclusion I would like to mention one further argument that I have against a fault locating van incorporating a whole series of instruments for each and every conceivable type of fault.

This is the mental welfare of my personnel. I have noticed that the so called "fault location artist" is subject to moods of despondency and elation, depending on his failure or success in locating a fault. Now should one fail with all the equipment envisaged by Mr. Baur, I submit that the operator would become a gibbering idiot. Unless, of course, one employs a person with the temperament of Mohammed Ali.

Also, I submit that the operator is going to attempt location with his "favourite" instrument first, obtain an inaccurate reading and we are back to square one.

Mr. President, I wish to thank Mr. Baur for presenting a paper which is of such great importance to us all as electrical engineers, and to bring to us up-to-date knowledge of the technology in this field. I wish Mr. Baur a most pleasant and enjoyable sojourn in our country, and that by the time he goes back, he may be able to speak Afrikaans which is very closely related to German.

ME. President, Mr. Baur in delivering his paper answered almost all the points I wanted to ask him on his paper, but perhaps he could enlarge on the amount of success obtained in locating faults on interconnected feed network without having to isolate each section.

Mr. M. Baur: "PEX cables, as I already explained in the paper, is very hard to burn down because PEX does not carbonise. So, it is necessary to start with a very low power to the faulty point and to watch the current and the voltage decrease. The resistance comes down very slowly and the procedure normally takes 2 or 3 times longer than paper insulated cables for fault burning."

Mr. A. H. L. Fortmann (Boksburg): Mr. President, just a word of thanks to Mr. Baur. Namens hierdie Konvensie, en u Mnr. President wil ek Mnr. Bauer graag hartlik bedank vir sy toespraak oor kabelfout-opsporoerusting en die gebruik daarvan. Die opsporing van foute in kabels is ons baie aan die hart en ons verseker u dat ons baie geleer het en dat ons u geskrewe toespraak kan gebruik en later daarna kan verwys. Dan wens ek u ook 'n aangename verblyf in Suid-Afrika toe in ons sonnige land en namens ons almal wil ons u graag vra om ons groete van die Konvensie na u mense in Oosentrepnyk oor te dra. Ons voel baie ge-eerd dat u al die pad van Oostentrepnyk hiermekaar gekom het. Baie dankie Mnr. Baur.

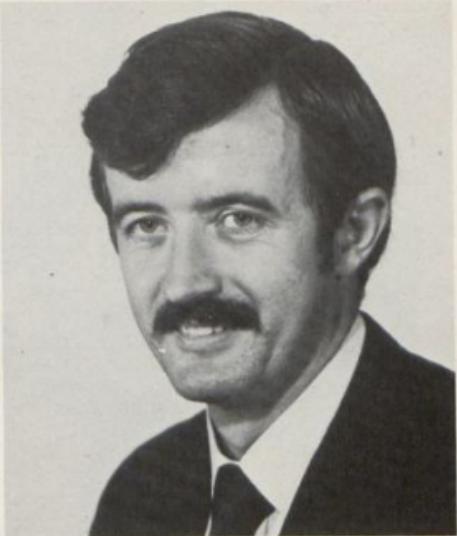
MR. H.R. WHITEHEAD

Mr Whitehead graduated in 1965 from the University of Natal with a Bachelor of Science in Electrical Engineering (Light Current). He then joined the Department of the City Electrical Engineer of Durban, where he has held various posts.

For the past seven years he has been in charge of the Light Current Section. His most recent promotion was to the post of Principal Engineer in charge of both the Light Current Section and the Test Section.

He has been involved in the wide area traffic control project from its inception.

He is a registered Professional Engineer and a member of the South African Institute of Electrical Engineers.



VERKEERSEINING IN DURBAN

H.R. WHITEHEAD PR. ENG. B.Sc. (ENG) M.S.A.I.E.E.

Bestek:

In hierdie referaat wil ek graag 'n kort oorsig gee van die geskiedenis van verkeerseining in Durban en uitkom by 'n beskrywing van die sentrale gerekarieerde stelsel, asmede die beheer van verkeer by enkele interseksies buite die sentrale sakegebied.

Inleiding:

Otomatiese verkeerseine langs ons strate is toerusting waarmee almal heel goed vertroud is, maar die voor- en nadele van die seintoorstelling self val egter buite die bestek van hierdie referaat. Ek gaan probeer om 'n insig te gee in die elektrotegniese aspek van verkeerseining, maar wil ook sekere aspekte van verkeerseinenieurwese aanraak en gee dus die volgende definisies:

- Verkeersplan** – 'n stel tydreelings ten opsigte van 'n straatkruising of groep straatkruisings ten einde voorsiening vir besondere verkeerstoestande te maak.
- Fase** – groep verkeerseinenkoppe wat by 'n interseksie dwarsdeur die hele sirklus identiese seine vertoon.
- Stadium** – die stand van alle verkeerseine wat by 'n interseksie nodig is om 'n besondere beweging of bewegings van die verkeer te bevestig.

Ek verstaan dat die wêreld se eerste verkeerslig gedurende 1918 in New York aangebring is. Hierdie brokkie inligting, wat eintlik nie ter sake is nie, bring my by 'n kort oorsig van die geskiedenis van die ontwikkeling van verkeerseining in Durban.

Geskiedenis:

1. Die sentrale sakegebied:

Gedurende 1931 het Durban sy eerste otomatiese verkeersligte gekry en teen 1940 tref ons seinapparatuur aan deur die interseksies wat in Fig. 1 aangevoerd word. Die tipe kontroleerdeer wat gebruik is, is deur die firma Tokheim vervaardig en ligskakeling is bewerkstellig deur 'n reeks swaardensienskontakte wat deur middel van 'n nokas in die verlengde volgorde oop- en toegemaak is. Die nokas kon gedurende sy tydsiklus die kontakte met wisselende tussenposes deur die gebruik van 'n werwelstroomboskyf lant oopmaak en sluit. Verskillende tydussenposes kon verkyf word deur die draaainheid van die skyf te wysig. Die kontroleerdeer het egter net een stel tydreeleys gehad sodat die ligwisseling 24 uur per dag konstant gebly het.

Gedurende die oorlosgjarige het daar baie min uitbreidings plaasgevind en dit was eers gedurende die vyftigerjare wat daar meer liggene aangebring is.

TRAFFIC SIGNALLING IN DURBAN

H.R. WHITEHEAD Pr. Eng. B.Sc. (Eng)
M.S.A.I.E.E.

Scope:

This paper covers the history of traffic signalling in Durban briefly, leading up to a description of the central computerised system, as well as the control of isolated intersections outside the central business district.

Introduction:

A traffic signal is an item of street equipment with which everyone is very familiar, however, the pro's and con's of signals themselves are outside the scope of this paper. I will attempt to provide an insight to the electrical side of traffic signalling but I will also touch on certain traffic engineering aspects and therefore, the following definitions are outlined:

- Traffic Plan** – A set of timings for an intersection or group of intersections to suit particular traffic conditions.
- Phase** – Groups of traffic signal heads at an intersection which play identical signals throughout the whole cycle.
- Stage** – The condition of all traffic signals at an intersection necessary to create a particular movement or movements of traffic.

I am given to believe that the world's first traffic light was installed in New York City in 1918 and that piece of irrelevant information brings me to a brief description of the historic development of traffic signals in Durban.

History: 1. Central Business District.

The first traffic signals were installed in Durban in 1931 and by 1940, signals had been installed at the intersections shown in Fig. 1. The type of controller used was manufactured by Tokheim and the lamp switching was carried sequence by means of a cam shaft. The cam shaft was stepped around at varying time intervals through the cycle by contacts operated by an eddy current disc. The various time intervals were by changing the speed of the disc. The controller had only one set of timings which remained the same, 24 hours a day.

Very little expansion took place during the war years and it was not until the 'fifties' before more signals were installed.



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Teen hierdie tyd is die meeste van die ou Tokheim-kontroleerdeurs deur ATM-eenhede van die type 37 vervang en 'n paar interseksies is pneumatiese voertuigdetektors aangebring wat die voertuie in werkingsgestel is – iets wat nie met die Tokheim-kontroleerdeurs moontlik was nie.

Die type 37 ATM-kontroleerdeur was wesenlik elektro-meganies, maar weerstandsbomme met 'n termioniese tydreliefsbus is gebruik om die beweging van verkeer te reël. Geen voorseenis is vir voetgangers gemaak nie en hulle moes net eenvoudig op die regte voertuigseite let.

Die pneumatiese detektors het bestaan uit 'n stewige gomlastekuis wat in 'n ingewinkelde raam van gietyster ingehou is. Die raam is op sy beurt op 'n betonfondament in die padopervalk ingelaai. Die installering was duur en die eenhede het heelwat instandhoudingsoefeninge gevorder. Voertuigdeteksis is natuurlik teweeggebring deur drukverandering in die gomlastekuis wanneer 'n voertuig daaroor gery het, om sodoeende 'n stel kontakpunte in werking te stel. Voertuigdruk op die gomlastekuis het dan die verlengde ligfase bestel en ook 'n maksimumtydrelaars aan die gang gesit.

Die funksie van hierdie tydrelaars was om die betrokke fase binne 'n voorafgesette minimumtydperk te beëindig, sodat voertuie vanuit 'n ander rigting wat 'n ligfase kon bestel, in die geval van druk voertuigverkeer is daar 'n tydverlengingsregelaar en 'n maksimumtydrelaars aan die gang gesit wat die fase volgens voorafgesette tydverlengings tot 'n maksimumtydperk kon verleng. Op hierdie wyse was dit dus moontlik om groenligtys na gelang van verkeersdrukte van 'n minimum tot 'n maksimumtydperk te wissel.

Nadat die Tokheim-kontroleerdeurs vervang is, was dit moontlik om drie van die nuwe type 37 ATM-kontroleerdeers, wat vier interseksies in Fieldstraat beheer het, met 'n koördinerende hoofkontroleerdeur te koppel ten einde 'n sekere mate van verkeersprogrisse te verkry.

Fig. 2 toon hoe die stelsel teen die einde van die tydperk 1950–1960 gekly het. Die interseksies in rooi aangesul, is die wat bygevoeg is en daardie wat binne die groenlyn lê, is die interseksies wat onderling met mekaar gekoppel was.

Teen die einde van die vyftigerjare het dit duidelik geword dat die snelle toename in motorverkeer en die nabhyheid van verkeersense aan mekaar, die daarstelling vereis het van gekoppelde stelsels wat op so 'n wyse voorseenis kom maak vir meer as een verkeersplan dat verkeers-toestande gedurende die oggende, agtermiddag en sferule die hoof gebied kon word.

Gedurende die seftigerjare is twee aaneengeskoppelde stelsels in gebruik geneem: die type 54 ATE-stelsel en 'n STC-stelsel. Een type 54 ATE-stelsel is benut om drie interseksies in Pointweg met mekaar te koppel en 'n ander onafhanklike stelsel van dieselfde type 54 is gebruik om vier interseksies in Mooreweg aan te sluit en te koppel. Hierdie stelsels het elektro-meganies gewerk en vir drie verkeersplante voorseenis gemaak. Synchronisering is bewerkstellig deur draanekisies gelyktydig deur die hoofbeenheid te laat beheer en die siklus van die draanekisies het die verskillende tydfases bepaal.

Gedurende 1962 is die STC-stelsel in gebruik geneem om sowat vyf interseksies in die middestad te beheer. Hierdie stelsel is in Suid-Afrika ontwerp en veraardig en het meer gevorderde faciliteite gebied as wat destyds in die buiteland beskikbaar was. Die stelsel het ses verkeersplante gehad wat na willekeur volgens die uur van die dag of die dag van die week geskakel kan word, sodat dit moontlik was om dagweekvariasies in verkeersdrukte te behartig.

- Die stelsel het 'n gedupliceerde puls generatorhoofeenheid gehad en deur gebruik te maak van 'n driedraadkringloop van die luste, is positiewe en negatiewe impulsen van 50V na die kontroleerdeur oorgenoem. Deur die pulsreks te tel en te dekoder, het die kontroleerdeer dan 'n geskakelde vastdraaiduur geskakel en die ligvolgorde sikkies in synchronisme met die ander kontroleerdeers in werking gestel.

Anvanklik was die stelsel heeltemal elektro-meganies met relé en kringwerk van die telefontoepsite, maar die bepaling van tydreliefs en synchronisering volgens die impulsstellingsmetode het sekere relékrys onbetrouwbaar laat blyk, sodat hulle deur vastetoestand-pulgensators en -tellers vervang is. Hierdie stelsel word tans nog in die stad gebruik en Fig. 3 toon die stand van die stelsel teen die einde van die seftigerjare.

Gedurende 1971, toe West- en Smithstraat eenrigtingstrate geword het, is die type 54 ATE-stelsel in die Pointweggebied uitgebrei deur die nodige kontroleerdeurs deur eenhede van die Moorewegstelsel te vervang. Die Moorewegstelsel is op sy beurt deur 'n geheel en al vastetoestand STC-stelsel vervang, soortgelyk aan die middestadstelsel, en uitgebrei soos in Fig. 4 aangegetoon.

2. Seintelsels buite die sentrale gebied:

Die meeste interseksies wat buitekant die sentrale gebied met so 'n apparaat toegerus is, is ver van mekaar af geleë, hoewel 'n paar stelle seiners naby genoeg aan mekaar was om koppeling te regverdig.

In die geval van afgesonderte interseksies, is die oueres oorspronklike toegerus met seintapparaat wat 'n vastetyd-enkelplankontroleerdeur gehad het. Namate die verkeer toegenomen het, het dit nodig geword om hierdie eenhede te vervang deur kontroleerdeurs wat oor meer as een verkeersplan beskik het, ten einde voorseenis vir spitsverkeerde te maak. Aangesien hierdie interseksies nie die algemeen voorgekom het in strate wat gedurende spitspunte aan verkeerstuwing onderworpes was, is dit nodig bevind om voertuigafsetting in te sluit met die oog op die verligting van bestuurderfrustrasie gedurende stil tye. Nog 'n fasilitate was met die oog op verligting van bestuurderfrustrasie ontwerp is, is

At this stage most of the old Tokheim controllers were replaced by ATM type 37 units and, at a few intersections, pneumatic vehicle detectors were installed to provide vehicle actuation – a facility which was not available on the Tokheim controller.

The ATM type 37 controller was basically electro-mechanical, however, RC circuits with a thermionic timing tube were used to time the traffic movements. Pedestrians were not catered for and they had merely to observe the appropriate vehicle signal.

The pneumatic detector consisted of a robust rubber tube mounted in an elaborate cast iron frame which was set in the road on a concrete foundation. Installation was expensive and the units required much maintenance. Vehicle detection was, of course, achieved by sensing the change in pressure in the tube with the passage of a vehicle and thus operated a set of contacts. The vehicle actuation would call the appropriate phase and start a "minimum" timer.

The function of this timer would be to terminate the phase within a preset minimum time to allow vehicles on another approach to call. If, however, vehicular flow was heavy, an extension timer and maximum timer would begin to run which would extend the phase in preset increments out to a preset maximum. Thus, it was possible to obtain a green time variable between a minimum and a maximum time, dependent upon vehicular demand.

With the replacement of the Tokheim controllers, it was possible to link three of the new ATM Type 37 controllers, which controlled four intersections in Field Street, with a master co-ordinating controller to provide some form of progression for the traffic.

Fig. 2 shows the state of the system at the end of the period 1950 to 1960. The intersections coloured red were those added and those with in the green line were linked together.

In the late 'fifties' it became obvious that, with the rapid growth in motor transport and the close proximity of signals, it was necessary to establish linked systems with facilities of more than one traffic plan to cater for the morning, evening and off-peak traffic conditions.

In the 'sixties' two types of linked systems were introduced, one being the ATE type 54 and the other an STC system.

The ATE type 54 system was used to link three intersections in Point Road and another independent type 54 system, was used to link four intersections in Moore Road. These systems were electro-mechanically operated and provided three traffic plans. Synchronisation was achieved by stepping uniselectors in unison under the control of the master unit. The various time intervals were taken from the cycle of the unisector.

The STC system was designed and manufactured in South Africa and installed in 1962 and controlled approximately fifty intersections in the city centre. The facilities available were at the time in advance of most systems available internationally. It provided six traffic plans, selectable by time of day and day of week, so that it was possible to cater for weekend variations.

The system consisted of a duplicated master pulse generating unit and using a three wire loop type circuit, 50V positive and negative pulses were transmitted to the controller. By counting and de-coding the pulse train, the controllers would select hardwired plan applicable and then step through the sequence cyclically in synchronism with the other controllers.

The system started out as a completely electro-mechanical system using telephone type relays and circuitry, however, in view of the pulse counting method of timing and synchronisation determination, certain relay circuits did not prove reliable and were replaced with solid state pulse generators and counters. This system is presently still in operation in the city and Fig. 3 shows the status quo in Durban at the end of the 'sixties'.

In 1971, with the introduction of the one-way routing of West and Smith Streets, the ATE type 54 system in the Point Road area was expanded by replacing the necessary controllers with ones from the Moore Road system. The Moore Road system was replaced with a fully solid state STC system, similar in operation to the central city system and expanded as shown in Fig. 4.

2. Signals outside the Central Area.

The majority of signalised intersections outside the central area are in isolated locations although there are a few groups of signals close enough to warrant linking.

In considering the isolated case firstly, the older intersections were originally signalised with a fixed time single plan controller. With the growth of traffic, it was necessary to replace these units with controllers which provided more than one plan to cater for the peak traffic times. As these intersections were generally on streets which catered for tidal traffic movements during the peak periods, it was found necessary to incorporate vehicle actuation to relieve driver frustration during the off peak periods. Another facility which has been designed to reduce driver frustration is one which discriminates between vehicular and pedestrian calls. This allows much shorter minimum greens to be

een wat die kontroleerde tussen voertuig- en voetgangerverkeer kan laat onderskei. Hierdeur is veel koper minimum groente moontlik wanneer daar geen voetgangerverkeer is nie, maar sodra 'n voetganger egter die knoppe druk, word die langer minimum groente in werking gestel sodat die voetganger genoeg tyd het om met veiligheid oor te steek. Aangesien daar nie seinbeheeraaparaat beskikbaar was om was aan al ons vereistes te voldoen nie, moes 'n Suid-Afrikaanse firma toerusting volgens ons spesifikasie ontwerp en vervaardig ten einde al hierdie verbeteringe moontlik te maak. Die resultaat was 'n kontroleerde wat drie vastetydplannede of anders drie plande vir voortuigafsetting gehad het en wat ses voertuigbewegings aannede ooreenstemmende voetgangerfasies kom behartig. Hierdie tipe kontroleerde maak van syfertydreëling gebruik en die kontroleerde kan ook gekoppel word.

In die gevval van die klein koppelstelseltjies wat op hoofverkeersweë vorkom, is die seine slegs gedurende spitsste tyd gekoppel en word daar gedurende stilte van voertuigafsetting gebruik gemaak.

Die is dan kortlik 'n verduideliking van die stad se huidige verkeersbeleid. Die seinstelsels is daarop ingestel om die verkeersvloei gedurende spitsste na wense te verbeter en bestuurderfrustrasie wat verkeersinners gedurende stil tye veroorsaak het, te verminder.

Gesentraliseerde verkeersbeheer

Met die stand van dié stelsel soos in Fig. 4 aangegetoon, is daar oorweging verleen aan die vervanging van die hele stelsel deur 'n gesentraliseerde beheerstelsel. By die oorweging van die nadelle van die huidige stelsel, is daar besef dat verkeersprobleme by die aansluitingspunte van die verskillende stelsels deur gebrek aan kontinuititeit veroorsaak is. Daarbenewens is daar groot voorstelling vir die oordrag van inligting ten opsigte van defekte gemaak nie, en was die departement geheen en al van berigte lede van die publiek afhanklik om te weet waar daar aanding aan defekte geskenk moet word. Bowendien is sodanige defekte deurentyd gedurende van omnididelike vóór spitsste aangemeld sodat defekte nie dadelik reggestel kan word nie, al kon 'n tegniese oor die druk verkeer by die defekte kontroleerde uitkom. Gevolglik is die verkeersvloei dwarsdeur die hele spitsyd belemmer.

'n Ander nadelle was dat die elektro-mekaniese toerusting voortdurend al om die derde maand routineversorging gevry het ten einde defekte te voorkom, en daarby nog was die nuttige gebruikstyd van die toerusting baas op 'n end.

Aangesien identiese of aanspashbare toerusting nie meer bekombaar was nie, kon die stelsels nie verder uitgebrei word nie. Gevolglik moes enige toerusting wat in die onmiddellike nabheid van die seiner net aangebring is, gemodifiseer word ten einde 'n mate van aaneenkoppeling met die aangrensende stelsel te bewerkstellig.

Een van die grootste nadelle van al hierdie vastetydstoerusting was dat enige wysiging van die tydreeleens *in situ* uitgevoer moet word, wat 'n stadige en onslaglike proses was. Gevolglik was dit onmoontlik om voorstelling vir besondere soos seisoenvereistes te maak, sou byvoorbeeld vir die drukste vóór Kerstfeeste of die dag van die universiteitsjaool.

As gevolg van al hierdie oorwegings is daar gedurende 1970 aan die aanbieding van 'n nuwe stelsel gedink. 'n Ondersoek van internasionale ontwikkelings het aan die lig gebring dat die Britse padnavorsingslaboratorium blykbaar die uitvoerigste navorsing met sy houdskemas in Glasgow gedoen het. 'n Loddkissima is ook in Wes-Londen van stapsel gestuur. Origens is daar ondersoek na ander skeemas in Madrid en Barcelono ingestel.

Daar is gemeen dat 'n stelsel wat op die gebruik van rekenomotome gebaseer is, die voordele sou wees. So 'n stelsel sou ons kon aanpas by die meeste ontwikkelings op die gebied van verkeersingenieurswese. Daarbenewens sal al die nadelle wat tot dusver genoem is, uitgesake kan word en bowendien sal voortsettigingspunte op plekke oor die hele stad ingestel kan word om sodoeende deur middel van dieselfde date-oorsendingsstoerusting inligting na 'n verkeer in enige straat terug te voer.

Die welslae van enige verkeersinnet is hoofsaaklik van bestuurdergedrag afhanglik. Ten einde die polisie te help in hul taak om motoriste „op te voer“, is daar derhalwe besluit om verkeerswaarneming deur middel van geslotebonne-televisië by die stelsel in te sluit. 'n Spesifikasie is op hierdie grondslag opgestel en op 23 April 1971 uitgereik, met 5 November van dieselfde jaar as die sluitingsdatum. Nadat met tenders sorgvuldig beoordeel is, is die kontrak op 26 Mei 1972 aan die firma Plessey S.A. Beperk toegekken.

Op hierdie tydstip moet ek daarop wys dat ek al baie vooropgetakte denkehoue van die toewerigste hoedanighede van rekenomotome te gekom het. Soos die outomate tans by verkeersbeheer gebruik word, is hulle egter steeds 'n handige beheermiddel en kan hulle nie die verkeersbehoeftes „aanvoer“ en groente sekond-vir-sekond wissel nie. Oor die algemeen beskik hulle steeds oor 'n geheue van verkeersplanne wat volgens die tyd van die dag gekies kan word of anders, soos daar tans in Durban en ander sentre profondervindlik bepaal word, volgens die wyse waarop 'n klein aantal detektors op strategiese plekke verkeerspatrone waarnem en inligting oormond. Die werk verbondne aan die opstel van verkeersplanne behels nog steeds verkeerswaarmings op strathoeke oor 'n betreklike lang tydperk en dit is eers na die ontleding en verwerking van hierdie aanvanklik gegeweens, dat die voordeeligste verkeersplan deur middel van heelwat menslike inspanning uiteindelik daargestel kan word.

used when there are no pedestrians, however, when a pedestrian does push the button, the longer minimum green is introduced to allow the pedestrian to cross in safety with ample clearance time. To achieve these refinements, it was necessary for a South African company to design and manufacture equipment to our specification as there was no signal available to fulfill all our requirements. The resultant controller has three fixed time plans or three vehicle actuated plans and caters for six vehicular movements plus pre-alarm pedestrian phases. The controller uses digital timing techniques and the controllers may also be linked.

In the small linking schemes which occur on arterial routes, the signals are only linked during peak periods and in the off-peak vehicle actuation is used.

That briefly is an explanation of the City's policies at present and the systems are achieving the desired results in improving flow during peak periods and reducing the driver frustration traffic signals caused in the off peak periods.

Centralised Traffic Control

With the status quo as shown in Fig. 4, consideration was given to replacement of the entire system with a centralised control system. In considering the disadvantages of the present set up, it will be appreciated that traffic problems arise at the junction points of the different systems due to the lack of continuity. Also, no feed-back of fault information was provided and the Department relied solely upon public reports to attend to faults. Invariably these faults would be reported during, or immediately prior to the peak period and, if a technician was able to get to the offending signal controller through the traffic, the repair would not be effected instantaneously and hence, the traffic suffered throughout the peak.

Further disadvantages were that the electro-mechanical equipment required continual routine maintenance on a three month cycle basis to obviate faults. Also, the useful life of the equipment was drawing to a close.

As identical or compatible equipment was no longer available, the systems could be extended no further. Hence, any equipment that was installed in close proximity to the network had to be modified to provide some form of linking to the adjacent system.

One of the largest disadvantages of all this hardwired equipment was that any timing alterations had to be carried out on site and this entailed a slow and tedious process. Thus, it was impossible to accommodate any special days or seasonal changes, such as the pre-Christmas rush or University Rag Day.

Taking all this into account, in 1970 consideration was given to the introduction of a new system. Having studied world progress and at the time the Road Research Laboratory appeared to have done the most research with pilot schemes in Glasgow and the GLC had a pilot scheme in West London. Other schemes were investigated in Madrid and Barcelona.

It was felt that it would be in the best interests to go in for a computer-based system which we would be able to adapt to most developments in the traffic engineering field. Furthermore, all the disadvantages mentioned previously could be overcome and besides, vehicle counting points could be established at points around the city to obtain a back to the traffic on the street through the same data transmission media.

The success of any traffic signal system is largely dependant upon driver behaviour. It was thus decided, in order to assist the Police in their task of disciplining motorists, to incorporate closed circuit television surveillance in the system. It was with this as the basis that a specification was prepared and issued on 23rd April, 1971 and closed on 5th November of the same year. After a long period of adjudication of nine tenders, the contract was awarded to Plessey S.A. Limited on 26th May, 1972.

I must point out at this juncture, that I have come across many pre-conceived ideas about the magical qualities of a computer. Computers in their present use for controlling traffic are merely a convenient method of control and do not sense the traffic and vary the green time on a second-by-second basis. In general, they merely store a library of traffic plans which can be selected by time of day or, as is being experimented with in Durban and other centres, by traffic pattern recognition from a small number of strategically placed detectors. The work involved in preparing the traffic plans themselves still remains a rather long process of traffic data acquisition on the street corner and after processing this raw data, off-line optimisation programmes are used and with a lot of human effort, a traffic plan is eventually derived.

Algemeen:

Die algemene reellings word op Fig. 5 aangetoon. Die grondslag van die stelsel is die twee Honeywell 316 - rekenoutomate of "kompers" soos hulle deesdes al hoe meer in dié handel en wandel bekend staan. Elk komper het 'n Sagem-delegeheue en die twee kompers is deur middel van 'n tussenkompareenhed met mekaar verbind. Die twee kompers is albei toegerus met koppelvlakke ten opsigte van die verskillende randeenvoud en die verbindings tussen die buitestasies word deur in-en uitvoerhoofnuw bewerkstellig.

Die werkingsgrondslag is dat albei komper vir verkeersbeheer gepronameer kan word, maar terwyl die een in beheer is, bly die ander in gereedheidsmodus, sodat hy die werk van die ander kan oornem indien iets verkeerd raak. Voorseeing is vir 'n otomatiese oorskakelingstelsel gemaak indien daar 'n defect van die een of ander beondere aard voorkom. Die eenheid het beheer oor sekere randeenvoud waaroor albei nie gesamentlik beheer het nie, en hierdie eenheid gaan gedurende stilte tyd vir verkeersontleding tydens gekoppelde ure en vir die voortsetting van verkeersplanned gebruik word.

Vir sover dit verkeersbeheer aanbetrif, gaan die vermoë van die stelsel soos volg wees:

250 buitestasies

30 verkeersplanned (waarvan 15 in die program van otomatiese kiesing gebruik kan word).

Daar is egter talyke fasilitete ten opsigte van die stelsel beskikbaar, waaroor ek later sal praat.

Maar, noudat ek u 'n algemene beeld van die stelsel gegee het, wil ek u graag nadere besonderhede van elke aspek van die stelsel gee. Ek begin by die straatruitering en dan kom ons by die beheersentrum uit.

Die Detektors:

Sosse reeds gesê, gaan verkeer by vyftig strategiese plekke oor die hele stad getel word. Die telmetode waarop daar besluit is, is deel van 'n stelsel waarby daar gebruik gemaak word van lusdetektors wat opgestel is in 'n $N + 1$ - modus; waar N die getal verkeersbane verteenwoordig.

Die beginsel was op die werking van die lus self berus, is betreklik eenvoudig, maar die versekerking van stabilitet maak die saak letwatt meer ingewikkeld. Vogtigheid, temperatuurwissellings, die aanwezigheid van geparkerde voertuie en verkeer op sangwisselende banen lewer algar probleme op wat elektroniese oorbruit moet word. 'n Lus met die vereiste getal dradwandings, gewoonlik draad met 'n deursnee van 25 mm^2 , word in 'n gloop onder die padoppervlak begrawe. Die lus self is die induktiewe deel van 'n oscillator met 'n frekwensie van naagenoeg 100kHz . Wanneer 'n metaalvoertuig oor die lus gaan word, verander die induktansiekoeffisientie van die lus en gevoldiglik die frekwensie, en so word die aanwezigheid van die voertuig opgespoor. Dit is alles goed en wel, maar daar is gevind dat een lus meer oor 'n pad as wat daar binne is, gepaard met die toepassing van 'n logiese telontleding, die heel beste samstellende oplossing. Daar is ook gevind dat hierdie reëling die oplossing is vir die probleem van bestuurders wat nie goed baandisplpline handhaaf nie, en oor 'n groot verskeidenheid snelhede en wissellings in verkeersdrukte is akkuraatheid tot weneen 2% bereik. Hierdie stelsel is deur navorsers in Brittanje ontwerp.

Kyk na Fig. 6 om hierdie beginsel van $N + 1$ beter te begryp.

In die geval van hierdie installasie is daar vier lusse oor 'n pad met drie banne aangebring. Daar word met behulp van logistiese kringwerk soos volgt gestel - indien 'n voertuig oor lus A ry, word daar slegs een getel. Indien twee aangrensende lusse afgeset word, bly die telling een. Op dieselfde wyse word daar twee voertuie aanteken wanneer drie aangrensende lusse afgeset word, en dieselfde geld wanneer lusse A en C afgeset word. Praktiese toets het die akkuraatheid van hierdie metode bewys.

Om te verhoo dat lusse wat langs mekaar lê, mekaar so werk belemmer, word die osilasiefrekvensie gewissel. Vir sover dit gepaard met 'n silensieinstelling verséel. Die detektooreenhede is in inspeksiegroepe aangebring en elkeenheid beheer vier lusse. Die hukringwerk van elke detektor verskyn op 'n afsonderlike, gedrukte kringkaart terwyl 'n ander kaart voorseeing vir die tel- en tologielikheid maak. Die regte hoeveelheid krag vir standveranderinge name daar 2, 4, 8, 16, 32 of 64 voertuie opgespoor is, word deur 'n binêre teller gegelei. Die getal voertuie per standverandering by enige besondere plek word met behulp van 'n draadkoppelung gekies en hang van die toestande ter plaatse af. Die toutydreeslaars kan van 0 tot 15 sekonde gestel word. Ons het op die sekonde as die aanvanklike tydregeling besluit en kan dit verander nameit ondervinding in verband met die werking van die stelsel opgedoen word. In elke eenheid is daar nog 'n kaart vir 'n monitorreder wat in die geval van detektordefekte in werking tree en ook voorseenis maak vir 'n voorafbepaalde uitsakelingstydperk wanante daar geen voertuie is nie of wanante die kragtoeroer na die eenheid onderbrek word. Die vyftig plekke word in Fig. 7 aangestoot.

Inligting word vanaf die detektorplekke na die naaste buitestasie-eenhed vir oorsending na die komper teruggesend.

General:

The general arrangement is as shown in Fig. 5. The heart of the system being the two Honeywell 316 computers, each supported by a Sagem fixed head disk backup store. The two computers are linked by an inter computer communication unit. They also house the interfaces for the various peripherals and access to and from the outstations is obtained via the input/output highway.

The basic principle of operation is that either of the two computers may be programmed to control the traffic and while the one is in control, the other is in standby mode to take over, should it fail. An automatic changeover routine changes the units over automatically in the event of fault detection of a particular category. The one unit has certain peripherals which are not common to both. This machine will be used during quiet traffic periods for off-line traffic analysis and traffic plan development.

As far as traffic control is concerned, the capacity of the system is as follows:-

250 outstations

30 Traffic plans (15 of which may be used in the automatic plan selection routine).

There are however, numerous other facilities available which will be dealt with in due course.

Having provided a general idea of the system, I will continue in some detail on each element of the system commencing from the street equipment and ending up back at the control centre.

The Detectors:

As already mentioned, traffic will be counted at fifty strategic points around the city. The method of counting adopted uses inductive loop detectors configured in an $N + 1$ mode where N is the number of traffic lanes.

The principle of operation of the loop itself is relatively simple; however, the achievement of stability is a factor which complicates the issue. Moisture, temperature variations, the presence of parked vehicles and adjacent loop interference are problems which are overcome electronically. A loop of the required number of turns of wire, usually 25 mm^2 cross-section, is buried in a slot cut in the road. The loop itself forms the inductive portion of the tank circuit of an oscillator of frequency in the region of 100 kHz. The addition of a metal body, in the form of motor vehicle, over the loop changes, the inductance of the loop and hence, the frequency and thus the car is detected. This is all very well, however, to obtain an accurate count it was found that by introducing one more loop across a road than the number of lanes and applying a logical counting solution, the best configuration was achieved.

This was found to overcome the problem of poor lane discipline of motorists and over a wide variation in speeds and lanes an accuracy within 2 percent was achieved. This method was established by research workers in the U.K.

To clarify this $N + 1$ principle, consider the following installation as shown in Fig. 6.

In this case, four loops are installed across a three lane road. By means of logic circuitry the counting is achieved as follows - should a vehicle cross Loop A, only one is counted. Should two adjacent loop be triggered, still only one vehicle is registered. Similarly, should three adjacent loops be triggered, two vehicles are registered. Further, should loops A and C be triggered, two vehicles would be counted. Practical tests have proved the accuracy of this method.

Adjacent loop interference is overcome by varying the frequency of oscillation. As far as parked or stopped vehicles are concerned, there is a timer associated with the unit which registers the presence of a queue should a vehicle stop over the unit for this present timeout period.

As far as the actual installation is concerned, the slots are cut in the road with a diamond tipped saw. The loops are then installed and sealed with an epoxy compound. The detector units are housed in manholes and each unit drives four loops, each detector loop circuitry being accommodated on a separate P.C. card. A further card provides the counting and queue logic. A binary counter provides the change-of-state output when 2, 4, 8, 16, 32 or 64 vehicles have been detected. The number of vehicles per change of state for a particular site, is chosen by a wire link and is dependent upon site conditions. The queue timers are variable between 0 and 15 seconds. We have settled on three seconds as an initial time setting and may alter it as experience is gained on the system operation. A further card in each unit provides a detector fault monitor which incorporates a pre-set time-out period for no vehicle output or when the power to the unit fails. The location of the fifty sites are shown in Fig. 7.

Information from the detector sites is passed back to the nearest outstation unit for transmission back to the computer.

Die Buitestasie-eenhede:

Die buitestasieterusting is hoofsaaklik tweeledig –

- a. Die buitestasie vir data-oorskakeling, waarby die modem inbegrepe is.
- b. 'n Vastetydse verkeerskontroleerdeer.

