DIE VERENIGING VAN MUNISIPALE
ELEKTRISITEITSONDERNEMINGS VAN SUIDELIKE AFRIKA

1966
TEGNIESE VERGADERING
2 Mei, 1966
BLOEMFONTEIN

THE ASSOCIATION OF MUNICIPAL ELECTRICITY
UNDERTAKINGS OF SOUTHERN AFRICA

1966
TECHNICAL MEETING
2nd May, 1966
BLOEMFONTEIN

THE ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA.

NOTICE OF 1966 TECHNICAL MEETING.

We hereby confirm that the 1966 Technical Meeting of the Association will be held on the 2nd May, 1966 at 8.30 a.m. in the City Hall, Bloemfontein.

DAVIDSON & EWING (PTY.) LTD.
per R. G. EWING.
Secretaries.

Items for discussion will include:

(1) Earthing.

(2) Rights of supply.

(3) Shortage of Technical Man-power.

(4) Discussion will also take place on the following if time permits:

(a) Limited demand tariffs where a circuit breaker or other device cuts off the supply when the demand reaches a predetermined amount.

(b) Transformers: (i) Capitalisation.
(ii) Voltage Regulation.

(c) Overhead Lines: Protection.

(5) Reports of sub-committees and Representatives.

All Delegates are reminded that lunch will be available at the venue of the meeting.

DIE VERENIGING VAN MUNISIPALE ELEKTRISITEITSONDERNEMINGS VAN SUIDELIKE AFRIKA.

KENNISGEWING VAN DIE 1966 TEGNIESE VERGADERING.

Ons bevestig hiermee dat die 1966 Tegniese Vergadering van die Vereniging sal op 2 Mei, 1966 om 8.30 v.m. by die Stadsaal, Bloemfontein, gehou word.

DAVIDSON EN EWING (EDMS.) BPK.
per R. G. EWING.
Sekretarisse.

Insluitend in die Bespreking sal die volgende Items verskyn:

(1) Aarding.

(2) Voorsieningsregte.

(3) Tekort aan Tegniese mannekrag.

(4) Bespreking van die volgende indien tyd beskikbaar is:—

(a) Beperkte aanvraagtariewe waar 'n stroomverbreker of ander toestel die toevoer afsny indien die aanvraag die voorafbepaalde perk oorskry.

(b) Transformators: (i) Kapitalisering;
(ii) Spanning regulasie.

(c) Bogrondse lyne: Beskerming.

(5) Verslae van Sub-komitees en Verteenwoordigers.

Alle Afgevaardigdes word herinner dat middagete bedien sal word by die Bloemfontein se Stadsaal.

THE ASSOCIATION OF MUNICIPAL ELECTRICITY
UNDERTAKINGS OF SOUTHERN AFRICA

1966
TECHNICAL MEETING
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DIE VERENIGING VAN MUNISIPALE
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1966
TEGNIESE VERGADERING
2 Mei, 1966
BLOEMFONTEIN

ANNUAL REPORT, 1965

ELECTRICAL WIREMEN'S REGISTRATION BOARD

The Board was constituted as follows during 1965:

Chairman: Mr. J. G. Wannenburg

Members: Mr. J. M. Fraser
Mr. C. Lombard
Mr. F. Leemans
Mr. T. Gregg
Mr. P. I. Wicht

The Board met on eleven occasions during the year Applications for registration from 710 persons were considered. Of these, 73 qualified for registration, 391 were accepted for the full examination, 197 were exempted from a part of the examination and 49 applications were refused or deferred.

The usual examinations were conducted at the various centres during the year.

The results of the written examinations (Parts A1 and A11) were as follows:

Passed A1 and A11 — 65
Passed A1, failed A11 — 102
Failed A1, passed A11 — 20
Failed A1 and A11 — 264
Failed A1 — 124
Passed A1 — 132
Failed A11 — 122
Passed A11 — 43
Absent — 122
Total — 1040

Of the 592 candidates who entered for the Part B practical examination, 292 passed, 250 failed while 50 were absent

I mentioned in my last report that the Board was giving consideration to difficulties which were being experienced by immigrants who were not sufficiently proficient in one of the official languages to write the examinations. I am now pleased to report that the Treasury has authorised the payment of expenditure in regard to the translation of answer books of immigrants who answer questions in their native language.

During the year Mr. J. J. Groenewald was transferred to another Department and Mr. J. G. Wannenburg was appointed Chairman of the Board.

I am indebted to the Board for the statistics provided and for permission to include them in this Report.

C. LOMBARD
Representative

JAARVERSLAG 1965 :

REGISTRASIERAAD VIR ELEKTROTEGNIESE DRAADWERKERS

Die Raad was soos volg saamgestel gedurende 1965 :

Voorsitter : Mnr. J. G. Wannenburg

Lede : Mnr. J. M. Fraser
Mnr. C. Lombard
Mnr. F. Leemans
Mnr. T. Gregg
Mnr. P. I. Wicht

Die Raad het elf keer gedurende die jaar vergader. Aansoeke en registrasie is oorwee van 710 persone. Van hierdie getal het 73 gekwalifiseer vir registrasie, is 391 aanvaar vir die volle eksamen, 197 vrygestel van 'n gedeelte van die eksamen terwyl 49 aansoeke van die hand gewys of uitgestel is.

Die gewone eksamens is deur die loop van die jaar by die verskillende sentrums afgeneem.

Die uitslae van die skriftelike eksamens (Deel A1 en A11) was soos volg :

Geslaag A1 en A11 — 65
Geslaag A1, gedruip A11 — 102
Gedruip A1, geslaag A11 — 20
Gedruip A1 en A11 — 264
Gedruip A1 — 124
Geslaag A1 — 132
Gedruip A11 — 122
Geslaag A11 — 43
Afwesig — 122
Totaal — 1040

Van die 592 kandidate wat vir die praktiese eksamen, Deel B, ingeskryf het, het 292 geslaag en 250 gedruip terwyl 50 afwesig was.

Ek het in my vorige verslag gemeld dat die Raad aandag skenk aan die moeilikhede wat immigrante ondervind met die skryf van die eksamens deurdat hulle nie voldoende kennis van die amptelike landstale het nie. Dis vir my aangenaam om nou te kan rapporteer dat die Tesourie magtiging verleen het tot die aangaan van uitgawe om antwoordboeke van immigrante in hul eie taal te laat vertaal.

Mnr. J. J. Groenewald is gedurende die jaar na 'n ander Departement oorgeplaas en Mnr. J. G. Wannenburg is aangestel as Voorsitter van die Raad.

Ek is die Raad dank verskuldig vir die statistieke wat beskikbaar gestel is en vir die toestemming om dit by hierdie verslag te mag insluit.

C. LOMBARD
Verteenwoordiger

ANNUAL REPORT

S.A.I.E.E. COMMITTEE TO REVISE THE CODE OF PRACTICE FOR OVERHEAD LINES FOR CONDITIONS PREVAILING IN SOUTHERN AFRICA

The Drafting Sub-Committee appointed during 1960 to re-draft the Code of Practice for Overhead Lines has completed its task.

It is expected that a meeting of the Main Committee will be convened towards the end of April to consider the Revised Code of Practice and if approved, to recommend to Council that it be published.

C. LOMBARD
Representative

ANNUAL REPORT

RECOMMENDATIONS COMMITTEE FOR NEW ELECTRICAL COMMODITIES

The Committee is constituted as follows:

(1) A.M.E.U.
Mr. C. Lombard
Mr. R. W. Barton

(2) Johannesburg City Council
Mr. R. Leishman

(3) S.A. Bureau of Standards
Mr. A. A. Middlecote
Mr. D. I. Jones

(4) Wiring Regulations Committee
Mr. J. T. Williams

(5) Electricity Supply Commission
Mr. J. W. Barnard
Mr. W. Stern-Stenerson

(6) Electrical Engineering and Allied Industries Association
Mr. J. Morrison

(7) Electrical Contractors Association of S.A.
Mr. J. Fraser
Mr. M. J. Jochelson

(8) Secretaries
Messrs. Davidson & Ewing (Pty.) Ltd.

One meeting was held during the year and the recommendations were circulated to Members through the medium of the News Bulletin.

Relatively few applications were received during the past year. With the exception of one application which has been deferred pending a report from the S.A. Bureau of Standards, all applications were finalised.

In conclusion, I wish to thank the representatives of the various organisations and bodies who served on the Committee for their valuable and generous assistance during the past year, and also the S.A. Bureau of Standards for its assistance in carrying out tests on Commodities where necessary.

C. LOMBARD
Convener

JAARVERSLAG

S.A.I.E.I. — KOMITEE BELAS MET DIE HERSIENING VAN DIE GEBRUIKSKODE VIR BOGRONDSE GELEIDING VIR TOESTANDE SOOS IN SUID-AFRIKA AANGETREF.

Die Onderkomitee wat gedurende 1960 aangestel is om die Gebruikskode vir Bogrondse Geleidings te hersien het sy taak afgehandel.

Na verwagting sal 'n vergadering van die Hoofkomitee teen die einde van April belê word om Hersiene Gebruikskode te oorweeg en, indien goedgekeur, die publikasie daarvan by die Raad aan te beveel.

C. LOMBARD
Verteenwoordiger

JAARVERSLAG

KOMITEE BELAS MET AANBEVELINGS OOR NUWE ELEKTRIESE HANDELSWARE

Die komitee is soos volg saamgestel :

(1) V.M.E.O.
Mnr. C. Lombard
Mnr. R. W. Barton

(2) Stadsraad Johannesburg
Mnr. R. Leishman

(3) S.A. Buro vir Standaarde
Mnr. A. A. Middlecote
Mnr. D. I. Jones

(4) Bedradingsregulasieskomitee
Mnr. J. T. Williams

(5) Elektrisiteitsvoorsieningskomissie
Mnr. J. W. Barnard
Mnr. W. Stern-Stenerson

(6) Elektrotegniese Ingenieurswese en Geallieerde Nywerheidsvereniging
Mnr. J. Morrison

(7) Elektrotegniese Aannemersvereniging van Suid-Afrika
Mnr. J. Fraser
Mnr. M. J. Jochelson

(8) Sekretarisse
Mnre. Davidson & Ewing (Edms.) Bpk.

Daar is een vergadering gehou gedurende die jaar en die aanbevelings is deur middel van die Nuusbrief aan lede gesirkuleer.

Betreklik min aansoek waarvoor uitstel verleen is in afwagting van 'n verslag van die S.A. Buro vir Standaarde, is alle aansoeke afgehandel.

Ten laaste wil ek graag die verteenwoordigers van die verskillende organisasies en liggame wat in die Komitee gedien het bedank vir hulle waardevolle en offervaardige hulp gedurende die afgelope jaar en ook aan die S.A. Buro vir Standaarde vir hulle bydrae met die toets van artikels waar dit nodig was.

C. LOMBARD
Saamroeper

REPORT FOR PRESENTATION TO MEMBERS, 1966: S.A. NATIONAL COMMITTEE OF THE INTERNATIONAL ELECTROTECHNICAL COMMISSION.

The South African National Technical Committees of the International Electrotechnical Commission have been functioning regularly throughout the year, and have submitted, where applicable, relevant comments constituting the South African National opinion. The bulk of the work has of course been done by the Technical Secretariate which is provided by the South African Bureau of Standards, but it was noted that members of Industry have been most active during the past year.

The highlights of the year were the attendance by one of the members of the Bureau of Standards (Mr. Jones) at the meeting of the technical committee held in Paris, to discuss the standards for electrical appliances, and the attendance of a large delegation at the Annual General Meeting held in Tokyo, where many technical committees met. This delegation was led by Mr. Middlecote and included Messrs. J. Smit, V. Meij and J. von Ahlften of the Bureau of Standards, and Dr. Maritz and Mr. Meyer representing Industry.

D. J. HUGO,
Representative.

VERSLAG VIR VOORLEGGING AAN LEDE, 1966: SUID-AFRIKAANSE KOMITEE VAN DIE INTERNASIONALE ELEKTROTEGNIESE KOMMISSIE.

Die volgende inligting is na aanleiding van u omsendbrief van 1 Februarie 1966, deur die Suid-Afrikaanse Buro vir Standaarde verstrek.

Die Suid-Afrikaanse Nasionale Tegniese Komitees van die Internasionale Elektrotegniese Kommissie het gereeld deur die jaar hul werksaamhede verrig, en het, waar nodig, toepaslike kommentaar, verteenwoordigend van die Suid-Afrikaanse mening, gelewer. Die meeste werk was natuurlik gedoen deur die Tegniese Sekretariaat, wat deur die Suid-Afrikaanse Buro van Standaarde beskikbaar gestel word, maar dit was gemerk dat nywerheidsverteenwoordigers gedurende die afgelope jaar 'n baie aktiewe bydrae gelewer het.