Die kontroleerdeer, bekend as type 85, is 'n vastetoestand syfereneheid, en hiervan is twee groottes aangeskaf. Die een grootte is vir die groter interseksies bedoel, en beskik oor 8 fasen en 8 stadia, terwyl die ander grootte, wat vir voetgangersoorsteande en eenvoudiger interseksies bestem is, 4 fasen en 8 stadia het.

Deur middel van die buitestasie vir date-oorskakeling kan die komper die stadia in enige volgorde bestel, maar terselfdertyd moet die buitestasie die komper sodat die kontroleerdeer na vaste tydwerk kan terugkeren indien daar iets met die komper of met die oorsendingsverbinding verkeerd raak.

Fig. 8 is 'n blokdiagram van die kontroleerdeer.

Hierdie diagram toon die leidingvoering na die modem aan. Die logistiekeenhed vir data-oorsending ontvang inligting van die detektor deur middel van die detektor se koppelelklaeheid, en eersgenoemde eenheid is ook in tweerigtingverbindiging met die kontroleerdeer een voorstoring vir stadiumbevele en -bevestiging, asmede ander moniterstappe, te maak.

Die ligstakelykstelsel is vergrendel, sodat daar nie bv. teenstrydig groenligstakelykstelsel vertoon kan word nie. Die volgende werkingsmodus is beskikbaar –

- a. Komperbeheer met terugkerung na geïsoleerde vastetydwerking wanneer iets met die komper of die oorsending van data verkeerd loop, met sekondêre oorskakeling na flitsende rooi en geel ligte in gevall toetsuur ter plaatse defek raak.

b. Werking siega volgens vaste tyd.

c. Handbeheerde werking.

In die geval van die vastetydmodus, word die tye van die verskillende fasen deur opeenvolgende syfertydreeelaars teweeggebring. Fig. 9 toon 'n tipiese voorbeeld.

Hierdie diagram toon sekere faciliteite wat by die ontwerp van die eenheid ingelyf is om aan die besondere behoeftes van Durban te voldoen, soos bv. voetgangersvertraging. Dit is 'n maatreël wat met die oog op die veiligheid van die publiek getref is as gevolg van die probleem wat weens die stad se breë strate ontstaan het. Gevolglik verskyn die groen mannetjie nie, dadelik nie, om te probeer vergoed dat voetgangers die straat oorsteek terwyl daar nog 'n voertuig aankom wat op die laaste oomblik van die geel oorskiet – iets wat heel dikwels in ons stad gebeur. Daarbenewens vertoon die kontroleerdeer 'n flitsende rooi teken om aan te dui dat voetgangers nog die oorkant van die straat betyds kan bereik.

Die Databuitestasie:

Woarde van 16 dele word gebruik om komperbeheer met behulp van die databuitestasie daar te stel.

Kragtoevoer na al die buitestasieterusting word van die naaste toevoerkabel van 220V, 50Hz verkry.

In die huisel van die eenheid is daar ook aanvullende toerusting soos toetsgeree met die hoofleiding verbind kan word en instandhoudingspersoneel met die beheersentrum in verbinding kan tree.

Die Kabelnet:

Daar het 'n taamlik uitgebreide kabelnet bestaan om die eenhede van die ou stelsel onderling met mekaar te koppel. Die kabels was van verskillende tipes en groottes, met inbegrip van telefoonkabel van 50 paar, driekeerloodskabel van 6 paar en meerkeern-verkeerseinakabel van 3/029. Hierdie net is met behulp van ge-pantsertelefoonkabel van verskillende paargroottes uitgebred en daar is genoeg kabelwerk reservé gelê om die stelsel tot sy maksimum vermoei uit te brei.

Terselfdertyd is daar koaksiale kabels na twintig piekplekke in die stad vir die geslotebaanbaan aangelaai, tesame met meerparige beheerkabels vir die kameras.

Fig. 11 toon die basiese aanleg van die kabelnet.

Data-oorsending:

Data-oversendingstoerusting van die firma Plessey se eie type „Telecommand 5“ is by die stelsel ingelyf.

Oversending geskied teen 50 Baud en modulering word deur middel van frekwensië-wisselskakeling bereik.

Daar is ook van frekwensië-multipleksering gebruik gemaak, sodat 'n groep van ses kontroleerdeers deur enige paar drade bedien kan word en kontroleerdeers kan met tussenposes langs die hele leiding aangesluit word.

Die frekwensië-bane vir oorsending en ontvangst word in Fig. 12 aangegeven.

Die Binnestasieterusting:

Fig. 13 toon die blokdiagram van die binnestasieterusting.

Elke kompresubstelsel bestaan uit 'n Honeywell H 316-komper, 'n papierbandafleser, 'n papierbandpunch en 'n teledrukker. By elke substelsel is daar ook 'n vastekop skyfdekgheue inbegrepe.

The Outstation Units:

The outstation equipment consists basically of two parts –

- a. The data link outstation which includes the modem.
- b. A fixed time traffic controller.

The controller, known as a Type 85, is a digital solid state unit and two sizes have been purchased. One size for larger intersections at 8 phases and 8 stages and another, for pedestrian crossings and less complicated intersections, has 4 phases and 8 stages.

The data link outstation allows the computer to call stages in any order but monitors the computer operation and allows the controller to revert to fixed time working if the computer or transmission link fails.

Fig. 8 is a block diagram of the controller.

This diagram shows the line input to the modem. The data transmission logic unit receives information from the detectors via the detector interface unit. The data transmission logic unit also has two way communication, with the controller for stage commands and stage confirmation and other monitoring functions.

The lamp switching is provided with interlocks to prevent the simultaneous display of conflicting green signals.

The following modes of operation are available –

- a. Computer control with reversion to fixed time isolated working following a computer or data transmission failure and secondary reversion to flashing amber and red when a local equipment malfunction is detected.
- b. Fixed time operation only
- c. Manual operation

In the fixed time mode, timings are achieved by a sequence of digital timers for the various phases. A typical example is shown in Fig. 9.

This diagram shows certain facilities which have been designed into the unit to suit the requirements of Durban, one of which is a pedestrian delay. This is a safety feature for the public as a result of a problem which arises out of the fact that Durban has wide streets. The appearance of the pedestrian green man indication is delayed in an attempt to prevent pedestrians from stepping off into the path of an on-coming vehicle, which has used the last second of the amber, – a practice which is very common in this City. A flashing red pedestrian indication for the clearance period is also provided in the controller.

The Data Outstation:

The computer control via the data outstation unit is carried out using 16 bit words.

The power supply for the entire outstation equipment is obtained from the nearest 220V 50 Hz supply cable.

Auxiliary equipment provided in the housing consists of a mains outlet for test equipment and communication link for maintenance personnel to the control centre.

The Cable Network:

A fairly extensive cable network existed for the interlinking of the previous system. This cable consisted of various types and sizes, including 50 pair telephone cable, 3 core 6 pair pilot cable and multicore 3/029 traffic signal cable. This network has been extended using armored telephone cable of various pair sizes with sufficient spare capacity to extend the system to its full capacity.

At the same time coaxial cable was laid to twenty sites in the city for the CCTV system along with multipair control cables for the cameras.

Fig. 11 shows the basic layout of the cable network.

Data Transmission:

The Plessey "Telecommand 5" data transmission equipment has been incorporated in the system.

The transmission rate is 50 baud and modulation is by frequency shift keying.

Frequency multiplexing is employed so that a group of six controllers may be fed by any pair of wires and controllers can be connected at intervals along the line.

The send/receive frequency channels are as per Fig. 12.

The Instation Equipment:

Fig. 13 shows the block diagram of the instation equipment. Each computer subsystem consists of a Honeywell H316 computer, a paper tape reader, paper tape punch and a tele-printer. Also included in each subsystem is a fixed head disc backing store. The teleprinter,

Die teledrukker, papierbandafleser en papierbandpons kan deur middel van kontakproppe met enigeen van die twee kompers verbind word.

Hoewel die twee stelsels identies is wanneer hulle vir verkeersbeheer geprogrammeer is, d.w.s. gekoppel, verwys ek gerieflikheidshalwe na die een as die beheerkomper en na die ander as die paraatkomper, omdat laasgenoemde met bykomstige randtoerusting vir ongekoppelde werking toegerus is.

Die Beheerkomper:

Hierdie komper het 32K aan kerngeheue, en dan is daar benewens die toerusting wat ek so pas genoem het, nog 'n tussenkomper-verbindingsruimte wat die twee kompers onderling met mekaar verbind.

Die paraatkomper:

Die paraatkomper het ook 32K aan kerngeheue, benewens bykomende randtoerusting soos bv. 'n kaartafleser en 'n ophiergeenheid vir magnetiese band.

Die skyf-dekgeheues:

Soos ek reeds gesê het, het elke komper 'n vastekop-skyfdekgeheue. Die geheuevermoë van elke eenheid is 360K en elke skyf het sy eie stabiliseerde kragtvoereenhed.

Otomatisiese heraanskakelingseenhede:

Elke komper het 'n otomatisiese heraanskakelingseenheid sodat die komper weer vanself kan begin werk nadat die kragtvoeroer na 'n onderbreking herstel is.

Die komper-koppelvlaktoerusting:

Elkeen van die kompers het 'n eenheid vir koppelvlaktoerusting. Die doel van die eenheid is om al die bykomende gemeenskaplike randtoerusting, die oorlosies en die oorskakelingslogistiek onderling te koppel.

Die volgende toerusting word onderling gekoppel –

- Die visuele waarnemingseenheid, wat by enigeen van die twee kompers ingeskakel kan word.
- Die reëldrukker, wat ook met enigeen van die kompers verbind kan word.
- Die hooflyn na die Telecommand 5 - data -oorsendingsstoerusting. Hierdie hooflyn word otomatis met enigeen van die twee kompers verbind.
- Die hoof-dataregistreerder, wat ook otomatis by enigeen van die twee kompers ingeskakel kan word.
- Die beheerraat van die hele stelsel.

Fig. 14 toon die uitleg van hierdie bykomende fasiliteite in die beheerkamer.

Die komperprogram of programmatuur:

Die programmatuur van die stelsel bestaan basies uit twee dele –

- Die kerngeheue van die komper en
- Die skyfgeheue.

a. Die kerngeheue:

Die belangrikste programme is die uitvoerende programme wat elke minuut deurloop en volslae beheer oor die stelsel het. Daar is ook ander programme in die kern vasgeleid ten einde die toe- en uitvoer na die verskillende bybehore, te beheer en te reg, soos bv. na die magnetiese bandeeneheid, skyf, bandafleser, kaartafleser, drukkers en natuurlik die Telecommand 5-data-oorsendingsstoerusting wat die seismiese beheer. Daar is vaste en wisselbare datastelsels wat die verkeersplan wanneer die wisselbare stelsel in werking gestel word deur inligting ontvang uit die plante wat op die skyf vasgeleid is. Hierdie stelsel, asmede verskillende ander programme, maak die kernstelsel uit.

b. Die skyf:

'n Duplikaat van die kerngeheue is op die skyf vasgeleid, sodat die kern in die geval van sekere defecte in 'n baie kort tydjie herlaai kan word. Daarby maak die skyf voorstiening vir sekere permanente programme wat die volgende insluit –

- Dektorprogramme
- Planbeheerprogramme
- Noordroete programme, en laastens is die stelseldata op die skyf vasgeleid om voorstiening te maak vir –
 - Verkeersplante
 - Programme vir sekere tye van die dag
 - Beslissingstabellie vir otomatisiese planseleksie.
 - Roosters vir nooddroetes.
 - Buitestasie – inligting.

paper tape reader and paper tape punch can be connected to either computer by means of plugs.

Although, when programmed for traffic control, i.e. on line, the systems are identical, for ease of identity I will refer to one as the control computer and the other as the standby computer as the standby computer has additional peripheral equipment for off-line working.

The Control Computer:

The control computer contains 32K of core store and, in addition to the equipment mentioned above, an Inter-Computer Communications Unit (I.C.C.U.) which interconnects the two computers.

The Standby Computer:

The standby computer also contains 32K of core store and additional peripheral equipment, i.e. a card reader and a magnetic tape storage unit.

The Disc Back up Stores:

As previously mentioned, each computer has fixed head disc store. The storage capacity of the units is 360K and each disc has its own stabilised power supply unit.

Auto re-start Units:

Each computer has an automatic re-start unit which allows an automatic power up of the computer on restoration of the supply after a power failure.

The Computer Interface Equipment:

Associated with each computer is the interface equipment chassis.

The purpose of this unit is to interface all the additional common peripheral equipment, the clocks and the change-over logic.

The equipment thus interfaced is as follows –

- The visual display unit (VDU) which may be switched to either computer.
- The line printer which may also be switched to either computer.
- The Highway to the Telecommand 5 data transmission equipment. This highway is automatically switched to either computer.
- The main logging type writer which is also automatically switched to either computer.
- The mimic map display.

Fig 14 shows the layout of these additional facilities in the Control Room.

The Computer Programme or Software:

Basically the system software is split into two parts –

- that which is stored in the core of the computer and
- that which is stored on disc.

a. The Core

The most important programme is the executive programme which runs once every minute and has complete control of the system. Various other programmes are resident in core for controlling and directing the input and outputs to the various devices such as the magnetic tape unit, disc, tape reader, card reader, printers and of course, the Telecommand 5 data transmission equipment for the control of the signals. There are fixed and variable data arrays which form the traffic plan when the variable part is fixed by information received from the plans stored on the disc. The above plus various other programmes form the core system.

b. The Disc

A copy of the core system is stored on the disc so that, in the event of certain faults, the core may be completely re-loaded in a very short period. Following on, there is a section of disc resident programmes included which are

- Dektor programmes
- Plan control programmes
- Emergency Route programmes

and lastly, the system data is stored on disc for –

- Traffic plans
- Time of Day schedules
- Decision tables for automatic plan selection
- Emergency route time tables
- Outstation information

Ongekoppelde kompergebruik en verkeersplanontwikkeling:

Omdat die H316 'n komper vir algemene doeleindes is, is hy geskik vir ongekoppelde gebruik, sodat daar van Fortran-programmering met die oog op ontledings- en ontwikkelingswerk gebruik gemaak kan word.

Die komper wat met die magnetiese bandebande verbind is, sal vir hierdie doel gebruik word aangesien die hele stelsel binne 'n kwestie van tien minute deur middel van die magnetiese bandebande met wat as 'n groepstelsel bekend staan, gelasai kan word. Ingeval die beheer-komper buite werkende rank, kan die parataankomper met die verkeersbeheerstelsel herlaai word en die beheer neem.

Verkeersplanontwikkeling:

Navorsing het redelik afdouende bewys dat daar in die geval van 'n beg saamgestelde net, geen beter manier is om verkeer te beheer as deur die gebruik van vaste tydplannede nie, mits sodanige plande ontwikkel is met behulp van die een of ander van die optimaliseringstechnieke wat deesdae beskikbaar is. In die geval van hierdie ongekoppelde ontwikkelingstechnieke vir verkeersplante, waaronder bv. TRANSYT, COMBINATION en SIGOP, word daar van historiese verkeersdata, deur mense ingesamel, en 'n herhalingsgelyk gebruik gemaak om geoptimaliseerde verkeersplante voort te bring, en die plante is gebaseer op norme soos „minimum totale vertraging“ en „minimum getal stilstande“ of 'n samestelling van die twee.

Die stadsraad het die TRANSYT-program aangeskaf om die stelsel wat aangebring is, aan te vul, en ten einde die programme in werking te stel word die volgende data ten opsigte van elke interseksie en aanloop met betrekking tot die betrokke tyd van die dag vereis –

1. Maksimum moontlike verkeersvloei volgens voertuie/uur per baan.
2. Diagramme van toegelaate verkeersbewegings of fasevolgorde.
3. Werklike verkeersvloei (links, regdeur en regs) ten opsigte van elke aanloop.
4. Afstande tussen stilhoustrepe met betrekking tot opeenvolgende seine.
5. Tyd per voertuig verloof as gevolg van bestuurdersreaksietyd, padhellings, ens.
6. Sikiystyd ten opsigte van die kritiekste interseksie.

Uit die levering van die TRANSYT-program is die moontlik om 'n stel verkeerstrydregtings te onwerp, wat dan in die werklike beheerstelsel vir verkeerstrydregtings opgename kan word ten einde die verkeer te beheer.

Voorsta wil ek 'n oorsig gee van die werkingsstelsel en die fasilitete wat as gevolg van die programmatuurstelsel tot die beskikking van 'n operateur is.

Werkung van die stelsel:

Die verkeersplante is op die skyf vasgelê en kan op drie maniere in die komperkern opgename word –

1. Operateurbeheer.
- b. Die tyd van die dag.
- c. Outomatics, deur middel van die outomaticse planseleksieroetnie wat by die detektorvooroor inbegrepe is.

Die eerste metode, nl. inwerkstelling deur 'n operator, het nie nader verduidelik nodig nie. 'n Plan wat egter volgens hierdie metode in werking gestel word, kan nie of deur metode b. of metode c. gekanselleer word nie.

Die tweede metode word in werking gestel deur 'n dagskedulegeheue wat in die komperkern vasgelê is en sal gebruik word wanneer daar iets met die toepassing van die derde metode verbond loopt.

Soeds voorheen gesê, is die laaste metode ietwat eksperimenteel. Niemand is die doel daarvan die bereikting van 'n sekere mate van werklike elastisiteit in die stelsel ten einde ongewone spitsstoestande die hoof te bied, soos bv. aan die einde van die maand of gedurende slegte weer. Die outomaticse planseleksieroetnie self word elke vyf minute outomatics in die stelsel herhaal om toestande na te gaan en om te beslis of 'n planwysiging nodig is. Om rondvallyer, te voorkom, kan planveranderinge egter nie met tussenposes van minder as twintig minute plaasvind nie.

Wanneer die plan eenmalig in die kern is, verloof die uitvoerende plan outomatics en word elke verkeerskontroleer elke sekond „aangetrek“ en „ondverva“. Beslissings oor tydregtings is dus elke sekond moontlik.

Op hierdie wyse word die seinstadia volgens die vereistes van die verkeersplan bepaal. Na bevestiging dat die aangevraagde stadium op straat vertoon word, word die ooreenstemmende groen sein op die beelderingram of -kaart verlig.

Die inligting wat die detektors verskaf, word verwerf en na die skyf oorgedra. Verkeerstellerings word dan of vir die outomaticse planseleksieroetnie gebruik of die operator kan vloeiverslaan van enige detektor aansya, waarna verslae ontvang word, soos in Fig. 15 aangebeeld.

Fig. 15 toon ook die weeklike en maandelike rekords met betrekking tot die detektors. Dit is moontlik om hierdie inligting op magnetiese band vir ongekoppelde verwerking vas te lê indien 'n druksel nie verlang word nie.

Off-line use of the Computer and traffic plan development

The Honeywell 316, being a general purpose computer, is suitable for offline operation using Fortran programming for analysis and development work.

The computer, to which the magnetic tape unit is attached, will be used for this purpose as the entire system may be loaded with what is called a batch operating system (B.O.S.) in a matter of ten minutes using the magnetic tape unit. In the event of a failure of the control computer the standby computer could be re-loaded with the traffic control system to take over.

Traffic Plan Development

Research has established fairly conclusively that, for a close knitted network, there is no better way for controlling traffic than using fixed time plans provided these fixed time plans have been developed using one or other optimisation techniques which are available today. These off-line traffic plan development techniques, amongst which are TRANSYT, COMBINATION and SIGOP, use hand collected historic traffic data and an iterative technique to produce optimised traffic plans based on criteria such as "minimum total delay", "minimum stops" or a combination of both.

The transyt programme has been acquired by the City to complement the system installed and in order to run the programme, the following data is required of each intersection and approach for the applicable time of day.

1. Saturation Flows in vehicles/hour per lane.
2. Diagrams of permitted traffic movements or phase sequence.
3. Actual vehicle flows (left, straight and right) on each approach.
4. Distance between stop lines of consecutive signals.
5. Lost time per vehicle due to driver reactiontime, gradient of road, etc.
6. Cycle time for the most critical intersection.

From the output of the transyt run it is possible to derive a set of traffic timings which may then be loaded into the real time traffic control system for controlling the traffic.

I will proceed to discuss the system operation and the facilities available to an operator, which are the end result of the software system.

System Operation:

The traffic plans are stored on the disc and these may be called into the core of the computer by three methods–

- a. Operator command
- b. Time of Day
- c. Automatically via. the automatic plan selection routine associated with the detector input.

The first method, by Operator command, is self-explanatory. However, a plan introduced by this method cannot be removed by either methods b and c.

The second method obeys a day schedule file which is stored in the core of the computer and will be used in the event of the third method malfunctioning. It may also override the automatic system under certain circumstances.

The last method, as has been mentioned earlier, is somewhat experimental. However, the idea behind it is to gain some form of real time flexibility in the system to cater for unusual peak conditions as do occur at month ends and in the event of inclement weather. The automatic plan selection routine itself is run automatically every five minutes in the system to check on conditions and decides whether a plan change is necessary. To prevent hunting, plan changes are not permitted to occur at intervals of less than twenty minutes.

Once the plan is in core, the system executive programme runs through its paces and every traffic controller is addressed and interrogated once per second. A one second resolution in timings is thus possible.

In this manner the signal stages are set up as required by the traffic plan. On confirmation that the stage commanded is being displayed on the street, the appropriate green signal is illuminated on the mimic diagram.

The information from the detectors is processed and transferred to the disc. The traffic counts are then used for either the automatic plan selection routine or the operator may request flow reports from any detector and reports, as shown in Fig 15, are received.

Fig. 15 also shows the weekly and monthly report formats for detectors. It is possible to transfer this information to magnetic tape for processing offline if a printout is not required.

Bereiding en inwerkstelling van plan:

Sodra 'n stel tydrelings ten opsigte van 'n verkeersplan bepaal is, afgesien van die metode wat toegepas is, word daar 'n papierband vir 'n piano-sprong voorligting deur die hand op enigeen van die twee ponsse met die hand te pons. Die data op hierdie hand word dan deur middel van 'n planbereidingsprogram verwerk terwyl die stelsel gekoppel is. Die doel van hierdie program is om seker te maak dat al die data geldig en nie strydig is met enige veiligheidsmaatrels wat by die basiese datastelsel ingebring is nie, soos bv. minimum groentie en die bevolking van stadiumveranderings. Die gevolg van die planbereidingsroetine is die levering van nog 'n papierband waarop data in basiese massientaal vasgelê is. Data op hierdie band word in die komper gevou en op die skyf bewaar, om gebruik te word wanneer dit nodig blyk. Enige foutie wat ontdek word, word na die tikmasjien uitgevoer sodat die nodige regstellings kan plaasvind.

Operateursfasilitete:

Die operateur kan die komperlewering met enige leveringsapparatuur verbind, maar die defekregisterasie- en waarskuwingsapparatuur voer altyd uit na die hoofstelsel se dataregisterer of tikmasjien in die beheerkamer. Die visuele waarnemingseenheid word gebruik om inligting baie vinnig van die stelsel te verkry wanneer 'n permanente rekord nie verlang word nie en bespaar sodoende natuurlik 'n ontsaglike hoeveelheid papier.

Die operateur kan baie funksies van die stelsel bestel en kan alleen, waaronder die volgende, en hoewel die lys geseens volledig is nie, dien dit nogtans as voorbeeld van die moontlikhede –

1. Planseksie.
2. Wisseling van tydrelings.
3. Kontroleerdeemonitering – d.w.s. tydrelings.
4. Uitskakeling van 'n kontroleerdeerde.
5. Aanmelding van die stand van 'n kontroleerdeerde – d.w.s. plannummer, uitskakeling, ens.
6. Defekte in die stelsel; aanmelding van defekte wat nie reggestel is nie.
7. Bevestiging van defekte wanneer hulle voorkom en kennisgewing wanneer hulle reggestel is.
8. Wysiging van voertuignelhede deur verandering van ligte tussen twee interseksies.
9. Kiesing van sesstien noodroetes.

Noodroetes:

Hierdie fasilitet maak dit moontlik dat 'n spesiale stel tydrelings lange 'n besondere roete deur die druk van 'n knoppie ingestel kan word om die deurgang van 'n noodvoertuig soos 'n brandweeraanval of 'n ambulans langs die betrokke roete te vergemaklik. Soos reeds gesê is daar sesstien roetes van stelle tydrelings beskikbaar, en is dit moontlik om die noodroete by enige bepaalde interseksie langs die roete te beïndig of anders die roete te handhaaf tot by die geprogrammeerde eind-interseksie. Die tydrelings maak voorstiening vir die wegruiming van verkeersophopings vooraf 'n brandweeraanval bv. by 'n besondere interseksie aankom, en is ook bedoel om tye gedurende spitspieke korte te probeer maak. Nadat die brandweeraanval die interseksie is, volg daar 'n "skoonvermeting" om die ophopings wat intussen in die systeem ontstaan het, uit die weg te ruim.

Die tydrelings in verband met hierdie noodroetes is deur middel van toetsrite in die strate deur die verkeerstak van die stadsingenieur se departement vasgestel.

Die beheerkamer:

Die uitleg van die beheerkamer word in Fig. 14 aangetoon.

Die agterste konsole is op 'n platformverhoog aangebring en word deur 'n verkeersingenieur beheer. Binne bereik van sy hand is daar die visuele waarnemingseenheid, die stelsel se waarskuwingspaneel, die dataregisterertikmasjien en 'n monitorerdeer vir die gesloteaan-tevisiestelsel. Die beheerkamer en die algemene televisiemonitordeerde is aan die voorwand gemonteer.

Die stelsel se waarskuwingspaneel behels die hoorbare alarmstelsel in verband met defekte in 'n uitskakelaarsleutel, die noodroetekeysers en die komperstandligties. Die beheerkamer gee die operateur 'n geheelheid van die stelsel se stand aangesien daar vir elke interseksie indikatorligties is wat defekte, gekoppelde/ongekoppelde stand en groenligstadia aandui. Dan is daar ook ligties wat flikker wanneer daar 'n tou by 'n detektorplaas begin ontwikkel. Elke interseksie en detektor se beheernummer in die stelsel verskyn duidelik op die beheerkart en hierdie nommer word deurgaans gebruik om die buitestatie uit te ken of met hom in verbinding te tree.

Die gesloteaan-tevisiestelsel:

Die stelsel is 'n 50Hz stelsel met 625 lyne, en die tien kameras is by die plekke wat in Fig. 16 aangetoon word, op pale van 60 voet hoog gemonteer.

Elke kamera is in 'n weerbestande hulsel ingebou en het afstandbeheerde ruitwassers en -veers. Die kameras het telefotolense van 40-

Plan preparation and plan entry:

Once a set of timings for a traffic plan has been determined, irrespective of the method used, a plan source paper tape is produced by manually punching the tape on either of the two punches. This tape is then processed by a plan preparation programme while the system is on line. The purpose of this programme is to verify that all the data is valid and does not conflict with any of the safety features built into the data base. For example, minimum green limits and stage change violations. The result of the plan preparation routine is the output of a further paper tape which is in basic machine language. This tape is then read into the computer and stored on the disc for use as and when required. Any errors which are detected are output on the typewriter so that the necessary corrections can be carried out.

Operator Facilities:

The operator can stream the computer output to any output device, whether the alarm and fault logging functions are always output to the main system typewriter in the Control Room. The VDU is used for gaining information at a fast rate from the system where a hard copy is not required and of course, saves a vast amount of paper.

The operator is able to command and cancel many functions among which are the following – this list is not complete however, it is an example of what is possible.

1. Plan selection
2. Vary timings
3. Monitor a controller – i.e. timings.
4. Isolate a controller
5. List the status of a controller i.e. plan No., isolated, etc.
6. List system faults which have not been cleared
7. Acknowledge on occurrence and cancel faults when cleared.
8. Change the offset between two intersections.
9. Selection of sixteen emergency routes.

Emergency Routes:

This facility enables a special set of timings along a particular route to be introduced at the push of a button, in order to facilitate the movement of an emergency vehicle such as a fire tender or ambulance along that route. As mentioned, sixteen routes or sets of timings are available and it is possible to terminate the route at a nominated intersection en route or allow the route to carry through to the programmed terminal intersection. The timings include a congestion clearance routine, prior to the arrival of a tender arriving at an intersection, which will attempt to clear the queues during peak periods. This is followed by a further congestion clearance routine after the tender has passed, to clear the congestion created on the side roads. The timings for these routes have been determined by the City Engineer's Traffic Division by means of street test runs.

The Control Room:

The control room layout is shown in Fig. 14.

The rear console which is on a raised platform is manned by a traffic engineer and he has at this finger tips the VDU, the System Alarm panel, the logging typewriter and a CCTV monitor. The mimic map and general TV monitors are mounted in front.

The system's alarm panel holds the audible alarm for faults and cancellation key, the emergency route selectors and the computer status lamps. This mimic map enables operators to have an overall view of the system status as each intersection has a fault indicator lamp and an on/off line indicator lamp as well as the stage green indicators. Also, there are queue indication lamps at the detector site which flash in the event of a queue developing. Each intersection and detector has its system control number denoted clearly alongside. This number is used for identifying the outstation and is used for addressing in all instances.

The Closed Circuit Television:

The CCTV is a 625 line 50Hz system with the ten cameras are mounted on 60-ft poles at the sites indicated in Fig. 16.

Each camera is mounted in a weatherproof housing with a remotely controlled windscreen washer and wiper. Cameras are fitted with a 40-

200 mm en kan in 'n volle sirkel van 360° geswaai en van 'n horizontale tot 'n vertikale posisie gerig word.

Die kameras lever aan 'n kompensator en 'n versterker by die moniteerde en die tien moniteerders is aan weerskante van die beheert kaart gemonteer.

Dit is moontlik om enige beeld, tesame met die kamerakontroles, na enigeen van die drie posisies op die konsoles te projekteer en oor te plaas, soos in Fig. 17 aangegetoon.

Slot:

Wanneer hierdie stelsel in werking tree, sal die stad 'n hulpmiddel hé waarmee hy die verkeer veel doeltreffender sal kan hantere en waar daar veranderinge aangebring word, sal dit moontlik wees om die uitwerking daarvan feitlik onmiddellik waar te neem en te bepaal of die verandering 'n verbetering was al dan nie. Daar word gehoop dat die nuwe stelsel tot voordeleiger gebruik van die bestaande pasie sal lei en gevoldlik die bou van duur snelwéé voorkom. Hierdie stelsel kos R1,3 m ten opsigte van 104 interseksies, terwyl die huidige boukoste van 'n gewone pad met vier rybane, soos bv. Brickhillweg, R600 000/km is – 'n ontstellende feit, nie waar nie!

Ek het vroër opgemerk dat kompers by hierdie type stelsel vir die algemeen net 'n program-biblioteek is. Die opstel van die programme vereis egter so 'n ontsaglike hoeveelheid werk dat daar tans oor die hele wêreld navorsing gedoen word na 'n stelsel wat hierdie hope werk uit-skakel, en dan word dus gestrew dat 'n optimaliseringsoortie vir 'n gekoppelde verkeersplan wat op verkeersdigtheid reageer en die plan dienooreenkomsdig otomaties wysig. Ons stelsel is met die oog hierop ontwikkel en kan in die toekoms by so 'n roetine aangepas word.

Met erkenning teenoor:

Die Stads-elektrotechniese Ingenieur.

200mm zoom lens and may be panned through 360° and tilted from horizontal to vertically down.

The cameras feed a compensator and amplifier at the monitor and the ten monitors are mounted on either side of the map.

It is possible to switch any picture, together with the camera controls, to any one of the three positions on the consoles, as shown in Fig. 17.

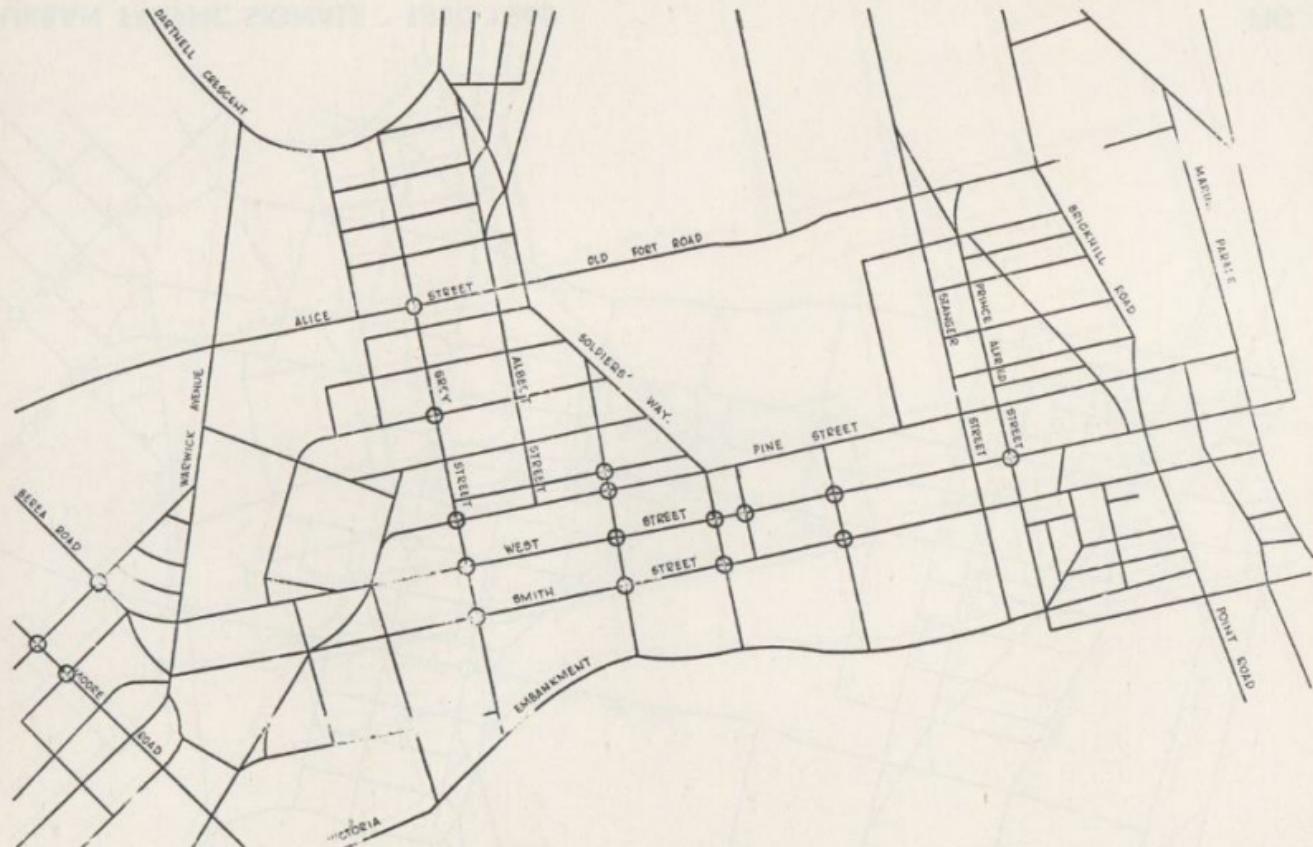
Conclusion:

When this system is commissioned the City will have a tool with which it will be able to manipulate the traffic far more efficiently and, having made changes it will be possible to observe the results almost instantaneously and assess improvements or otherwise. In this manner, it is hoped that better use will be made of the existing roads and hence, forestall the construction of costly freeways. When one considers that this system costs R1,3m for the benefit of 104 intersections and that the present construction cost of a normal fourlane dual carriageway road, i.e. Brickhill Road, is R600 000/km – that alone is rather a startling fact.

Although I mentioned earlier that generally the computers, in this type of system, store a library of programmes and, in view of the vast amount of work involved in preparing these plans, research is being carried out around the world to obviate this. The aim is to have an online traffic plan optimisation routine responding to traffic volumes and varying the traffic plan accordingly. It was with this in mind that our system was developed and it could be adapted for such operation in the future.

Acknowledgements:

The City Electrical Engineer

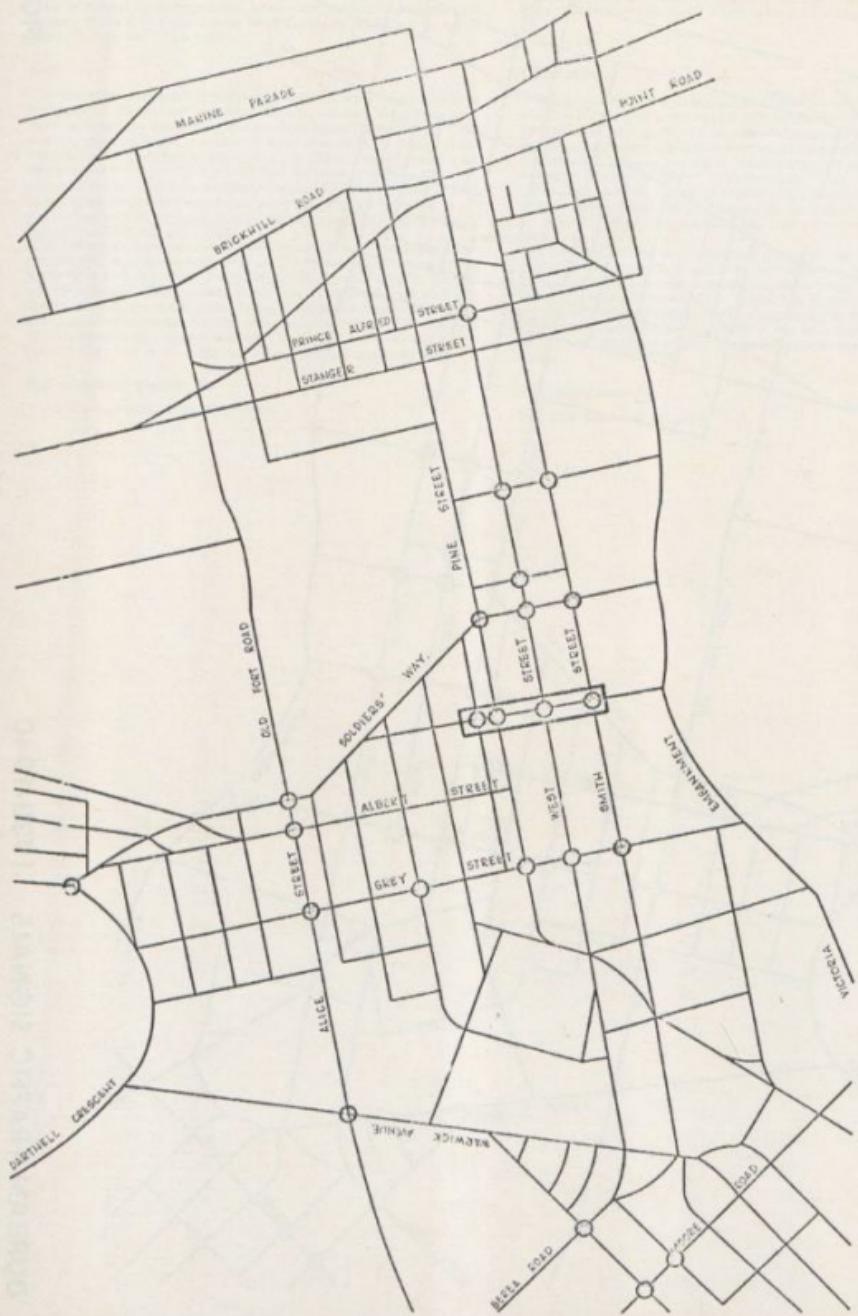


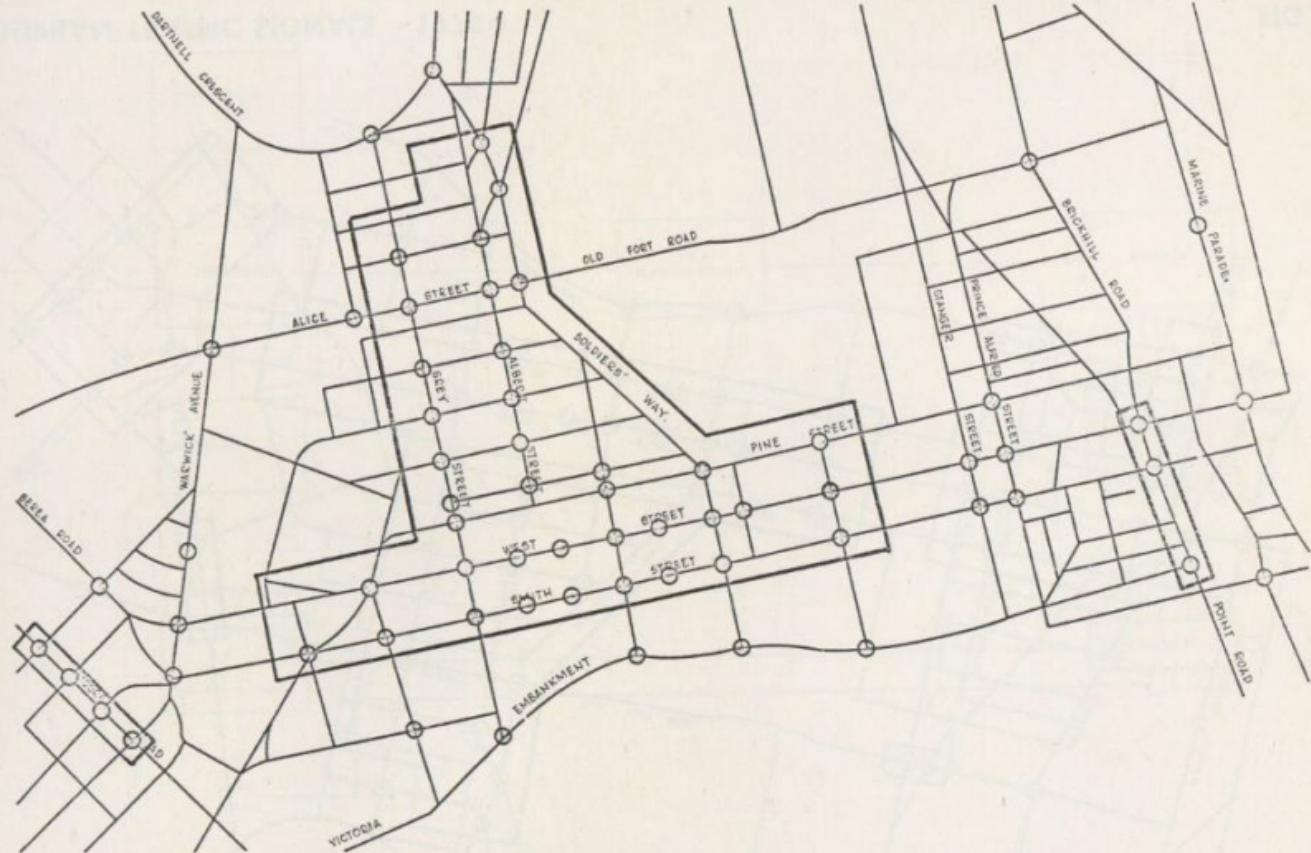
DURBAN TRAFFIC SIGNALS 1930-1940

FIG. 1

FIG. 2

DURBAN TRAFFIC SIGNALS 1950-1960



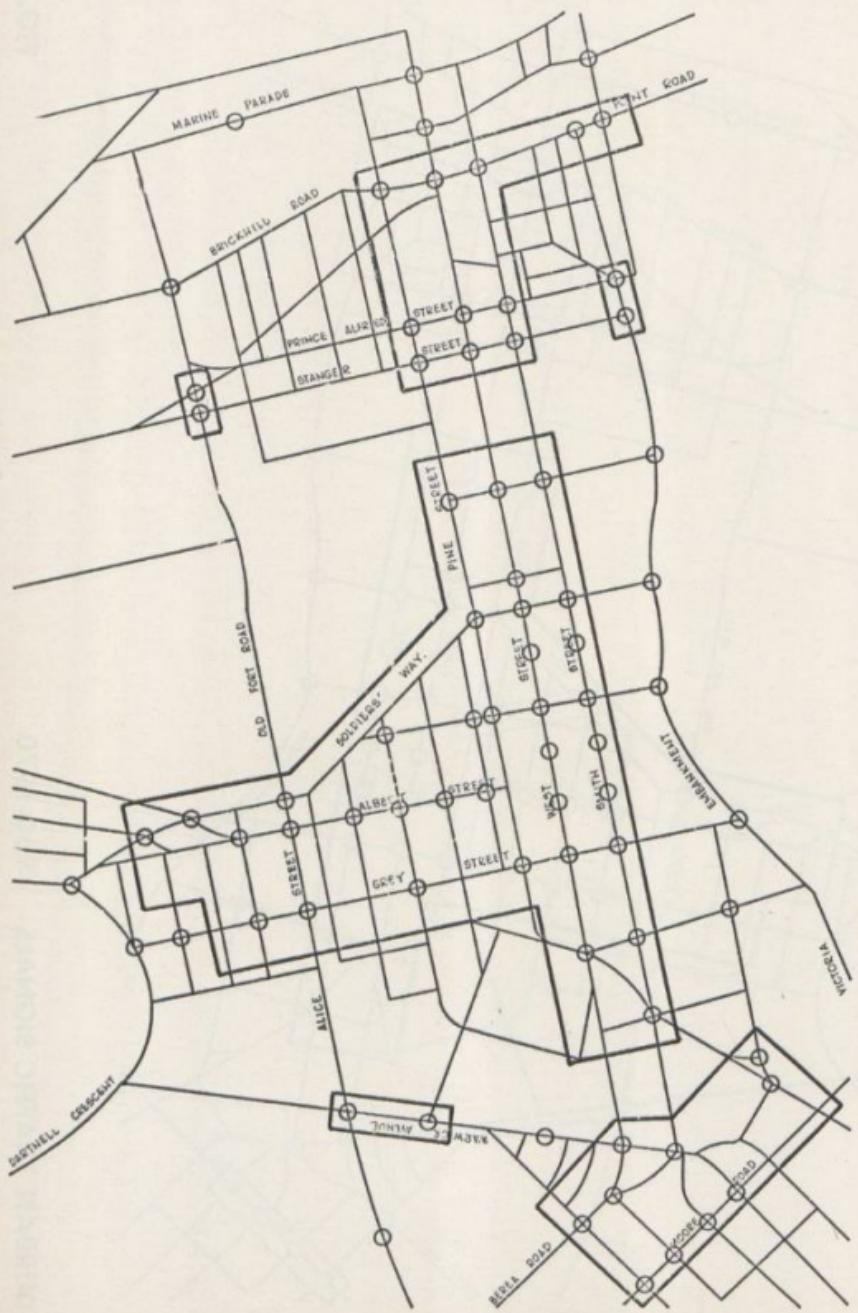


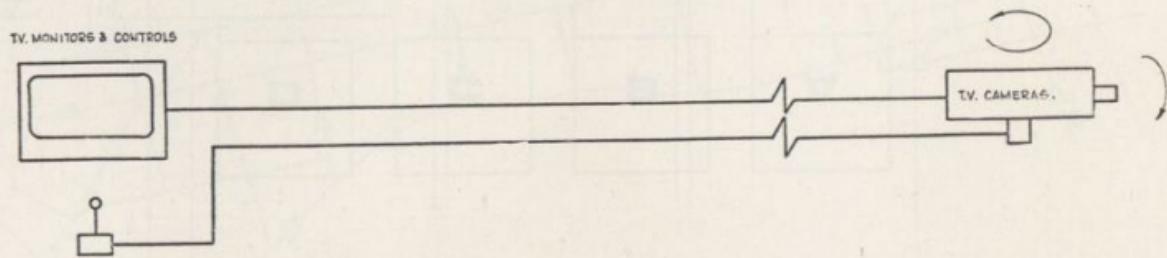
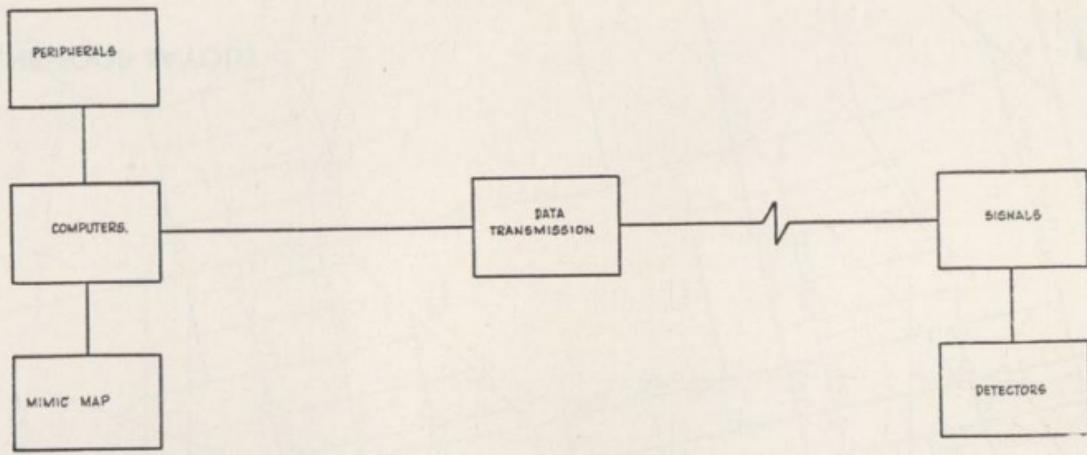
DURBAN TRAFFIC SIGNALS 1960-1970

FIG. 3

FIG. 4

DURBAN TRAFFIC SIGNALS 1970◆





GENERAL ARRANGEMENT

FIG. 5

FIG. 6

THREE LANE LOOP LAYOUT

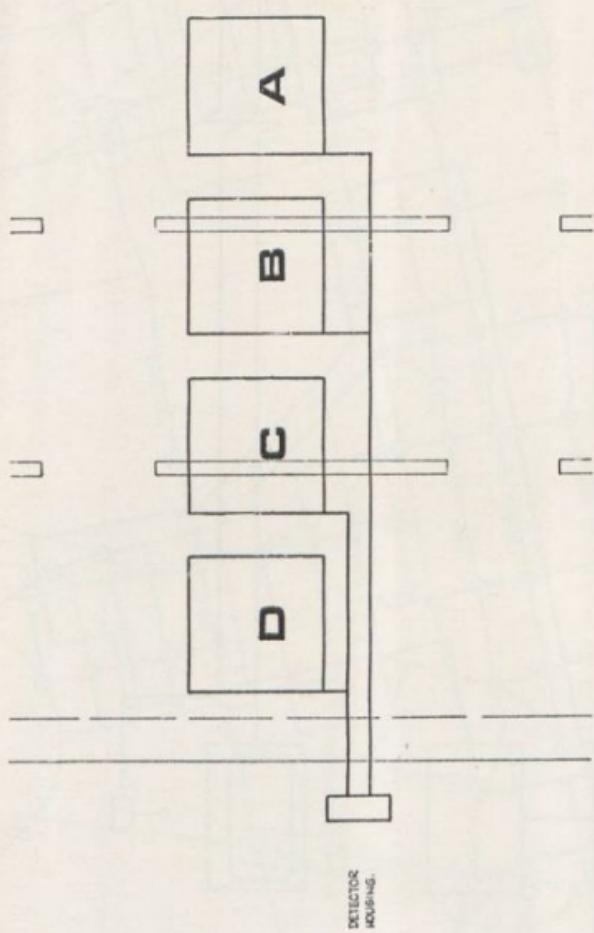
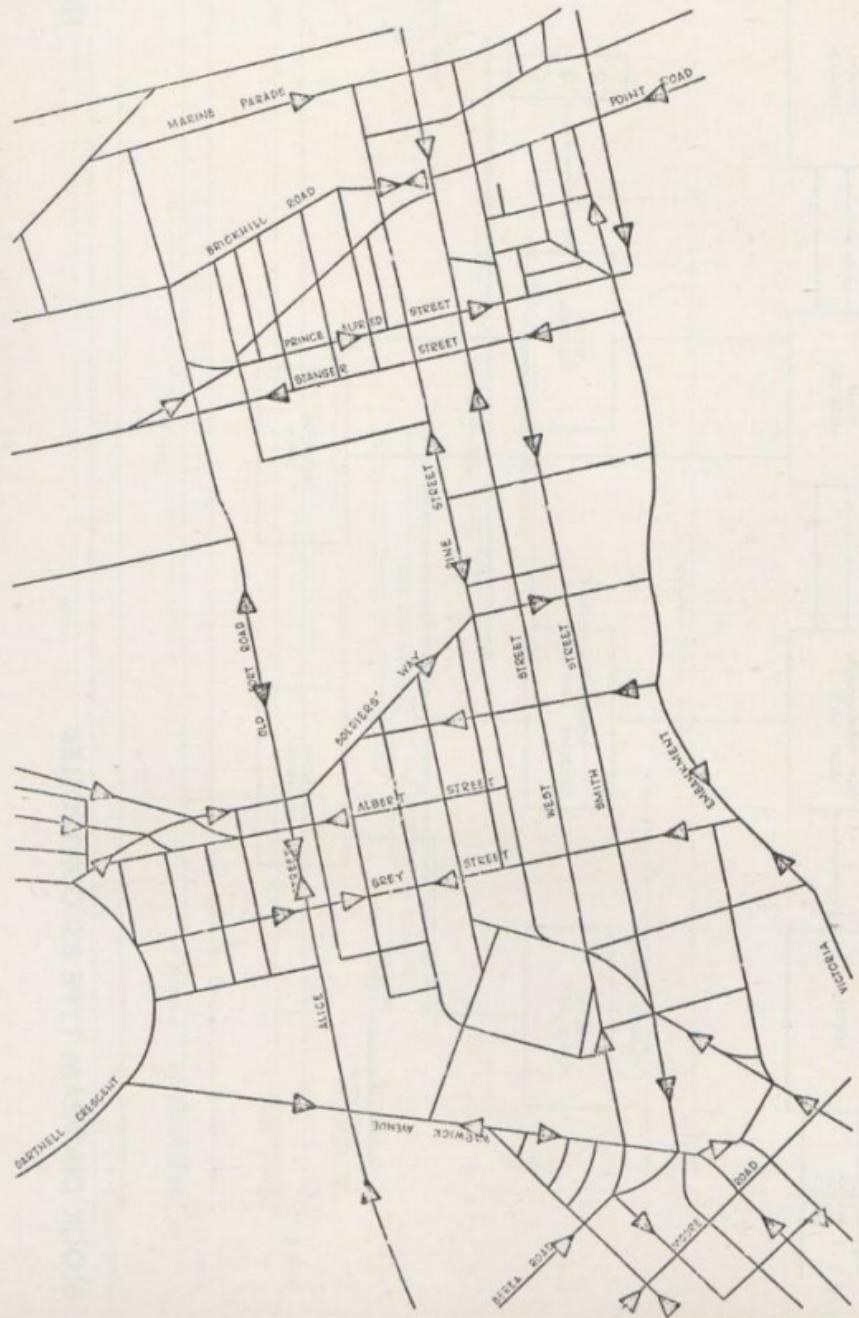
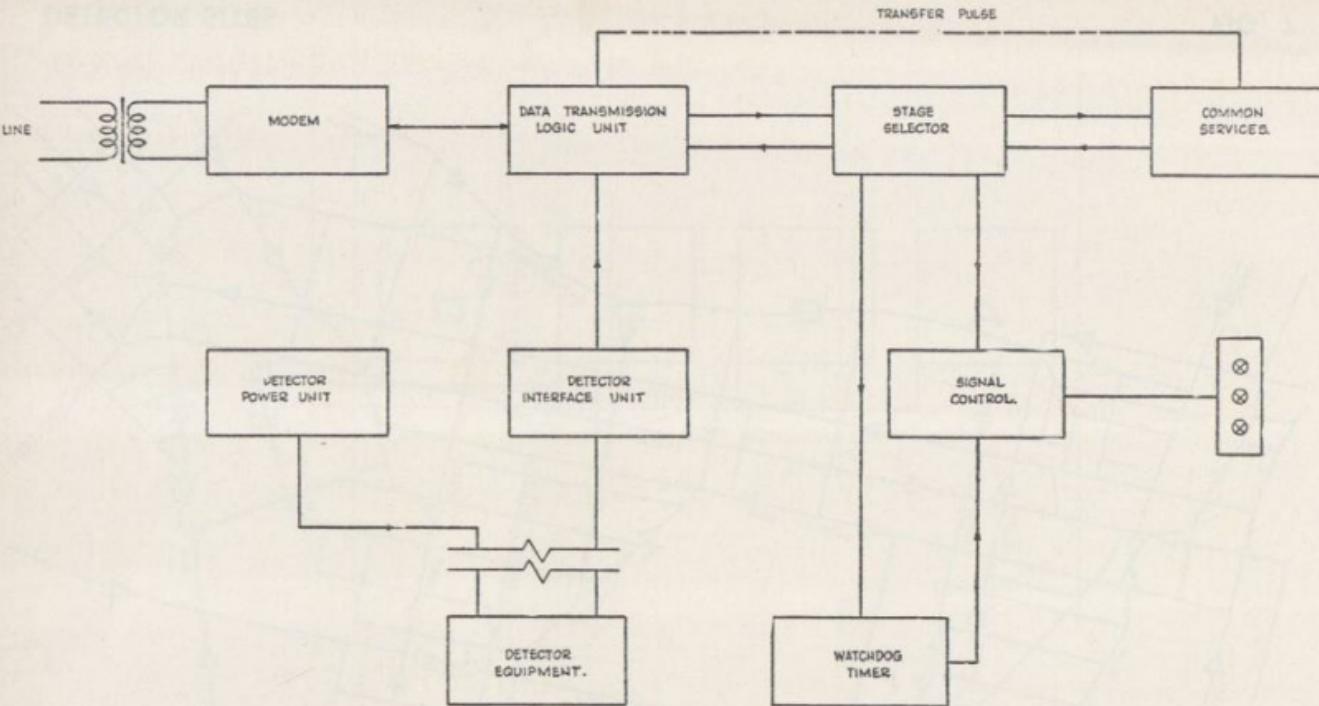


FIG. 7

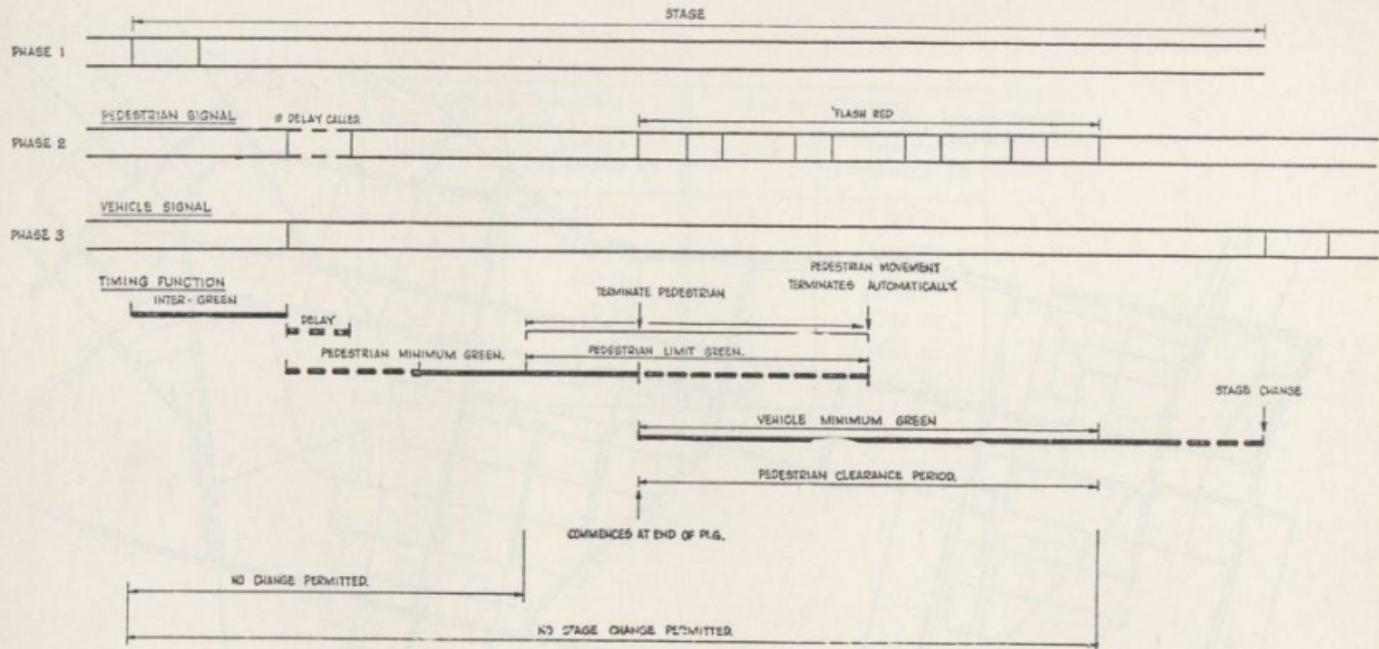
DETECTOR SITES





BLOCK DIAGRAM TYPE 85 CONTROLLER

FIG. 8

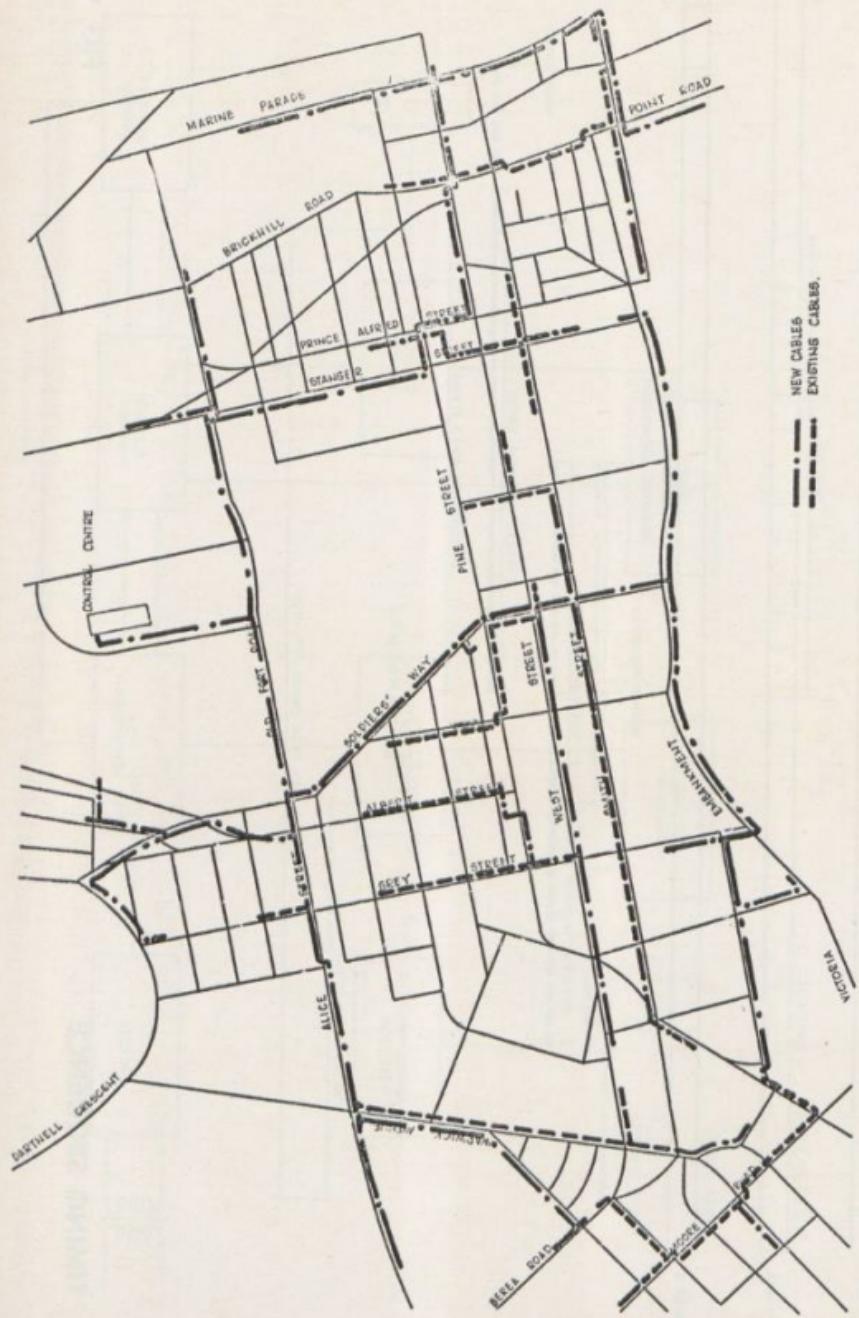


TIMING SEQUENCE

FIG. 9

FIG. 11

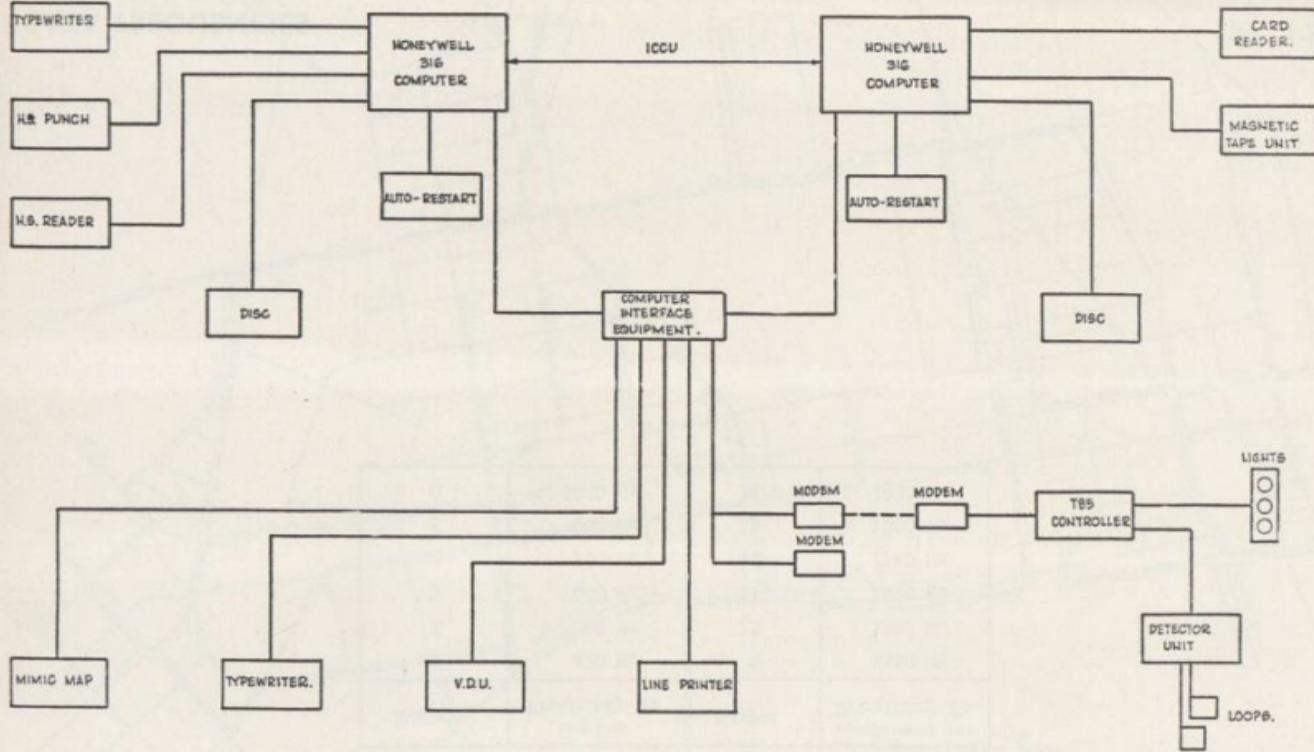
CABLE LAYOUT



Transmit Channel		Receive Channel	
Number	Centre Frequency f_0	Number	Centre Frequency f_0
1	420 Hz	9	1380 Hz
2	540 Hz	10	1500 Hz
3	660 Hz	11	1620 Hz
4	780 Hz	12	1740 Hz
5	900 Hz	13	1860 Hz
6	1020 Hz	14	1980 Hz

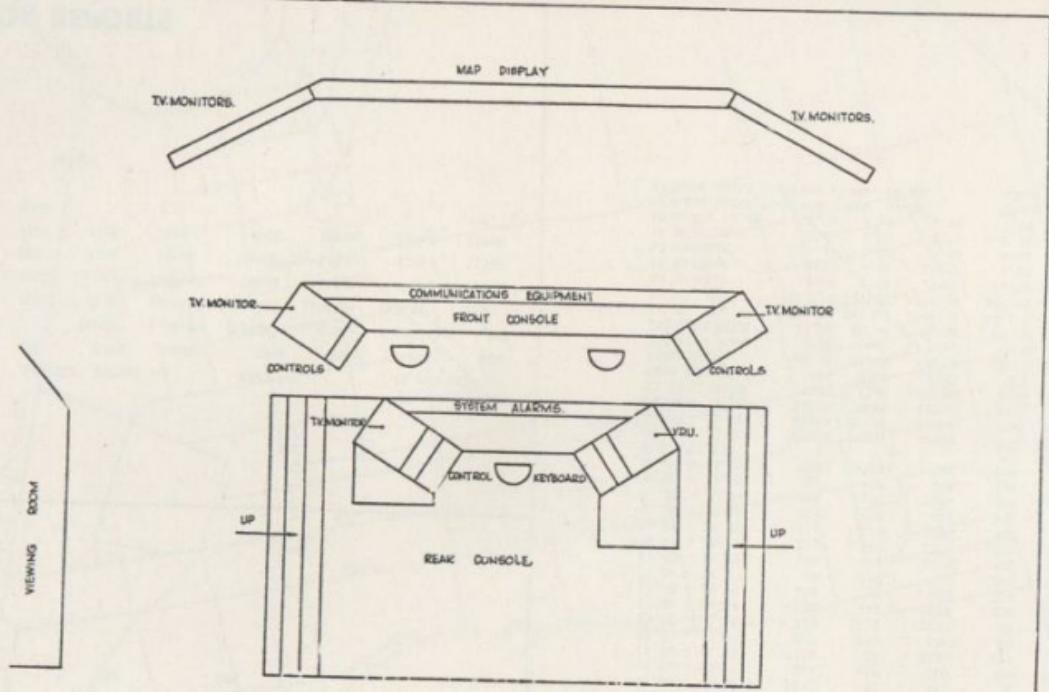
DATA FREQUENCIES

FIG. 12



SYSTEM CONFIGURATION

FIG. 13



CONTROL ROOM LAYOUT

FIG. 14

10.00
 08.30 FLOW 5223 12 AUG 1974
 08.10 2400
 08.15 2340 - 2%
 08.20 2400 + 2%
 08.25 2160 - 10%
 08.30 720 - 67%

10.30 MONTHLY REPORT 5223 19 AUG 1974
 MON TUES WEDS THUR FRI SAT SUN
 21 JUL (6488) (7048) (15688) (4068) (9504) (72)
 22 JUL 28 JUL (4688) (6728) (10488) (10504) (10848) (10656) (11600)
 29 JUL 4 AUG (9000) (6304) (10464) 10648 11008 10632 11688
 5 AUG 11 AUG 9008 6816 10528 10528 11000 10488 11928
 12 AUG 18 AUG 8784 7128 10504 8248 10976 10568 11960
 19 AUG 9040