Die glanspunte van die jaar was die bywoning, deur een van die lede van die Buro vir Standaarde (mnr. Jones), van die vergadering in Parys, van die Tegniese Komitee belas met die voorbereiding van standaarde vir elektriese toerusting, en die bywoning van die Jaarlikse Algemene Vergadering in Tokyo, deur 'n groot groep afgevaardigdes. Verskeie tegniese komitees het by hierdie geleentheid byeenkom. Die afvaardiging was gelei deur mnr. Middlecote en het mnre. J. Smit, V. Meij en J. von Ahlften van die Buro van Standaarde, en dr. Maritz en mnr. Meyer as Nywerheidsverteenwoordigers, ingesluit.

D. J. HUGO,
Verteenwoordiger.

WIRING REGULATIONS COMMITTEE.

Sales of the Second Edition of the Regulations together with the pamphlet of the 1963 Amendments, which are printed in both official languages, continue to be satisfactory.

South Africa appears to have settled down to the current set of regulations and no matters have arisen during the year to warrant convening a meeting of the Main Committee. A period of quietude prevails despite intensive building activities.

The following are the principal matters which have been dealt with by correspondence during the year:—

(i) Regulation 1102A (iii) is not intended to cover drive-in cinemas where car headlights are available.
(ii) Under Regulation 1219B the 'switch' referred to should be double-pole to ensure safety of persons working on water heaters in the event of reversed polarity. The 1940 Regulations required this.
(iii) If Regulation 1302E is fulfilled by soundly designed conduit locknuts, separate earth wires to socket outlets are not warranted.
(iv) Wiring colours for imported appliances, switchboards, etc. continue to give rise to problems.
(v) Application of regulations to solar water heaters operated in parallel with electric units.
(vi) Desirability of amending Regulation 1302B to promote earth bonding to cold water pipes in ceiling

BEDRADING REGULASIES KOMITEE.

Verkope van die Tweede Uitgawe van die Regulasies tesame met die pamflet van die 1963 Amendemente, wat in albei offisiële tale gedruk word, bly bevredigend.

Blykbaar het Suid-Afrika homself geskik volgens die bestaande regulasies en geen sake het gedurende die jaar opgeduik wat die sameroep van 'n vergadering van die Hoof-komitee regverdig het nie. 'n Periode van stilte heers ten spyte van intensiewe boubedrywighede.

Die volgende is die hoofsake wat deur korrespondensie afgehandel is gedurende die jaar:—

(i) Regulasie 1102A(iii) is nie bedoel om te geld vir inry teaters waar motorkar hoofligte beskikbaar is nie.
(ii) Onder Regulasie 1219B moet die „skakelaar", waarna verwys word, dubbel-pool wees om die veiligheid van persone wat aan water verwarmers werk, te verseker ingeval van omgekeerde polariteit. Die 1940 Regulasie het die vereis.
(iii) Indien aan Regulasie 1302E voldoen word deur goed ontwerpe leipyp sluitmoere, is aparte aardgeleiers na die kontaksokke nie geregverdig nie.
(iv) Draad kleurs vir ingevoerde toestelle, skakelborde ens. lewer voortdurend probleme op.
(v) Toepassing van regulasies op son water verhitters wat in paralel met elektriese eenhede gebruik word.
(vi) Wenslikheid om Regulasie 1302B te wysig om aardverbinding aan kouewater pype in plafon

space or other interference-free locality.

(vii) Use of the cheaper auto-transformer under Regulation 712(B) for ratios about 220/250 volts for domestic appliances where owners move to different voltage areas.

R. LEISHMAN,
Representative.

WITWATERSRAND ELECTROLYSIS MAIN COMMITTEE

On 3rd June, 1965 the above committee held its 10th and final meeting. It is to be replaced by the South African Electrolytic Corrosion Committee and from the date of its first meeting the Witwatersrand Committee will be regarded as dissolved but it has first drafted a proposed Constitution and Terms of Reference for the new Main Committee. This document has been circulated to all parties who are to be represented on the new Committee for acceptance and nomination of representatives and alternates.

Regional Field Committees appointed by the Witwatersrand Committee continue to function on the Witwatersrand and at Cape Town and Durban, and it is intended to reconstitute them under the new National Committee.

In the course of these changes it has been made clear that the A.M.E.U. has had no representation on the Witwatersrand Main Committee and that the undersigned and his predecessor, Mr. R. W. Kane, have sat on the Committee as representing Johannesburg Municipality. It is, however, intended that the A.M.E.U. shall have direct representation on the new National Committee but no meeting thereof has been convened as yet.

R. LEISHMAN.

ANNUAL REPORT OF THE ACTIVITIES OF THE ELECTRICAL ENGINEERING DIVISION OF THE S.A. BUREAU OF STANDARDS.

It is indeed an honour for me to report as follows on the activities of the electrical engineering division of the S.A. Bureau of Standards during the year 1965.

1. The demise of Dr. A. W. Lategan former director of the S.A.B.S., was a great loss to the Bureau and the country and our association which is closely associated with the bureau and its personnel, records this with deep regret.
2. The association also wishes to congratulate Mr. T. Bedford on his appointment as director of the bureau of standards and is assured that the close association which exists between the A.M.E.U. and the S.A.B.S. will under his capable direction, continue to the advantage of both parties and the country as a whole.
3. Compulsory standard specifications in respect of 10 commodities are applicable as from the 3rd July, 1965. It was found necessary to introduce a few amendments in order not to exclude new materials and manufacturing methods which were submitted for consideration during the year.
4. The sub-committees dealing with the following commodi-

spasies of ander steuringsvrye plekke te bevorder.

(vii) Die gebruik van die goedkoper outotransformator onder Regulasie 712(B) vir verhoudings rondom 220/250 volt vir huishoudelike apparate waar eienaars na ander spannings gebiede verhuis.

R. LEISHMAN,
Verteenwoordiger.

WITWATERSRANDSE ELEKTROLISE HOOFKOMITEE.

Die bogenoemde komitee het sy tiende en finale vergadering gehou op die 3de Junie 1965. Dit moet vervang word deur die Suid-Afrikaanse Elektrolise Invretings Komitee en die Witwatersrandse Komitee sal as ontbind beskou word vanaf die datum van sy eerste vergadering, maar dit het alvorens 'n voorgestelde Konstitusie en Terme van Verwysing in konsepvorm opgestel vir die Hoofkomitee. Hierdie dokument is gesirkuleer onder al die partye wat op die nuwe Komitee verteenwoordig sal moet word, vir aanname en benoeming van verteenwoordigers en plaasvervangers.

Streek Veldwerkerskomitees, aangestel deur die Witwatersrandse komitee, doen nog steeds diens op die Witwatersrand en in Kaapstad en Durban, en die voorneme is om hulle weer opnuut saam te stel onder die nuwe Nasionale Komitee.

Gedurende die verloop van daardie veranderinge is dit duidelik gestel dat die V.M.E.O. geen verteenwoordiging op die Witwatersrandse Hoofkomitee gehad het nie en dat die ondergetekende en sy voorganger, Meneer R. W. Kane, op die Komitee sitting gehad het as verteenwoordigende die Johannesburgse Munisipaliteit. Die voorneme is egter dat die V.M.E.O. direkte verteenwoordiging op die nuwe Nasionale Komitee sal hê, maar tot nog toe is daar nog nie 'n vergadering daarvan saamgeroep nie.

R. LEISHMAN.

JAARVERSLAG OOR DIE WERKSAAMHEDE VAN DIE ELEKTROTEGNIESE INGENIEURSAFDELING VAN DIE S.A. BURO VIR STANDAARDE.

Dit is vir my 'n eer om soos volg verslag te doen oor die werksaamhede van die S.A. Buro vir Standaarde se elektrotegniese afdeling gedurende die jaar 1965.

1. Die heengaan van dr. A. W. Lategan, in lewe direkteur van die SABS, was 'n gevoelige verlies vir die Buro en die land en ons vereniging wat nou met die Buro en sy personeel skakel, neem met leedwese daarvan kennis.
2. Die vereniging wil ook mnr. T. Bedford gelukwens met die aanstelling as direkteur van die Buro vir Standaarde en weet dat die goeie betrekkinge wat daar bestaan tussen die V.M.E.O. en die SABS onder sy bekwame leiding steeds gehandhaaf sal word tot voordeel van albei partye en die land in geheel.
3. Veerpligte standaardspesifikasies ten opsigte van 10 kommoditeite is van toepassing vanaf 3 Julie 1965. Enkele wysings aan die oorspronklike spesifikasies ten einde die vereistes aan te pas by nuwe toerusting en praktyke is gedurende die jaar oorweeg en aanbeveel.
4. Die subkomitees wat handel met die volgende kommodi-

ties were very active during the year.

(a) Induction motors
Representative — Mr. P. Botes

(b) Lighting of highways
Representative — Mr. F. Turnbull

(c) High tension line insulators
Representative — Mr. C. Lombard

(d) Nomenclature*
Representative — Mr. J. K. von Ahlften

(e) Distribution transformers
Representative — Mr. F. Knobel

(f) Transformer cable end boxes
Representative — Mr. F. Knobel

(g) High tension lightning arrestors
Representative — Mr. J. M. Gericke

(h) Busbar trunkings
Representative — Mr. F. Turnbull

*Consists of seventeen sections in various stages of progress

The association is greatly indebted to the engineers and Councils for the time made available for attending meetings and the contributions made in order to establish specifications which the local authorities can accept and use with confidence.

Our thanks and appreciation also go to the many other represenatives on existing committees as previously scheduled and for the time they put into the work.

5. Progress report on projects:

Approved for publication

Basic standards for electronic apparatus: domestic radio receivers for the reception of broadcast transmissions in the MF, HF and VHF bands, 755-1965.

Electric kettles and similar portable appliances (revision of 158-1965).

Electrotechnical vocabulary: with definitions: Group 35: Electromechanical applications, 042-35-1964).

Electric air heaters (revision of 160-1965).

High voltage porcelain and toughened glass insulators, 177-1963.

Busbar trunking, 784-1965.

Code of practice for the petroleum industry: Part II - Electrical code 189-1965.

Domestic electric refrigerators and food freezers. SV 134-1965.

Code of practice for the testing of domestic electric refrigerators and food freezers, 093-1965.

Electrotechnical vocabulary: Group 07: Electronics. Group 45: lighting.

Code of practice for the installation and maintenance of electrical apparatus used in explosive atmospheres, 086-1964.

Wooden telephone and general purpose electric light poles, 754-1964 (supercedes 339-1951).

Wooden power transmission poles and cross-arms, 753-1964 (supercedes 339-1951).

Isolation tranformers for use on low voltage, 743-1963.

Flame proof enclosures for electrical apparatus, 314-1965.

teite was besonder aktief in die jaar van oorsig:—

(a) Induksiemotors
Verteenwoordiger — mnr. P. Botes

(b) Straatverligting
Verteenwoordiger — mnr. F. Turnbull

(c) Hoogspanningslynisolatore
Verteenwoordiger — mnr. C. Lombard

(d) Nomenklatuur*
Verteenwoordiger — mnr. J. K. von Ahlften

(e) Distribusietransformatore
Verteenwoordiger — mnr. F. Knobel

(f) Trasformatorekabelentkaste
Verteenwoordiger — mnr. F. Knobel

(g) Hoogspanningweerligafleiers
Verteenwoordiger — mnr. J. M. Gericke

(h) Geleistamvoerders
Verteenwoordiger — mnr. F. Turnbull

* Bestaan uit 17 dele in verskillende stadiums van vordering

Die vereniging is baie dank verskuldig aan die ingenieurs en Stadsrade wat tyd beskikbaar gemaak het vir die bywoning van vergaderings en die bydrae wat hulle lewer ten einde spesifikasies daargestel te kry wat plaaslike owerhede met vertroue kan aanvaar en toepas.

Ook aan die verteenwoordigers op die vele ander bestaande subkomitees soos van tyd tot tyd gelys, ons opregte dank en waardering vir die tyd opgeoffer.

5. Vorderingsverslag van projekte:

Goedgekeur om gedruk te word:

Basiese standaarde vir elektroniese apparaat: Huishoudelike radio-ontvangers vir radio-uitsendings in MF, HF en BHF-bande, 755-1965.

Elektriese ketels en soortgelyke draagbare elektriese toestelle vir die verwarming van vloeistowwe, 158-1965.

Elektrotegniese verklarende woordelys: Groep 35: elektro meganiese toepassing, 042-35-1964.