TOTAL FOR MONTH 191480

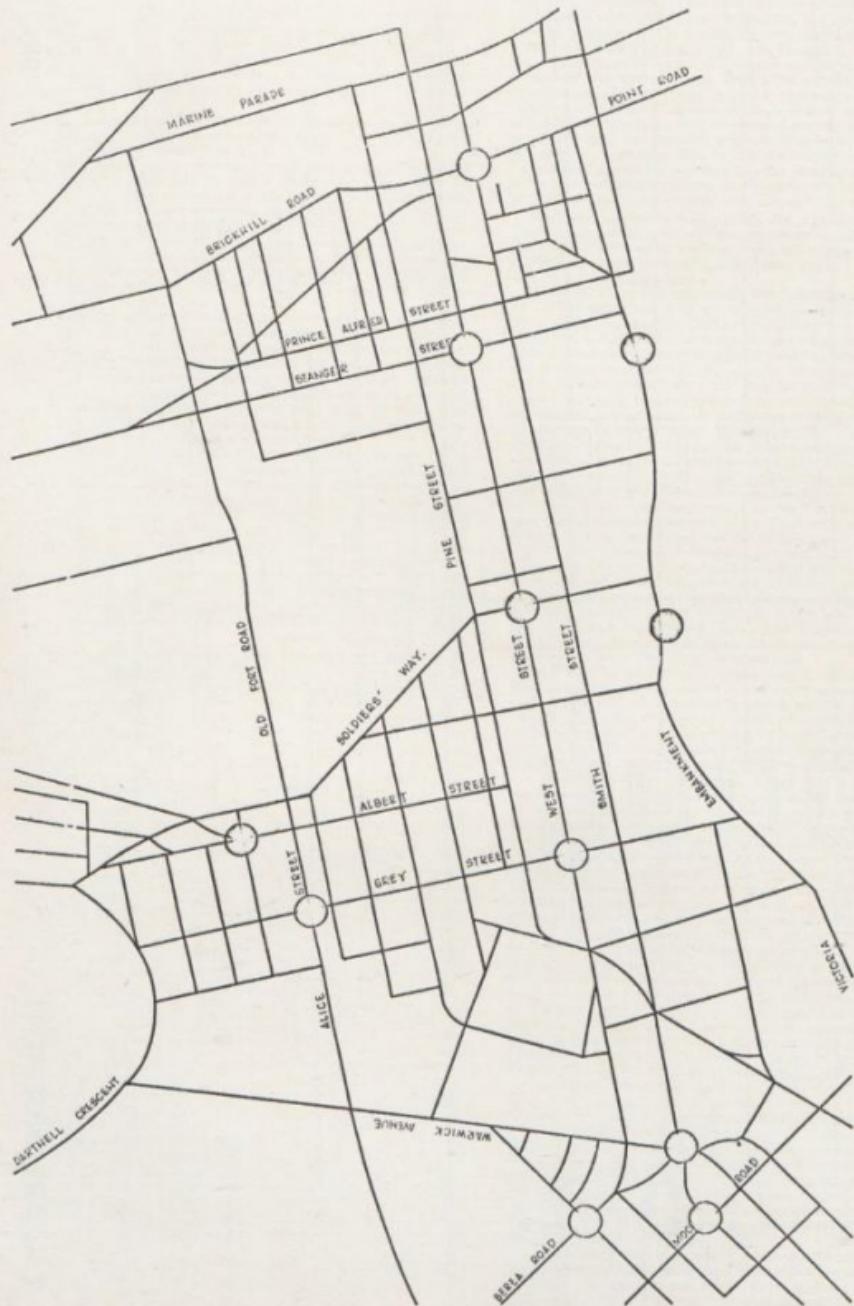
	WEEKLY REPORT						5223	19 AUG 1974
	MON	TUES	WEDS	THURS	FRI	SAT	SUN	
00.00 - 00.59	1585	32	2384	24	8	154	32	
01.00 - 01.59	140	712	2392	712	952	960	1440	
02.00 - 02.59	1440	720	2384	354	960	952	1432	
03.00 - 03.59	1440	720	2392	712	960	960	384	
04.00 - 04.59	1440	720	2392	720	32	960	24	
05.00 - 05.59	1440	720	2392	720	312	952	16	
06.00 - 06.59	1440	720	2152	304	288	960	72	
07.00 - 07.59	1440	720	2072	192	960	360	1160	
08.00 - 08.59	1440	720	2392	640	960	352	1440	
09.00 - 09.59	1432	552	960	8	152	360	864	
10.00 - 10.59	664	960	968	88	664	360	288	
11.00 - 11.59	1520	24	2384	224	8	360	496	
12.00 - 12.59	968	952	680	88	96	352	376	
13.00 - 13.59	720	1032	1232	48	224	24	816	
14.00 - 14.59	712	248	1976	656	840	1432	408	
15.00 - 15.59	256	712	352	288	144	2152	504	
16.00 - 16.59	34	720	34	240	304	1448	440	
17.00 - 17.59	328	400	2296	472	304	1432	112	
18.00 - 18.59	712	648	2376	952	352	1424	384	
19.00 - 19.59	712	704	2384	960	352	1432	448	
20.00 - 20.59	224	1400	872	952	96	1432	376	
21.00 - 21.59	664	1120	2384	352	848	1432	288	
22.00 - 22.59	792	632	712	968	200	1432	1232	
23.00 - 23.59	720	2392	96	960	320	1432	1440	
FLOW TOTALS								
00.00 - 23.59	23552	18280	40688	11664	10336	21144	14472	
06.00 - 21.59	13256	11632	25544	6464	6592	15312	8472	
07.00 - 18.59	10216	7688	17752	3896	5008	10056	7288	
07.10 - 16.19	5376	3760	10160	2504	3032	5376	4400	
PEAK FLOW	1584	2392	2392	968	960	2152	1440	
PEAK TIME	00.00	23.00	08.00	22.00	08.00	15.00	23.00	
2ND HIGH FLOW	1520	1400	2382	960	960	1448	1440	
2ND HIGH TIME	11.00	20.00	05.00	19.00	07.00	16.00	08.00	
24 HR. AVE	981.33	761.66	1695.33	486.00	430.66	964.33	603.00	
16 HR. AVE	828.50	727.00	1596.50	404.00	412.00	957.00	529.50	
24 HR./PEAK	14.86	7.64	17.01	12.04	10.76	10.75	10.05	
16 HR./PEAK	8.36	4.86	10.67	6.67	6.86	7.11	5.88	
12 HR./PEAK	6.44	3.21	7.42	4.02	5.21	4.07	5.06	
16 HR./6 HR.	2.46	3.09	2.51	2.58	2.17	2.84	1.92	
PEAK/AVE 24 HR.	1.61	3.14	1.41	1.99	2.22	2.28	2.38	
AVERAGE DAILY FLOW MON - FRI 24 HR.				20904				
AVERAGE DAILY FLOW MON - FRI 16 HR.				12696				

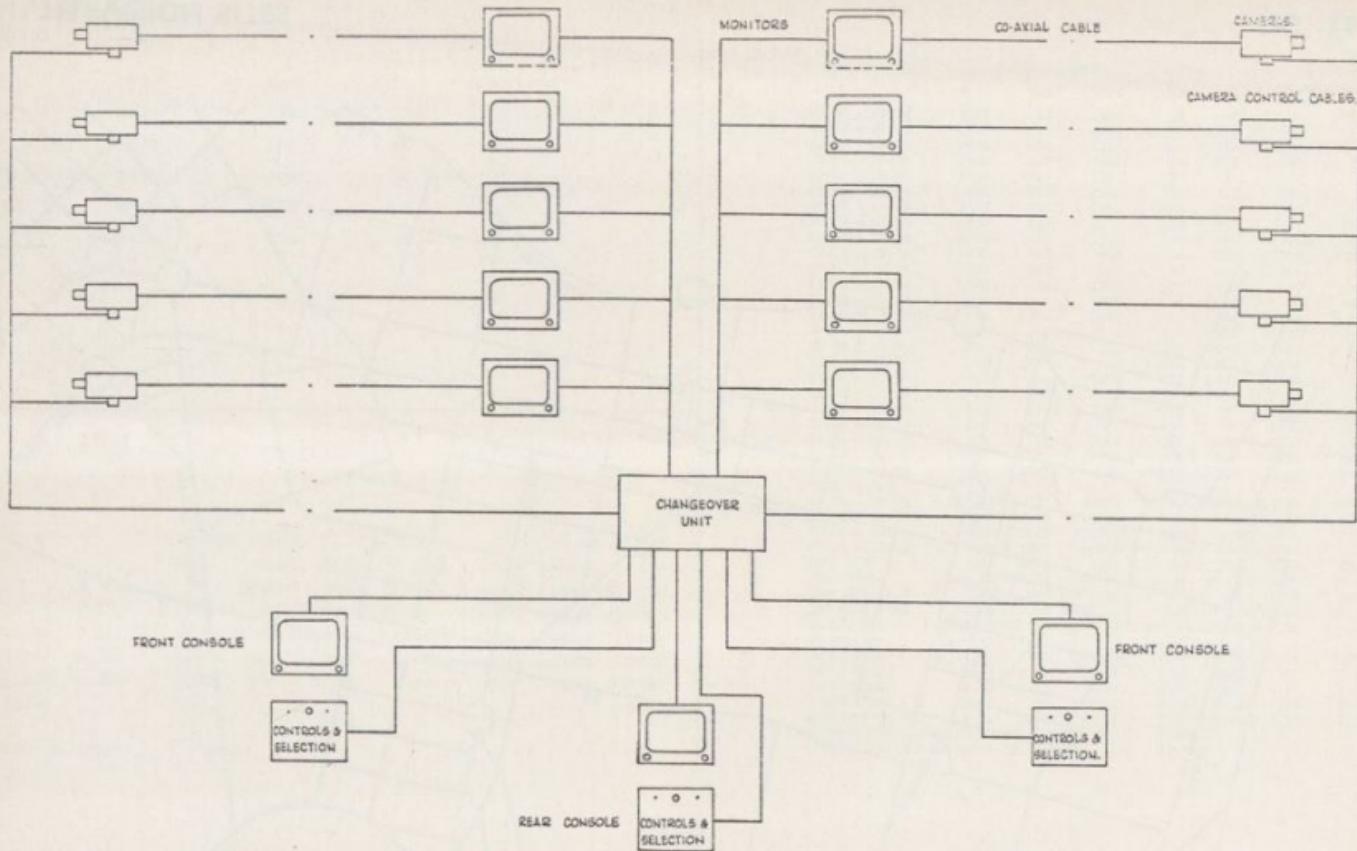
DETECTOR REPORTS

FIG. 15

FIG. 16

TELEVISION SITES



**FIG. 17**

Mr. S. Folgosa (Affiliate): In his excellent paper Mr. Whitehead conveyed very clearly the idea that the computer in an area traffic control system is a flexible and convenient part of a fairly complex system.

I would like to mention some traffic engineering ideas which lead to an understanding of the present stage of successful application of computers to area control well beyond simple fixed time control.

With the present trend in the minicomputer field it is expected that systems using Master Controllers (that is purely hardware systems) will in future only be used in networks of not more than 20 intersections.

The endless possibilities offered by the computers to the traffic engineers and scientists has encouraged them to design systems using the most advanced control techniques.

But away from the laboratory and being faced with the problem of controlling the traffic flow through a network one realises that the control loop in such a control system has many inherent weak points.

Motorists and Pedestrians are given visual indications which are not immediately nor necessarily effective. Furthermore certain information about the traffic, like for example the origin and destination of individual vehicles cannot be made available via the feedback path.

Therefore one cannot expect to achieve control over individual vehicles but must rather take the entire flow in the network into account.

If further development follows along the lines of recent advances in technology one would expect LSI to make available micro-computers to control the signals at each intersection, these in turn being co-ordinated by a Master Computer. However intersection equipment costs in this case will be considerably higher than those of present equipment. It is unlikely that a city with say 200 intersections will install intersection equipment costing an average of R5 000,00. The maintenance problems with such a large number of complex equipment installed at the road side would be colossal.

The limited information supplied by measuring stations in the system must certainly be supplemented by the results of traffic surveys and on-the-spot observations. Only then can that information be meaningful and provide a picture of the prevailing traffic situations.

The street network is designed to cater for predominant traffic flows along certain routes, to and from the city centre. It is logical to design the basic timing frame for the traffic on the basis of typical flow patterns. Optimized signal plans for basic traffic situations are related to the geometry of the network and there is therefore no reason why they should be generated on-line, according to traffic conditions but based on a model for the particular network derived after many assumptions and taking into account all the required clearance times etc.

Each plan has a certain capacity and will apply to a certain flow. Selection of plan on the basis of time of day is satisfactory in the initial stages to allow for minor corrections and to evaluate the result of assumptions made about the behaviour of the traffic stream.

Since traffic situations do not necessarily occur at pre determined times it is essential to make the selection of signal plans on the basis of actual traffic conditions. This step will follow that of clock selections.

It must be mentioned at this stage that the number of basic signal plans does not in general exceed 10 because each optimised signal plan is not very sensitive to very large changes in flow. Apart from this, frequent changes should be avoided since a signal plan change for a network introduces delays in the order of half a minute for each vehicle.

How can we cope with the short term fluctuations in traffic flow?

One way to achieve this is to consider the critical intersections in the controlled area and to provide them with special signal plans within the optimized pattern for each basic signal plan. The equipment delays during change over. Strategically placed detectors about the critical intersections provided the required additional information. One can then achieve a reaction time of the order of 1 minute.

The detector information to be used for such fine control is not the actual volume or occupancy of the loops but exponentially smoothed values so that accidental fluctuations do not induce system instability. This data processing feature is ideally suited to computer control and is used in the control and measurement of time variant phenomena.

In describing the Durban system, Mr. Whitehead mentioned that in the event of breakdown of the Control Computer during off-line work, the stand-by Computer can be reloaded with the control system by the operator. Whereas the use of an off-line machine has its merits when the amount of off-line work is considerable the additional cost cannot be justified in terms of the standby facility alone if the off-line work can be carried out in a normal data processing centre.

The high reliability of the computer itself is not matched by the peripheral equipment in a control system and a few expected failures will occur during peak traffic conditions. An immediate standby facility can be provided by a Master Controller with single signal plan and the system will remain under co-ordinated operation. However, such standby as provided could be used in a system where all intersections would revert to vehicle actuated operations in the event of a failure in the central equipment.

No standby power supply seems to be provided for the equipment in the Control Room, so that in the event of a power failure all form of Central Control is lost.

To terminate I would like to suggest the idea of a on-line performance-index evaluation for area control systems. This could

take the form of pilot vehicles travelling in predetermined routes within the network and supply the computer with information about travel time or journey time and number of stops plus stopped time. This information would be transferred from a loop under the pilot vehicle to a loop embedded in the road surface. The operator would then have an indication of the system efficiency during peak hours.

Mr. D.C. Palser (Cape Town): Mr. Durban and Cape Town computerised traffic control systems are generally very similar in both size and type. Both cities employ the widely used "signal plan selection" control system as opposed to the less common "signal plan generation" system. In the "selection" system the vehicle actuated loop detectors continually sense changes in traffic patterns, to which the computer responds and selects from its memory an appropriate pre-calculated plan to suit the change conditions. In the "generation" system the loop detectors also sense movements in traffic patterns, but this information is used by the computer to calculate the optimum plan for the particular conditions pertaining at the moment.

Mr. E.A. Trautmann (Ladysmith): Just a short question. You did speak about the actuators who are controlling the signals and I would just like to know whether you have a retarded cycle at night time when traffic is slowing or is all switched to amber, and how does a car switch over to a cycle control then.

Mr. W. Barnard (Johannesburg): The author is to be congratulated on his interesting and informative paper which describes the many facets of the computerised traffic signal system in a manner which is readily understandable. The many benefits which result from the introduction of such a system are equally clear and serious consideration will probably be given to the introduction of such systems elsewhere.

The most important feature of a computer controlled system are the synchronisation of adjacent intersections and the ability to select traffic plans in accordance with the traffic flow at various times of the day. These features are, however, also present in various synchronised systems to a greater or lesser extent. Johannesburg began with the installation of an electronic synchronised traffic signal system in 1975 and this system now consists of 275 intersections controlled from one master controller and 58 intersections controlled from a second master controller. The system has proved to be very flexible and as a result of various modifications incorporated over the years, it will probably continue to serve Johannesburg well for many years to come.

The controllers make provision for 3 different splits of the cycle and 3 offsets giving 9 basic traffic plans. In addition, it is possible to vary the cycle time over a large range to cater for widely varying traffic conditions. Programme plugs are used to determine the split and offset making it possible to exchange controllers or to alter settings without any special work being required in the field. This is complemented by an "all amber" safety circuit which will set all the signals to amber in the event of conflicting signals being shown.

There are a further 340 electromagnetic traffic signal controllers outside the central business district and in many cases it has been found necessary to link these together in groups ranging from 5 to 20. By changing the offset it is possible to cater for tidal flows without introducing any further complication. One controller serves as a master and a time switch is used to select the appropriate offset. This low-cost unsophisticated system has proved to be most effective.

It may appear from the remarks above that a computer is not necessary but the system described by the author does have some important additional features. In the first place, it is possible to change the traffic plan at any given intersection without changing any other intersections. Secondly, a very much larger number of traffic plans are available making it possible to cater for unusual traffic conditions.

This flexibility would however have limited value in Johannesburg, particularly because of the small block grid street pattern. The volume of traffic is divided almost equally between east-west and north-south flows and there are a relatively small number of combinations of traffic plans which work satisfactorily. The task set for the Traffic Engineer becomes one of making fine adjustments to achieve the best possible results, which are probably not very effective in practice because the motorist will inevitably take the least line of resistance and forthwith upset the previous traffic pattern. As the author has pointed out, the calculation of traffic plans must be done in a separate computer using a large amount of data collected by hand. It appears, therefore, that given the same amount of effort in developing traffic plans, there is not a great difference between a computer controlled system and a good synchronised system when dealing with normal traffic conditions. The real benefit of the computer controlled system therefore appears to be in its ability to cope with abnormal traffic conditions.

Much of the power of a computer controlled system derives from the telecommunication network which gathers up to date information from the field and permits very specific and detailed commands to be sent to the field. A significant portion of the cost is allocated to this equipment since data rates are several orders of magnitude higher than is the case with older systems. Where existing communication cables are inadequate, the laying of new cables also constitutes a major cost item. This alone is sufficient to make the replacement of a good existing system unattractive.

A recent development promises, however, to provide a solution to the communication problems and to provide a number of additional facilities. The compact and robust micro processor which are now appearing on the market, could, when incorporated into the intersection controller, provide a degree of local intelligence which drastically reduces the amount of information transmitted to and from the central

computer. the micro processor may also be able to cater for short term deviations from the average traffic flow such as buses stopping, vehicles turning, empty lanes or reservoir areas which have filled up.

It will be readily accepted that the total traffic capacity of two streets which intersect is always somewhat less than half the capacity of two streets which are separated by a bridge or underpass. Traffic signals are therefore not a miracle low cost alternative to civil works, but a means of using existing road facilities to the best possible advantage.

Mr. H.R. Whitehead (Durban): Thank you Mr. President, Gentlemen, firstly I would like to thank the speakers for their kind words before I start. Mr. Folgosa mentioned another philosophy of control. There are various philosophies, Durban has chosen one, the one that Mr. Folgosa outlined is another and of course they all have their pros and cons. The short term variation he mentioned within a controller, certainly could have its merits. I must agree with him that the change of traffic plans over a short period does cause delays, there is no doubt about it. Although I mentioned that our automatic plan selection would be restricted to 20 minutes to avoid hunting, the restriction is also to avoid delays caused by too frequent changes. His proposal about a moving vehicle within the network is an interesting one. I would imagine it would be a radio communication problem more than anything else to get the information back to the computer.

As far as answering Mr. Trautman's question, I take it he was referring to the isolated form of control with vehicle actuation. I discussed the differentiation between pedestrian and vehicular calls in my paper. The road traffic regulations for a flashing red amber facility in light traffic conditions. We have not used that to any great extent in Durban. We would merely use the vehicle actuator to call the phases as required after peak periods. I hope that answers Mr. Trautman's question.

Mr. Palser from Cape Town, mentioned his plan selection and plan generation techniques. We found that as far as plan generation goes in the world today, no-one has really proved a system. They have tried it out, but as far as practical before and after studies are concerned, not much has been published. I think it was in Switzerland where a study was carried out comparing a generation technique to the transit system, that we use, and I think it proved quite conclusively that a fixed time programme was a far better arrangement. But as I mentioned in my paper, there are methods being developed by the RRL certainly in the UK and research is being carried out in the USA. The method of course would obviate all this tedious data collection. To answer Mr. Palser's 1st question about the total over all cost, the answer is "Yes", R1.3 m is the total overall cost for the entire system, including departmental works.

The comparative accuracy for the N and N+ techniques. We did try

an N system on the Southern freeway but we found the lane discipline in Durban definitely reduced the accuracy quite considerably. Our accuracy per cent, we found to be better than that, in fact we are hoping that will be the worst we will achieve. It's all a matter of lane discipline, if the traffic adheres to the lane, you will get an accurate count.

The problem is in selecting the position of the detector, if you place the detector where there is a lot of weaving taking place, with the N loop system, you will more likely to have inaccuracy, but if CT have positioned their detectors carefully, I have no doubt that they will achieve accuracy.

As far as timing between traffic plan changes I did cover that in discussing Mr. Folgosa's comments. We feel that 10 minutes is as short as you can go with a plan change to obviate any unnecessary delays.

The solder joints in the TV. We are still in the commissioning stages and as yet have not accepted the system from the suppliers and are unfortunately not in a position to comment at this stage. We haven't had sufficient experience.

In reply to Mr. Barnards comments in so much as being leaders, I must mention that Mr. Palser of Cape Town certainly set the ball rolling first, as far as getting a computerised system is concerned.

Mr. Barnard mentioned that their system having a master controller does not present any problems with changing timings, and they cope adequately. If that is the case then that is fine, our computer would fulfill the same function. As I said there is nothing magical about the computer, it is merely a convenient form for handling the data and storing the plans. The computer has the advantages that Mr. Barnard mentioned, but there is not much more to it. The other advantages that we have achieved of course, which I do not know whether Mr. Barnard has, but I am certain he could achieve if necessary, the feed back of faults from intersections. It is a feature we did not have when we had a master control system and this was one of its major disadvantages. The microprocessors he mentioned are being investigated for a ground ring-road which the City Engineer is planning to construct, starting the Central Business District of the city to link the Southern and Northern freeways, this in other words is a ring road at ground level. We are considering this type of micro processor, which is, as far more expensive controller itself, for this type of system to achieve the desired flexibility. This system would be independent of the network because of the prime object on this ground ring would be to keep the traffic moving from North to South and vice versa. The micro processor would certainly provide a far more flexible form of control as network system is rather rigid. As far as the replacement of freeways, I didn't mean to indicate that our system would replace a freeway, it might forestall construction but that is all, it certainly would not replace the freeways. Thank you.

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Middel: G. Aalbers (Wellington), P.S.J. Brink (Hermanus), J.G. Brümmer (Stellenbosch), P.G.J. Mans (Riversdal), D.C. Palser (Cape Town), T. Pollack (Gordonsbaai), J.A. Venter (Kaapstad), J.G. Hugo (Bredasdorp).

Voor: I. Hess (Retired), H.C. Dreyer (Paarl) Streekverteenwoordiger, C.P. Du Plessis (Worcester) Onder-voorsitter, K.J. Murphy (Somerset West) Chairman, A.C.T. Frantz (Retired) Hon. Secretary, P. Du P. De Villiers (Onder-Burgemeester – Paarl), A.G. Scholtz (Voors. Elek. Kom. – Paarl).

MR. H. WOOD

SENIOR CITY ELECTRICAL ENGINEER, CAPE TOWN

Born in Lancashire, England and held various distribution engineering posts in Southport and Brighton prior to emigrating to South Africa in 1952.

Spent six years in the RAF bomber command engaged on the maintenance of instruments and electrical installations in aircraft in England, West Africa and South Africa.

Qualified as a graduate of the IEE in 1949 and subsequently became a corporate member in 1958. Elected a member of the South African Council for Professional Engineers in 1969.

Worked as a Technical Assistant with the Johannesburg Electricity Department from 1952 to 1955 before moving to Cape Town; Electrical Engineer engaged on the design and construction of the overhead and underground distribution networks.

In 1959 was promoted and took charge of the rapidly growing Street Lighting Section and since that time has been responsible for the design and installation of all the freeway, high mast and suburban lighting in Cape Town as well as the design and construction of the decorative illuminations throughout the City.

Author of two technical papers namely *The Design and Economics of Township Reticulation presented to the AMEU in 1958* and *The Lighting of Freeways and Expressways presented to the SAEE (Cape Town) in 1963*.



DIE PRAKTIESE EN EKONOMIESE ASPEKTE VAN MODERNE STRAATVERLIGTING

DEUR H WOOD
Pr. Eng., C. Eng., M.I.E.E.

1.0 INLEIDING

2.0 DIE SUID-AFRIKAANSE GEBRUIKSKODE

3.0 LUMINANSIE OF ILLUMINANSIE

4.0 VERLIGTINGSMETODES

4.1 Gebruikelike Verligting

4.2 Hoëmasverligting

5.0 OORHANG VAN ARMATURE

6.0 DIE EKONOMIE VAN LAMPVERVANGING

7.0 VOORSTEDELIKE STRAATVERLIGTING

8.0 GEVOLGTREKKINGS

9.0 DANKBETUIGINGS

10.0 BRONNE

1.0 INLEIDING

Hierdie verhandeling oor straatverligting word aangebied met inagneming van die vele voorstreliese verhandelinge wat tevore voorgeleg is aan hierdie en ander liggange in die Republiek, waarin die grondbeginsels van staatverligting beskryf word. Daar word dus nou oorgegaan na 'n kort besprekking van die Suid-Afrikaanse Gebruikskode en oorweging van sommige van die ander praktiese en ekonomiese aspekte wat nie in die Kode genoem word nie, maar wat nitemin van die grootste belang is vir openbare verligtingsingenieurs. Ten slotte word 'n opsummering gegee van 'n onderzoek wat ingestel is na die ekonomiese van die installasie van kwikkampverligting in voorstedelike strate, tesame met die faktore rakende die besluit van die Stadsraad van Kaapstad om alle wolframgloeidraadlampe in sodanige strate te vervang deur die kwikkamp tippe.

THE PRACTICAL AND ECONOMIC ASPECTS OF MODERN STREET LIGHTING

BY H. WOOD
Pr. Eng., C. Eng., M.I.E.E.

1.0 INTRODUCTION

2.0 THE SOUTH AFRICAN CODE OF PRACTICE

3.0 LUMINANCE OR ILLUMINANCE

4.0 METHODS OF LIGHTING

4.1 Conventional Lighting

4.2 High Mast Lighting

5.0 OVERHANG OF LUMINAIRES

6.0 THE ECONOMICS OF LAMP REPLACEMENT

7.0 SUBURBAN ROADWAY LIGHTING

8.0 CONCLUSIONS

9.0 ACKNOWLEDGEMENTS

10.0 REFERENCES

1.0 INTRODUCTION

In presenting this paper on street lighting consideration has been given to the many excellent papers previously presented to this and other bodies in the Republic describing the fundamental principles of street lighting and it is therefore now proposed to discuss briefly the South African Code of Practice and to consider some of the other practical and economic aspects which are not mentioned in the Code but are nevertheless of extreme importance to public lighting engineers. Finally, a summary of an investigation undertaken into the economics of installing mercury vapour lighting in suburban roads will be given together with the factors affecting the decision by the Cape Town City Council to replace all tungsten filament lamps in such roads by the mercury vapour type.

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2.0 DIE SUID-AFRIKAANSE GEBRUIKSKODE

Belingstelling in die ontwerp van straatverlichtingsinstallasies het 'n geweldige suid voorntre gekry met die ingebruikneming agt jaar gelede van die Suid-Afrikaanse Bureau vir Standarde se Gebruikskode insake Padverligting. Voorheen het ingenieurs op hierdie gebied gewoonlik die een of ander oorsese kode gebruik, of hierdie kodes aanpass om te voldoen aan hul eie vereistes of idees. Dit het daaroor gelei dat daar oral en in die land 'n totale gebrek aan standaardisasi was wat betref luminansiewaardes, gradiante en die kontrole oor skittering, en in hierdie opsig was die skemas so uittekenlopend en verskillend soos die aantal ingenieurs betrokke by die beroep.

Enige skema wat vandag nie voldoen aan die minimum vereistes van die Gebruikskode nie, word gewoonlik afgekeur as synde benede standaard, en dit streek die Suid-Afrikaanse Bureau vir Standarde tot eer dat hierdie dokument, wat so gretig afgewag is, in die algemeen so gereklik aanvaar is deur openbare verligtingsingenieurs.

Die aanbevelings beoog die voorsiening van verligting van goedie gehalte vir alle soorte paatre, wat verenigbaar is met die vereistes van die motoris en voetganger.

As gevolg van heelwat fundamentele navorsing, veral op die Vasteiland, is dit vastgestel en deur die CIE aanbeveel dat 'n droeppadopervlakte-luminansie van 2 kandelas per vierkante meter 'n aanvaarbare middleweg is tussen die verlangde en ekonomies geregtigde luminansiespiele vir snelwee, en dat die minimum-luminansie nie benede 40% van die gemiddelde behoort te wees nie, soosgemee in die waarnemingsveld tussen 60 en 160 meter van die waarnemer, kyk Figure 1(a).

Vir motorpadverligting is die aanbevoelde gemiddelde padopervlak-teluminansie in die Suid-Afrikaanse kode 1,5 kandelas per vierkante meter, met 'n egalidensverhouding van 3,5 : 1. Hoewel hierdie waarde van 1,5 cd/m² laer is as die CIE aanbeveling, steek dit gunstig af by die meeste van die ander nasionale codes en lewer dit verligting van 'n baie hoë gehalte. Hierdie waardes wissel na gelang van die klassifikasie van die pad, kyk Figure 1(b); die langste is naamlik vir voorstedelike strate, waar die aanbevoelde luminansie 0,25 kandelas per vierkante meter is en die eeniformgidsverhouding 6:1.

Hoevel luminansiewaardes aanbeveel word, wissel die verskillende kodies heelwat in die praktyk wat betref die wyse waarop hierdie waardes verkry word, en hierna sal later in die verhandeling verwys word.

Beperking van skittering word verkry deur spesifikasie van sekere beperkings op die lig uitgestraal deur die armatuur in die sones van 80° en 90°, die hoofhoekelhoeuk en minimum-monterhoogtes gebaseer op die kandelas van spits-intensiteit.

3.0 LUMINANSIE OF ILLUMINANSIE

As gevolg van heelwat fundamentele navorsing ooreen gedaan is, daar wat betref luminansiewaardes vir die gunstigste sigtoestande snags nou feitlik internasionale ooreenstemming, maar die wyse waarop hierdie waardes verkry word, veraf in die ontwerpstadum, het geleit tot heel wat uiteenlopende menings in die gelede van die verskillende internasionale deskundiges by die vierjaarlike CIE-kongresse, soos blyk uit die volgende tabel uit dr W M H Rennhackkamp se verhandeling gevlewer tydens die SANVK-kongres in 1965:

Vergelyking van metodes waarvolgens verligtingvereistes weergegee word in verskillende gebruikskodes insake straatverligting

Land	Titel van Gebruikskode	Verligtingvereistes ooreenkomsdig:
Internasionale Kommissie insake Verligting, CIE	International recommendations for the lighting of public thoroughfares, 1964	Luminansiewaardes
Nederland	Aanbevelingen voor openbare verligtings, 1959	Luminansiewaardes
Frankryk	Recommendations relative à l'éclairage extérieur, 1961	Aanvangs-illuminansiewaardes
Sowjet-Unie	Straatverligtingskode, 1963	Luminansiewaardes
Denemarke	Belysning af gader og veje m.m. 1963	Nominale kaalampvloed per m ² van padvlak
Verenigde Koninkryk	British Standard Code of Practice C.P. 1004, 1963	Minimum-ligvloed in onderste halfronde
Verenigde State van Amerika	American standard practice for roadway lighting, 1964	Gemiddelde horizontale lumens per vk. vt. (In 'n bylae word luminansiewaardes verstrek)
Republiek van Suid-Afrika	S A B S-kode vir straatverligting	Luminansiewaardes

2.0 THE SOUTH AFRICAN CODE OF PRACTICE

Interest in the design of street lighting installations received a tremendous boost with the introduction eight years ago of the South African Bureau of Standards Code of Practice on Highway Lighting. Previously engineers engaged in this field were generally using one or other of the overseas codes or adapting these to suit their own requirements or ideas. This resulted in a complete non-standardisation throughout the country regarding luminance values, gradients and the control of glare and in this respect the schemes were as wide and varied as the number of engineers engaged in the profession.

Any scheme today which does not comply with the minimum requirements of the Code of Practice is generally frowned upon as being sub-standard and it is to the credit of the South African Bureau of Standards that this document which was so eagerly awaited has generally received the acceptance it has among public lighting engineers.

The recommendations aim at providing good quality lighting for all classes of road compatible with the requirements of the motorist and pedestrian.

As a result of much fundamental research being carried out, particularly on the Continent, it has been established and recommended by the CIE that a dry road surface luminance of 2 candelas per square metre is an acceptable compromise between the desired and economically justifiable luminance level for high speed motorways and that the minimum luminance should not be below 40% of the average as measured in the field of observation between 60 and 160 metres from the observer, see Figure 1(1).

For motorway lighting the recommended average road surface luminance in the South African code is 1,5 candelas per square metre with a uniformity ratio of 3,5 : 1. Although this value of 1,5 cd/m² is lower than the CIE recommendation, it compares favourably with most other national codes and produces lighting of a very high quality. These values vary according to the classification of the road, see Figure 1(b), the lowest being for suburban roads where the recommended luminance is 0,25 candelas per square metre and the uniformity ratio 6 : 1.

Although luminance values are recommended the means of obtaining these values in practice vary considerably between the different codes and reference will be made to this later in the paper.

Restriction of glare is accomplished by specifying certain limitations to the light emitted by the luminaire in the 80° and 90° zones, the main beam angle and minimum mounting heights based on the peak intensity candelas.

3.0 LUMINANCE OR ILLUMINANCE

As a result of much fundamental research carried out overseas the luminance values for optimum seeing conditions at night have now more or less received international agreement but the means of obtaining these values particularly in the design stage has resulted in a considerable divergence of opinion between the various international experts at the quadrennial CIE congresses as shown in the following table taken from Dr. W.M.H. Rennhackkamp's paper to the SANCI congress in 1965:

Comparison of methods of expressing lighting requirements in different codes of practice on street lighting

Country	Title of Code of Practice	Lighting requirements in terms of:
International Commission on Illumination, CIE	International recommendations for the lighting of public thoroughfares, 1964	Luminance values
Netherlands	Aanbevelingen voor openbare verligtings, 1959	Luminance values
France	Recommendations relatives à l'éclairage extérieur, 1961	Initial illumination values
Soviet Union	Street lighting code, 1963	Luminance values
Denmark	Belysning af gader og veje m.m. 1963	Nominal bare lamp flux per m ² of road surface
United Kingdom	British Standard Code of Practice C.P. 1004, 1963	Minimum light flux in lower hemisphere
United States of America	American standard practice for roadway lighting, 1964	Average horizontal lumens per sq. ft. (In an appendix luminance values are given)
Republic of South Africa	S A B S Code for street lighting	Luminance values

Note: CIE is the abbreviation of Commission Internationale De L'Eclairage and is not translated.

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The SABS translation is as follows: "Die ligintensiteit in die gegewe rigting van 'n infinitesimale element op die oppervlak wat die betrokke punt bevat, gedeel deur die reghoekig geprojekteerde oppervlakte van die element op 'n vlak loodreg op die gegewe rigting."

Luminansie word omskryf as "die ligsterkte, in 'n bepaalde rigting, van 'n oneindig kleine element van 'n vlak verdeel deur die reghoekig geprojekteerde area van die element op 'n vlak reghoekig op die bepaalde rigting", wat die moeilikhede inherenter aan berekening en meting duidelik laat blyk.