Elektriese lug- en stralingsverwarmers, 160-1965.

Hoogspanningslynisolatore, 177-1963.

Geleistamvoerders, 784-1965.

Gebruikskode vir die hantering, opberging en verspreiding van petroleumprodukte: Deel II: Elektriese Kode, 089: Deel II-1965.

Huishoudelike elektriese yskaste en voedselvriesmasjiene, SV134-1965.

Gebruikskode vir die toets van huishoudelike elektriese yskaste en voedselvriesmasjiene, 093-1965.

Elektrotegniese verklarende woordelys: Groep 07: elektronika, Groep 45: verligting.

Gebruikskode vir die installering en onderhoud van elektriese apparaat vir gebruik in ontplofbare atmosfere, 086-1964.

Hout-telefoonpale en elektriese ligpale vir algemene gebruik, 754-1964 vervang 339-1951.

Kragoorbrengingspale en dwarsstukke van hout, 753-1964 (vervang 339-1951).

Skeitransformatore vir gebruik by lae spanning, 734-1963.

Vlamdigte omhulsels vir elektriese apparate, 314-1965.

Under review following comment

Code of practice for the lighting of streets and highways

High and low voltage bushings.

Standard bushing.

Cable glands for use in flameproof enclosures.

Standard isolators.

Electric toasters (revision of 157-1950).

Electric stoves and hotplates (revision of 153-1958).

Electric irons (revision of (159-1950).

In course of preparation - General

Code of Practice for industrial lighting.

Code of practice for the classification of and choice of electrical equipment in dangerous locations.

Copper wire and bar for the manufacture of electrical conductors (quality).

Copper — "Tough Pitch" high conductivity.

Flame-proof electric motors having increased safety properties for uses other than mining.

Fluorescent lamp ballasts.

Electronic:

Connection cupboards for electricity.

Distribution transformers.

Electric arc welding sets.

Code of practice for testing of tranformers.

Code of practice for the protection of buildings against lightning.

High voltage lightning arrestors.

Induction motors.

Medium voltage vulcanized rubber insulated cables and flexible cords for power and lighting purposes (revision of 168-1952).

Code of practice for the handling, installation and operation of electric cables.

Electric cables and flexible cords with PVC isolation (revision of S.A.B.S. 150-1957).

Standard test methods for electrical cables and flexible cords.

Post isolators.

Ball and socket accesories for overhead power lines.

Cable end boxes for distribution tranformers.

6. Co-ordination of activities and opinions.

The S.A. Bureau of Standards made representations that the A.M.E.U. representatives should be in a position to express the considered opinion of Municipal engineers throughout the country.

Your Executive Council therefore decided that representatives should in future report back to the secretaries before any matter of importance is finalized. The report will then be submitted to the branches for comments which will be co-ordinated and passed to the S.A.B.S. as the official comments of the associations. This procedure has been successfully applied in a few instances.

G. C. THERON
Co-ordinating Representative on S.A.B.S.
Sub-Committees

NB: Glasses for electric safety lamps for use in mines with explosive atmosphere - project cancelled.

Wat oorweeg word na ontvangs van kommentaar:—

Gebruikskode vir die verligting van strate en hoofweë.

Hoë- en laespanningsdeurvoerders.

Standaarddeurvoerisolatore.

Kabeldrukstukke vir gebruik in vlamdigte omhulsels.

Standaardisolatore.

Elektriese broodroosters (hersiening van 157-1950).

Elektriese stowe en verwarmingsplate (hersiening van 153-1958).

Elektriese strykysters (hersiening van 159-1950).

Wat opgestel word — Algemeen:—

Gebruikskode vir industriële verligting.

Gebruikskode vir die klassifikasie van en keuse van elektriese uitrusting vir gebruik op gevaarlike plekke.

Koperdraad en staaf vir die vervaardiging van elektriese geleiers (kwaliteit).

Koper met hoë geleidingsvermoë.

Vlamdigte elektriese motors met groter veiligheidseienskappe vir ander gebruike as in die mynbedryf.

Smoorspoele vir flouressente lampe.

Elektrotegniek:—

Aansluitingskassies vir elektrisiteitsmeters.

Distribusietransformatore.

Elektriese boogweistoestelle.

Gebruikskode vir die toetsing van transformatore.

Gebruikskode vir die beveiliging van geboue teen weerlig (hersiening van SABS 03-1952).

Hoogspanningsblitsafleiers.

Induksiemotors.

Kabels en buigbare koorde met 'n isolering van gevulkaniseerde rubber vir krag- en verligtingsdoeleindes onder middelmatige spanning (hersiening van 168-1952).

Kode vir die installering en werking van elektriese kabels.

Elektriese kabels en buigbare koorde met poliviniel-chloried- (PVC-) isolering hersiening van SABS 150-1957).

Standaard toetsmetodes vir elektriese kabels en buigbare koorde.

Steunisolatore.

Vurk- en tongtoebehore vir bogrondse kraglyne.

Kabelentkaste vir distribusietransformatore.

6. **Koördinasie van werksaamhede en opinies:—**

Die S.A. Buro vir Standaarde het gevoel dat hulle graag deur die V.M.E.O. verteenwoordigers die opinie sal wou hê van Munisipale ingenieurs dwarsdeur die land. Die uitvoerende Raad van die vereniging het derhalwe besluit dat die verteenwoordigers in die toekoms voordat enige aangeleentheid van belang afgehandel word daaroor aan die sekretaris verslag moet doen. Die verslag sal dan aan die streekstakke vir kommentaar beskikbaar gestel word en die opinies ontvang sal verwerk word en as die amptelike sienswyse van die V.M.E.O. aan die SABS oorgedra word. Die prosedure is reeds in 'n paar gevalle met vrug nagekom.

G. C. THERON,
Koödinerende Verteenwoordiger op
SABS sub-komitees

NB. Dekglase vir elektriese veiligheidslampe vir gebruik in vlamgashoudende myne — projek gekanselleer.

EARTHING BY MEANS OF CONDUCTORS UNDER FOUNDATIONS.

by

F. STEVENS, Assoc.I.E.E., M.(S.A.)I.E.E.

INTRODUCTION.

While carrying out a probe into the effectiveness of earthing conductors under foundations of buildings I kept the Members of the Natal Regional Branch of the Association of Municipal Electricity Undertakings informed of the results I have been getting.

At the last meeting of the Branch it was decided to bring the idea to the notice of the Executive of the Association with a view to it sponsoring it going to the "Council of Scientific and Industrial Research" or "South African Bureau of Standards" for a fuller investigation. This the Chairman did at the Meeting of the Executive held towards the end of last year when the following was recorded —

> "A suggestion by the Branch that an approach be made to the C.S.I.R. to investigate the whole subject of foundation earthing was considered by the Council, and, after discussions it was agreed that, before taking this step Mr. Stevens be requested to produce a short paper on the subject for discussion at the next convention."
>
> Hence the reasons for me addressing you to-day.

REASON FOR THE INVESTIGATION.

A great deal has ben said and written and legislation passed during the last twenty or so years concerning the earthing of consumers installations on account of the ever increasing use of electricity for domestic and other purposes, consequently most electrical engineers are by now familiar with its importance. The same cannot be said of many electrical contractors and wiremen, which is the reason for the South African Government legislating that buildings to be supplied with electricity must first have all their roofs, gutters and downpipes effectively earthd before the Supply Authority may connect the installation to the supply mains. It is equally important that all metal conduits and frames of current consuming appliances are effectively earthed.

But to this day engineers are, at times, at their wits end to know the best way of ensuring all non-current carrying parts of installations are in fact positively earthed, bearing in mind the expense a consumer can be put to in providing a really reliable connection with the general mass of earth and his reluctance to spend money on something which appears unnecessary.

To make the position more difficult for those responsible for ensuring installations are safe are the many inferior materials and appliances already sold at attractive prices and on easy terms which have a low factor of safety thereby subjecting the consumer unwittingly to electric hazards.

Still I, and I am sure other engineers have been tempted at times to accept earthing resistance values of the order of 5 ohms on account of experiencing difficulty in obtaining a good connection with the general mass of earth at a reasonable cost although realizing this impedence added to others in the fault circuit may not permit the protective fuse or circuit breaker to operate.

Unfortunately this step is sometimes taken by people lacking the most rudimentary knowledge needed in connection with earthing installations.

Having referred to earthing impedences, size of fuses and the lack of knowledge, it will not be out of place for me to illustrate my last point by mentioning an incident involving my assistant and a foreman of a large electrical contracting firm.

Within my hearing the two became involved in an argument in connection with the earthing of an installation having been condemned. From the foreman's point of view it was obvious to me he had never given thought to earthing values as he was surprised when told that unless the total impedence of a fault circuit is sufficiently low, the supply pressure cannot cause enough current to flow to blow the fuse or operate the breaker.

That an earth fault circuit could comprise part of the mains in the street, service wires or cable, installation wiring up to the point of the fault, some conduit with joints, earthing conductors and bonds, and when there is no protective multiple earthing conductor the connection with the general mass of earth twice over, i.e. at the consumer's premises and the supply authorities transformer was beyond his comprehension.

I am quite convinced that far too many people who should know better look upon earthing as a piece of wire that should be connected to the conduit of an installation and the nearest water tap without realizing its significance.

Then there is the problem of complying with legislation which can be difficult because of not being specific. As an example, literally, every sheet of iron forming a roof should be checked for being earthed which of course is rarely done as it is almost impossible to do so.

Another difficulty is that many electrical contractors do not possess means of testing the effectiveness of their bonding and earthing, consequently it is only when the supply authority does its testing, often on the day the supply is required, that the earthing is found to be of little use.

ESSENTIAL REQUIREMENTS FOR EARTHING.

In short the purpose of earthing may be considered to be:—

(a) To protect personnel from the danger of electric shock.

(b) To protect electrical equipment from dangerous over voltages and current.

(c) To facilitate the operation of protective devices.

To decide how an installation is to be earthed the following has to be considered:—

A. The possibility of there being an existing earth connection on the property that has been used with satisfactory results, such as buried metallic water pipes or armoured cables.

B. Where there is no earth connection as envisaged under A. the possibility of making good earth contact with the general mass of earth has to be investigated which involves:—

(i) Determining the conductivity of the ground necessitating resistivity tests.

(ii) Ascertaining if there are corrosive agents in the soil which requires an analysis.

(iii) Detecting if there are any stray direct currents present or signs of electrolytic corrosion.
(iv) Determining the magnitude of the maximum fault current.
(v) Deciding on the permissable time for clearing the fault current which is dependent upon how long the resistance of the connection to earth remains sufficiently low.
(vi) The voltage gradient on the ground surface under fault conditions.
(vii) Cost of excavations particularly where there is a lot of rock.

This is undoubtedly as it should be but in most cases impracticable owing to the time taken.

The conclusions I have reached from our experiences with other forms of earthing are:—

Driven Pipes and Rods.

Are the best where it is possible to drive them to a depth of 20 feet or more but this is rarely possible in our area on account of rock and shale being encountered near the surface.

Buried Plates.

Found to be unreliable owing to being comparatively near the surface and the resistivity of the soil varying between wet and dry seasons.

Copper Conductors in Trenches.

These take up too much space as no two points of the conductor (100 feet or more long) should come nearer than 100 feet apart, besides the resistivity of the ground varying as above.

NEW APPROACH

Because of the difficulties just mentioned and the inconsistency of the results obtained, I have for the last two or three years tried to find a reliable straight forward way of making contact with the general mass of earth that can be relied upon to produce acceptable results independent of water mains that can be changed from metallic to non metallic pipes, and distribution earthing conductors that can become disconnected unknowingly through screws and bolts working loose.

Most industrial concerns have their own transformers and business premises supplied from underground cables they have a direct means of earthing their equipment to the star point of the supply transformer. I, therefore, only propose dealing with the problem of finding a reliable earth for domestic installations where the maximum fault current should not exceed 100 amperes momentary, being limited by the supply authorities service fuse with a continuous current rating of say 50 amperes.

I know some supply authorities provide fuses of 60 and 80 amperes rating for domestic loads which seems excessively high.

EARTHING CONDUCTORS UNDER FOUNDATIONS.

As the weight of a building should ensure ultimate undisturbed compaction of the ground under its foundations and the presence of the structure prevent the heat of the day warming the ground there is a chance of the moisture present being retained with the consequent lowering of the resistivity of the soil at this point.

Under foundations should, therefore, be a favourable position for earthing conductors.

To test this contention I have had No. 8 copper wire placed at the bottom of excavations for foundations of some two hundred and five houses built within the past two years on various types of ground.

The wire was brought to the surface at diagonally opposite corners for testing for continuity from time to time.

Earthing connection resistance tests have been made with an Evershed & Vignoles earth resistance tester and collated as shown in Tables 1 and 2.

Table 1 shows the average result obtained from 122 installations irrespective of the type of ground. It will be seen that the resistance does not appear to decrease in direct proportion to the length of conductor. The reason for this is the variations in the types of ground under one foundation, the compaction and the moisture content. This is bourne out in the next Table 2 which shows the results obtained from four types of ground.

The curves in Figure 1 have been plotted using the information contained in Tables No. 1 and No. 2. They clearly show that the resistance of the contact made with the general mass of earth decreases with the lengthening of the conductor as expected, and that some types of ground are more responsive than others to this form of earthing, due, no doubt, to their capacity for holding moisture.

The results obtained where there is dolomite rock interspersed with soil, clay or decomposed shale are not consistent. It will be seen that the resistance is at times remarkably low considering the earthing conductor is between two substances themselves semi insulators namely concrete and rock.

In such cases the conductivity must be dependent on the amount encased in voids which link up with the surrounding ground.

From the curves, with the exception of the one for rock, it will be seen that around about 160 feet of conductor there is a tendency for them to flatten out, this might be due to a complex of factors still to be investigated.

In the case of rock I think it can be assumed that had there been more earthing conductors of over 200 feet the curve would have flattened out instead of turning up as shown.

It should be noted that the average annual rainfall at Ladysmith is 29 inches, shade temperatures Maximum 101°F, Minimum 29°F, while the relative humidity is 50 per cent at 72°F, seeing any variation from these conditions might produce slightly different results.

I am now having empty cement packets placed over the conductor before concrete is poured to ensure the earthing conductor does not get into the concrete. This has made little or no difference in the few cases we have tried which may be due to the weight of the wet concrete causing the packet to wrap round part of the wire. If this is the reason the results should improve as the packets disintegrate.

On account of expense no experiment has yet been carried out using strip copper which should produce better results as it is more likely to lie flat.

There is one case where a larger section of aluminium has been used.

EARTHING RESISTANCE IMPROVES.

Realizing that in time a change can be expected in the resistance values originally obtained due to better consolidation of the ground and variations in the moisture content according to the seasons, provision is made for disconnecting the earthing conductors under the foundations from all other earthing connections to enable periodic tests to be undertaken which I referred to earlier.

Such tests are being made but not as frequently as I had hoped, those already obtained have been collated see Table 3.

The results confirm that changes do occur and that there is a definite tendency for the resistance to drop in time in the majority of cases. When there is an increase it is thought to be due to an excess of moisture in the excavations during building operations which gradually dries out leaving the normal moisture content.

PHASE LOOP IMPEDANCE TEST.

Although most of the earth resistance tests have been within say 2 Ohms, a figure often used as the maximum permissable, when a Phase Loop Impedance test is made it is found that the total impedance of the fault current loop is far in excess of this, necessitating the connection with the general mass of earth having to be reduced before the desired amount of current can flow. Increasing the size of earthing bonds usually short makes little or no difference.

Assuming the largest fuse involved in supplying a domestic consumer at 220 Volts is 45 Amps such a fuse will require approximately 90 Amps to blow instantly in the event of a short circuit, this being so the total impedance of the fault current loop cannot be more than 2.4 Ohms.

Referring to Table 1 it will be seen that the average resistance of 48 foundation earth connections was 1.6 Ohms and from Table 3 that this resistance can be expected to drop after a year or two by 25 percent to say 1.2 Ohms, but from Table 4 we find the total impedance is likely to be twice this which is 2.4 Ohms the limit set in the previous paragraph.

To some my reasoning will appear to be fortuitous, but it is based on the average of actual mesurements which I am satisfied can be improved upon by using better materials such as strip copper as the conductor and given time for the ground to compact and re-absorb the moisture that had dried out through being exposed to the atmosphere.

If a Factor of Safety of 3 is to be provided in terms of the Wiring Regulations of the "Institution of Electrical Engineers", London then the loop impedance will have to be reduced to something like 1.6 Ohms in the above case which will be even more difficult to attain.

Having only recently acquired a Loop Impedance Tester the only tests so far made are shown in Table 4 which gives some indication of the difference to be expected between the two tests i.e. Ohms Earth Test using driven pegs and the Phase Loop Impedance Test.

TABLE 1.

AVERAGE OVERALL RESULTS

Reference Length	0 to 100 Feet	101 to 200 Feet	201 to 300 Feet	301 to 400 Feet
Cases 122	38	48	29	7
Average Length	82	169	253	508
Average Resistance	3.24	1.60	1.26	.75

TABLE 2.

AVERAGE RESULTS FROM DIFFERENT GROUND.

Reference Length	0 to 100 Feet	101 to 200 Feet	201 to 300 Feet	301 to 400 Feet
SOIL-SAND Cases	5	7	5	—
Average Length	84	176	2.73	—
Average Resistance	1.90	1.13	.90	—
DECOMPOSED SHALE Cases	10	14	10	5
Average Length	75	164	256	467
Average Resistance	3.41	1.46	.81	.50
HARD SHALE Cases	15	9	4	2
Average Length	86	164	260	549
Average Resistance	3.50	2.15	1.65	1.00
DOLOMITE ROCKS WITH SOIL Cases	8	18	10	—
Average Length	81	173	245	—
Average Resistance	3.36	1.62	2.08	—

DIFFICULTIES WITH FOUNDATION EARTHING.

Difficulty has been experienced in getting earthing conductors placed in position before the foundation concrete is poured, to overcome this my Department has an arrangement with the Building Inspector that he does not pass excavations for foundations of houses and flats until the earthing conductors are in.

Bearing in mind that these conductors will be the first part of a building to be placed in position, often before it is known who the Electrical Contractor will be, requires a decision regarding —

(a) Who is to provide the conductor.

(b) Who is to install and be responsible for it.

Being part of the electrical installation the Building Contractor may not want to concern himself, but I can see no good reason for him doing so as at present he is required to erect lightning conductors.

To ensure the earthing conductors are put down before the foundations may require legislation being passed calling on the Building Contractor to be responsible.

ADVANTAGES AND DISADVANTAGES.

These I consider to be —

(Advantages)

a. A sufficiently low resistance for earthing almost assured.

b. Best results for the least outlay.

c. The connection can be expected to improve with time.

d. The conductor cannot be interfered with.

(Disadvantages)

a. The conductor having to be put in at the commencement of building operations by other than the electrical trade.

b. The conductor being inaccessable for subsequent inspections for continuity and corrosion.

CONCLUSION.

It is my contention to continue investigating the effectiveness of earthing conductors under foundations of houses, invloving keeping records of periodic resistance and loop tests.

In the mean time I would recommend that the "Association of Municipal Electricity Undertakings of Southern Africa" asks the "Council for Scientific and Industrial Research" or the "South African Bureau of Standards" to conduct a more thorough investigation into the use of conductors under foundations of houses for earthing to determine the minimum requirements as to length, size and shape with a view to a Specification or Code of Practice being drawn up dealing with earthing Domestic Installations, and to consider the advisability of introducing leglislation calling on Builders to install what might be referred to as "FOUNDATION EARTHS".

TABLE 3.

ANALYSIS OF SUBSEQUENT TESTS — CONDUCTORS COMPLETELY INDEPENDANT AS IN CASE OF FIRST TEST.

Time Interval Months	Cases	Cases Res. Same	Cases Res. Decreased	Ohms Per Cent Average	Cases Res. Increased	Ohms Per Cent Average
Less than one	16	12	4	14	—	—
1	71	23	43	19	5	27
2	34	8	24	16	2	20
3	18	4	10	40	4	20
4	6	2	3	23	1	10
5	4	—	4	30	—	—
6	—	—	—	—	—	—
7	8	3	5	9	—	—
	2	—	2	13	—	—
9	2	—	2	15	—	—
—	161	52	97	23	12	22
Per Cent	100	32	60	—	8	—

SUBSEQUENT RESULTS — TYPICAL CASES.

Date	Ohms	Date	Ohms	Date	Ohms	Date	Ohms
2/62	.8	3/62	.7	—	—	6/65	.6
10/63	.9	2/64	.6	—	—	6/65	.5
5/64	.3	6/64	.3	—	—	6/65	.3
5/64	.4	9/64	.4	—	—	6/65	.4
12/62	1.0	1/63	.8	9/63	.8	6/65	.5
1/63	1.8	2/63	1.4	8/63	.8	6/65	.8
11/62	1.2	12/62	1.0	9/63	.8	6/65	.5
1/64	.25	2/64	.25	—	—	6/65	.25
11/62	1.0	2/63	.6	9/63	.6	6/65	.4
12/62	3.8	3/63	2.8	8/63	2.0	6/65	1.7

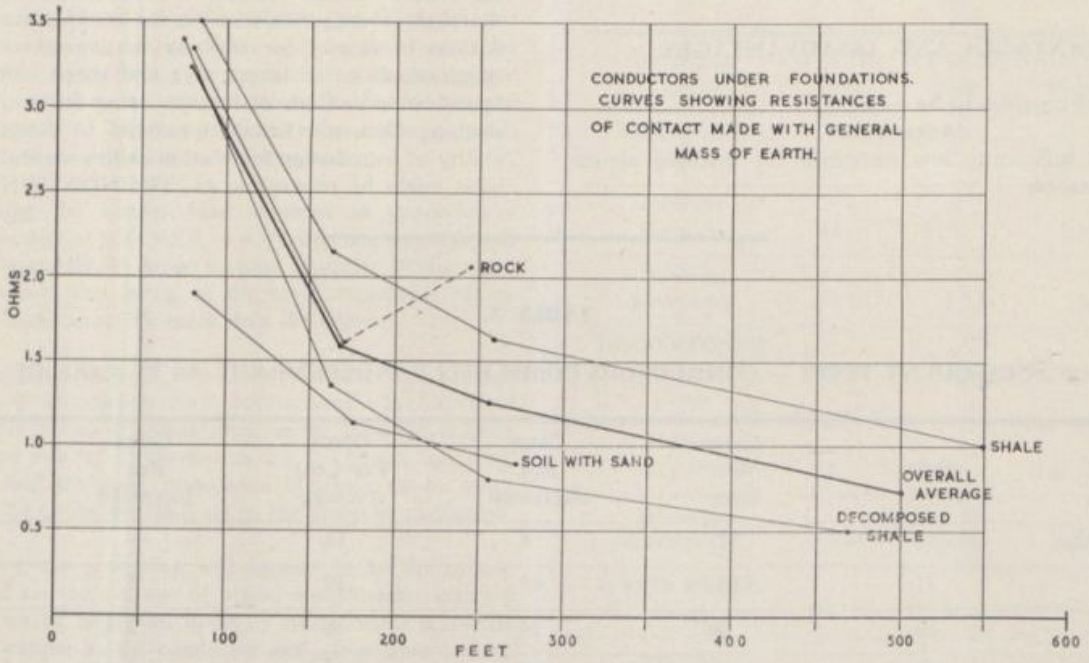

TABLE 4.

Cases Difference between Meg. & Loop Tests	Ohms Earth Test	Apparant Possible Fuse Size	Ohms Loop Imp. Test	Highest Permissable Rating of Fuse I.E.E. Reg.
Average of 12 Cases	1.25 Ohms	176 Amps	2.74 Ohms	80 Amps
Greatest difference between Meg. & Loop Tests	1.50 Ohms	146 Amps	5.30 Ohms	41 Amps
Lowest difference	.25 Ohms	880 Amps	.80 Ohms	275 Amps

AARDING DEUR MIDDEL VAN GELEIERS ONDER FONDAMENTE.

deur
F. STEVENS, A.I.E.E., M.(S.A.)I.E.E.

OPSOMMING.

Redes vir die ondersoek.

Baie is gedurende die afgelope paar dekades gepraat, geskrywe en deur wetgewing bepaal oor die aarding van verbruikersinstallasies. Maar selfs vandag nog is ingenieurs onseker aangaande die beste manier om die aarding te bewerkstellig met inagneming van die uitgawe vir die verbruiker maar wel onder die indruk van die gevare afgesluit in die baie minderwaardige toerusting dikwels beskikbaar teen lae pryse.

Ingenieurs moet dikwels aardverbindings met 5 ohms aanvaar weens die probleme verbonde aan die verkryging van 'n meer doeltreffende verbinding.

Baie persone wat beter behoort te weet besef nie die belangrikheid van 'n goeie aardverbinding nie. En dan is daar die probleem aan die vereistes van die wet te voldoen omdat dit somtyds vaag is. Baie elektrotegniese aannemers het ook nie die nodige toerusting om die toetse mee uit te voer nie.