Terwyl die begrip van padopervlakteluminansie fundamenteel korrek is, aangesien die oog die lig sien soos dit van die padopervlakte weerkaats word, is dan verskeie argumente teen die gebruik daarvan by die ontwerp van straatverligting, wat soos volg opgesom kan word:

Luminansiewaarde hang nie alleen af van die waarde en rigting van die invalys nie, maar ook van die weerkaatsingsseisenskappe van die padopervlakte en die posisie van die waarnemer. Wisseling van weerkaatsingskoëfisiënt en tekstuur, toe so skryf aanslays en hervlakkings, kan nie in aanmerking geneem word nie, aangesien dit omhankende faktore is hierdie, waaroor alleen die siviele ingenieur beskik. Die berekening wat nodig is ten einde die gehalte-kriteria vas te stel, is so omvattend dat dit die gebruik vereis van moderne rekenaars, wat gewoonlik nie beskikbaar is vir die meeste openbare verligtingsingeenseurries nie.

Die Britse metode, om sy vereistes wat betref minimum-ligvloed in die onderste halfreën te speesifiseer met 'n stele tabelle byderhand vir die verskillende straatkonfigurasies, gepaard met 'n gespesifieerde armatuur-ligverdeling (BS 1788), is die resultaat van omvattende profondervindelike studie, en hoewel dit redelik eenvoudig is om toe te pas, is dit nadruk wanneer die onbougaamheid daarvan dat alleen armatuur met 'n gespesifieerde ligverdeling gebruik kan word, (nl. BS 1788:1964 – Straatverligtingsoorname; kyk Figure 1(c) en 1(d)).

Die Australiese kode beveel luminansiewaarde aan, maar hulle is ook berlei tot die vereistes van installasieemeetkunde, soortgelyk aan die Britse kode, aangesien weer eens gomeen is dat hierdie tip van benadering verligtingsontwerp eenvoudiger mank.

Die Nederlandse en Suid-Afrikaanse codes beveel luminansiewaardes aan, maar albei val terug op illuminansie vir die uiteindelike parameters. Hier volg 'n aanhaling uit 'n samenvatting van die Nederlandse kode:

"Vir elke kandelaar per vierkante meter gemiddelde padopervlakteluminansie word 'n gemiddelde illuminansie (luminansie) van 10 – 15 lux vereis."

Vir ontwerpdoeleindes beveel die Suid-Afrikaanse kode luminansiewaarde aan wat na illuminansiewaardes berief word deur middel van die Luminansie/Illuminansie-verhoudings vir die verskillende tipes van ligverdeling en padopervlakte, en met die gebruiklike metode vir die berekening van die verskillende parameters wat nuttigheidsfaktore gebruik, is dit uitsers buigsaam.

Met ander woorde, hoewel luminansiewaarde aanbeveel word in albei hierdie kodes, word die eenvoudiger metode van die gebruik van illuminansie vir ontwerpdoeleindes aanvaar.

Met die oog op al die fundamentele ondersoek wat ingestel is en tans ingestel word na die begrip van luminansie-ontwerp en die immer wisselende ontwikkelinge op die gebied van die kuns van straatverligting, sou dit in hierdie stadium egter verstandig wees om uitspraak voor te behou wat betref die metode wat uiteindelik internasionaal aanvaar sal wees in die toekoms.

Afvoerens die aanbevelings van corsese lande slaafs na te volg, moet 'n mens egter seker maak dat hulle van toepassing is op die toestande wat op Suid-Afrika betrekking het. Baie verligtingsingenieurs bepleit byvoorbeeld nie aan die paais van ligte tekstuur van beton, wat die koste van verligting ongetwyfeld heelwat sal verminder vanwee die hoe weeraarskoëfisiënt en redelike verspreidingskenmerk daarvan, maar wat toestande van intense skittering sou veroorsaak in die sonnige klimaat van Suid-Afrika.

4.0 VERLIGTINGSMETODES

4.1 Gebruiklike Verligting

Verskeie rangskikkings vir die armature word in die kode aangegee, en vir sekondêre paale sal die eenkantplasing of verspringende plasing voldoende wees – die beslisning hang gewoonlik af van die beskikbaarheid van bestaande bogrondse verdeeliale op die armature te steun, of van die koste in die geval van ondergrondse kabelstelsels.

Op snelwye en hoofpaaie met 'n medianaal lê die keuse tussen 'n middelfrangskikkings en teenoorgesteldeplasings. Die kuns van sentrale medianaal word dikwels afgewy of gedeel uit ekonomiese oorwegings alleen, sonder enige gedagte aan die toekomstige probleme van instandhouding van die toerusting. Die vervanging van skoomaanval van lampie vanuit 'n onderhoudsvoertuig op die vinnige binnekoste baan kan uiters gevraaglik wees, en val om hierdie rede glad nie in die guns in Kaapstad nie. Die teenooromekaarplasing, hoewel duurder, besit die voordeel dat die meer egallige verligting bied en dat die pale nie so maklik beskadig word nie.

Senatrale mediaanplasings wat gebruik maak van 'n drakabstelsel om die armature te steun, geniet voorkeur in baie stede in alle wêrelddele, maar hoewel hierdie rangskikkings die nodige luminansiepeil mag lewer, laat die geindustrialiseerde voorkoms daarvan veel te wenseloor.

Comparison of methods of expressing lighting requirements in different codes of practice of street lighting

Luminance is defined as "the luminous intensity, in a given direction, of an infinitesimal element of a surface divided by the orthogonally projected area of the element on a plane perpendicular to the given direction" which clearly reveals the difficulties inherent in calculation and measurement.

Whilst the concept of road surface luminance is fundamentally correct, as the eye sees the light as it is reflected from the road surface, there are various arguments against its use in the design of roadway lighting which may be summarised as follows:

Luminance values are not only dependent on the value and direction of the incident light but also on reflective properties of the road surface and the position of the observer. Variations in reflectance and texture due to wear and resurfacing cannot be taken into account as these are unknown factors which lie purely in the hand of the civil engineer. The calculations required in order to assess the quality criteria are so extensive as to require the use of modern computers which are not generally available to the majority of public lighting engineers.

The British method of specifying its requirements in minimum light flux in the lower hemisphere with a set of ready-to-use tables for the various road configurations coupled with a specified luminaire light distribution (BS 1788) were arrived at by extensive empirical studies and, whilst being comparatively simple to apply, the disadvantage lies in its inflexibility in that only luminaires have a specified light distribution can be used (viz. BS 1788 : 1964 – Street Lighting Lanterns) see Figures 1(c) and 1(d).

The Australian code recommends luminance values but these are also translated into installation geometry requirements similar to the British code as it was again considered that this type of approach made lighting design simpler.

The Netherlands and South African codes recommend luminance values but both revert to illuminance for the ultimate design parameters. The following is taken from a summary of the Netherlands code:

"For each candela per square metre of average road surface luminance an average illumination (illuminance) of 10 – 15 lux is required".

For design purposes the South African Code recommends luminance values which are converted to illuminance values by means of the Luminance/Illuminance ratios for the various types of light distribution and road surface and, with the conventional method of calculating the various parameters using utilisation factors, it is extremely flexible.

In other words, although luminance values are recommended in both these codes the simpler method of using illuminance is adopted for design purposes.

In view of all the fundamental research that has been and is being undertaken into the concept of luminance design and the ever-changing developments in the art of roadway lighting, it would however be wise at this stage to reserve judgement as to the method which will ultimately be internationally acceptable in the future.

Before slavishly following the recommendations of overseas countries, however, one must ensure that these are applicable to the conditions pertaining to South Africa. For instance, many lighting engineers advocate the laying of light textured or concrete roads which would undoubtedly considerably reduce the cost of lighting due to its high reflectance factor and fairly diffusing characteristic but which would produce very high glare conditions in the sunny South African climate.

4.0 METHODS OF LIGHTING

4.1 Conventional Lighting

Various arrangements for the luminaires are given in the code and generally for minor roads the single side or staggered arrangements will suffice, the decision generally resting on whether or not existing overhead distribution poles are available for supporting the luminaires, or cost in the case of underground cable systems.

On freeways and major roads having a central median the choice lies between a central or opposite arrangement. The choice of central median is often dictated or made by economic considerations only without any thought being given to the future problems of maintaining the equipment. Lamp replacement or cleaning from a maintenance vehicle on the "fast" inner lane can be an extremely hazardous occupation and is not favoured at all in Cape Town for this reason. The opposite arrangement although more costly has the advantages of achieving better uniformity of illumination and the poles are less liable to damage.

Central median arrangements using a catenary system for supporting the luminaires have found favour in many cities throughout the world, but whilst this arrangement may produce the necessary luminance levels its industrialised appearance leaves very much to be desired.

4.2 Hoëmaasverligting

Hoëmaasverligting, wat sowat vyftien jaar gelede in gebruik gestel is as oplossing vir die probleme in verband met die verligting van afsen-derlik gegradeerde aansluitings het in die algemeen byval gevind vir verligtingingenieurs in alle wêrelddele, en die gebruik daarvan is in-deerdere uitgebrei tot die verligting van groot areas soos parkeerter-reine en stadspleine.

Die voordele van hierdie tipe van verligting, soos 'n nette voor-koms, geen verwarring van ligbronne, verminderde skittering en min-der kolomme, is welbekend, maar hulle moet opgeweeg word teen die verhoogde koste.

Tot die in gebruik gestel is, is algemeen erken dat die gelykbrekings-punt wat betrek kapitaalkoste bereik is waar een hoë mas seew ge-bruklike verligtingseenhede vervang het. Ten bededasse kaste is hierdie syfer waarskynlik nader aan tien, en aangesien dit uiterst selde bereik word, selfs met die digte tipe van aansluiting, is die koste van die hoëmaasinstallasie gewoonlik 30% hoër. Met wdy gespasioneerde aansluitings waar die verbindingspasie 'n belang van die hoofselvat ge-leë is, moet gebruiklike verligting dus geïnstalleer word.

Kolomontwerp is ook uiterst belangrik, aangesien dit 'n ernstige uit-werking kan he, nie alleen op die aanvanklike kapitaalkoste nie, maar ook die daaropvolgende onderhoudskoste. Die optimum sterkte van 'n kolom wat bereik wanneer die variatie in profielmodulus eweredig is met die buigmoment. 'Oor-onterwepre kolom kan ormatige trilling en versnelings veroorsaak aan die boompunt van die kolom, selfs in lige windtoestande, met gevoldiglike skade aan lamp en toerusting. Daar moet ook noukeurige toegesien word dat die resonansiekrefwensie tydens windtoestande nie saamval met die natuurlike frekwensie van die kolom nie, aangesien dit ook ormatige versnelning aan die boompunt kan veroorsaak. Demping deur die installering van 'n neoprenekussing onder die voetstuk van die kolom sal veel daartoe bydra om oormatige versnelings hierdeur veroorsaak te verminder.

Die ligter tipe van kolom wat groter defeksie het tydens windtoe-stande is meer gesik vir hoëmaasgebruik, mits 'n veiligheidsfaktor van minstens 2,5 op die werklaas verkyk kan word.

Die baie høe kantelmoem van hoëmaaskolomme tydens winde van stormsterkte wat in Kaapstad ondervind word, het veroorsaak dat baie swaai fondamente vereis word. Die fondament verteenwoordig ongeveer 30% van die koste van 'n volledige eenheid, en die moontlikheid om 'n liger en goedkooper vorm van konstruksie te kry, waarskynlik deur gebruik te maak van stapes en slagsmuse, word tans ondersoek.

5.0 OORHANG VAN ARMATURE

Nog 'n belangrike aspek van die ekonomiese van straatverligtingsont-werp wat dikwels oor die hoof gesien word, is die kwestie van oorhang. Die kode meld dat die oorhang nie een kwart van die monteerhoogte of breedte van die straat mag oorskry nie, wat ook al groter is. Sonder 'n deeglike ondersoek kan arbitriële waardes dus gekies word, wat 'n ernstige uitwerking kan hê op die globale ekonomie van die skema.

Met die immer stygende kaste van arbeid en materiaal vandag, is dit noodsaaik om elke kanaal te ondersoek ten einde hierdie koste tot 'n minimum te beperk, en 'n versigtig gekeurde oorhang wat die grootste spaasiëring bied met die aanbevoele egaliteit, kan in hierdie opsig heel-wat help.

Die gunstigste oorhang vir maksimum-spaasiëring word bepaal deur die meetkundige verdeeling van lig deur die armatuur. In die geval van aksiale, assimmetriek ligverdeling, soos aangetref in die meeste ar-mature wat lineêre ligbronne gebruik waarin die nuttigheidskromme van die straat en huiskant identies is, word die maksimum-spaasiëring be-reik wanneer die armatuur oor die middel van die straat geplas word. Met armature wat nie-aksiale assimmetriek ligverdeling het, wat mees-al gebruik word, wissel die optimum oorhang vir die grootste spaasiëring heelwaar na gelang van die verskil tussen die nuttigheidsfak-tore van die straat en huiskant en die monteerhoogte.

As voorbeeld toon Figuur 1(e) 'n dwarsprofiel van 'n tipiese motorpad in Kaapstad en Figuur 1(f) die fotometriek gegevens van 'n hoëdruk-natriumdamplarmatuur van 400 watt wat vir die skema cor-weeg is. Die idee was om 'n illuminansiepeil van Klas A1-standaard te verkyk vir 'n straat met middelmalte oppervlakte, met die pale agter die buitenste skouers geleef.

Die uitwerking van oorhang op die spaasiëring en egaliteit by monteerhoogtes van 12 en 15 meter is corweeg, en die resultate word grafies aangedui in Figuur 2, waaruit blyk dat die egaliteit op 'n monteerhoogte van 12 meter oormatig is vir die vereiste armatuur-konfigurasie. Op 'n monteerhoogte van 15 meter het die gunstigste spaasiëring corengestel met 'n oorhang van 2,9 meter en vir gunstigste egaliteit 2,25 meter. Enige waarde tussen 1,2 en 2,9 meter sou vol-doen aan die vereiste van die kode, en die finale beslissing sou moont-doen aan die spaasiëring van die estetiese oordragings.

6.0 DIE EKONOMIE VAN LAMPVERVANGING

Wanneer die ekonomiese van verligtingskemas vergelyk word, moet kennis geneem word, nie alleen van die aanvanklike kapitaalkoste nie, maar ook die energie- en onderhoudskoste, die lasongenoemde waarvan 'n aansienlike proporsie uitmaak van die totale jaarlike kaste van die installasie.

In die kleiner onderneming waar fondse beperk is, lever kapitaal-koste moontlik geen noemenswaardige problem op nie, veral wanneer die skema deur die Provinciale Owerheid gesubsidyseer is, maar die energie- en onderhoudskoste stel geweldige eise aan die jaarlike begroting.

4.2 High Mast Lighting

High mast lighting which was introduced some fifteen years ago as a solution to the problems associated with the lighting of grade separated interchanges has generally received the approbation of lighting engineers throughout the world and has in fact been extended for use in the illumination of large areas such as parking lots and city squares.

The advantages of this type of lighting, such as nearer appearance, no confusion of light sources, reduced glare and fewer columns are well known but these must be off-set against the increased cost.

When introduced it was generally recognised that the break-even point regarding capital cost occurred where one high mast replaced seven conventional lighting units. With present day costs this figure is probably nearer to ten and, as this is very rarely achieved even on the close knit type of interchange, the cost of the high mast installation is generally 30% higher. With widely spaced interchanges where the link roads are some distance from the main freeway conventional lighting should be installed.

Column design is also extremely important as this can seriously affect not only the initial capital cost but also the subsequent maintenance costs. The optimum strength of a column occurs when the variation in section modulus is proportional to the bending moment. An over-designed column can produce excessive vibration and accelerations at the top of the column even under low wind conditions causing damage to the lamps and equipment. Care must also be taken to ensure that the resonant frequency under wind conditions does not coincide with the natural frequency of the column as this can also cause excessive acceleration at the top. Damping by installing a neoprene pad under the base of the column will considerably assist in reducing excessive acceleration due to this cause.

The lighter type of column having the larger deflection under wind conditions is the more suitable for high mast applications provided a factor of safety of not less than 2,5 on the working load can be obtained.

The very high overturning moment of high mast columns under the gale force winds experienced in Cape Town has resulted in very heavy foundations being required. The foundation represents approximately 30% of the cost of a complete unit and investigations are now being carried out to find a lighter and cheaper form of construction possibly using piles and pile-caps.

5.0 OVERHANG OF LUMINAIRES

Another important aspect in the economics of street lighting design which is often overlooked is the question of overhang. The code states that the overhang shall not exceed one quarter of the mounting height or width of road which ever is the greater. Consequently, without a thorough investigation, arbitrary values may be chosen which can seriously affect the overall economics of the scheme.

With the over increasing costs in labour and material today it is essential to explore every avenue in order to reduce these costs to a minimum and a carefully chosen overhang which produces the greatest spacing with the recommended uniformity can considerably assist in this respect.

The optimum overhang for maximum spacing is determined by the geometric distribution of light by the luminaire. In the case of axial, asymmetric light distribution, such as is encountered in most luminaires using linear light sources where the street and house side utilisation curves are identical, the maximum spacing occurs when the luminaire is positioned over the centre of the roadway. With luminaires having non-axial asymmetric light distribution which are the most widely used the optimum overhang for greatest spacing varies considerably according to the difference between the street and house side utilisation factors and the mounting height.

As an example, Figure 1(e) shows a cross section of a typical motorway in Cape Town and Figure 1(f) the photometric data of a 400 watt high pressure sodium vapour luminaire which was under consideration for the scheme. It was desired to obtain an illuminance level to Class A1 standard for a medium surface road with the poles situated behind the outer shoulders.

The effects of overhang on the spacing and uniformity at mounting heights of 12 and 15 metres were considered and the results are shown graphically in Figure 2 from which it can be seen that at a 12 metre mounting height the uniformity is excessive for the required luminaire configuration. At a 15 metre mounting height the optimum spacing corresponded with an overhang of 2,9 metres and for optimum uniformity 2,25 metres. Any value between 1,2 and 2,9 metres would meet the requirements of the code and the final decision would probably be made on pole cost or aesthetics.

6.0 THE ECONOMICS OF LAMP REPLACEMENT

When comparing the economics of lighting schemes cognisance must be taken not only of the initial capital cost but also the energy charges and maintenance costs, the latter forming a substantial proportion of the total annual cost of the installation.

In the smaller undertaking where funds are limited the capital cost may present no undue problem particularly when the scheme is subsidised by the Provincial Authorities but the energy and maintenance charges can place a severe strain on the annual budget.

Die kapitaal- en energiekoste vir die verskillende ligbronne kan maklik bereken word, en die mees ekonomiese in hierdie opsig geskies word, maar as die kwessie van onderhouder ter sprake kom, is 'n grondige ondersoek ter plaatse na plaaslike toestande noodsaklik vooraf 'n besluit geneem kan word. Daar is geen towerfomule wat op alle ondernemings toepgespas word nie. Besonderde van die energiekoste vir die verskillende ligbronne soos van toepassing op Kaapstad word in Figuur 2(a) aangedui.

Die grootste koste in die onderhoud van 'n verligtingstelsel is patrollering, skoonmaak en lampvervanging, en dit is op hierdie gebied dat heelwaar bespaar kan word.

'n Studiegevolg wat deur APLE in Engeland die in lewe geroep is, het aan die hand gedoen dat weeklike patrollering nodig is vir ontladingsverdiging, maar dat wolframlooddraadverdiging twee of drie maal per week vereis. Terwyl laaggenoemde wenslik mag wees, sou gewigde eise stel aan die arbeids- en vervoerbronnes van die meeste ondernemings.

In Kaapstad vind die patroolleer van hoofplaas weekliks plaas, en die vervanging van uitgebrande lampes soos vereis, maar om redes waaraan later in hierdie verhandeling verwys sal word, word geen patroolleerwerk op voortgedelike pasie gedoen nie, en word dit aan die individuele verbruiker oorgelaat om uitgebrande lampes te rapporteer.

Voordat 'n kostevergelyking tussen groep- of afsonderlike lampvervanging getref kan word, is dit nodig om die arbeids- en vervoerkoste van toepassing op die twee werkmetodes te verkry. 'n Ondersoek na hierdie koste in Kaapstad in 1969 het die volgende aan die lig gebring:

Item	Koste per armatuur per jaar		
	Arbeid	Vervoer	Totaal
	R	R	R
Weeklike patroolleerwerk	0,17	0,34	0,51
Afsonderlike lampvervanging (natrium)	0,35	1,03	1,38
Afsonderlike lampvervanging (kwik)	0,18	0,82	1,00
Groeo-lampvervanging	0,34	0,14	0,48
Skoonmaak van armatuur al om die 15 maande (kwik)	0,17	0,07	0,24
Skoonmaak van armatuur al om die 15 maande (natrium)	0,34	0,14	0,48

Daar sal opgelet word dat die koste vir afsonderlike lampvervanging en skoonmaak verskillend is vir die twee soorte lampes, eersgenoemde toe te skryf aan die verskil in lewensuur en laaggenoemde aan die stelsel van lampvervanging.

Aangesien die natriumplampe die kortste lewensduur het, vereis dit meer individuele lampvervanging weekliks terwyl kwikkoplampen maar al om die twee tot drie weke vervaag hoeft te word.

Ten einde te voldoen aan die Gebruikskode is dit noodsaklik om groepvervanging van kwikkoplamppe al om die 2½ jaar te doen, wanneer die lumenelevering van die lamp 80% van sy aanvanklike waarde bereik het. Die armature mag dan skoonmaak word tesame met die lampvervanging, en 'n spesiale skoonmaakprogram halfpad tussen hierdie tydperk, naamlik al om die 15 maande.

Weens hul standhoudende lumenuitstaande word natriumlampes afsonderlike vervang in verg dus spesiale skoonmaakprogramme.

Sodoende gevind, moet die kwikkoplamppe as groep vervang word ten einde te voldoen aan die bepalings van die Gebruikskode, wat nou nog ondersoek moet word, is die ekonomiese van groep- of afsonderlike vervanging vir die kwikkoplamppe.

Tipiese lewensduur- en lumenhandhawingskromme vir die natrium- en kwikkoplamppe word in Figuur 3 aangevoer. Volgens die lewensduurkromme is die eintlike getal natriumplampe wat 4 jaarslang vervang moet word, bereken, en die resultate word in Figuur 4 aangevoer.

Deur gebruik te maak van die syfers wat voorheen vir vervoer en arbeid verstrekk is, tesame met die koste van die lampes en skoonmaak al om die vyfde maande, is die kromme wat in Figuur 5 aangevoer is, verkyk, 'n duidelike aanduiding van die ekonomiese voordele van die afsonderlike vervanging van hierdie lampes.

Ten slotte toon Figuur 6 en 7 die jaarlike koste van lampvervanging en skoonmaak vir die verskillende tipes van lamppe oor 'n tydperk van twaalf jaar, wat in aanmerking geneem kan word wanneer die globale gekapitaliseerde koste van 'n straatverligtingskema gekapitaliseer word. Daar moet egter in gedagte gehou word dat die syfers wat gebruik word, alleen van toepassing is op die Kaapstad onderneming, en aansienlik mag wissel in toestande wat elders heers.

7. VOORSTEDELIKE STRAATVERLIGTING

Die beginsels van die verligting van voorstedelike strate is in hoofsaak dieselfde as dié van toepassing op motorpadverligting, maar aangesien hulle gewoonlik ongeveer 80% tot 90% uitmaak van die totale

The capital cost and energy charges may easily be calculated for the various light sources and the most economic in this respect chosen but when it comes to the question of maintenance a thorough on-the-spot investigation into local conditions is essential before a decision can be made. There is no magic formula that can be applied to all undertakings. Details of the energy costs for the various light sources as applicable to Cape Town are shown in Figure 2(a).

The major costs in the maintenance of a lighting system are patrolling, cleaning and lamp replacement and it is here where considerable savings can be achieved.

A study panel set up by the APLE in England has suggested that for discharge lighting weekly patrols are sufficient but for tungsten filament lighting two or three times per week. Whilst the latter may be desirable it would put a severe strain on the labour and transport resources of most undertakings.

In Cape Town patrolling of major roads is carried out weekly and replacement of burnt out lamps are required but on suburban roads, for special reasons which will be referred to later in the paper, no patrols are carried out and it is left to the individual consumer to report burnt out lamps.

Before comparison of costs between group or individual lamp replacement can be made it is necessary to obtain the costs of labour and transport applicable to the two methods of operation. An investigation into these costs in Cape Town in 1969 revealed the following:

Item	Cost per luminaire per annum		
	Labour	Transport	Total
Weekly patrolling	0,17	0,34	0,51
Individual lamp replacement (sodium)	0,35	1,03	1,38
Individual lamp replacement (mercury)	0,18	0,82	1,00
Group lamp replacement	0,34	0,14	0,48
Luminaire cleaning every 15 months (mercury)	0,17	0,07	0,24
Luminaire cleaning every 15 months (sodium)	0,34	0,14	0,48

It will be noted that the costs for individual lamp replacement and cleaning are different for the two types of lamp, the former being due to the difference in mortality rate and the latter to the system of lamp replacement.

The sodium lamp having the higher mortality rate, requires individual lamp replacement to be carried out weekly whilst mercury vapour lamps only need replacing every two to three weeks.

In order to comply with the Code of Practice it is essential to carry out group replacement of mercury vapour lamps every 2½ years when the lumen output of the lamp has reached 80% of its initial value. The luminaires may then be cleaned in conjunction with the lamp replacement and a special cleaning programme midway between this period namely every 15 months.

Sodium lamps with their high lumen maintenance are individually replaced and therefore require special cleaning programmes.

As previously stated the mercury vapour lamps must be group replaced in order to comply with the Code of Practice and it now remains to investigate the economics of group or individual replacement for the sodium vapour type.

Typical mortality and lumen maintenance curves for the sodium and mercury vapour lamps are shown in Figure 3. From the mortality curves the actual number of sodium vapour lamps to be replaced per annum has been calculated and the results are shown in Figure 4.

Using the figures previously given for transport and labour together with the cost of the lamps and cleaning every fifteen months the curves shown in Figure 5 were obtained which clearly illustrate the economic advantages of individually replacing these lamps.

Finally, Figures 6 and 7 indicate the annual costs of lamp replacement and cleaning for the various types of lamps over a period of twelve years which may be taken into account when calculating the overall capitalised costs of the street lighting scheme. It must be borne in mind however that the figures used are only applicable to the Cape Town undertaking and may vary considerably under the conditions obtaining elsewhere.

7.0 SUBURBAN ROADWAY LIGHTING

The principles of illuminating suburban roads are substantially the same as those applying to motorway lighting but as these generally constitute about 80% to 90% of the total road layout in most towns and

straanleg in die meeste dorpe en stede, is dit klaarblyklik hier waar daar heelwat bespaar kan word, en 'n grondige ondersoek na die verligting van hierdie strate kan verrassende resultate lewer.

So'n ondersoek is in 1969 in Kaapstad ingestel, en as gevolg daarvan is besluit om al die voorstedelike straatverligting te omskip in kwikkamp van 80 en 125 watt. Die totale getal gloeiendraadlampe in die stelsel op daardie tydstip was 33 000, en die geraamde koste van die projek R600 000. Met die oog op die omvang van die werk, is besluit om die omskipking oor 'n tydperk van vyf jaar te doen, en 85% van die werk is nou voltooi. Skerp stygende koste het binne hierdie tydperk die oorspronklike raming geafgetrek, maar die geraamde globale besparing het so te sê in dieselfde propesie gehou.

Ben behalwe die kapitaalkoste, moet baie faktore in ammering geneem word, wat 'n algemene reorientasie van die werkmetode meegebring het. Terwyl die wolframgloeiendraadlampe afsomderlik vervang is gedurende nagieltige patrouillewerk, kon nou oorweging geskenk word aan 'n stelsel van groepvervanging van die kwikkampplame, wat sou lei tot 'n aansienlike verbetering van die doeltreffende werking van die straatverligtingstelsel. Met die langer lewe van die kwikkampplame en 'n stelsel van groepvervanging, is die patrouillewerk van voorstedelike strate onnodig geweest, dus kan dit aan die individuele verbruiker oorgelaat word om uitgebrande lampe te rapporteer.

Die aantal lampe wat per jaar vervang word, sou met ongeveer 90% verminder word, met bykomstige besparing wat betref arbeid en vervoer. Daarby sou die aantal klages van individuele verbruikers insake uitgebrachte lampe ook in dieselfde propesie verminder word en aldus die verbruikerverhoudinge verhoog.

Volgens hedenstaande is die wolframgloeiendraadlampe van 100 en 200 watt nie voldoende om te voorsien in die openbare vraag na versterkte verligting nie, dus is dit nodaanklik om die gebruikte te oorweeg van die verskillende tipe van dampontladingslighbronne met hul groter doeltreffendheid.

Van die drie soorte dampontladingslampe in algemene gebruik, naamlik natrium, fluorescerende en kwikkamp, is natrium nie geskik vir gebruik in voorstedelike strate nie, vanweë die uitsers swak kleurweergawe daarvan, en hoewel fluorescerplante elders taamlik gewild is, is daar in Kaapstad nie voorkeur aan hulle gegee nie, vanweë hul groot, onnoeglike voorkoms en die betreklike swak ligverdeling van die armature. Dit het die kwikkampbron gelagt as die enigste geskikte alternatief vir die wolframgloeiendraadlamp.

Nog 'n belangrike oorweging was die aansienlike vermindering van die hoeveelheid elektriese energie verbruik, wat terloops vandaag van geweldige belang geword het met die oog op die energiekrisis en skerp stygende koste.

Sonder die spesifikasie van koste, wat terloops alleen op Kaapstad van toepassing sou wees, volg hier die ontleding van die jaarlike besparing wat opgelewer sou word deur die gloeiendraadlampe van 100 en 200 watt te vervang deur die kwikkampplame van 80 en 125 watt ondersteuning, tesame met 'n herregeskikking van die stelsel van lampvervanging:

Jaarlike besparing (cents per lamp)		
	Kwikkampplam van 80 watt	Kwikkampplam van 125 watt
Elektrisiteit	98,4	369,0
Arbeid	55,7	55,7
Vervoer	33,8	33,8
besparing op vervangingskoste van lampe van 125 watt	—	5,8
	187,9	464,3
Min bykomende vervangingskoste van lampe van 80 watt	42,4	—
By benadering	145c	464c

Die netto besparing ten gunste van oorskakeling na kwikkampamp is dus geneem as:

80 watt R1,45 per lamp per jaar.
125 watt R4,64 per lamp per jaar.

Toe het dit nodig geword om vas te stel of die bykomende kapitaal benodig vir die voorgenome stelsel soos in Figuur 8 aangedui, sou kan opgeweeg teen die bogenoemde besparing. Die netto jaarlike besparing meegebring deur die oorskakeling na kwikkampplame word in Figuur 9 aangedui. Die uitwerking van sterk stygende koste is nagelaat aangesien aanvaar is dat stygende koste gepaard gaan saam met 'n stygging van inkomste, daarom sou die waarden in Figure 8 en 9 aangedui konstant bly in reële termen. Dit is 'n redelike en vereenvoudigende veronderstelling wat die argument nie wesentlik verander nie.

Gehooseer op 'n vergelykende tydperk van 25 jaar, "was die huidige waarde van kapitaalaftogwees in verhouding tot die huidige waarde van jaarlike besparing soos volgt:

Huidige waarde van netto jaarlike besparing ..	R575 033
Huidige waarde van bykomende kapitaalaftogwees ..	R292 915
Netto voordeel teen huidige waarde	R272 118

It is obviously here where substantial overall savings can be achieved and a thorough investigation into the lighting of these roads can produce surprising results.

Such an investigation was carried out in Cape Town in 1969 and as a result it was decided to convert all the suburban roadway lighting to 80 and 125 watt mercury vapour. The total number of filament lamps on the system at the time was 33 000 and the estimated cost of the project R600 000. In view of the magnitude of the work it was decided to implement the conversion over a period of five years and the work is now 85% complete. Escalating costs have over this period affected the original estimate but the estimated overall savings have substantially remained in the same proportion.

Over and above the capital cost many factors had to be taken into account involving a complete re-orientation of the modus operandi. Whereas previously the tungsten filament lamps were replaced individually during night patrols consideration could now be given to a system of group replacement of the mercury vapour lamps which would result in a substantial improvement in the operating efficiency of the street lighting system. With the longer life of the mercury vapour lamp and a system of group replacement, patrolling of suburban roads was considered to be unnecessary and it could therefore be left to the individual consumer to report burnt out lamps.

The number of lamps replaced per annum would be reduced by approximately 90% with attendant savings in labour and transport. In addition, the number of individual consumers' complaints regarding burnt out lamps would also be reduced by the same proportion thus enhancing consumer relations.

By present day standards the 100 and 200 watt tungsten filament lamps are not adequate to satisfy the public's demand for improved lighting and it is therefore essential to consider the use of the various types of vapour discharge light sources with their higher efficacy.

Of the three types of vapour discharge lamps in general use namely sodium, fluorescent and mercury vapour, sodium was not considered suitable for use in suburban roads because of its very poor colour rendering and although fluorescent lamps are quite popular elsewhere they have not been favoured in Cape Town because of their large and unsightly appearance and the relatively poor light distribution of the luminaires. This left the mercury vapour source as the only suitable alternative to the tungsten filament lamp.

Another important consideration was the substantial reduction in the amount of electrical energy consumed which incidentally would assume an aspect of tremendous importance today in view of the energy crisis and escalating costs.

Without going into the detailed costs, which incidentally would only apply to Cape Town, the following was the analysis of the annual savings which would accrue by replacing the 100 and 200 watt filament lamps by the 80 and 125 watt mercury vapour type respectively together with a re-arrangement of the system of lamp replacement:

Annual savings (cents per lamp)		
	80 watt Mercury Vapour Lamp	125 watt Mercury Vapour Lamp
Electricity	98,4	369,0
Labour	55,7	55,7
Transport	33,8	33,8
Savings on replacement costs of 125 watt lamps	—	5,8
Total	187,9	464,3
Less additional replacement costs of 80 watt lamps	42,4	—
Say	145c	464c

The net saving in favour of conversion to mercury vapour lamps was therefore taken as:

80 watt R1,45 per lamp per annum
125 watt R4,64 per lamp per annum

It then became necessary to determine whether or not the additional capital required for the proposed system as shown in Figure 8 could be off-set by the above savings. The net annual savings effected by the conversion to mercury vapour lamps are shown in Figure 9.

The effect of escalating costs was neglected since it was assumed that rising costs would be matched by increased revenue hence the values shown in Figures 8 and 9 would remain constant in real terms. This is a reasonable and simplifying assumption that does not materially alter the argument.

On the basis of a 25 year comparative period the present value of capital outlays relative to the present value of annual savings was as follows:

Present value of net annual savings ..	R565 033
Present value of additional capital outlay ..	292 915
Net present value advantage ..	R272 118

Daar is dus bevind dat die globale netto voordeel van oorsakeling na 'n kwikkampstelsel sowat R272 000 sou wees, as huidige waarde-ekwivalent uitgedruk. Uitgedruk as gemiddelde jaarlike besparing binne hierdie tydperk, is gevind dat die ooreenstemmende syfer met rente teen 7% per jaar R272 000 @ R23 000 per jaar sou wees.

Die voordeel ten gunste van die oorsakeling was dus R23 000 per jaar vir 25 jaar, of R272 000 as huidige waarde-ekwivalent.

Volgens die reëling van destyds is 'n bedrag van R32 000 per jaar voorseen om die bestaande reflektornarmatuur van 100 watt te verander in die moderne refraktor-tipe, binne 'n tydperk van 10 jaar, en bykomende refraktornarmatuur te installeer. Die netto bykomende kapitaal benodig nadat rekening gehou is met besparing vir die eerste vyf jaar en die koste van oorsakeling na kwikkampverligting te dek, word in Figuur 9 aangedui en is soos volg:

1ste jaar	R58 900	R58 900
2de jaar	R58 900	R58 900
3de jaar	R69 600	R69 600
4de jaar	R58 200	R58 200
5de jaar	R40 100	R40 100

Daarna sou daar in die 6de jaar 'n jaarlike besparing van sowat R76 000 wees, wat in die 25ste jaar sou styg tot sowat R87 900.

Die voorgaande toon dat die waarde van ondersoek na die ekonomiese van voorstedelike straatverligting, en dus inderdae duidelik aan dat die wolframglöödraadlamp op die lange duur veels te duur is vir gebruik in voorstedelike straatverligting.