Noodsaaklike vereistes vir aarding.

Kortliks is die doel van aarding om

(a) personeel van die gevare van elektriese skok te beskerm;
(b) elektriese toerusting van gevaarlike strome en spanning te vrywaar;
(c) die werking van beskermingsapparaat moontlik te maak.

Met inagneming van verskillende faktore is die volgende gevolgtrekkings gemaak ten opsigte van aardverbindings:

Pyp of Stawe Ingeslaan
Is beste indien 'n diepte van 20 voet bereik kan word, maar dit is selde moontlik.

Plate Begrawe
Wisselvallig weens wissellende toestande naby die oppervlakte.

Koper Geleiers in Vore
Neem te veel plek op omdat geen twee punte van die geleiers tot 100 voet lank nader as 10 voet van mekaar moet wees nie en wissellende grond toestande.

Nuwe Benadering.

Weens die probleme reeds genoem in verband met die verkryging van goeie aardverbindings is ondersoek ingestel na 'n metode om, hoofsaaklik in die geval van huishoudelike installasies wat tot 50 ampere stroom trek, 'n eenvoudige dog doeltreffende verbinding daar te stel.

Aardgeleiers onder fondamente.

Die gewig van die gebou behoort 'n sekere mate van vastigheid onder die fondament te verseker en daar is 'n moontlikheid dat die vogtigheid behoue sal bly en gevolglik die weerstand van die grond sal verlaag. Hier is dus 'n gunstige plek vir die geleiers. Die teorie is getoets oor 'n tyd van sowat twee jaar in 205 huise en die weerstande soos bepaal met 'n Enershed & Vignoles meter is in tafels 1 en 2 getabuleer en in figuur in kaart gebring. Die resultate wys duidelik dat die weerstand afneem met die lengte van die draad en ook deur die aard van die grond beinvloed word.

Verskillende eksperimente was uitgetoets en daar is bewys dat in grond 'n lengte van 160 voet en in klip 200 voet die beste resultate gee.

Aardingsweerstand verbeter.

Dit was besef dat toestande wat met die tydsduur verband kom, die aardingsweerstand sou beinvloed en voorsiening vir opvolgingstoetse is gemaak en die resultate is in tafels 3 weeregee. Die resultate het gewoonlik verbeter.

Inpedans toetse was ook uitgevoer op die kringstroomlaan en die besonderhede verskyn in tafel 4.

Probleme me fondamentaarding.

Dit was nie altyd maklik om die geleiers geplaas te kry voordat die beton gegiet word nie maar die bou-inspekteur help nou in die opsig.

Daar moet egter bepaal word wie die geleiers moet voorsien en wie dit moet plaas en verantwoordelikheid aanvaar. Die elektriese aannemer is nie altyd op hierdie vroeë stadium aangewys nie en die bouer is huiwerig om dit te onderneem. Wetgewing om dit af te dwing mag nodig wees.

VOORDELE EN NADELE.

Die voordele skyn te wees.

(a) 'n Lae weerstand word feitlik verseker.
(b) Beste resultate vir die minste uitgawe.
(c) Die verbinding sal by verandering verbeter.
(d) Daar kan nie met die verbinding gepeuter word nie.

en nadele is seker

(a) Die geleiers moet met die aanvang van die gebou geplaas word deur iemand anders as die elektrisiën.
(b) Die geleiers kan nie later nagesien word nie.

GEVOLGTREKKING.

Die plan is om voort te gaan met die ondersoek en gereelde aardweerstand en lustoetse uit te voer.

In die tussentyd word aanbeveel dat die V.M.E.O. die W.N.N.R. of die S.A.B.S. versoek om 'n deurtassende ondersoek in te stel betreffende die gebruik van geleiers onder fondamente vir aardverbindings met die doel om 'n gebruikskode daar te stel en die moontlikheid om dit met wetgewing af te dwing.

„AARDING" : SOOS OMSKRYF IN DIE WET OP FABRIEKE, MASJINERIE EN BOUWERKE.

(a) **Inleiding :**

Regulasie C.61 is in vier dele verdeel waarvan die uitvoering van die eerste twee dele by die „Gebruiker" berus en die laaste twee dele by die „Leweransier".

(b) **Gebruiker en Leweransier :**

„Gebruiker" word gedefineer in die Wet of Fabrieke, Masjinerie en Bouwerke as volg :—

„Gebruiker" met betrekking tot masjinerie; die eienaar of persoon wat voordeel trek uit gebruik van die masjinerie of enige struktuur of uitrusting op die perseel waar die masjinerie ingerig is wat by 'n werksaamheid met betrekking tot die masjinerie of 'n daarmee in verbandstaande werksaamheid gebruik word, en ook die persoon belas met die toesig oor bedoelde masjinerie, struktuur of uitrusting;"

Onder Regulasie C.61 1(a) moet die Gebruiker toesien dat alle metaaldakke, geute, geutpype en vuilwaterpype van geboue geleë op „persele waar masjinerie gebruik word", geaard is. Volgens hierdie Regulasie lyk dit asof die Leweransier elektrisiteitstoevoer kan aankoppel sonder om na die aarding om te sien, aangesien dit die verantwoordelikheid van die „Gebruiker" is. Hierdie vertolking word egter deur Regulasie C.61 2(b) omver-gegooi, waar die Leweransier „enige elektriese installasie in 'n gebou" die aarding moet toets en die eienaar of houer dertig dae te gee waarin die werk uitgevoer moet word.

Indien met die eerste aansluiting dus op die finale inspeksie deur die Leweransier gevind word dat die aarding „op persele waar masjinerie gebruik word" nie gedoen is nie, kan die toevoer aangeskakel word, maar die houer/eienaar van die perseel moet die aarding dus binne dertig dae regstel.

Dit is dus nog verpligtend vir die Leweransier om die aarding „op persele waar masjinerie gebruik word", te toets en is dit nie uitgesluit uit die verpligtinge van die Leweransier nie.

Onder Regulasie C.61 1(a) en (b) moet die „Gebruiker" toesien dat die aarding uitgevoer word en alleenlik die toets van die aarding of inspeksie berus by die Leweransier soos voorgeskryf onder Regulasie C.61 2(a) en (b).

Die vergunning wat wel gemaak is, is dat die Gebruiker van „persele waar masjinerie gebruik word" tyd gegun word waarin hy die aarding moet doen na aansluiting teenoor ander Gebruikers waar die aarding eers gedoen moet word voor aansluiting.

(c) **Metaal in Aardvrye Plekke :**

Onderafdeling 1(b)(i) van Regulasie C.61 verplig die Gebruiker om „alle toeganklike metaaldele van elektriese installasies" te aard of te isoleer, uitgesonderd, "metaal in aardvrye plekke — behalwe lengtes metaalgeleier en die nousluitende metaalomhulsel en -pantsering van kabels".

Onder hierdie bepaling sou ek graag 'n definisie van die woorde „metaal in aardvrye plekke" in die Wet wou gesien het.

Oor hierdie aangeleentheid laat R. W. Ryder in ‚Earthing Principles and Practice' homself as volg uit:

„A point often overlooked is that where the apparatus is situated in an earth-free situation, i.e. in any location where there is no danger of contact with earthed metalwork or other conducting surfaces, it would be far more beneficial to refrain from earthing metalwork, as by so doing one is only introducing a hazard where no such danger existed."

Alhoewel hierdie uitsluitsel gemaak is word dit verderaan onder sub-item 2(a) van bogenoemde Regulasie verpligtend vir die Leweransier om toe te sien dat „alle metaaldakke, geute geutpype en vuilwaterpype van die gebou", geaard word. In meeste van die moderne geboue is die geute, geutpype en vuilwaterpype in 'n aardvrye posisie, selfs fabrieke met nie-metaaldakke en gewone huise met nie-metaaldakke, substasie-geboue en blokke woonstelle.

In hierdie „geutpype" ens. te aard, is dit definitief meer gevaarlik want in sekere gevalle is dit gevind dat die hele aarding van 'n perseel lewendig kan word en dus word die geutpype „lewendig" en stel 'n dodelike gevaar daar, war daar andersins indien sulke pype nie geaard was nie, geen gevaar sou gewees het nie.

Noordlottige ongelukke wat in baddens plaasgevind het as gevolg van die inbring van foutiewe radios, wasmasjiene, verwarmers ens. in die badkamers, sou heelwaarskynlik nie gebeur het as die vuilwater-uitlaatpype nie geaard was nie.

Selfs in Bantoe dorpsgebiede waar kabelaansluitings gedoen word na huise met 'n metaaldak is daar geen rede waarom die dak geaard moet word nie, as gevolg van die aardvrye toestand deurdat geen waterpype of elektriese-drade naby so 'n dak kom nie.

(d) **Vervanging van Bo-grondseleidings :**

Munisipaliteite wat besig is met die vervanging van verweerde bogrondse-diensaansluitings word onder Regulasie C.61 2(b) verplig om die aarding van so 'n perseel te toets en indien die aarding swak is, mag die toevoer nie aangekoppel word alvorens die eienaar of houer van die perseel die aarding uitgevoer het nie. Dit is dus noodsaaklik vir die Leweransier om eers die aardink van geboue waaraan veranderings in die toevoerdrade aangebring gaan word, te toets, die eienaar dan dertig dae gee waarin die aarding gedoen moet word en daarna eers kan die Leweransier die bogrondse aansluitingsdrade vervang. Hierdie metode bemoeilik die werk van die Voorsiener.

Uitsluitsel in hierdie geval in sovêrre dat die Leweransier na vervanging van die diensdrade die eienaar of houer versoek om binne dertig dae die aarding te verbeter sal die werk bespoedig en ook heelwat aan koste spaar.

(e) **Vergelyking met Artikel 19(1) van die Wet op Elektrotegniese Draadwerkers en Aannemers :**

Artikel 19(1) van die Wet op Elektrotegniese Draadwerkers en Aannemers, lui egter :—

„In 'n gebied ten opsigte waarvan 'n bepaling kragtens Artikel agtien gemaak is —

(a) mag geen Voorsiener draadwerk verbind of toelaat dat dit verbind word; en

(b) mag niemand draadwerk verbind, met 'n bron van elektrisiteitsvoorsiening wat aan 'n Voorsiener behoort of onder sy beheer is nie, tensy die draadwerk ondersoek, getoets en goedgekeur is deur iemand in die diens van die Voorsiener wat hy vir dié doel genomineer het, en die Voorsiener tot die verbinding toegestem het;

met dien verstande dat die bepalings van hierdie sub-artikel nie geld met betrekking tot draad werk deur of ten behoewe van die Regering met inbegrip van die Spoorweg Administrasie en Provinsiale Administrasie, uitgevoer of draadwerk ten opsigte van 'n hystoetstel of roltrap waarop die bepalings van die Wet op Fabrieke, Masjienerie en Bouwerke 1941 (Wet No. 22 van 1941), van toepassing is nie."

Onder Regulasie C.61 van die Wet op Fabrieke, Masjinierie en Bouwerke word die Leweransier verplig om alle „aarding" te toets, terwyl die toets van bedrading van persele van sekere instansies soos hierbo omskryf in die Wet op Elektrotegniese Draadwerkers en Aannemers, uitgesluit is.

Heelwat probleme word ondervind met die elektrotegniese draadwerker wat wel deeglik bewus is daarvan dat die bedrading nie getoets word nie, en doen die aarding van die dakke, geute ens. op sy manier wat nie volgens die spesifikasies van die Elektrisiteitsonderneming is nie, en dring aan op 'n aansluiting indien die aarding volgens die megger-toets slaag.

Nou wil ek net meld dat die Leweransier oor 'n tydperk van jare die mees effektiewe en duursame metode van aarding ontwerp het.

Oor 'n tydperk van ses maande is in Roodepoort gevind dat in die geval van 370 huise wat volgens 'n vroëre metode geaard is — die aarding oorgedoen moes word. In nie enkele geval is die aarding goed gevind nie. Daarenteen is die huidige metode van aandring wat reeds vir die afgelope tien jaar in werking is, in slegs enkele gevalle sleg gevind en meestal as gevolg van meganiese beskadiging.

Die Elektrotegniese Draadwerker voer nou sy eie idees uit, en die aarding is op 'n swak metode uitgevoer en die betrokke persele sal oor 'n tydperk van enkele jaar weer die aarding moet laat nagaan.

In Roodepoort word toevoer eenvoudig nie aangeskakel voordat die aarding soos dit deur die Munisipaliteit voorgeskryf is, gedoen is nie, maar wetlik glo ek nie het die Leweransier die reg om dit te eis nie. Persoonlik voel ek dat indien uitsluitsels gemaak is waar daar op sekere persele die bedrading nie hoef getoets te word nie, die ooreenkomstige uitsluitsel gemaak moet word oor die aardings-aspek van die persele.

(f) **Die Leweransier as Gebruiker :**

Die Leweransier as Gebruiker moet onder Regulasie C.61 1(b) die algemene aarding van sy sisteem uitvoer. Gewoonweg word die aarding van apparate aan die hoogspanningskant nie aan die waterpype geaard nie, maar wel die laagspanningsretikulasie.

Aardverbinbings aan die bogrondse-pale en waterpype lewer heelwat probleme op as gevolg van slegte kontakte. In Roodepoort is boute in die staalpale ingeskiet waaraan die verbinding gedoen word, wat baie meer effektief was. Aan die waterpype is die aarding gedoen met klampe wat om die waterpype gaan wat heelwat probleme opgelewer het met slegte kontakte. 'n Nuwe metode is onlangs in werking gestel om die verbings aan pale, waterpype en T-aardlaskonneksies te doen, en dit behels die gebruik van die eksotermiese aansweis van die aarddrade met behulp van die metode wat deesdae toegepas word op die Spoorweë om die deur-koppeling van een staafaan 'n ander te doen.

Dit word verkry deur die reduksie van koperoksied deur aluminium in 'n poeier vorm. Aangesien die reaksie gou is met 'n goeie termiese rendement is dit ideaal geskik vir die las van kopergeleiers. Dit kan egter nie op bogrondse lyne ens. gebruik word nie, want die geweldige hitte versag die koper. Die voordeel van hierdie proses is —

(1) Geen probleme i.v.m. verwering kan verkry word by so 'n las nie, aangesien daar geen meganiese drukking of kontak oppervlaktes is nie;

(2) Die stroomdra-vermoë is dieselfde as die van die geleier;

(3) Oorstrom en foutstrome het geen effek op die las nie, die geleier sal eers smelt voor die las iets oorkom.

Dit is gou om te gebruik en die geval van T-laste tydbesparend. Sorg moet gedra word dat metaal oppervlaktes skoon is om 'n effektiewe verbinding te kry, en dat die regte lading van die ontplofbare medium gebruik word vir die grootte van die las.

Die reaksie vind plaas in 'n koolstof houer wat in die verlangde vorm gemaak is vir 'n spesifieke gebruik.

Die aarding van die hoogspanningsisteem in Roodepoort, wat nie aan die waterpype geaard word nie, verg noukeurige aandag. Met elke hoogspanningskabel wat gelê word, word by elke eindpunt 'n lengte van 250 vt. .06 vk.dm. kopergeleier in die kabelsloot gelê as 'n aard. Die lengte van 'n 100 vt. behoort voldoende te wees maar daar is op 250 vt. gestandaardiseer omrede die rotsagtigheid van die grond. Dit is nie ongewoond om tot 80% van die lengte van die kabelsloot met dinamiet oop te skiet nie, en die kabels word feitlik in soliede rots gelê.

Aardpen-elektrodes kan nie gebruik word niie. Om die waarheid te sê, die penne wat gebruik word vir die toets van die aardweerstand kan op party plekke nie ingeslaan word nie. Leemgrond word aangery en die kabels en aarddrade word daarin gelê. Desnieteenstaande word toetse gevind van 25 ohms. op so 'n elektrode waar 2 x 250 vt. lengte .06 geleiers as aard gelê is.

In die oprigting van 'n bogrondse 33 kV-lyn kon in sekere lengtes 'n aard draad gelê word, maar in die meeste gevalle is drie gegalvaniseerde waterpype ses voet lank in 'n driehoek met sye sewe voet uitmekaar ingeplant, en die grond behandel met gewone grofsout. Aldrie pype is gekoppel met .1 koperdraad.

Hierdie aardingsmetode verg egter aanhoudende aandag om die aardingsweerstand binne perke te hou.

Ter Afsluiting :

Aarding van verbruikerspersele, en die aarding in die Elektrisiteits-voorsieningsnetwerke is seker die belangrikste verantwoordelikheid van die Stadselektrotegniese-Ingenieur.

Ek het net probeer om 'n vertolking te gee van die Wetgewing en sekere praktyke wat in Roodepoort toegepas word.

Verwysings:

R. W. Ryder: 'Earthing Principles and Practice'

P. J. BOTES
Stadselektrotegniese-Ingenieur

"EARTHING" : AS DEFINED IN THE FACTORIES, MACHINERY AND BUILDING WORKS ACT.

SUMMARY OF PAPER BY MR. P. J. BOTES ELECTRICAL ENGINEER

(a),(b) It is pointed out that the first two requirements of regulation C.61 have to be met by the "user" and the second two by the "supplier". Regulation C. 61 2(b), however, places the responsibility for earthing squarely on the shoulders of the supplier, although the **user** of premises where machinery is used is allowed time in which to do the earthing.

(c) Metal in "earth free" situations are in regulation C. 61(1)(b)(i) exempted from the earthing requirements. The author considers that many situations would be safer if the scope of this clause could be extended in order to cover metals now specifically listed for earthing.

(d) The procedure set out in regulation C. 61 (2)(b) is difficult to apply in conjunction with the changing of overhead service connections and a relaxation is requested.

(e) Difficulty is experienced in that section 19(1)(b) of the Electrical Wireman and contractors Act exempts installations in state and provincial buildings from being tested by the supplier except in so far as the earthing requirements of regulation C. 61 of the Factories Act apply. It is thus found difficult to apply the suppliers requirements of earthing which have been tested and proved over many years. The two acts should be brought in line.

(f) A method of making the earth connections and joints is described and the difficulty of obtaining a satisfactory earth in certain localities is pointed out.

ELECTRICAL PROTECTION WITH SPECIAL REFERENCE TO EARTH LEAKAGE

by E. Tarchalski, B.Sc.(Eng.), AM(S.A.)I.E.E.

Electricity is a great boon to mankind. No other recent discovery has changed the mode of our lives more than electricity. It is an excellent servant and must be looked after well, for if neglected it can become dangerous, as has happened too often in the past.

The method of distribution of electricity and the various standards have developed over the years into present day practice which we know and which is similar, if not basically identical, throughout the world. Similar conclusions were arrived at independently. We thus find that the domestic distribution voltage is predominantly of the order of 200 to 250 volts phase value, and that the supply is obtained from a transformer which in turn obtains its supply at a very much higher voltage. The possibility of the low voltage winding of the transformer assuming a high potential relative to ground for one reason or another has resulted in the low voltage winding being deliberately "earthed". If this was not done, the distribution networks would in any case have become "earthed" through low insulation resistance of the system or defective insulation of installation and equipment. The result would have been a badly earthed system as compared with an intentionally well earthed system.

The first use of electricity in homes was in the form of an electric light. This was a simple affair. The light bulb was suspended from a ceiling and a suitable switch was fixed to the wall. The wires which conveyed the current and which could be accessible were suitably protected e.g. were put in metal pipes just in case there was a breakdown of insulation and the protecting pipes themselves became alive, they were also earthed. Any exposed metal parts of electrical equipment of appliances are earthed for the same reason — safety! Safety from contact with live metal. Earthing as a safety measure against the exposed metal parts of appliances becoming alive. Sound and continuous earthing for safety conditions which are not difficult to achieve on fixed installations.

Then came portable electrical appliances which for one reason or another could not be made as fixed installations. These had to have power outlets from which they could be energised and electric cords by which to connect them to these

power outlets. The exposed metal parts of these appliances, which on breakdown or damage of insulation could become alive, had to be earthed via the flexible cord. There had to be suitable connectors at one or both ends of the flexible cords.

Unfortunately, this safety earthing of portable appliances is not always sound and often not continuous. Even the best of flexible cords, connectors and appliances deteriorate through wear and tear, use or abuse. The very nature of a portable appliance is such that it lends itself to wear and damage. The earthing connection is passive and its soundness and continuity are not automatically detectable. An accidentally or intentionally unearthed appliance may become alive and constitute a danger to persons. It is thus obvious that the earthed distribution system developed naturally and that this development has created conditions where a human can receive an electric shock by touching live metal and making contact with "earth", be it a true earth or an earthed metal object. Further, it is known that most of such shocks and fatalities due to electric shocks were associated with portable electrical appliances which were not effectively earthed. The greater the use of electricity (and particularly portable electrical appliances) the greater the possibility of human contact with electrically live objects. The number and variety of electrical appliances in the homes is constantly increasing. In the U.S.A. there are some 350 on farms. We in South Africe have not reached this stage yet, but it may not be too far off.

Though the use of electricity has increased tremendously the methods of protection remained unaltered or at least no additions or improvements were made until the introduction several years ago, of differential or current balance earth leakage relays. The principal of operation of core balance relays is well known and core balance relays were made and used long ago. These relays were however, insensitive and were unsuitable as a protection against direct contact with electricity. It is only recently that earth leakage relays sufficiently sensitive to give such protection were made available.

Several countries in the world, aware of the increasing hazards and fatalities from electricity began investigating the mechanisms and causes of electrocution and methods of improving safety measures. South African engineers were the first to develop and use earth leakage relays sufficiently sensitive to protect persons making direct contact with electricity. The earth leakage relay, by virtue of its principle of operation and sensitivity is the most advanced method of protection in this regard.

Much has been said and written about the magnitudes and durations of "safe" or "dangerous" currents as well as mechanisms and circumstances of electrocution. It is certain that all the available information on this subject was unearthed and brought to light. The conclusions are embodied in the S.A.B.S. Specification No. 767-1964, Core Balance Earth Leakage Units, the first specification of its kind in the world. This document acknowledges that currents below 25 milliamps. are not considered dangerous for an average human being.

The use of earth leakage units in domestic and industrial installations has yielded considerable information. Initially earth leakage units were installed to protect the whole domestic installations. The high sensitivity of the unit demanded the appliances to have very small leakage currents and to maintain this condition. This is not easy to achieve, particularly with some ceramic embedded and similar heating elements which exhibit a natural low insulation resistance at high temperatures. Fortunately, appliances with such characteristics are normally of the "fixed" type and could be bypassed. There is no known record of any fatality or serious injury caused by a fixed electric stove except where the electric wiring of the stove was tampered with by an unauthorised and untrained person or where the body of the stove served as a good "earth". The majority of such fatalities due to electricity occurred with portable appliances energised from socket outlets. There is thus a strong case for installing earth leakage units on socket outlet sub-circuits only and thus provide protection where it is needed most. While many other conditions exist and deserve separate consideration, the above could serve as the first practical approach.

Another aspect in connection with earth leakage protection is its role as a "warning monitor". Should an earthed appliance begin to deteriorate with consequent leakage of current to earth, the overload protection would not normally operate but the earth leakage protection will operate and give warning of possible impending danger and thus help keep appliances in good electrical condition.

While it is realised that earth leakage devices do not protect under all conceivable conditions, yet they are the most advanced contribution in the field of safety measures against the hazards of electricity. Serious consideration should thus be given to eventual provision of earth leakage protection on all domestic installations and where electrical hazards may exist.

ELEKTRIESE BESKERMING MET SPESIALE VERWYSING NA AARDLEKKE.

deur E. Tarchalski, B.Sc(Ing.), AM(S.A.)I.E.E.

Elektrisiteit is 'n groot seën vir die mens maar moet goed versorg word anders is dit gevaarlik.

Vir tegniese en veiligheidsredes word die laagspanningswikkeling van distribusie transformators ge-aard. Die eerste verbruikersinstallasies was die eenvoudige lig en ook hier is die metaalpype wat die geleiers moet beskerm ge-aard ten einde dit veilig te maak ingeval van foute; toe het draagbare toerusting gevolg en die metaaldele moes weer vir veiligheidsredes deur die buigbare snoer ge-aard word. Uit die aard van die saak is aarding van die apparaat deur middel van die buigbare snoer onbetroubaar, gevaarlik en die oorsaak van baie ongelukke.

By verre die grootste aantal noodlottige ongelukke met elektriese toerusting is as gevolg van die gebruik van draagbare apparaat.

Alhoewel die gebruik van elektrisiteit steeds toeneem is dit eers betreklik onlangs dat vordering op die gebied van beskerming gemaak is toe die sensitiewe gebalanseerde spoeltipe relê ontwikkel en gebruik is.

Op hierdie gebied was die Suid-Afrikaanse ingenieurs aan die spits. Baie is reeds gesê en geskrywe oor die „gevaar-

like" en „veilige" strome met betrekking tot elektrokusie maar die S.A.B.S. spesifikasie No. 767-1964 is die eerste van sy soort in die wêreld wat 'n stroom van 25 milliampere as nie gevaarlik vir die gewone persoon aanvaar.