8.0 GEVOLGTREKKINGS

Sedert die ingebuikstelling van die Suid-Afrikaanse Gebruikskode, het die standaard van straatverligting in hierdie land aansienlik verbeter, veral op die hoofpaasse, en steek dit gunstig af by die meeste ander stede in alle wêrelddele.

Die aanbevele standaarde van verligting, wat selfs tien jaar gelede as duur en onekonomies beskou is, is nou, met die ingebuikstelling van nuwe ligbronne en armature, ekonomies 'n voordele proponeer, mits grondige ondersoek ingestel word ten einde optimale onderhoudskoste te handhaaf.

Die ingebuikstelling van die kwikkamplamp vir voorstedelike straatverligting kan, soos aangetoon, lei tot 'n drievoudige vermoeidering van lumenintensiteit, met aansienlik besparing in vergelyking met die wolframglöödraadlamp.

Daar is egter nog ontzaglik veel om te leer, en die skrywer wil die hoop uitpers dat die opmerkings en menings in hierdie verhandeling verwoord, besprekking sal aanwakker oor die praktyk en ekonomie van straatverligting in Suid-Afrika.

9.0 DANKBETUIGINGS

Graag wil die skrywer mnr D C Palser, Elektrotegniesestadsingenieur, Kaapstad, bedank vir die geleentheid aan hom gegun om hierdie verhandeling aan u Vereniging voor te leê, asook vir toestemming tot die gebruik van verskeie gesgewens en foto's van die Kaapstadse straatverligtingstelsel.

Die skrywer bedank ook sy kollegas in die Kaapstadse Straatverligtingsafdeling vir veel waardevolle hulp en kritiek tydens die opstel van die verhandeling.

10.0 BRONNE

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It was thus found that the overall net advantage of conversion to a mercury vapour system would be of the order of R272 000 expressed as a present value equivalent. Expressed as a mean annual saving over this period the corresponding figure with interest at 7% per annum was found to be R272 000 – R23 000 per annum.

The advantage in favour of the conversion was accordingly R23 000 per annum for 25 years or R272 000 as a present value equivalent.

Under the existing arrangement at that time an amount of R32 000 per annum was provided for changing the existing 100 watt reflector lanterns to modern refractor type over a period of 10 years and installing additional refractor lanterns. The net additional capital required after allowing for savings for the first five years to cover the cost of conversion to mercury vapour lighting are shown in Figure 9 and are as follows:

1st year	R58 900
2nd year	R58 900
3rd year	R69 600
4th year	R58 200
5th year	R40 100

Thereafter there would be an annual saving of around R76 000 in the 6th year rising to about R87 900 in the 25th year.

The foregoing shows the value of investigating the economics of suburban roadway lighting and does in fact clearly indicate that under present day conditions and taking the long term view, the tungsten filament lamp is far too expensive for use in suburban street lighting.

8.0 CONCLUSIONS

Since the introduction of the South African Code of Practice the standard of street lighting in this country has improved considerably, particularly on the major roads, and compares favourably with most other cities throughout the world.

The recommended standards of lighting, which even ten years ago would have been considered expensive and uneconomic are now, with the introduction of new light sources and luminaires economically viable provided a thorough investigation is carried out to optimise the maintenance costs.

The introduction of the mercury vapour lamp into suburban lighting can, as shown, result in the threefold increase in luminaire level with considerable savings when compared with the tungsten filament lamp.

However, there is still very much to be learnt and it is the author's hope that the comments and opinions expressed in this paper will stimulate discussion on the practice and economics of street lighting in South Africa.

9.0 ACKNOWLEDGEMENTS

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The author also wishes to thank his colleagues in the Cape Town Street Lighting Section for much valuable assistance and criticism during the preparation of the paper.

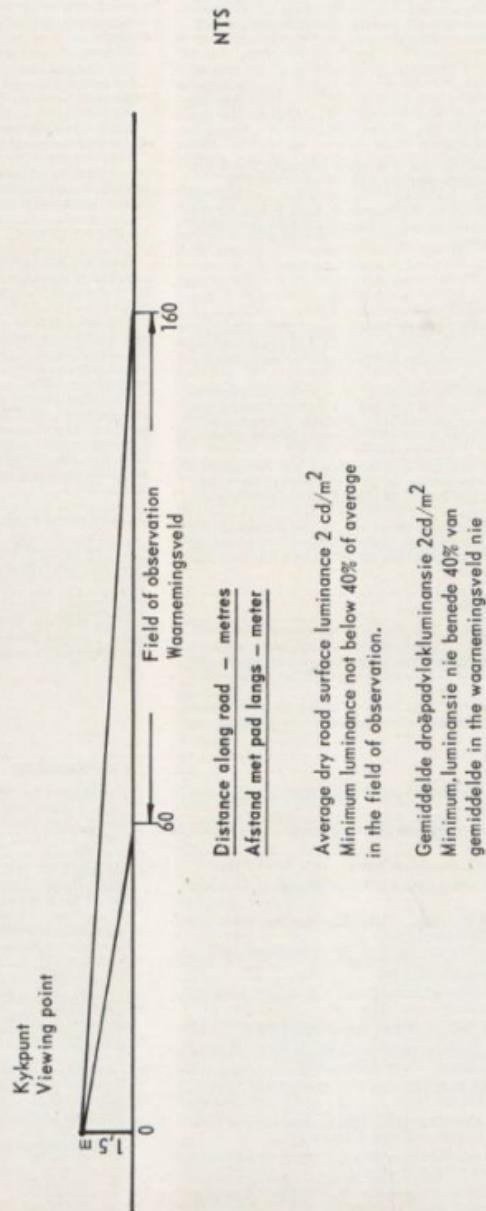
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Fig 1 (a)



Average dry road surface luminance 2 cd/m^2
Minimum luminance not below 40% of average
in the field of observation.

Gemiddelde droëpadvlakluminansie 2cd/m^2
Minimum, luminansie nie benede 40% van
gemiddelde in die waarnemingsveld nie

C.I.E. RECOMMENDATIONS

E.S.I. — AANBEVELINGS

RECOMMENDED LUMINANCE LEVELS AND UNIFORMITY RATIOS (C.I.E. AND S A B S)
AANBEVOLE LUMINANSIEPEILE EN EGALIGHEIDSVERHOUDENGS (ESI EN SABS)

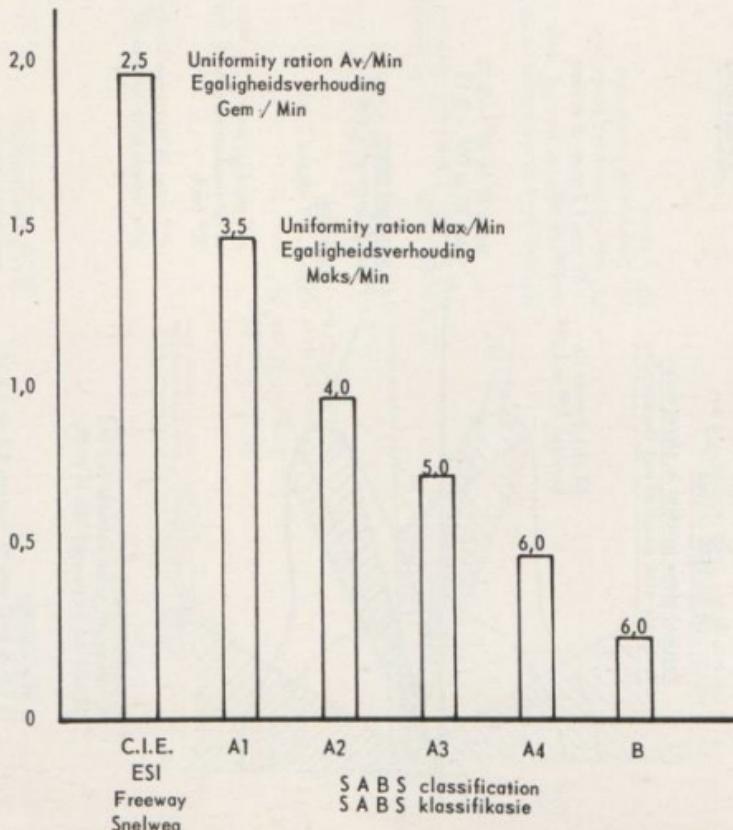
S A B S ROAD CLASSIFICATION

- A1 - Freeways - motorways
- A2 - Trunk and arterial roads
- A3 - Through roads
- A4 - Link roads through suburbs
- B - Suburban roads

S A B S - PADKLASSIFIKASIE

- A1 - Snelweë - motorpaaie
- A2 - Hoofpaaie en hoofverkeersweë
- A3 - Deurpaaie
- A4 - Vervindingspaaie deur voorstede
- B - Voorstedelike strate

Average luminance on dry road surface - cd/m^2
Middelmatige luminansie op droë padoppervlakte - cd/m^2



LIGVERDELING
AFSNYDING

B S 1788 - 1964

Vertical plane parallel to street axis
Vertikale vlak parallel met straat-aslyn

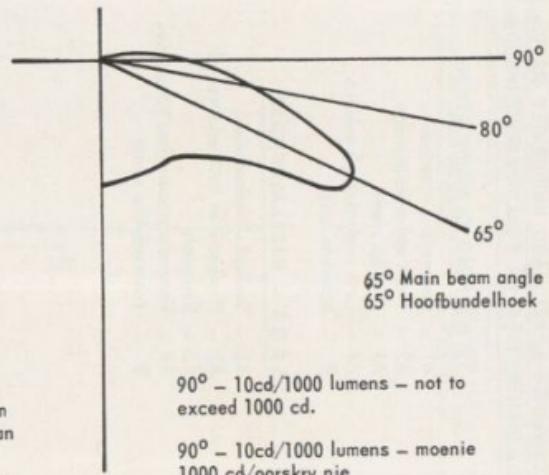
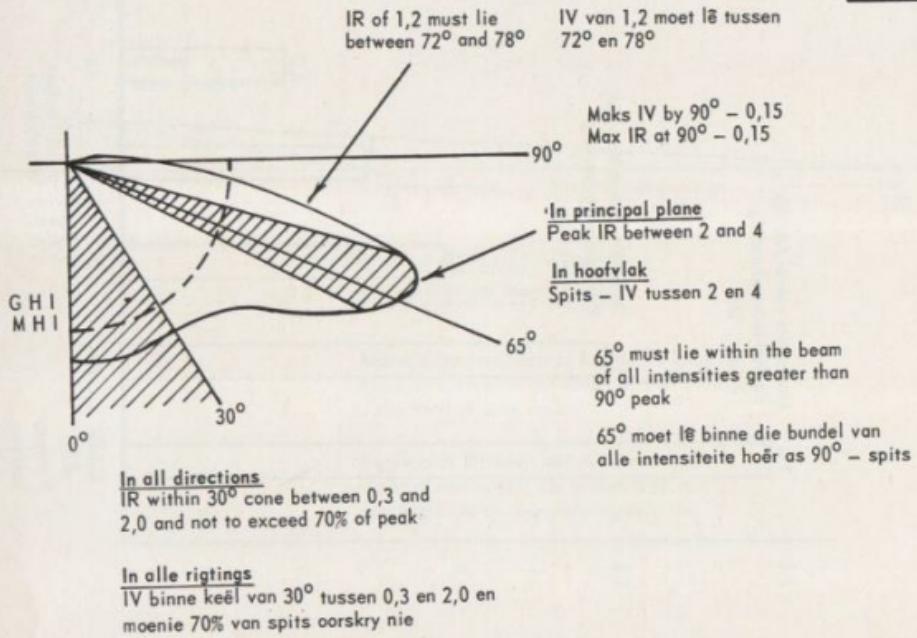
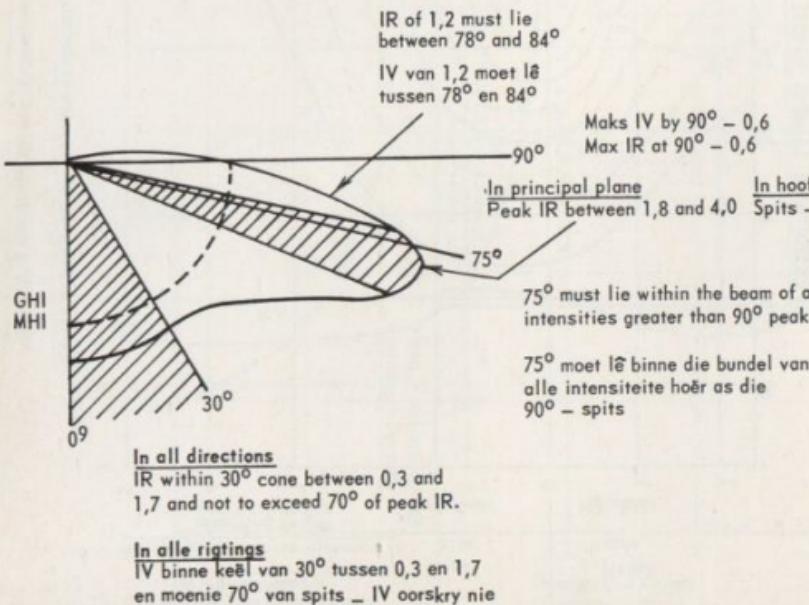


Fig. 1(c)

LIGHT DISTRIBUTION
SEMI-CUT-OFF
LIGVERDELING
HALF-AFSNYDING

B S 1788 - 1964

Vertical plane parallel to street axis
Vertikale vlak parallel met straat-aslyn



S A B S 097 - 1967

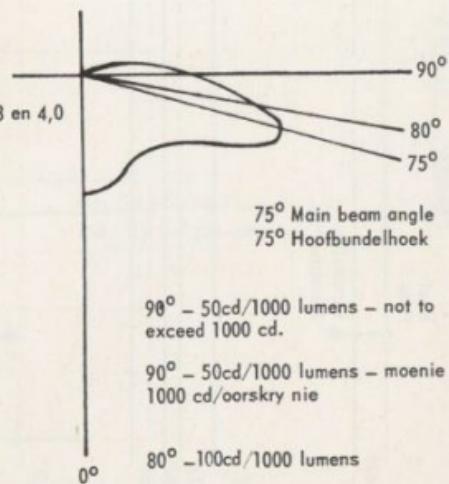


Fig 1(e)

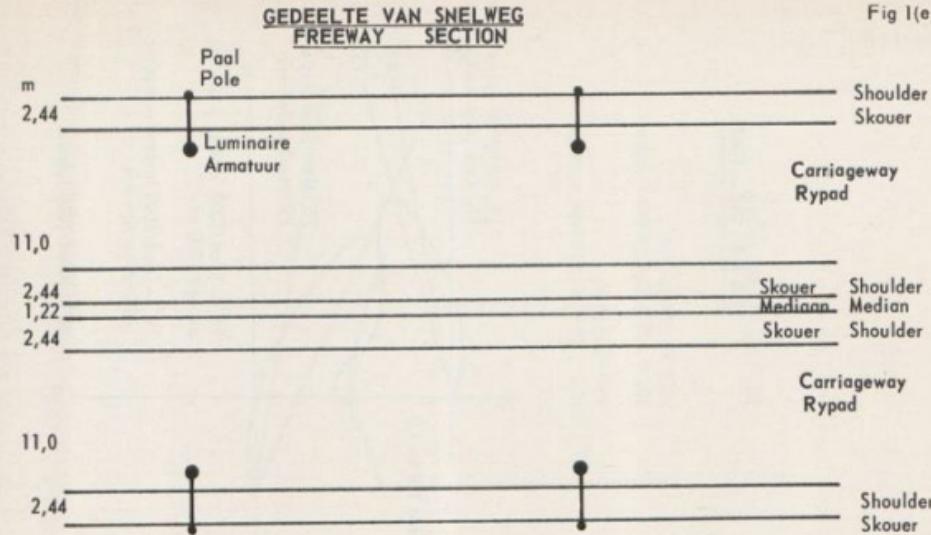
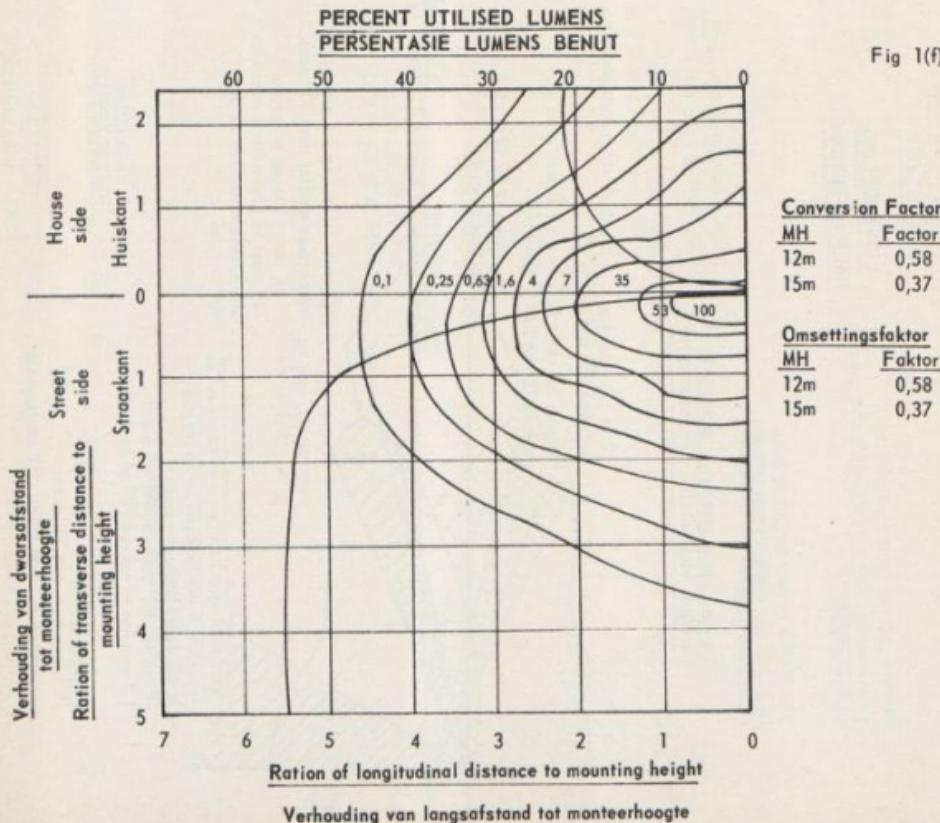
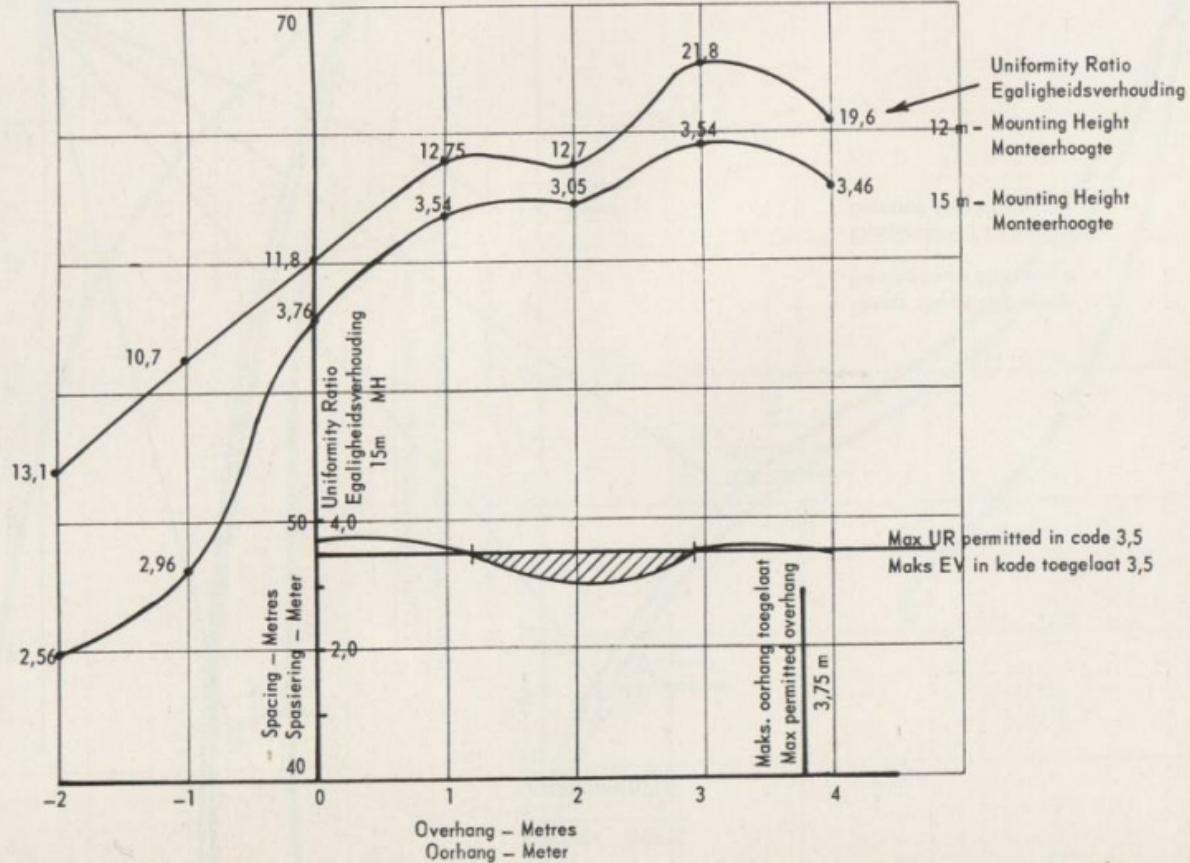


Fig 1(f)



EFFECT OF OVERHANG AND MOUNTING HEIGHT ON UNIFORMITY RATIO
UITWERKING VAN OORHANG EN MONTEERHOOGTE OP EGALIGHEIDSVERHOUDING



ENERGY COSTS

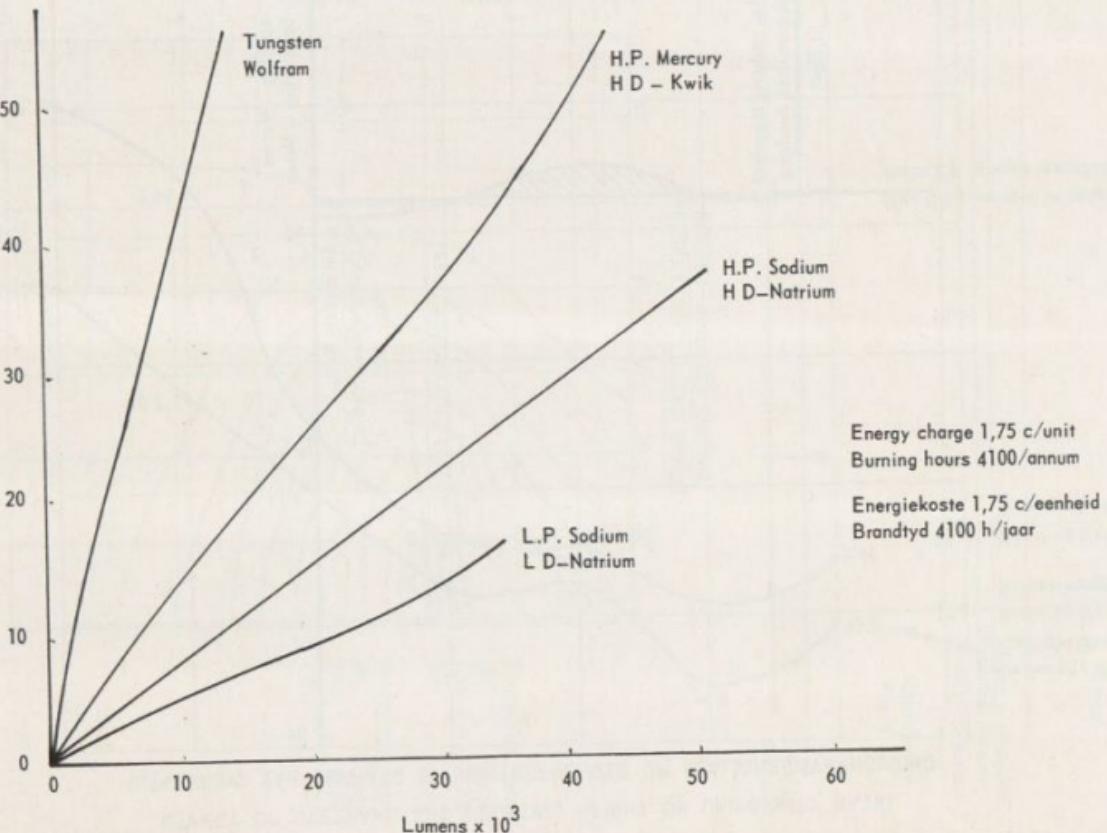
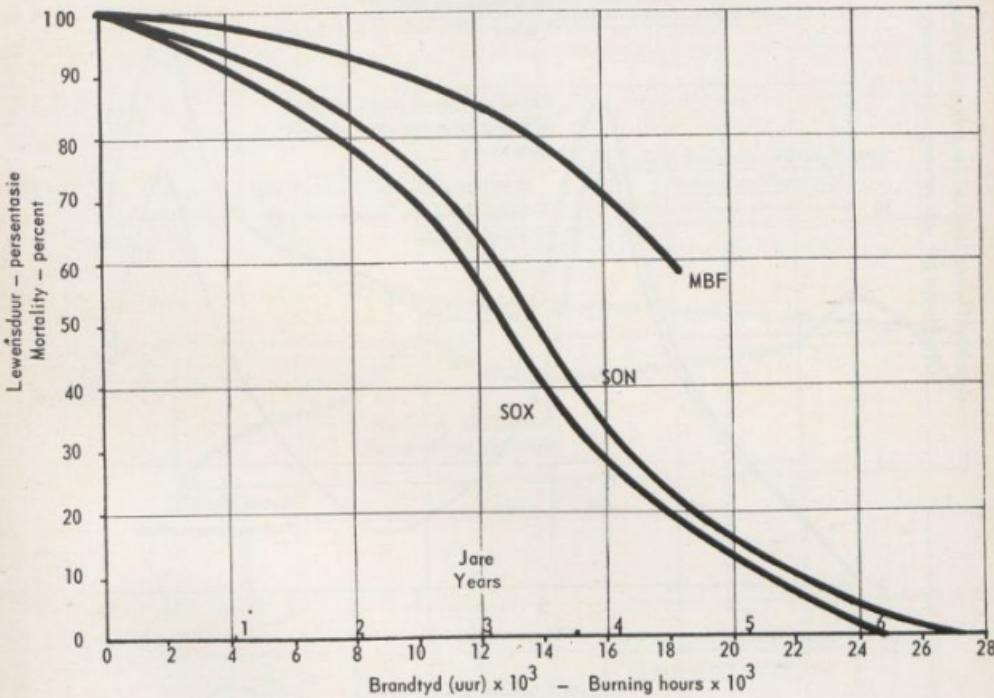
ENERGIEKOSTE

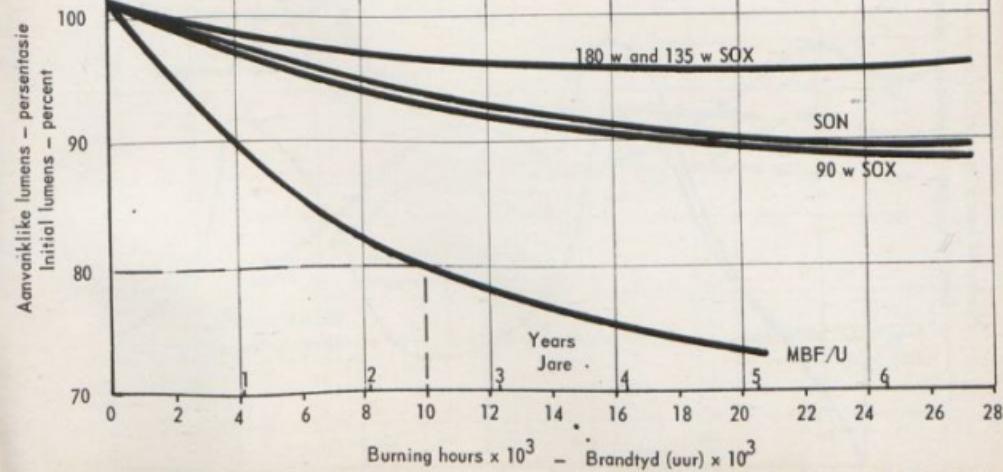
Fig 2 (a)

Fig 3

TYPICAL LAMP MORTALITY CURVES
TIPIESE LAMP-LEWENDUURKROMME



TIPIESE LUMENWAARDE-VERMINDERINGSKROMME
TYPICAL LUMEN DEPRECIATION CURVES



INDIVIDUAL LAMP MORTALITY
AFSONDERLIKE LAMP - LEWENSDOON

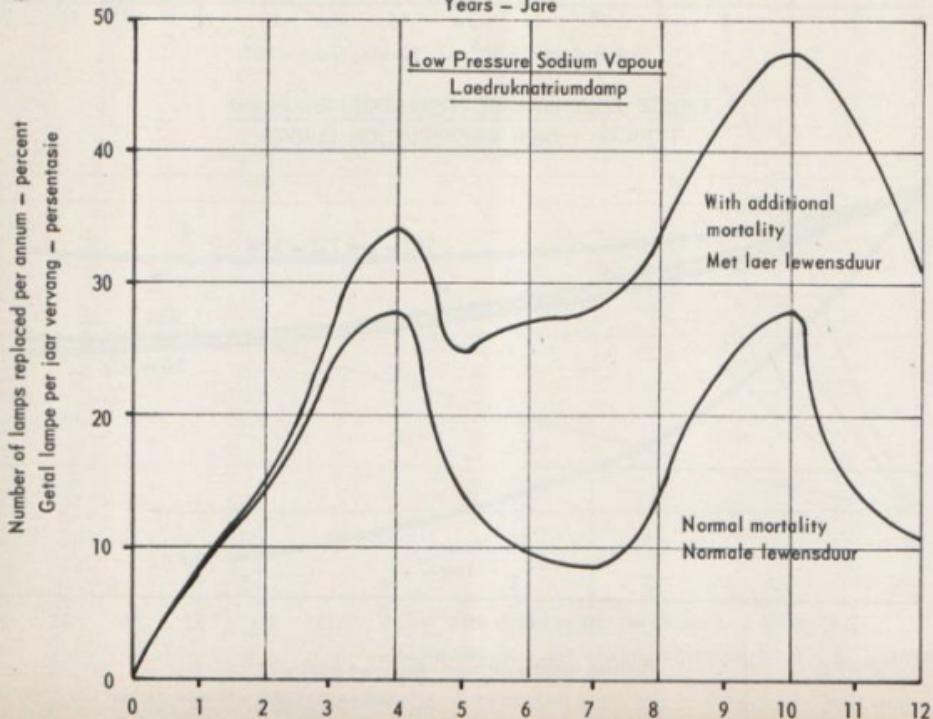
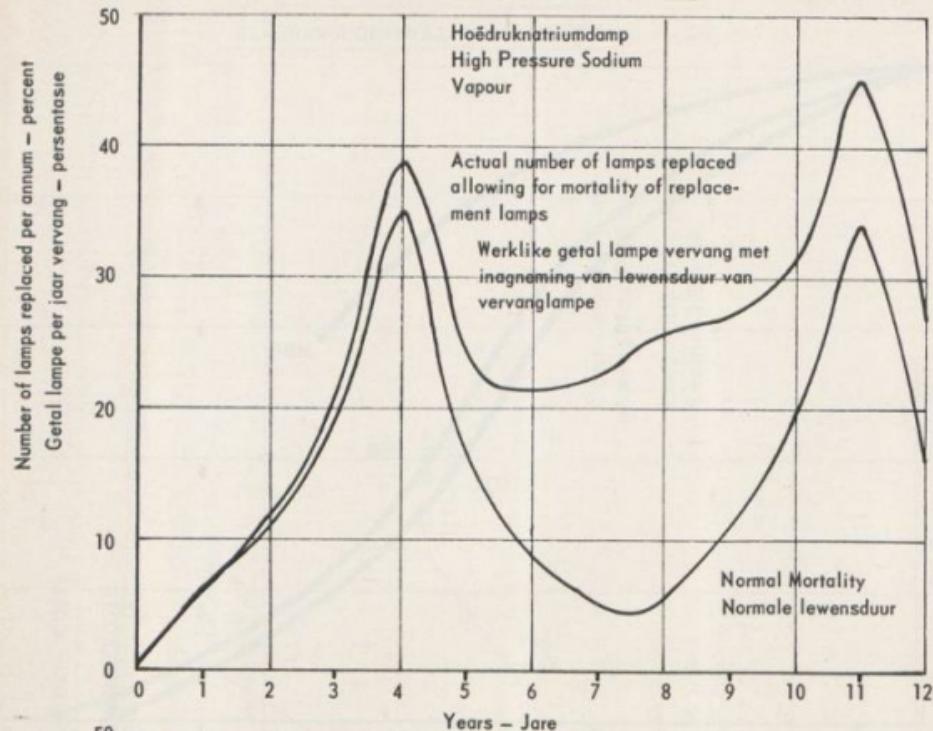
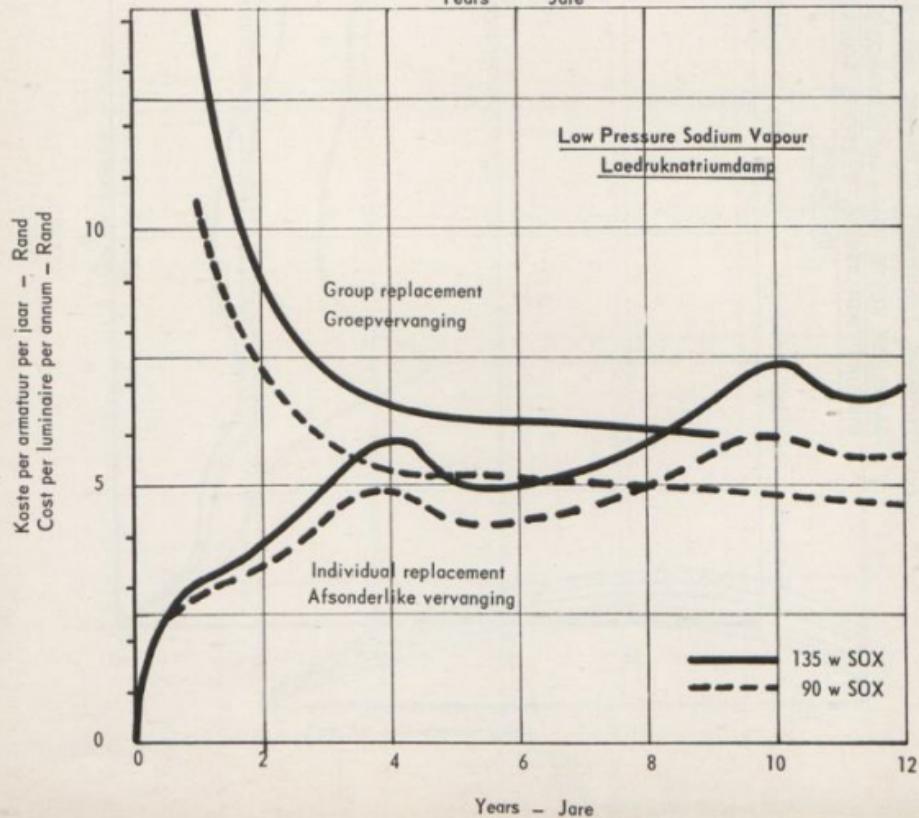
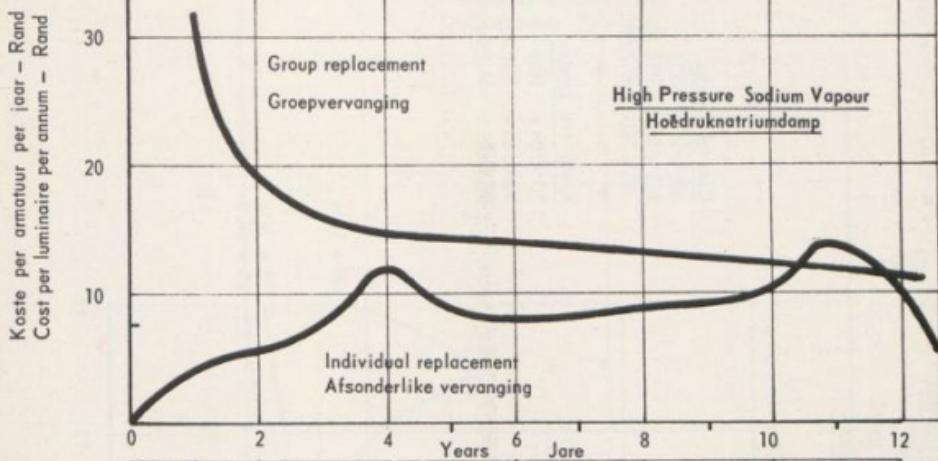