Die gebruik van aardlek-relês in huishoudelike en nywerheidsinstallasies het baie inligting opgelewer.

Probleme is ondervind deur die hele installasie in 'n huis daarmee te beskerm. Gelukkig is noodlottige ongelukke as gevolg van foute op vaste toestelle betreklik seldsaam. Ongelukke spruit meestal uit die hantering van draagbare toerusting wat vanuit kontakdose gevoer word. Daar is dus 'n sterk saak uit te maak om vir 'n begin altans, aardlekrelês net op die stroombane vir kontakdose aan te bring. Dan dien die relês ook 'n goeie doel om te waarsku teen ontwikkelende gevare.

Alhoewel die aardlekrelê nie onder alle moontlike omstandighede doeltreffend mag wees nie behoort ernstige oorweging daaraan geskenk te word om dit geplaas te kry op alle huishoudelike installasies en waar elektriese gevare bestaan.

THE ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA.

NOTICE OF 1966 TECHNICAL MEETING.

We herby confirm that the 1966 Technical Meeting of the Association will be held on the 2nd May, 1966 at 8.30 a.m. in the City Hall, Bloemfontein.

DAVIDSON & EWING (PTY.) LTD.
per R. G. EWING.
Secretaries.

Items for discussion will include:

(1) Earthing.
(2) Rights of supply.
(3) Shortage of Technical Man-power.
(4) Discussion will also take place on the following if time permits:
   (a) Limited demand tariffs where a circuit breaker or other device cuts off the supply when the demand reaches a predetermined amount.
   (b) Transformers: (i) Capitalisation.
   (ii) Voltage Regulation.
   (c) Overhead Lines: Protection.
(5) Reports of sub-committees and Representatives.

All Delegates are reminded that lunch will be available at the venue of the meeting.

DIE VERENIGING VAN MUNISIPALE ELEKTRISITEITSONDERNEMINGS VAN SUIDELIKE AFRIKA.

KENNISGEWING VAN DIE 1966 TEGNIESE VERGADERING.

Ons bevestig hiermee dat die 1966 Tegniese Vergadering van die Vereniging sal op 2 Mei, 1966 om 8.30 v.m. by die Stadsaal, Bloemfontein, gehou sal word.

DAVIDSON EN EWING (EDMS.) BPK.
per R. G. EWING.
Sekretarisse.

Insluitend in die Bespreking sal die volgende Items verskyn:

(1) Aarding.
(2) Voorsieningsregte.
(3) Tekort aan Tegniese mannekrag.
(4) Bespreking van die volgende indien tyd beskikbaar is:—
   (a) Beperkte aanvraagtariewe waar 'n stroomverbreker of ander toestel die toevoer afsny indien die aanvraag die voorafbepaalde perk oorskry.
   (b) Transformators: (i) Kapitalisering;
   (ii) Spanning regulasie.
   (c) Bogrondse lyne: Beskerming.
(5) Verslae van Sub-komitees en Verteenwoordigers.

Alle Afgevaardigdes word herinner dat middagete bedien sal word by die Bloemfontein se Stadsaal.

HOT DIP GALVANISED ZINC COATINGS.

No meetings have been held this year of the committee appointed by the Council of the South African Bureau of Standards as the Bureau were of opinion that sufficient information had been obtained to formulate an omnibus specification for the hot dip galvanising and testing of articles and wire.

The draft specification is in the process of formulation.

P. A. GILES,
Representative.

'n Vertaling van hierdie verslag sal by die vergadering beskikbaar wees.

RIGHTS OF GENERATION AND SUPPLY SUB-COMMITTEE.

1. This sub-committee has taken over amongst other items the functions of the Original Orange River Hydro Electric Project sub-committee.. Messrs. Giles and de Villiers attended a meeting of the United Municipal Executive in Pretoria on 11th August, 1965 and the following points were stressed in the discussion:—
   (a) Strong views were expressed that local authorities should not be restricted in their efforts to build and extend their own supply undertakings wherever it is

found to be more economical to do so than to take a supply from Escom.

(b) Having regard to the enormous capital cost and the resolve to use revenue from electricity to pay for the dams in the Orange River, it is seriously doubted whether Escom would be able to supply electricity at a reasonably economic tariff compared with local authorities in the affected area who have established large supply undertakings.

(c) Local authorities should not agree to Escom monopolising the supply of electricity. There is no guarantee that Escom will supply electricity more cheaply and if there is no competition there is no means of testing the fairness of its tariffs.

(d) The desirability of developing the electricity supply industry in the national interest is conceded but at the same time the existing rights and interests of local authorities should be protected as far as possible.

(e) It is undesirable that Escom should be the advisers to the Provincial Administrations on the electricity supply schemes of local authorities, as they are then virtually acting as arbiters in their own cause.

(f) When Escom conducts investigations in regard to electricity supply and the undertakings of local authorities are likely to be affected in the area investigated there should be close consultation with those local authorities.

(g) Some indication should be given as to when and the extent to which electric power may be expected to become available from the Orange River scheme.

(h) Steps should be taken to rectify known defects in the Electricity Act, 1958. It should be mentioned that information in this regard has been obtained from Paarl who acted as convenor for a number of local authorities in the Western Cape in recent discussions with the Electricity Control Board.

Consideration of these items is progressing.

2. A meeting of the sub-committee was held on 17th January, 1966 to compile a memorandum to the United Municipal Executive of South Africa on the matters concerning supply of electricity by local authorities outside their areas of jurisdiction, raised in the letter of the 10th September, 1965, reference A.3/7/2, addressed to the Director of Local Government, Transvaal Provincial Administration, by the Secretary for Commerce and Industries. This memorandum has been circulated to members (Bulletin 77).

3. A delegation consisting of Messrs. Giles, de Villiers and Frantz attended a meeting of the United Municipal Executive on 22nd February, 1966 where Items 1 and 2 above were discussed, but a more urgent matter arose in reference to Witbank where the municipal area has been extended into Escom's area of supply and the Electricity Control Board have advised that a condition for the take over of the electricity supply in the incorporated areas by Witbank is the need to prove to the Board that the consumers in these areas will be satisfied with such an arrangement.

This item 3 will be considered at the next meeting of the Rights of Generation and Supply sub-committee. It is hoped to prepare a report for submission to the August 1966 meeting of the United Municipal Executive.

P. A. GILES,
Convenor.

'n Vertaling van hierdie verslag sal by die vergadering beskikbaar wees.

SOUTH AFRICAN NATIONAL COMMITTEE OF THE WORLD POWER CONFERENCE

The objecs of the World Power Conference are the peaceful use of energy resources to the greatest benefit of all, both nationally and internationally by:

i) Considering the potential resources and all the means of production of energy in all their aspects,

ii) Collecting and publishing data on energy resources and their utilization,

iii) Holding conferences of those concerned in any way with surveying, developing, or using energy resources.

The South African National Committee consists of representatives from :-

The Electricity Supply Commission, Johannesburg

South African Railways

The South African Institution of Mechanical Engineers

SUID-AFRIKAANSE NASIONALE KOMITEE VIR DIE WÊRELDKONFERENSIE M.B.T. KRAG.

Die doelstellings van die Wêreldkonferensie M.B.T. Krag is die vreedsame aanwending van energiebronne tot die voordeel van almal, beide op nasionale en internasionale wyse deur:

i) Oorweging te verleen aan potensiale bronne en al die middele vir energieproduksie uit alle aspekte beskou.

ii) Die bymekaarmaak en publikasie van data T.O.V. energiebronne en die gebruik daarvan.

iii) Die hou van konferensies deur alle belanghebbendes wat enigsins betrokke is by die opneem ontwikkeling en gebruik van energiebronne.

Die Suid-Afrikaanse Nasionale Komitee bestaan uit verteenwoordigers van —

Die Elektrisiteitsvoorsieningskommissie, Johannesburg.

Die Suid-Afrikaanse Spoorwee.

Die Suid-Afrikaanse Instituut vir Werktuigkundige Ingenieurs.

The South African Institute of Electrical Engineers
The Associated Scientific and Technical Societies of South Africa
The Association of Municipal Electricity Undertakings of Southern Africa
The Fuel Research Institute of South Africa
The South African Atomic Energy Board
The Department of Labour.
The Department of Mines
The Transvaal and Orange Free State Chamber of Mines

The Council for Scientific and Industrial Research with Dr. Strazacker as chairman and Mr. G. R. D. Harding as secretary.

World Power Conferences are held every sixth year, the last having taken place in 1962, in Melbourne, Australia, while the next is due in 1968, the venue being Moscow, U.S.S.R.

Sectional meetings are held every alternate year. The 1964 meeting was in Lausanne, Switzerland and the 1966 meeting will be in Tokyo, Japan.

Meetings of the Executive Council are arranged every year, the last, in 1965, being held in Haifa, Israel.

The South African National Committee was represented in Lausanne by Dr. Strazacker and Mr. Harding, both of whom have also been delegated to attend the Sectional Meeting in Tokyo this year.

Meetings of the South African National Committee are held annually in Johannesburg.

At the meeting which took place on the 25th March, 1965, Dr. Strazacker reported briefly on the Sectional Meeting held in Lausanne in 1964. The theme of this meeting had been "The Struggle against Losses in the Field of Energy Economics".

There had been over 1,100 participants and about half that number of accompanying persons from 59 member countries. 146 Papers had been circulated before-hand and discussed at the meeting, which lasted five days.

The theme itself had been divided into various divisions under four main sections, the first being "General Aspects", the second "Avoidance of Losses in Conversion", subdivided into five sections according to the type of power (mainly water, thermal and nuclear), then fuel conversion and finally direct conversion. The third section had been the "Avoidance of Losses" in connection with fuel transport and power transmission and lastly "Losses in Industrial Utilization". That part had been divided into two sections, one dealing with industry and one dealing with space heating.

In connection with the section dealing with industry, Dr. Strazacker had been asked to act as Vice-Chairman. This section dealt mainly with the application of power in industry, particularly the steel and petroleum industries.

Dr. Strazacker said that what impressed him most was the evidence of very rapid development in places, hinging on extensive research both by manufacturing firms and the public utilities.

Die Suid-Afrikaanse Instituut vir Elektrotegniese Ingenieurs.
Die Geassosieerde Wetenskaplike en Tegniese Verenigings van Suid-Afrika.
Die Vereniging vir Munisipale Elektrisiteitsondernemings van Suidlike Afrika.
Die Brandstofnavorsingsinstituut van Suid-Afrika.
Die Suid-Afrikaanse Atoomkragraad.
Die Departement van Arbeid.
Die Departement van Mynwese.
Die Transvaalse en Vrystaatse Kamer van Mynwese.

Die Raad vir Wetenskaplike en Nywerheidsnavorsing met Dr. Strazacker as Voorsitter en Mnr. G. R. D. Harding as Sekretaris.

Konferensies i.v.m. Wêreldkrag word elke sesde jaar gehou en die jongste het in Melbourne, Australië, in 1962 plaasgevind terwyl die volgende een vir 1968 bepaal is en in Moskou, Rusland, gehou sal word.

Afdelingsbyeenkomste vind elke alternatiewe jaar plaas. Die 1964-vergadering was in Lausanne, Switserland, en die 1966-vergadering sal in Tokyo, Japan gehou word.

Vergaderings van die Uitvoerendekomitee word elke jaar gereël en die laaste een is gedurende 1965 in Haifa, Israel gehou.

In Lausanne was die Suid-Afrikaanse Nasionalekomitee deur Dr. Strazacker en Mnr. Harding verteenwoordig. Albei van hulle is ook afgevaardig om die Afdelingsbyeenkoms vanjaar in Tokyo by te woon.

Vergaderings van die Suid-Afrikaanse Nasionalekomitee word jaarliks in Johannesburg gehou.

Op die vergadering wat op 25 Maart 1965 plaasgevind het, het Dr. Strazacker en Mnr. Harding kortliks verslag oor die Afdelingsbyeenkoms wat in Lausanne in 1964 gehou was, gelewer. Die tema vir hierdie vergadering was „Die stryd teen verliese op die terrein van Energie-Ekonomie".

Daar was meer as 1,100 deelnemers en ongeveer die helfte van hierdie getal ander persone uit 59 ledelande wat hulle vergesel het. Altesaam 146 lesings is vooraf gesirkuleer en op die vergadering wat vyf dae geduur het, bespreek.