Fig 5

**COMPARATIVE COSTS PER LUMINAIRE PER ANNUM
BETWEEN INDIVIDUAL AND GROUP REPLACEMENT
OF LAMPS**

**VERGELYKENDE KOSTE PER ARMATUUR PER JAAR
TUSSEN AFSONDERLIKE EN GROEP LAMP VERVANGING**



ANNUAL COSTS OF LAMP REPLACEMENT INCLUDING
LABOUR, TRANSPORT, CLEANING AND LAMPS
JAARLIKSE KOSTE VAN LAMPVERVANGING MET
INBEGRIJP VAN ARBEID, VERVOER, SKOONMAAK
EN LAMPE

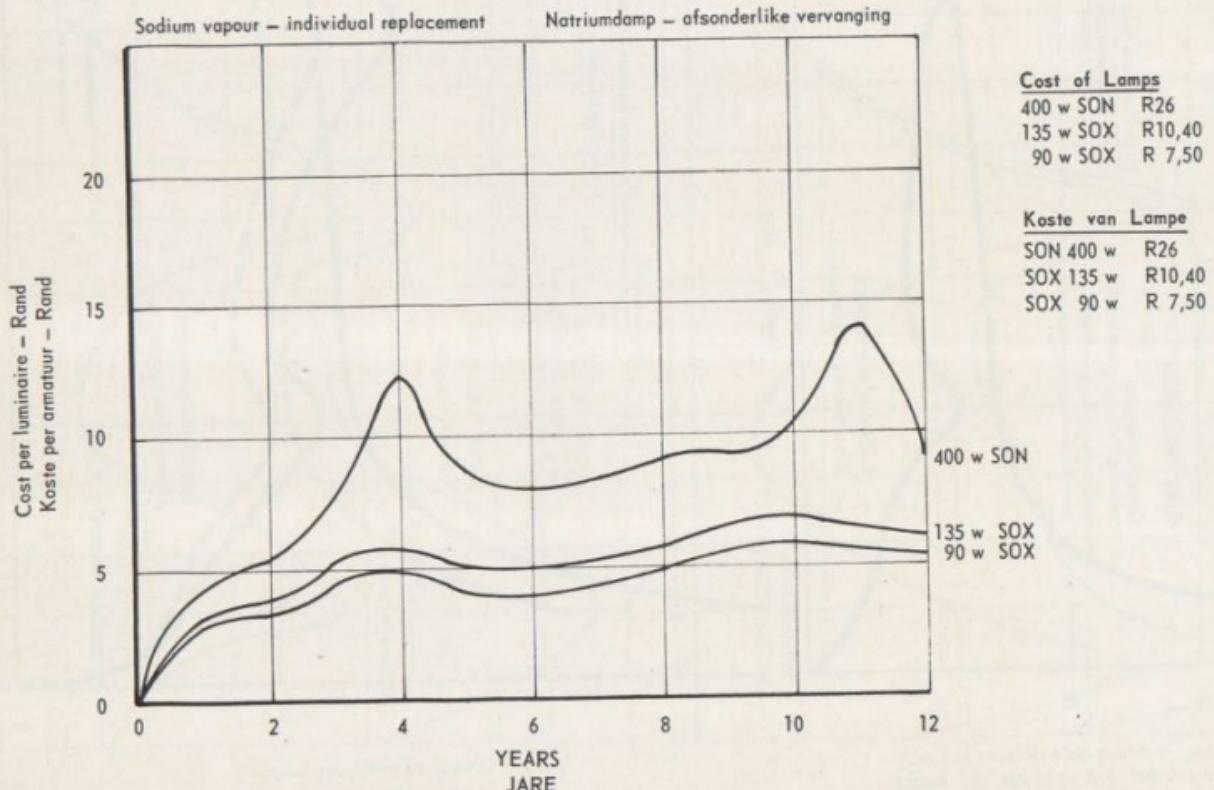
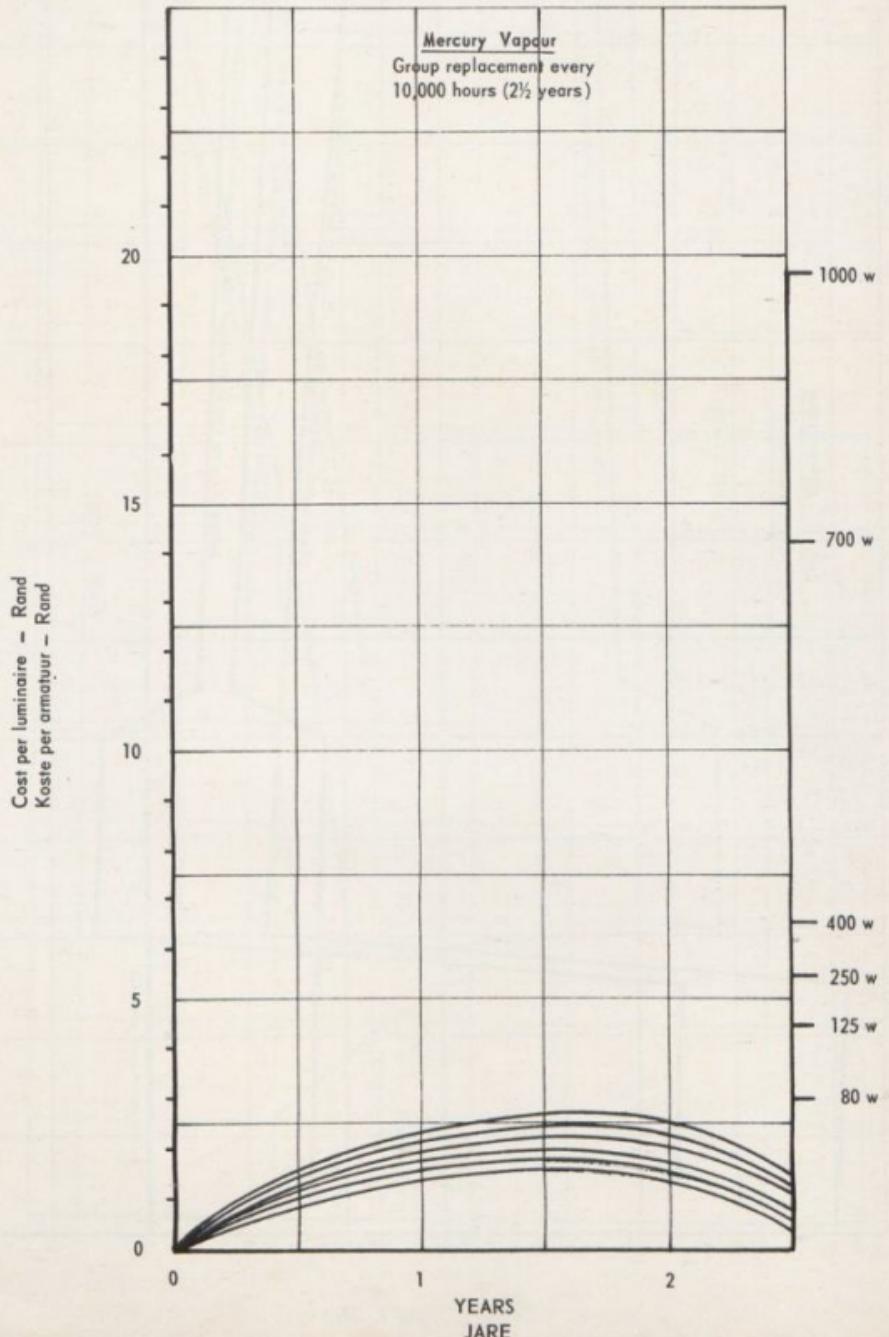
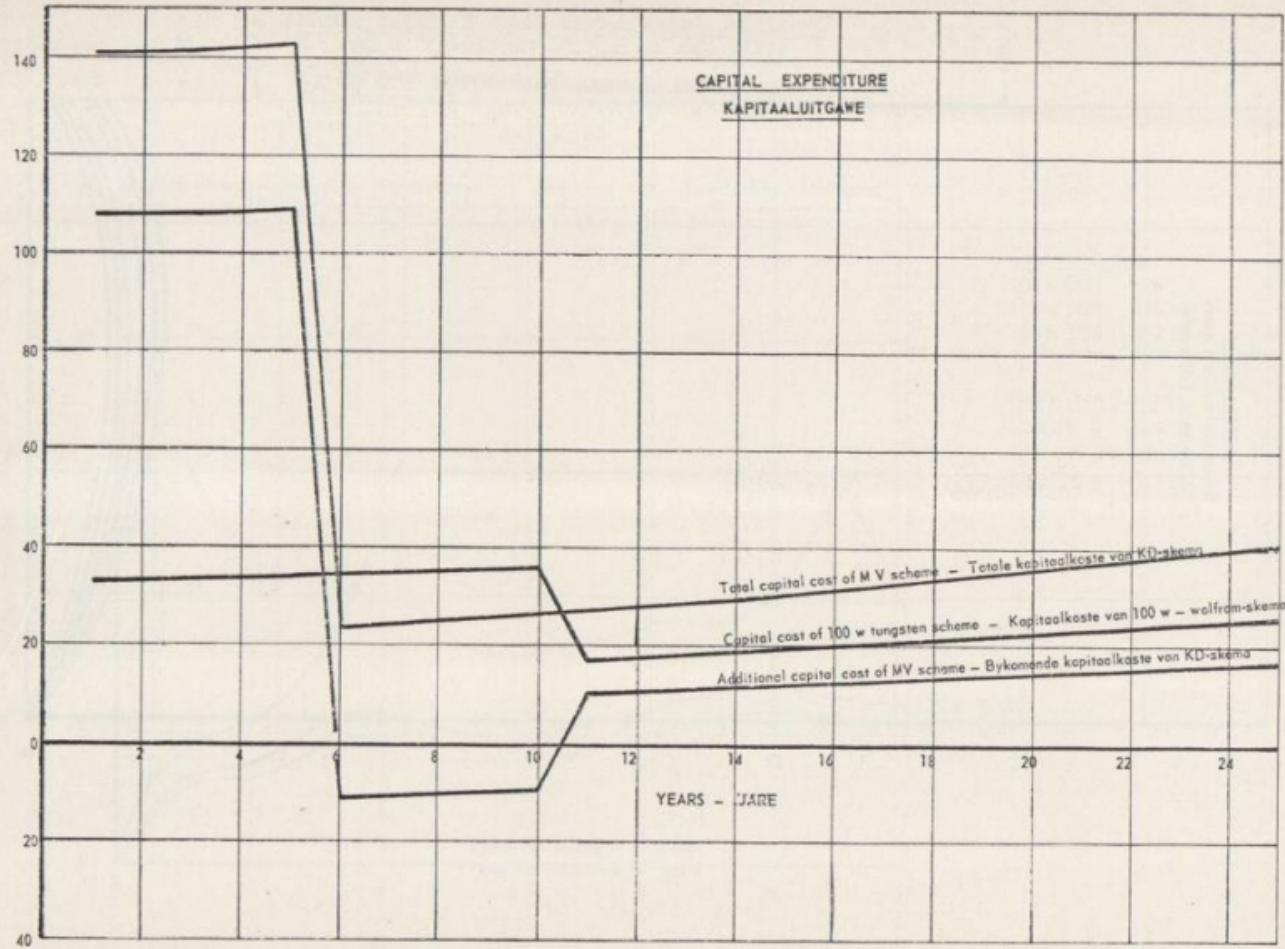


Fig 6

Fig 7

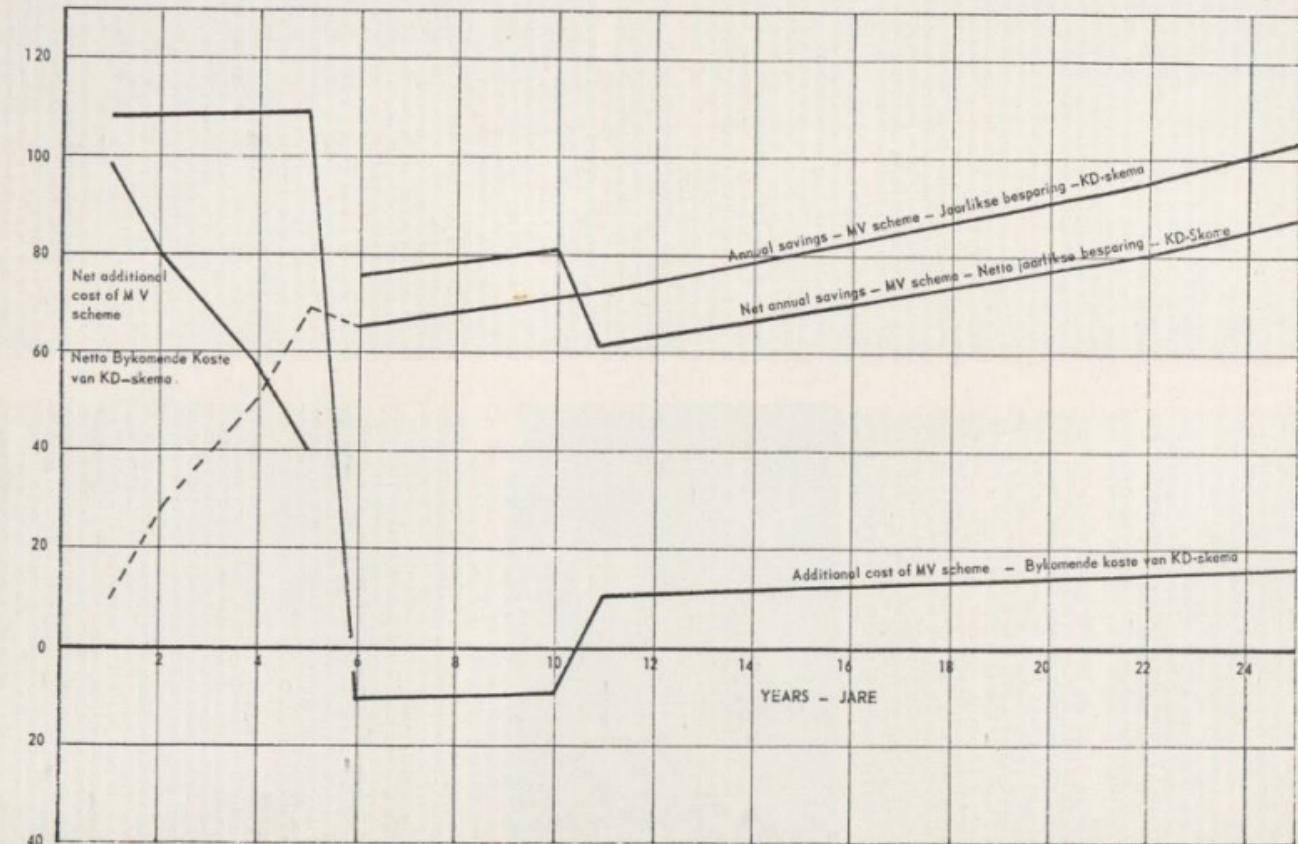
Annual cost of lamp replacement including labour, transport, cleaning and lamps
 Jaarlikse koste van lamp vervanging met inbegrip van arbeid, vervoer, skoonmaak en lamp





NETTO - KAPITAALKOSTE EN BESPARING

NET CAPITAL COST AND SAVINGS



Mr. J. T. Grundy (Affiliate): It is customary for the discussion leader to compliment the author on his paper and then ask a series of awkward questions. Having known Mr. Wood for more years than either of us care to remember, when your President invited me to open this discussion, I was innocent enough to write dear Harry, what would you like me to say? In reply I got, dear John, I would like to know . . . followed by a series of questions for ME to answer. Just because I run a lighting laboratory in Springs doesn't mean I know all the answers and if I did try to answer fully all the questions, I'd be imposing another Paper on you.

To come to only some of Mr. Wood's questions:

- (a) Are we going to plan schemes by luminance or illuminance?
- (b) Has the 1, 2 Intensity Ratio in the British Code been raised from 78° to 82° for the cut-off distribution?
- (c) Are the differences associated with glare restrictions in the various codes going to be resolved? Code only codifies current good practice.

Some may wonder why the SABS Code of Practice for Street-lighting has not been revised since its publication in 1967. The reason, which I'm hoping Mr. Smit the Chairman will confirm, is that as it was based on the International C.I.E. Document No. 12, the SABS Code Committee are only too well aware of the intensive activity which has been going on for the past four years in revising Document No. 12.

As a result of the meetings in Barcelona in 1971, at which Mr. Dempster of Johannesburg represented South Africa, a number of WORKING Groups were formed, charged with the task of completely revising Document No. 12. I might add largely as a result of the furious arguments which went on between the British and European Contingents, extra meetings taking place at 7 a.m. in the mornings and late at night, with the Americans, strangely enough lagging, possibly for commercial reasons. Just for one item, Mr. Wood is not quite correct in his Table wherein he states the British Code CP1004 is based on the maximum light in the lower hemisphere. Whilst from Mr. Wood's Paper it is not possible to ascertain which statements he has selected from the Authors he quotes a references. I note he does quote as a reference a Paper by Lambert and myself written as a result of some research work in 1971 and another Paper written by myself in 1970. From these and others I would like to make it quite clear that BSCP 1004 was always based on the ROAD Brightness Theory, which is only another semantic for Road Luminance. The British, for reasons of brevity failed to disclose that all the Tables published which enabled the engineer to speedily calculate his scheme, were aimed at providing good and even road luminance. One of the criticisms of the SABS Code is the time and labour involved in calculating a scheme. In my opinion resulting from all this CIE work over the past four years we shall have available a new International Code to which all National Codes can be aligned. In fact, already partly aligned a revised BSCLP 1004 Part 2 was issued in 1974.

This Revised CIE Document No 12, which has been freely available from SANCI in draft form, will be presented at the CIE Conference in London in September. It has five chapters and here I must be as brief as possible.

1. Purpose, Scope and History.
2. Fundamentals of Lighting for Road Traffic.
3. Criteria for decisions as to whether a road should be lit.
4. Criteria of quality in road lighting.
5. Installation performance data.

The document is supplemented by the following separate technical reports, TCI. Calculation and measurement of luminance, illuminance and glare.

2. Glare in streetlighting.
3. Lighting in situations requiring special treatment.
4. Depreciation of installations and their maintenance.
5. Classification of luminaires and their performance data.

On the luminance of road surfaces, very extensive work has been done on the measurement and specification of road surface properties and this enables road surfaces to be classified broadly into only four groups. For the use and/or scheme planner, luminaire data computer calculations enable him to select a luminaire for his selected road luminance.

On Glare of an installation, discomfort glare is quantified by the Glare Index G for an installation, which runs from 1 to 9, based on subjective appraisals by teams of observers over the past four years. In fact, somewhat similar to the British IES Glare Index System for Interior Lighting which is also incorporated in the SABS Code for Interior Lighting. In this streetlighting system, the formula takes into consideration the height of the luminaires above the drivers eye, the flashed areas of the luminaire, the average road surface luminance, the number of luminaires per kilometre and whilst Mr. Wood in his Paper refers to the angles 80° and 90° in the formulae it is the angles 80° and 88° which are involved. The quality of an installation is determined by the luminance level of the road, its uniformity, the lighting or surrounds, the limitation of glare and the visual and optical guidance.

Some of the foregoing may make members feel they are going to be involved in extensive labour and computer work. This is not so. The luminaire manufacturer must provide data on his luminaire and within Document No 12 a number of nomograms and tables are provided which enable to user and planner to calculate his scheme or to check one submitted by a manufacturer or consultant. If one does want to study much closer, Technical Report No 1. alone runs to 127 pages.

In regard to luminaires, we can forget all such expressions as Cut-Off, Semi-Cut-off, Non-cut-off, Intensity Ratios, Beam Angles and the like. I hope Mr. Smit will join the discussion and elaborate on this. Briefly, each luminaire will have a Specific Luminaire Index, which will incorporate a measure of degree of the limit of glare OF THE LUMINAIRE, NOT THE INSTALLATION. A limited control luminaire will have a SLI up to 2, a moderate control will be 2 to 4, and a tight control will be over 4. What is termed THROW means Q SHORT, 0°-55°, Medium 55° to 70°, LONG, over 70°, spread in azimuth will be stated, Narrow being 0° to 45°, Average 45° to 55° and Broad OVER 55°. Thus from what I have said, you will appreciate that Mr. Wood's Paper pages 1 to 7 and Figs. 1a to 1d may be regarded as historical, as historical as the City of Cape Town itself, and therefore interesting to review.

However, Mr. Wood also provides us with a series of data, curves, tables on energy costs, most of which I am sure will be of interest to delegates and also to Cities as far apart as Salisbury and London. These data seem to differ from the data published by those two Cities.

I am delighted that Mr. Wood has raised the subject of Energy Costs and hence Energy Conservation which to date has not created the future here evident in Europe and U.S.A. I think it well worth noting that a 250W HPSO lamp gives near the same lumens as a 400W MBFU lamp and with the increasing luminous efficacies, the 400W HPSO lamp luminous flux is rapidly approaching that of the 1kW MBFU lamp. HPSO Lamps mean smaller luminaires, which is saving, but as a luminaire manufacturer I would issue a word of warning to users of HPSO lamps to make sure that the variety of lamps and control gear are not only compatible between the components but also between the luminaire and those components. Our studies of the various types available in the Republic have provided us with considerable data which we are quite happy to make available to anyone at any time.

Finally, whilst there is a great deal more I would like to comment on in Mr. Wood's valuable Paper, such as residential suburban lighting and the like, I would just mention that his section on high masts was fully covered by Mr. Crowther's Paper at the SANCI Annual General Meeting in Kimberley and the subsequent discussion and answers which no doubt Mr. Barton of Welkom will report.

The City of Cape Town I understand only joined SANCI last year, hence Mr. Wood has been at some disadvantage. I would like to say personally and on behalf of my Company that whilst we have only been established here in the Republic for the past five years, we have greatly appreciated and benefited from being allowed to be members of SANCI and affiliated with the AMEU.

SANI is sending a strong delegation to the CIE Conference in London in September led by Mr. Dempster as President of SANCI. Hence if members here have any comments to put forward on CIE Document No 22, I am sure Mr. Barnard of Johannesburg will ensure that they are passed on to Mr. Barnard of Johannesburg.

M. R. S. Yates (Johannesburg): I would like to take this opportunity of congratulating Mr. Wood on his interesting and timely paper which I am sure has been well received by all Municipal delegates to this congress. Such a paper, based on the policies of a major South African city, provides some of the answers to the ever intriguing question of "what is the other fellow doing and why does he do it?" It inevitably also invites comparisons with the policies of your own organisation and its systems of lighting.

With this in mind I must join issue with Mr. Wood about his statement that "the choice of central median is often dictated or made by economic considerations only, without any thought being given to the future problems of maintaining the equipment". Granted that work on the fast lane of a freeway can be dangerous, but motorway maintenance should not, indeed must not, be considered similar to the maintenance of normal street lighting. Specially trained crews and special equipment is necessary to carry out the work safely and efficiently whatever lighting system is installed. The British Department of the Environment has closely investigated this matter and has drawn up stringent regulations, not only for safety procedures, but also for the equipping of special vehicles. Johannesburg, which has a lot of central median lighting on its freeways, has adopted these regulations and has experienced little trouble as a result. As lamp replacement for both carriageways can be carried out in one operation, costs are lower and there is less disruption to traffic - an important factor. I must also dispute the statement that opposite arrangement achieves better uniformity of illumination than median lighting. Illuminance ratios measured on the Johannesburg axial median lighting system are 2.2:1, far better than the minimum recommended by the SABS or the CIE codes. The higher illuminance areas occur, moreover, in the fast lane where it is most needed. Another advantage of the axial median system of lighting is that it improves perspective vision which, as I tried to prove in one of my papers referred to by Mr. Wood, is an important aid in judging the movement of vehicles in relationship to one another. Axial median lighting also provides excellent visual guidance in inclement weather conditions such as fog or heavy rain and hail. Furthermore, light originating at right angles to the line of sight under such conditions is less scattered than with transverse mounting and the haze produced by the light source is considerably reduced. I think that the very low night accident rates on the Johannesburg freeways are proof of the effectiveness of this system of lighting.

I would be very interested to know the basis on which Mr. Wood states that poles on the outside of a carriageway are less liable to

damage than on the median. Data collected would seem to indicate otherwise.

I would agree with Mr. Wood that there is a certain "industrial" appearance about catenary lighting with its larger poles and long visible cable runs. It was for this reason that the use of this system in Johannesburg was confined to industrial and mining areas where it is not in conflict with its surroundings. Axial median lighting can however be just as effectively employed by using suitably designed double arm poles, which, although slightly more expensive, is considered more aesthetically acceptable in other environments.

Finally, I would question the advisability of replacing low pressure sodium lamps individually on failure. If economics were the sole factor this practice may have merit, but the increased frequency of visits necessary to replace individual lamps must lead to greater overall disruption of traffic flow and the time taken to come off an area of work and move to every lamp failure location is excessive.

To conclude, I hope, as Mr. Wood does, that his paper will stimulate much discussion, as it is through this medium that we can all learn a bit more about how lighting can play its part in reducing the abhorrent night accident rate existing in this country. I would like to thank you President for providing me with the opportunity of contributing to this important paper.

Mr. H. Wood (Cape Town): Mr. President, gentlemen, thank you for all the very kind comments that has been expressed from the floor. I would just like to take up a few moments of your time to answer the questions, Mr. Grundy, first of all, he mentions that the British Code is not based solely on lumens in the lower hemisphere. This is strictly correct. The British Code based on empirical studies carried out many years ago with luminaire output based on intensity ratio's was adopted. The only way of therefore combining all the data for the different types of luminaires, such as the sodium or mercury vapour, was to base the total lumen output in lumens in the lower hemisphere. I am very glad to see that Cape Town has finally joined SANCI and that all the data for the CIE document¹² is available for inspection. The reason why I asked Mr. Grundy these questions was because I have read numerous summaries over the years of CIE congresses and noted the controversies arising between the British and Continental engineers regarding the design of street lighting schemes. But there was a lot of controversy regarding the glare formula which I understand from Mr. Grundy's remarks that the glare formula is now being adopted in Britain. The British for many many years argued that the glare formula was extremely difficult to apply because the flashed area of the luminaires was difficult to assess, and also no account was taken of any background luminances. But it appears that they have changed their minds, since the advent of the European Common Market. Maybe we will in the future get some sort of form of international agreement. Regarding the SABS 098 I feel we have a very good code and would be very reluctant to change the provisions contained therein.

We in Cape Town have been using the SA Code ever since its inception and in fact the Provincial authorities will not subsidise any scheme unless it complies with the Code. The SABS Code is well worth a good try before we start ringing any changes.

Mr. Grundy brought out the problems of the HPS lamp, I feel the manufacturing tolerances between the lamp and the control gear are not as wide as the normal mercury vapour lamp and I don't think anyone is going to be very happy using lamps on various types of control gear. Control gear and lamps must be matched for efficient operation. He also said that the luminaires used on suburban roads do not comply with the code of practice. The luminaires used in Cape Town have a slightly higher main beam angle. But let us bear in mind that we are not dealing with high powered light sources but rather with mercury vapour lamps having a lumen output of only 3 600 lumens. The light control we have on this lamp I feel is adequate for suburban road lighting and even the slightly higher angle does enable us to design the suburban lighting more or less in accordance with the Code.

Mr. Yates brought up the subject of central median lighting. I always understood that this arrangement would be cheaper than the opposite arrangement which is normally used in Cape Town. But I find to my surprise that it is far more expensive. He also mentioned the safety procedures adopted when maintaining median lighting which are unnecessary if the opposite arrangement is used. I have heard of cities in England where they drum off or they close off one or more kilometre of road for maintenance and this to me is inconvenient and results in increasing costs. Why not site the poles outside the freeway shoulders and then we can carry out maintenance without causing any interruption to the traffic. Incidentally the question of uniformity ratio's being better from the outside than from the central median lighting is perfectly true in the case of a normal designed luminaire which compiles pushbutton with the SABS or the BS Code. In the case of Johannesburg's scheme the luminaires were specially designed for this installation.

Mr. Raynal mentioned loading. In Cape Town virtually all street lighting is supplied from the LV substations. Control is carried out from the five depots using pushbutton control cascading through the LV substation network. We have very little trouble with the supply arrangements particularly when careful checks are kept on voltage variation which can be quite a problem when using vapour discharge lamps. Excessive voltage regulation with the mercury vapour lamp that lamp will either not strike at all or go on the blink. We have met these troubles on the system over the five years we have been con-

verting to mercury vapour lamps and have installed the necessary additional supply points.

Councillor C. de Kock (Potchefstroom): Mr. President, ladies and gentlemen, it is with great pleasure that I may on your behalf thank Mr. Wood for an excellent prepared and very well presented paper.

I do not think that you should worry too much about the code of practice because you see its Councillors that normally give the money to purchase these things. We have listened a lot about curves today. I think the ratio is wrong, you should have shown us more curves that we as laymen could understand. However, Mr. President, it is most gratifying in these times that we live in where there are so many people trying to 'verkrampt' us that they are so use that some people still are trying to make our lives 'verlig'. Thank you.

HONORARY MEMBERSHIP : COUNCILLOR H.G. KIPLING

Councillor C. de Kock (Potchefstroom): Councillor Bert Kipling first became a member of the Executive Council of the Association in 1961 and except for a break of two years, has been a member since that date.

He was in Kimberley and served an apprenticeship as an electrician with De Beers Consolidated Mines Limited and subsequent to the completion of his apprenticeship worked as an electrician with that Company.

He was subsequently appointed Construction Electrical Engineer for the first Iscor Works at Pretoria in 1932; Works Engineer at Iscor in 1935 in which capacity he served until 1947. During that year he moved to East London due to ill health where he became Consulting and Construction Engineer for the new Chloride Battery Factory in East London on which construction began in 1951. He was appointed Works Engineer of the Chloride Factory in 1954 which position he occupies until his retirement in 1969.



Mr. Bert Kipling receiving his honorary membership certificate from the President, Mr. Eugene Pretorius.

He is a member of the East London City Council since 1961 and a past member of the East London Divisional Council for 5 years.

He is still a member of the South African Institute of Electrical Engineers; the Chartered Institute of Safety Engineers and The Institute of Supervisory Management.

Member of the Springbok Rugby Team which toured the British Isles in 1931/32 and of the Springbok Rugby Team in South Africa in 1933. He played in all the Internationals in the British Isles in 1931/32 and all the Internationals against Australia in 1933.

He served for a brief period as Springbok Rugby Selector.

Mr. President, ladies and gentlemen, it affords me great pleasure to formally propose that the honorary membership of the AMEU be bestowed on Councillor Bert Kipling.

President: Be it known here that this certificate has been presented on behalf of all the members of this Association to Councillor Herbert George Kipling. Mr. Kipling was elected an honorary member of the Association of Municipal Electricity Undertakings of South Africa in 1975 and this certificate is a token of appreciation of his long and loyal services in fostering the objects of the Association. Hartelisid geluk, Raadsid Kipling.

Councillor H.G. Kipling (East London): Mnr. President, Dames en Here, soos ek nou voel sal ek liever in die middel van die skrum wees as hier op die verwoog. Mnr. President, ek wil graag my oopgeste dank en waardering teenoor die Uitvoerende Raad en die lede van die VMEO uitstrek vir die groot eer wat u my sangesond het. Dit is 'n toekeuring wat altyd 'n ereplek in my aandenkinge sal inneem. Yes, Mr. President, the reward affords me two additional pleasures, first when I realised that the recommendation was suggested by the Transvaal members of the Executive and secondly, that when my years as a councillor have expired, I will be permitted to attend the Conventions. I

have had a very happy association with the AMEU for many years, and the numerous friends I have accumulated during this period, has been ample award for any service that I have contributed as a member of the Executive. I therefore accept the award with humble feelings. It will be treasured among my souvenirs. Mr. President, I conducted my thanks through these notes as I was of the opinion that the only way I could adequately do it, was to express my thanks and appreciation to you all in this manner. Thank you very much.

ERE-LIDMAATSKAP : MNR. C. LOMBARD

Mnr. P.J. Botes (Roodepoort): Mnr. die President, dames en here, mnr. Chris Lombard is reeds 32 jaar verbondne aan munisipale elektrisiteitsondernemings, waarvan 26 jaar, d.w.s. vanaf 1949, ingenieurslid van die VMEO is. Hy het dus al meer as 'n kwarteeu diens aan die VMEO gelewer en op sy breet skouers het hy meer as sy deel van die VMEO bestuurspilgrimage gedra.

Reeds so vroeg as 1955 was hy verkies tot lid van die Uitvoerende Raad. Vir die ampstermy 1960/61 word hy verkies tot Vice-president en direk daarna 1961/62 beklee by die amp van President. Na verstryking van sy ampstermy het hy nog vir etlike jare op die bestuur gedien.

Op die VMEO komitees het Chris gedien as sameroeper op Rekte van Voorstiening-nywerheidswerkers. U en ek weet wat hierdie komitees vir die VMEO heteket het. Hy was ook lid en later sameroeper van die Aanbevelingskomitee insake Nuwe Elektriese Ware, en was ook lid van die geidsake-onderkomitee.



Mnr. Chris Lombard ontvang sy erelidmaatskap sertifikaat van die President, Mnr. Eugene Pretorius.

Hy was die VMEO verteenwoordiger op die SAEI komitee wat belang was met die opstel van 'n Gebruikskode vir substasies en die hersteling van die Gebruikskode vir Bogrondse Gelysings vir toestande soos in Suid-Afrika aangetref. Op laastgenoemde komitee het hy gedien as lid van die hoofkomitee, sowel as werkende onder-komitee. Hy het ook gedien op die Afrikaanse Elektrotekniese Nommentaklaturus onderskeide-komitee.

Chris was vir jare lid van die Raad vir Registrasie van Draadwervers, waar hy baanbrekerswerk verrig het.

Hy was ook verteenwoordiger van die VMEO op verskeie SABS-komitees, behalwe met opstel en hersien van standaard spesifikasies.

Hy is 'n persoon wat gereeld die vergaderings van die Hoëvel-tak buwoon, waar hy ook 'n leidende rol speel.

Chris was en is nog altyd bereidwillig om na enigeen se probleme te luister en sy rand word gewoonlik aanvaar.

Mnr. die President uit wat ek nou hier gesê het, moet dit vir ons een en almal duidelik wees dat Chris ten koste van homself nooit geskrom het om diens te lewer aan die VMEO nie en dit is dus met groot genoegte dat ek aanbeveel dat hierdie Vereniging erelidmaatskap aan Chris Lombard toeken vir die uitstekende en voortreffelike diens wat hy gelewer het.

President: Hiermee word meegeede dat hierdie sertifikaat naamens alle lede van die Vereniging toegeken is aan Christoffel Lombard. Mnr. Lombard is gekies as 'n erelid van die Vereniging van Munisipale Elektrisiteitsondernemings van S.A. in 1975 en hierdie sertifikaat is 'n aandekning vir die waardering van sy verbintenis en sy getroue dienste ter bevordering van die doelstellings van die Vereniging. Baie hartlik gevordering aan die doelstellings van die Vereniging. Baie hartlik gevordering aan mnr. Lombard.

Mnr. Christoffel Lombard (Germiston): Mnr. die President, dames en here, ek was nou nie eintlik voorberei om hier 'n toespraak te maak nie. Ek dink hierdie is 'n bietjie onverwag. Ek wil net sê dat ek my dank betuig teenoor die Vereniging vir die groot eer wat hulle my nadoen het, om my erelidmaatskap toe te ken. Oor die jare heen was die

VMEO baie naby my hart, en hy sal nog altyd in die toekoms naby aan my hart wees. Ek is bly dat ek die geleentheid gehad het om in die verlede 'n klein bietjie by te gedra het in belang van die Vereniging en ek wil die Vereniging alle sukses toewens in die toekoms. Baie dankie.

HONORARY MEMBERSHIP : MR. D.C. PLOWDEN

Mr. H.W. Barton (Welkom): Mr. President, Johannesburg has been very fortunate over the years in having a long succession of eminent engineers in charge of their Electricity Department. The AMEU has been equally fortunate in that these engineers have invariably taken a great and active interest in our affairs.



Mr. Derek Plowden receiving his honorary membership certificate from the President, Mr. Eugene Pretorius.

In the forefront of them has been Derek Plowden who has served on the Executive Council for several years and has put in a lot of hard work on many Sub-Committees, notably the Technical Training Sub-Committee.

In the numerous meetings involved, Mr. Plowden's talent for going to the heart of a problem and doing something about it, has always been evident. The words of Sir John Lubbock, to the effect that a man's life is not to be judged by the passage of time, but by his thoughts and deeds, apply especially to him.

On behalf of us all I would like to wish Mr. and Mrs. Plowden a long and happy retirement and I take great pleasure in proposing Derek as an Honorary Member of our Association.

President: Be it known hereby that this certificate has been presented on behalf of all the members of this Association to Derek Chichele Plowden. Mr. Plowden was elected an honorary member of the Association of Municipal Electricity Undertakings of S.A. in 1975 and this certificate is a token of appreciation of his long and loyal services in furthering the objects of this Association. Heartiest congratulations, Mr. Plowden.

Mr. D.C. Plowden (Johannesburg): Mr. President, ladies and gentlemen, may I express my very real appreciation for this high honour that had been conferred upon me, today. I can assure you that whatever I might have done to deserve this, I took with utmost pleasure, I could not have done it, without the whole hearted co-operation that I received from my colleagues in the Association. For me it is a happy coincidence that this event should have taken place here in Durban because it was in Durban at the University of Natal that I received my academic training as an Electrical Engineer; it was here in Durban that I bow out from direct involvement in the AMEU. Thank you!

ERE-LIDMAATSKAP : MNR. J.G. WANNENBURG

Mnr. J.K. von Ahlfen (Springs): Meneer die President, dames en here, dit is vandaag my aangename voorreg om 'n voorstel vir Ere-lidmaatskap aan die Konvensie voor te lê, naamlik die van mnr. J.G. Wannenburg, Hoof Inspekteur van Fabrieks van die Departement van Arbeid, Pretoria.

Hy is sekery by die meeste van u bekend as „Wannie“ sedert hy as die amptelike verteenwoordiger van die Departement van Arbeid hierdie Konvensies bygewoon het.

Baie dae het ek hom jammer gekry met al die vertolkings wat ons so vryklike aan die Fabrieksset, die Draadwerverset en ander gegee het, dat dit hom soms sprakeloos gelant het. Geen wonder dan dat hy op 'n keer moedeloos moes toegoe „Ten Years in Labour haven't Produced anything yet.“

Maar een ding moet ons vandag hier erken en dit is dat mnr. Wannenburg altyd bereid was om leiding met die vertolkings van 'n regulasie te gee en dat hy daarby volstaan het omgaag van sy onderseskiktes

nou daarmee saamgestem het nie. Dit het ons taak as verantwoordelike ingenieurs natuurlik soveel makliker gemaak. Ek onthou nog goed die dae vir mnr. Wannenburg, dat dit eenvoudig onmoontlik was om die Departement van Arbeid tot 'n standpunt te dwing by hierdie Konvensies.



Mnr. J.G. Wannenburg ontvang sy erelidmaatskapp sertifikaat van die President, Mnr. Eugene Pretorius.

Die antwoord was maar altyd skouerophalend „dit is wat die Wet sê en dit is wat julle gaan doen“ ongeag of dit nou verstaanbaar was of nie. Daarvoer is ons mnr. Wannenburg dus baie dank verskuilid dat dit nooit sy houding hier was nie. Hy is 'n ferm vertolkter van die Wet maar nooit onredelik nie.

Mr. President, ladies and gentlemen in my capacity as a member of the Electrical Wiremen's Registration Board as the AMEU representative since 1969, I must thank Mr. Wannenburg as Chairman of the Board on your behalf for the understanding and interest he has shown concerning us as "suppliers" with the many problems we encountered with the administration of the Act, although he had to rap us across the knuckles on many an occasion. To show in which high esteem Mr. Wannenburg is being held in his own Department, after 3 years of unfruitful "labour" in trying to amend the Act, he was eventually called upon to "produce" something. As we know Mr. Wannenburg he will either "make" or "break" the Act and we can rest assured that once he has finished this work it will be a job well done.

I also know that many people do not always agree with his views as far as the Act is concerned, but I also know that he will not be swayed by any bottomless arguments.

Mr. President, I am sure you will all agree with me that Mr. Wannenburg is worthy to be honoured as such by our Association. I doubt if we will very soon again be privileged with a Chief Inspector of Factories of Mr. Wannenburg's calibre and may the "Gods" have mercy on us when his successor is appointed. But let us be appreciative of what he has done for us municipal electrical engineers with our crammed up technical brains and very little legal abilities.

If therefore gives me great pleasure in formally proposing that Mr. J.G. Wannenburg be made an Honorary Member of our Association, which I am sure will receive your unanimous approval.

Thank you Mr. President.

President: Hierdie word meegegee dat hierdie sertifikaat namens alle lede van die Vereniging toegeken is aan Johannes Gerhardus Wannenburg. Mnr. Wannenburg, is gekies as erelid van die Vereniging van Munisipale Elektriesiteitsondernemings van S.A. in 1975 en hierdie sertifikaat is 'n aanndeling dat die waardering vir sy verbintenis en getroue dienste ter bevordering van die doelstellings van die Vereniging. Baie hartlike geluk, Oom Wannie.

Mnr. J.G. Wannenburg (Pretoria): Mnr. die President, dames en herre, ek wyl net eers gou aan die negen se oase nartuig dank vir die desondere eer wat julle my aangelewer het. Dit is wat my bref is, dat besondere eer omdat ek nie juis 'n lid van u Vereniging was nie, en ek weet nie of dit baie keer van tevore al geheur het nie, en daarom slaan ek myself nie op die skouer nie, dat 'n buitestaander hierdie eer aangelewer was nie. Baie hartlik dank daarvoor.

Dit is die 11de Konvensie wat ek bywoon en wat ek hier gesit het en saam met julle geluister het na rodenisse en referate. As u maar net weet hoeveel ek van u geleer het. U soet dat u baie van my geleer het, en as dit die geval was, dan is ek baie dankbaar dat ek aan u Vereniging van 'n bietjie hulp kon wees. Nou was ek maar altyd bekend gewees hier, as „die stout seun“ tussen die klomp en nou wil ek vir u soé hoedat ek hierdie toekeening in 'n sekere mate op grappige manier beskou. Gammel het 10 kinders gehad, hulle het almal Bybelse name gehad, Moses, Jakob, Johannes, Markus, ens. ens. en tot kon die 11de enetjie. En die 11de enetjie se naam toe hy dit gaan opgee by die predikant was Onex. Toe vra die predikant vir hom watter mooi Bybelse naam het jy

nou vir hierdie kind uitgedink, toe sê hy: „Nei maaster, die kind se naam is Onex.“ „Ja dit is nou nie 'n Bybelse naam nie, maar dis daarnem pragtige semi edele gesigte.“ sê die predikant. Toe sê Gammel vir hom: „Nei Maaster, maaster verstaan heetleem verkeerd, sy naam is Onex because why he came so unexpected.“

Nou kan ek sê hierdie vereering het vir my ook baie „unexpectedly“ gekom. Dit is die minste wat ek verwag het toe ek verlede jaar saam met julle was dat ek hierdie eer toegelewer sou gewees het, vandag.

Weereens my innige dank vir die eer wat my aangelewer het, en as dit misken die laaste vergadering van konvensie van ons is wat ek offisieel in huidige kapasiteit sal bywoon dan hoop ek immers dat ek met wat my vanding aangelewer is, ook nog in die toekoms u vergaderings sal kan bywoon. Baie hartlike dank.

CLOSING ADDRESS BY THE DEPUTY MAYOR COUNCILLOR DR. G. J. HOLLIS

Meneer die President, Dames en Here, Sy Edelagbare Die Burmester, Raadslid Adams, is baie spyt dat hy, weens amperpligte, nie van middag in u middie kan verkeer nie. Ek is egter besonder bly dat ek die voorreg gegun is om 'n paar woordes aan u te kan rig. Dankie vir die pluimpies wat u en die afgevaardigdes, ons en ons stand gegee het.

We are particularly pleased to have had the 44th Convention in our city because the connection of Durban with the Association goes back to the late John Roberts, who was our first Borough Electrical Engineer and was second President of your Association, namely, from 1917 to 1919 and again from 1924 to 1926. His successor, the late H. G. Giles and Clarence Kinman were each Presidents in the years 1927/38 to 1947/48 respectively. The later Edgar Poole, Durban's first Assistant Borough Electrical Engineer acted as Honorary Secretary/Treasurer to your Association through various periods from 1917 to 1940. So as you see, Durban is very closely associated with your Association and perhaps it would be very appropriate if you scheduled Durban as your convention venue more often.

I must congratulate you Mr. President, on what I hear has been a most successful conference and I hope that in your deliberations, you were able to, or more hopefully, maybe able to, in the coming year, devise some scheme whereby you could reduce the cost of the "Units" because that is what our ratepayers want.

I am given to understand that an excellent spirit has prevailed among the delegates and many subjects of interest and considerable importance have been discussed. I can well believe this because modern civilisation is very dependent on electricity for its many needs, whether it be for light or power and on the more spectacular uses such as Christmas illuminations, Neon Signs, etc. The City of Durban is indebted to the Electricity Department as it is one of the trading undertakings that makes a profit and so contributes to the Borough Funds and so helps to reduce our rates.

I am reminded of the old saying that all work and no play makes Jack a very dull boy, so we hope that the delegates tasted a few of Durban's many entertainments during their leisure period - accompanied, naturally, by their wives who I understand have been looked after by a very active ladies committee.

Ladies and Gentlemen, all good things unfortunately come to an end. I hope I can place this convention in this category. When you leave Durban during the next few days to return home, you will leave with very happy memories of your stay here, so much so that in future years you will need very little encouragement to return.

Graag verskeer ek u dan u altyd in ons stad welkom is, en nie net wanneer u 'n kongres hier kom bywoon nie.

Ten slotte wens ek u alle heel en seën toe en speek ek ook graag die hoop uit dat u almal veilig huis sal aankom. Dankie.

CLOSING ADDRESS BY COUNCILLOR C. DE KOCK

Mr. Deputy Mayor, President, ladies and gentlemen, it is with great sense of pride that I stand here today as a representative of the most important town in the Transvaal, viz. Potchefstroom, to thank the City Council of Durban for accommodating the 1975 Convention of the Association of Municipal Electricity Undertakings of South Africa.

As a member of this Association, Potchefstroom has come a long way since the first day electricity was used in our town.

Before August 15, 1903, Potchefstroom had no electric light supply, but on that date a number of Potchefstroom people assembled at the power station of the Potchefstroom Consumers Electric Light Company to witness the inaugural ceremony of turning on the electric current. The budget described the dynamics as "ponderous".

At this time the electricity was generated and stored in large accumulators during the day, from which the current was drawn at night. The dynamos were put in action for some fifteen minutes, when it was ascertained that some parts of them had become unduly heated. Success to the Company was then drunk and the dynamos were set in action again, and levers were pulled which brilliantly illuminated both the Queens and the Royal Hotels.

In 1906 the Municipality took over the Power Station, which was in full commission until 1936, when the Victoria Falls Power Company agreed, partly to supply the town. (Quoted from "A Century of History" - The Story of Potchefstroom by Geoffrey Jenkins 1939).

As far as street lighting is concerned, the Potchefstroom Municipality in 1911 took over the business of the Potchefstroom Consumers

Electric Light Company, and erected a handsome building to accommodate an up-to-date plant comprising two 60 K.W. Belliss-Siemens sets single voltage three-wire D.C. generators, also a battery consisting of 274 cells with a capacity of 300 ampere hours. (Quoted from a brochure issued in December 1913).

From this small beginning Potchefstroom progressed to this important point today where we can take home with us the President of this very important Association.

Namens Potchefstroom en namens al die kongresgangers wil ek aan die Burgemeester van Durban en alle lede van sy Raad sê, dat ons baie groot waardering daarvoor het dat u as ons geskrewe opgetree het.

U het baie bygedra tot die sukses van die Konvensie, u het ons vergelyk hier aangenaam gemaak en met baie aangename gedagtes en herinnerings gaan ons na ons tuisdorp terug.

Wees verseker van ons beste wense aan u mooi stad en al sy inwoners vir die toekoms.

CLOSING ADDRESS ON BEHALF OF AFFILIATE MEMBERS BY MR. JOHN MORRISON

Mnr. President, dames en here, in Natal is die plesang die emblem en ook die weergawe van die natuur van die blom in die son, wanneer die sentiment daaraan verbonden ten volle en selfs deur munisipale elektriese ingenieurs waardeer word, veral as 'n bikini dra. Dit is klein dingeties soos hierdie wat ons studies veraangenaam, en ook die rede is waarom ons dit geniet ons konferensies in Durban te hou. Durban die hoofstad van plesangland! Mr. President I would like to dwell for a moment on this very aspect of Nature and the Electrical Industry.

With the high increases in fuel costs, nations throughout the Western World are allocating millions to finding new and cheaper sources of energy and whilst the use of solar heat is probably foremost in their investigations, research scientists are also devoting much time and effort to harnessing other forms of our environment, such as the wind and the rise and fall of the tides – in order to generate electricity.

I sincerely believe that if we in South Africa could only divorce our thinking away from coal and uranium as future reserves of energy, and revert to Mother Nature as a source, we might come up with something that is both efficient and inexpensive to operate.

I suggest two such sources of electrical energy within our own human resources.

You realise Mr. Deputy Mayor, that if all the go-go girls in the Durban night clubs were placed side by side, they would generate sufficient frictional electricity to light up the beach front. This exciting prospect has given me many hours of happy contemplation, but not being of scientific bent, I have been unable to contrive a method of harnessing the benefits of this truly mobile power pack. Accordingly I consulted an expert in this field – none other than Mr. Mat Diddlecote, who to my great joy, has thrown himself wholeheartedly into the project and who, during the short space of the last four days, has devised a highly sophisticated instrument called the GO-GONOMETRE which will collect and store these electrical surges. However, he does have a personal problem, for being of a shy and retiring nature, he is hesitant to ask where he should put it and perhaps some of our more worldly members would tell him! Developing further this theme of human resources, I feel confident that we could somehow harness the millions of brain impulses generated during this Convention.

Perhaps it is not generally known that the Central Nervous System – that part which controls our thinking process – has 20 Billion cells which continuously emit electrical impulses and which in terms of energy require an input of between 500 and 1 500 kilogram meters per minute (when under stress or when making a speech, this can increase to 2 000 kilogram meters per minute). Converted to electrical terms, this amounts to an average of 160 watts per person. Of course, my calculations are based on an optimum, and assumes that the brain has been active all the time which may not have been the case after lunch with certain affiliates who, after all, are at a disadvantage to the Municipal Engineers in that they have no Councillor alongside to keep them awake! However, allowing for a diversity factor of 80%, we arrive at the important conclusion that the total electrical output of all our members would have been sufficient to operate 29 Convector Heaters – which I suppose is equivalent to the "hot air" produced during the Convention by other sources.

At this stage Mr. President, I know that my critics are murmuring – Oh yes his theory is all very well – but not all the power was positive – some of it could have been negative. Anticipating this, I have taken the trouble of finding out exactly how our members have been thinking during the long hours of deliberation by glancing at the comments and drawings that appear on the papers littering their tables – and some very interesting facts emerge. For example, it would seem that a great number of the Municipal Electrical Engineers have already latched onto my go-go project in that we have innumerable illustrations of the female form in all shapes and sizes. I suppose that this is natural because after all, anatomy is something everyone has – but then it looks so much better on a girl – and, in conventions such as this, one really has to draw the line somewhere.

I must confess some puzzlement at the drawings that were on the E.S.C. tables, for they consisted of a conglomerate of stars, lightning flashes and arrows shooting out in all directions – but, having consulted my tame psychiatrist, I was advised that these were an illusion to fission and nuclear explosions prompted by a subconscious concern with the installation of our pioneer nuclear power station.

I came across the first staff advertisement the other day which read: "Engineer wanted to work on thermo-nuclear diffusion apparatus with dangerous radio-active unstable isotopes – in a marginal gamma radiation bio-environment – no previous experience necessary".

Then we have our Councillors – these worthy and unselfish citizens who are prepared to sacrifice a week in their business lives to keep us – nose to the grindstone – on the straight and narrow paths leading away from the flesh-pots of Durban. Being hard-bitten business men, their private thoughts stray to matters practical and here possibly we have the most constructive illustration of the lot. It consists of a sports car with a large handle on the side and I am told it is designed so that when you spot a woman driver – you can pull the lever and the car folds up and hides itself in the glove compartment.

Last but not least we have the strong silent men – our affiliates who believe in the adage that blessed are those who have nothing to say and cannot be persuaded to say it. However, their time has not been wasted and judging by the telephone numbers that appear on their jotter-pads, it would seem that they already have some exciting prospects in mind – which factor has prompted me to dedicate this short ditty to them:

"In Umtata it was Una – she was Phyllis down at Potch

At Roodepoort it was Rosie – such a lovely girl to watch.

In Cape Town she was Carol – quite the finest of the bunch

But down on his expenses – she was petrol, oil and lunch"

So you see Mr. President, each one of us has contributed, whether actively or passively, to make this one of the finest Conventions that we have ever had. The papers have been outstanding, the control and administrative arrangements by Bennie van der Walt quite excellent and the hospitality shown to us by the Mayors of Potchefstroom and Durban, their Councils and their staff has been simply wonderful.

To you Sir and to all those who have made this such a memorable week – I tender our sincere thanks.

CLOSING ADDRESS ON BEHALF OF THE LADIES BY MR PAT MIDDLECOTE

Mr. President, Mr. Deputy Mayor, Mr. Fraser, you might wonder why I – a humble man – have been asked to propose a vote of thanks on behalf of the ladies; but I think it is appropriate, because after all, woman was made from the rib of man and she is in fact but a part of us.

One philosopher said in the very early 10th century that wicked women bother one while good women bore!

It was an engineer I believe and not an anatomist who had the audacity to say: "You see dear, it is not true that woman was made from the rib of man – she was made from his funny bone!" It is quite possible that this is the origin of the modern word to rib, which means to poke fun at or to joke. That woman is but Adam's rib I do not agree but rather would I command the adage that woman was made of a rib out of the side of man, not out of his feet so as to be trampled on, nor from his head so as to rule or nail him, but out of his side to be equal of him, to be held by his strong arms and to be loved by his heart. Now many people would tend to believe that these lovely creatures on whose behalf I talk were responsible for our downfall in Eden – but look at their efforts to get us back there! These have inspired the poet in me to write the following which I offer to you:

The woman tempted me and tempts me still
Lord God, I pray you that she never will
Twas her who put me out of Paradise
To eat her apple I could not refrain
Her beauty and her charm yet entice
She and only she can get me back again

Still better if you follow his teachings, are the words of that great Persian poet, Omar Khayam who said – "In the beginning Allah took a rose, a lily, a dove, a serpent, a little honey an apple and a handful of clay and lo and behold when he looked again, it was a woman."

But there is absolutely no support for the contention made that the clay unfortunately segregated to the feet. The goddesses on whose behalf I talk do not have feet of clay!

I would like to proceed to thank you on behalf of these roses, these lilies, these honeys, these doves or maybe these ribs – call them what you will.

Ek wil eers 'n storie vertel, "n Dominee was besig om 'n begraffenisdiens te hou onder dié indruk dat hy die vader van die huis begrawe. Hy het taamlik breedvoerig oor sy geoeie besondere prestasies en alles wat hy bereik het uitgewei. Naderhand phik iemand hom aan sy baadjie en sê, „Dominee, dit is die vrou wat u begraw." Die Dominee het ongesteld voortgegaan en teen die einde sê hy: „Vriende, agter elke uitstaande man, staan daar 'n vrou wat hom tot die prestasies ondersteun het, en ons is hier blymekaar om so'n besondere vrou te begrawe."

Dit is die rede waarom ons dames moet bedank word. Hulle het hierbeen gekom om agter ons te staan, en om ons hulle tyd op die strand deur te bring nie. Ek soond rok kyk en al die mooi dames sien, word ek herinner aan die paar dae wat ek hulle wel op die strand gesien het! Ek het nie gedink dat ek ooit die dag sou beleef dat dames op sovele verskillende plekke bruingebrand word nie! Hulle staan agter ons ons om te help met die oplos van probleme wat ons nie sou gehad het as ons nie met hulle getroud was nie.

In the case of the electrical engineers, we are very fortunate that our

ladies stand even more firmly behind us. This is quite natural for since the beginning of time women have been concerned intimately with the generation of electricity. If one knows ones Greek mythology, one is aware that Jupiter was the god of the sky and atmospheric phenomena – the lord of winds, clouds, lightning and thunder.

The first electrical engineer in fact, if one considers the high voltages he generated. But in this work he was helped by his wife Juno, who was queen of the sky – like most of our ladies here – very virtuous.

In fact, mythology has it that it was the noisy domestic quarels of Jupiter and Juno which constituted the storms, atmospheric disturbances, thunder and lightning. So Juno was behind this first electrical engineer, just as our ladies stand behind us. I am sure that the reliability of our electricity supplies are not a function of their domestic bliss.

However, there is one big difference between Jupiter and all of us engineers here today – he was unfortunately rather a philanderer. He would look round from heaven and see a beautiful mortal creature and would immediately transform himself into either a bull or swan and sneak upon this innocent creature and duly shock her. In fact he was the first high voltage transformer in the world! So ladies don't get excited now and when next your husband tells you he has got a new high voltage transformer – do not think it is a new seductive good looking Deputy Town Electrical Engineer.

Mnr. President, mnr. Fraser en al hulle gevwingige helpers, ek wil jullie graag bedank vir die aangename tyd wat u aan ons dames besorg het.

Julle het almal 'n verjouingskurs ondergaan en wanneer ons teruggaan huis toe sal ons beter in staat wees om die reserse kapasiteit te voorseen wat 'n ingenieur van die VMEO nodig het om 'n betroubare elektrisiteitsvoerder te waarborg. Dankie mnr. die President.

BEDANKINGSWOORD EN AFLUITINGSTOEESPRAAK ACKNOWLEDGEMENT AND CLOSING ADDRESS by/deur Eugene Pretorius President

Mnr. die Onder-Burgemeester, goagte pasgekose erelede, geerde gaste, dames en here, vir my bly daar net een baie aangename taak om er dit is on dankie te se.

Hierdie 44ste Konvensie dink ek sal onthou word as een van die uitstaande Konvensies in die geskiedenis van ons Vereniging, en dit ten spye van die President. Dit kortslik is te danke aan nie woodwendig in volgorde van belangrikheid nie, aan eersteens die vriendelike stads Durban, tweedens ons ewige Sekretaris en, maar veral uit die afgevaardigdes wat dit ook vir my met al my tekortkominge so maklik en aan-genaam gemaak het.

Eks begin by Dennis Fraser en sy hoogs doeltreffende personeel, sonder wie se toewyding hierdie Konvensie nie moontlik sou gewees het nie. Ek wil toe mnr. Allister Whyte en Stewart McKellar wat 'n leue aandee in die reeelings gehad het by name noem. Also Miss Cheryl Reiner and her bevy of very charming girls. On behalf of the AMEU, I wish to present a small token of appreciation to Mr. Whyte and Miss Reiner, and the latter to please be shared with the other Girls.

Wat Durban betref, wil ek ook so baie dankie aan die Pie Department vir al die pragtige blomme rangskikkings en die versiering van die verhoog hier en ook Dinsdagdag in die Stadsaal. Vir ons Potchefstomers, toe ons Magistrate in hierdie saal aanloek, en ons sien ons stadswapens so pragtig uitgestal was ons onsept. Ek het nog nooit so iets gesien nie. Baie baie dankie!

Ek wil ook van die Burgemeesterspaar van Durban, Raadslid en mev. Adams baie hartlik bedank, eersteens vir die wonderlike skermekelkthal, en tweedens namens die dames vir die tuinparty wat die Burgemeesters aangebied het Dinsdagmiddag.

Ek wil ook van die geleentheid gebruik maak om die firma Cu Al Engineering (Pty) Ltd. te bedank vir die middagete wat die dames aangebied was Dinsdagmiddag.

Aan die referente s們 ons hartlik dankie vir die moeite wat hulle gedoen het in die voorbereiding asook aanbieding van u referate.

Baie dankie aan mnr. J.D. Naude Van Wyk wat ons vereer het om die Konvensie ampelik te open. Ek wil die man in die glashokkie mnr. Piet Conradie baie hartlik bedank vir die uitstekende vertaling dienste wat hy gelewer het.

Ek wil van die geleentheid gebruik maak om mnr. Jack Waddy, Derek Plowden, Bob Barton en Emile de Villiers wat hierdie Vereniging op die Uitvoerende Raad vir baie jare gedien het weereens te bedank vir die goeie dienste wat hulle oor baie jare aan die VMEO gelewer het.

Ek s� dankie aan my vriende mnr. Pat Middlecote en Jules van Ahlsten wat die ledeforum sessie waargeneem het.

Baie dankie aan die pers en aan die SAUK vir die publisiteit wat aan hierdie Konvensie verleen is.

Baie dankie aan my eie Stadsraad vir die finansiële steun verleen aan die Konvensiekomitee en wat ook die voorblad van die Verrigtinge van hierdie Konvensie opgeneem het vir reklame.

Ek bedank die aangeswee President mnr. Ken Robson vir sy morele steun by hierdie Konvensie en byvooraat vir sy onderskraging die volgende twee jaar.

Ek wil die Stadsraad van Rustenburg byvooraat bedank vir hulle vriendelike uitnodiging om die Tegniese Vergadering in 1976 in Rustenburg te hou; ook aan Oos-London baie dankie vir die uitnodiging om ons 45ste Konvensie in Oos-London te hou.

I would like to express our sincere appreciation to the following Organisations who contributed towards making this an outstanding Convention:-

Messrs. Carst and Walker Industrial Materials (Pty) Ltd.

Messrs. Fuchs Electrical Industries (Pty) Ltd.

Messrs. G.E.C. Power Distribution (Pty) Ltd.

Messrs. Heinemann Electric S.A. Ltd.

Messrs. Hulets Aluminium Ltd.

Messrs. Scottish Cables S.A. Ltd.

These Affiliate members, under the co-ordinating hand of Mr. Peter Capra sponsored the "Tropical Evening" on Monday. What a resounding success! Thank you very much!

The management of the following organisations which were responsible for the various tours viz:-

Messrs. Consolidated Textile Mills Ltd.

Messrs. Smith & Nephew (Pty) Ltd.

The South African Sugar Association.

The South African Railways and Harbours.

Messrs. Caravan International (Pty) Ltd.

The Hulets Country Club.

Messrs. J.R. Ivy (Pty) Ltd.

The following concerns for their respective contributions:-

1. The Transport Department of Durban for providing motor coaches for the various tours etc.
2. The City Police Department for organising the traffic control.
3. The Town Clerk's Department for the loan of staff.
4. The Durban Corporation – Electricity Department for their general organisation during the Convention.
5. Prof. Knight of the University of Natal for providing the audio translation equipment.
6. Messrs. Manpower Temporary Services for their Bilingual Transcription Typists.
7. Messrs. Total S.A. (Pty) Ltd. for providing the Convention folders and stationery.
8. Messrs. Rothmans of Pall Mall London Ltd. for providing cigarettes and matches.
9. Messrs. Prestige Cosmetics for providing the ladies with perfume samples.
10. Messrs. Sterling Winthrop Druggists for their gift packs.
11. Messrs. Supima Corporation (Pty) Ltd. for providing the electronic transcription equipment.
12. Messrs. Bird & Leeney for providing the photographic services.
13. The Elangeni Hotel Management for their efficient and courteous service during the Convention. Especially many thanks to Messrs. Perez, O'Donnell and Steinbakker and their staff for the tremendous work behind the scenes.
14. The Durban Country Club for their kind hospitality to cater for the closing function.

Ek teen slotte, ek kan nie help om dit weer te noem nie mnr. Bennie van der Walt, baie dankie vir alles wat jy gedoen het om hierdie Konvensie 'n groot sukses te maak. Dit het begin by hierdie pragtige geplante Agenda. Ons het dit al Bennie te danke dat ons vandag hierdie pragtige sertifikate kon oorhandig aan ons erelede. Lets warop die VMEO trots kan wees.

Baie dankie ook aan my vrou Toepie, Val Fraser en Annatjie van der Walt wat gehelp het om die dames te organiseer.

Mr. R.W. Barton (Welkom): Mr. President Elect thank you for giving me this opportunity to say the final word. I seem to have inherited this particular job and I must say I appreciate it very much indeed. The purpose of me being here is to thank our President for the magnificent job which he has done during this Convention. Things have gone very well indeed. I know only too well what can happen when things do not go right, and I think its largely due to our President's personal qualities that this Convention has gone so well and that everything has gone right. I would like to congratulate him on his appearance on the radio this morning. I am sure I was the only one to hear it, because it was pretty early, 7h15 this morning, and our President equipped himself extremely well, both in what he said and the manner in which he said it. I think it redounded very much to the credit of our Association and of course I am sure now we all look forward to seeing our President on S.A.T.V. Thank you.

President: Baie dankie mnr. Barton. Voordat ons afsluit, wil ek nog neem dat ons afskeid sal moet neem van die volgende Ingenieurslede wat gedurende die volgende 2 jaar met pensioen aflat, nl.:-

Mnr. C.L. Cosser – Bulawayo, mnr. C. Aalbers – Wellington, mnr. J.I. Inglis – Pietersburg, mnr. D.R. Verschoor – Fort Beaufort en mnr. K.U. Pötta – Keetmanshoop.

Net 'n paar baie interessante bywoningssyfers. Die 1965 Konvensie in Pretoria was bygewoon deur 386 persone, insluitende dames, die 1965 Konvensie in Fort Elizabeth – goue-jublieumjaar, 603 persone en nu in 1975, 556 persone.

Hiermee verlaat ek die 44ste Konvensie van die VMEO gesluit. I hereby declare the 44th Convention of the AMEU closed.

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Dundee Natal
Durban Natal

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East London CP
Edenvale Tvl
Empangeni Natal
Ermelo Tvl
Eshowe Natal
Estcourt Natal
Evander Tvl

F.

Fochville Tvl
Fort Beaufort CP

G.

Gorge CP
Germiston Tvl
Glencoe Natal
Gobabis SWA
Gordons Bay CP
Graaff-Reinet C.P.
Grahamstown CP
Greytown Natal

H.

Heidelberg Tvl
Henneman OVS
Howick Natal

J.

Johannesburg Tvl

K.

Kakamas KP
Koetmanshoop SWA
Kempton Park Tvl
Kenhardt KP
Kimberley KP
Kingwilliamstown CP
Kirkwood KP
Klerksdorp Tvl
Knysna KP
Kokstad Oos-Griekwaland
Komga CP
Koppies OVS
Kroonstad OVS
Krugersdorp Tvl
Kuruman KP

L.

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Ladysmith Natal
Lichtenburg Tvl
Louis Trichardt Tvl
Lydenburg Tvl

M.

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Matabatile O. Griekwaland
Messina Tvl
Meyerton Tvl
Middelburg KP
Middelburg Tvl
Mooi River Natal
Mosselbani KP

N.

Nelspruit Tvl
Newcastle Natal
Nigel Tvl

O.

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Oos-Randse Bantoesake-administrasieraad
Orkney Tvl
Otjiwarongo SWA
Oudtshoorn KP

P.

Paarl KP
Parys OVS
Phalsburg Tvl
Pietermaritzburg Natal
Pietersburg Tvl
Piet Retief Tvl
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Somerset East CP
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Winburg OVS
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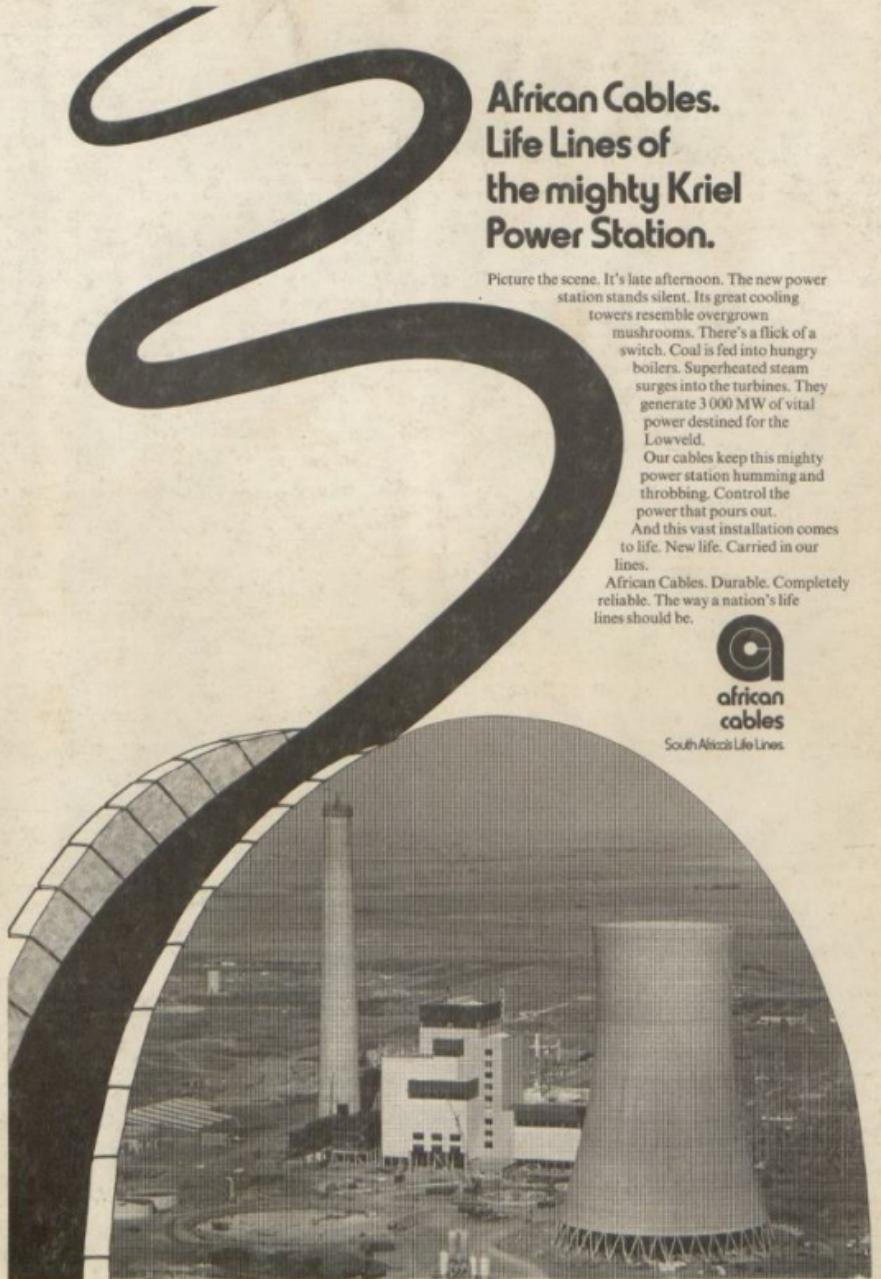
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