Die tema in sigself is in verskillende afdelings onderverdeel onder vier hoofseksies. Die eerste hiervan was „Algemene aspekte", die tweede „Voorkoming van Verliese in Omsetting", onderverdeel in vyf seksies volgens die soort van krag (hoofsaaklik water-kern- en termale krag), dan brandstofomsetting en ten laaste direkte omsetting. Die derde seksie was „Voorkoming van Verliese i.v.m. Brandstofvervoer en Kragtransmissie" en laaste „Verliese in Nywerheidsaanwending". Hierdie gedeelte is in twee seksies verdeel, die een waarvan oor die nywerheid handel en die ander oor ruimteverhitting.

Met betrekking tot die seksie wat oor die nywerheid handel, is Dr. Strazacker gevra om as ondervoorsitter waar te neem. Hierdie seksie het hoofsaaklik gehandel oor die aanwending van krag in die nywerheid, veral ten opsigte van die staal- en petroleumnywerhede.

Dr. Strazacker het gesê dat wat hom die meeste beïndruk het, die getuienis was dat daar in sekere vertakkinge snelle ontwikkeling plaasvind as gevolg van uitgebreide navorsing deur beide vervaardigingsfirmas en publieke utiliteitsondernemings.

That research had led to a marked decrease in the capital cost per kilowatt in electric plant, irrespective of the type of plant, mainly by increasing the size of the units and by improving efficiencies of the conventional type, as well as improving efficiencies by developments in new directions, particularly in the nuclear field. Those improvements were such that on the generation side thought was being given to units 1,000 MW or even 1,200 MW in size. On the power transmission side the first 750 kV lines were already going into operation, and thought was being given to high voltage transmission of up to 1,000 kV. An aspect that had been given a good deal of attention at the meeting was the integration of the various sources of energy, taking the ordinary fossil fuel which was still the main source of energy for power generation, and combining with it hydro power sources. Pumped storage schemes were coming to the fore more and more because of the fact that hydro potential as a generating source, was gradually coming to the end of possible development, because the best sites had already been used. Nuclear power was coming in very rapidly for base load purposes, and gas turbines for peaking. The application of jet engines in gas turbines for power generation, often as a movable unit or for peaking at certain times of the day, sprang from the jet engines developed to a high degree for military purposes.

On the matter of cooling towers and cooling in general for large power stations, the "dry" cooling tower was receiving a good deal of attention, and was a type of cooling tower that he thought would grow in importance so far as South Africa was concerned. A "dry" cooling tower was in operation at Rugeley Power Station for a 120 MW unit and from all reports was working quite well, apart from the initial teething troubles. His conclusion was that the "dry" cooling tower had come to stay and would cover a wide field.

The progress made with direct conversion was perhaps slower than was envisaged some time ago but steady progress had nevertheless been made. The general feeling had been that by 1980 direct conversion would have developed to such an extent that it could be thought of on a larger scale than at the present. A good deal of experimental work, which was very intricate, was being carried out on magnetohydro dynamics. Both the World Power Conference and the special Conference which was held in Geneva two weeks before the World Power Conference had indicated rapid progress in reducing the capital cost of nuclear plant. That was due mainly to technological development of the components of that plant. There were places where normal fuel costs were high and where nuclear power was becoming competitive mainly for large units. Much depended on the price of fuel. A number of smaller countries did not have cheap fuel. Among those were Pakistan, Israel, Peru and the Arab Republic, which were going ahead with nuclear stations. Such stations would involve high capital cost, but the smaller countries often received financial support from the U.S.A. and the U.K., or from the companies designing the stations. In those particular cases nuclear power stations were already economic, otherwise his general impression was that the development in that field had not yet reached the stage where, with the cheap fuel prices in South Africa, nuclear power was competitive, but developments should be watched

Hierdie navorsing het gelei tot 'n merkbare vermindering in die kapitale koste per kilowatt ten opsigte van elektriese toerusting en masjinerie, ongeag die soorte daarvan, hoofsaaklik deur die grootte van die eenhede te laat toeneem en deur die doeltreffendheid van konvensionele tipes te verbeter, sowel as om doeltreffendheid te verbeter deur ontwikkelings in nuwe rigtings, veral op die kernkraggebied. Hierdie verbeterings was sodanig dat daar, wat ontwikkeling betref, gedink is aan eenhede van 1,000 MW of selfs 1,200 MW in omvang. Wat betref kragtransmissie, word die eerste 750 kV lyne reeds in werking gebring, en daar word ook gedink aan hoogspanningstransmissie van tot 1,000 kV. 'n Aspek waaraan die vergadering heelwat aandag gegee het, was die integrasie van die verskillende bronne van energie, bv. deur fossielbrandstof, wat nog steeds die hoof energiebron vir kragontwikkeling is, met waterkragbronne te verbind. Skemas met betrekking tot gepompde voorrade tree meer en meer op die voorgrond aangesien water as 'n kragbron geleidelik aan die einde van sy eksploitasie- en ontwikkelingsmoontlikhede kom omdat die beste persele in hierdie opsig reeds in gebruik is. Kernkrag tree snel op die voorgrand veral ten opsigte van basiese belading, en gasturbines vir spits-belading. Die aanwending van spuit-motore in gasturbines, in baie gevalle as mobiele eenhede, vir kragopwekking of om spitsaanvraag te voorsien op sekere tye van die dag, ontstaan uit die feit dat op militêre gebied spuit-motore tot 'n baie hoë graad ontwikkel is.

Met betrekking tot verkoelingstorings en verkoeling in die algemeen by groter kragstasies, geniet die sogenaamde „droë" verkoelingstoring heelwat aandag en vir so ver dit Suid-Afrika betref is dit 'n tipe van verkoelingstoring wat in belangrikheid sal toeneem. 'n „Droë" verkoelingstoring vir 'n 120 MW eenheid is by Rugeley-kragstasie in gebruik en volgens alle verslae werk dit baie goed, afgesien van die tandekrymoelikheidjies. Sy gevolgtrekking is dat die „droë" verkoelingstoring sy plek permanent ingeneem het en 'n wye veld sal dek.

Die vordering wat daar met direkte omsetting gemaak is, was miskien stadiger as wat voorsien was maar stelselmatige vordering kan nietemin gerapporteer word. Die algemene gevoel was dat direkte omsetting teen 1980 in so 'n mate sou ontwikkel het dat daar dan op groter skaal daaraan gedink sal kan word as wat vandag geval is. Aanmerklike en ingewikkelde eksperimentele werk word reeds uitgevoer in verband met die magnetohidrodinamika. Sowel die wêreldkonferensie as die Spesiale Konferensie wat in Geneva gehou is twee weke voor die Wêreld Konferensie het die aanduiding gegee dat kapitale koste van kernkraginstallasies snel aan die afneem is. Dit kan hoofsaaklik toegeskryf word aan die tegnologiese vordering wat daar gemaak is i.v.m. die onderdele van hierdie soort installasies. Daar is plekke waar normale brandstofkostes hoog is en waar kernkrag, veral met betrekking tot groot installasies mededingend word. Die groot faktor is die prys van brandstof. 'n Hele paar van die kleiner lande beskik nie oor goedkoop brandstof nie. Onderhulle is Pakistan, Israel, Peru en die Arabiese Republiek wat voortgaan met die ontwikkeling van kernkragsentrales. Sulke sentrales sal groot kapitale koste meebring maar die kleiner lande kry dikwels geldelike hulp van die V.S.A., die Verenigde Koninkryk of van die maatskappye wat hierdie kernkragsentrales ontwerp. In hierdie besondere gevalle is kernkragsentrales reeds ekonomies, ander-

very closely. Sight should not be lost of the lack of water in South Africa and since the coal deposits did not happen to be in the coastal areas, water for inland power stations had to be found on the coalfields. Consequently, the possibility of a nuclear station on the sea front had to be kept in mind, and that pointed to the need to devote attention to the interconnection of Escom's systems throughout the Republic. That was taking place systematically and fairly rapidly. Escom was planning to build transmission lines through to Cape Town by 1969, and that it would be possible to have a nuclear station, for example, at Cape Town. Large units could possibly be installed because power not absorbed in the Cape could be transmitted elsewhere.

Nuclear power so far hinged on uranium, and the various discussions that had taken place on that front had pointed to the inadequacy of uranium reserves. Once the change over to nuclear power started, as was expected, by the middle 1970's, there would be insufficient cheap uranium, and an alternative fuel would have to be found.

Dr. Strazacker, continuing, said that it was interesting to see how the different countries applied differential tariffs for certain types of load during their peak periods on the basis off the load at any time if it was necessary for it to do so, and that such loads were not definite. The power utility could call on that basis it was prepared to grant certain reduced tariffs. That was made use of to a large extent in Britain, for example, where such an arrangement could work quite well with their type of load factor.

Dr. A. J. A. Roux, Director-General of the Atomic Energy Board then commented briefly to the effect that remarkable progress had been made during recent years in making nuclear power more competitive, there was the possibility that during the next 10 to 15 years several nuclear power stations might be erected. It had been mentioned that the world might have to look again at its uranium reserves. That was a very important matter, as South Africa was the third largest producer and had the second largest reserves in the world. If one looked at South Africa's reserves and at the possible consumption, one would be forced to the conclusion that the reserves would not last a long time. In that connection it might be of interest to know in what direction one had to work apart from looking for new reserves. If, for instance, South Africa could extract uranium from low grade ores yielding down to .1 lb. uranium per ton of ore, instead of .25 lb. or .3 lb. as at present, the position regarding its reserves would change considerably.

Nuclear energy was also becoming of particular interest in situations where not only power was needed but also fresh water. At the Geneva Conference, there had been a good deal of discussion on new purpose stations to be used, apart from power generation, for desalination of sea water.

Further discussion evoked the opinion that coal reserves could last well into the next century, but that by the end of the present century, nuclear power would have to supply more

sins is dit sy algemene indruk dat die ontwikkeling in hierdie veld nog nie die stadium bereik het waar, die goedkoop brandstofkostes in Suid-Afrika in ag geneem, kernkrag wedywerend geword het nie. Ontwikkelings moet, egter, noukeurig dopgehou word. Die gebrek aan water in Suid-Afrika moet ook nie uit die oog verloor word nie en aangesien steenkoolneerslae nie in die kusgebiede voorkom nie moet water vir die binnelandse kragstasies in die steekoolvelde self gevind word. Die moontlikheid van 'n kernkragstasie op die seefront moet dus in gedagte gehou word en vanselfsprekend bring dit weer die noodwendigheid om aandag te skenk aan die onderlinge verbindings oor die hele Republiek tussen EVKOM se sisteme, na die voorgrond.

Dit gebeur tans sistematies en redelik vinnig. EVKOM beplan reeds die bou van transmissielyne wat tot in Kaapstad sal strek en wat teen 1969 voltooi sal wees. Hierdie ontwikkeling sal dit byvoorbeeld moontlik maak om 'n kernkragstasie in Kaapstad te bou. Groot eenhede sal klaarblyklik geïnstalleer kan word omdat krag wat nie in die Kaap self verbruik word nie elders heen gelei kan word.

Tot dusver is uranium nog die basis van kernkragontwikkeling en die verskillende diskussies wat plaasgevind het, het daarop gedui dat uraanreserwes onvoldoende is. Wanneer daar, soos verwag word, na kernkragstasies oorgeskakel word (teen midde 1970) sal daar nie genoeg goedkoop uraan beskikbaar wees nie en 'n alternatiewe brandstof sal gevind moet word.

Voortgaande het Dr. Strazacker gesê dat dit interessant was om te sien hoedat verskillende lande gedifferensieërde tariewe toepas vir sekere soorte ladings gedurende die spitstye op die grondslag dat sulke ladings nie werklik bestaan nie. Die Kragutiliteitsonderneming kan die kraglading te enige tyd staak as dit vir hom nodig word om dit te doen en op hierdie grondslag is die onderneming bereid om sekere verminderde tariewe aan te bied. In Groot Brittanje, byvoorbeeld, waar so 'n reëling baie goed inpas by die tipe van ladingsfaktor waarmee hulle werk, word op groot skaal hiervan gebruik gemaak.

Dr. A. J. A. Roux, Direkteur-Generaal van die Atoomkragraad het vervolgens kortliks kommentaar daaroor gelewer dat daar die afgelope jare opmerklike vooruitgang gemaak is ten opsigte daarvan om kernkrag meer wedywerende te maak. Dit is moontlik dat daar gedurende die volgende 10 - 15 jaar 'n hele paar kernkragsentrales opgerig sal word. Daar is op gewys dat die wêreld weer 'n opname van sy uraanreserwes behoort te maak. Wat Suid-Afrika betref is dit 'n baie belangrike saak omdat die land die derde grootste uraanprodusent is en wat reserwes betref, tweede op die wêreldlys staan. As mens Suid-Afrika se reserwes beskou en die moontlike verbruik bereken dan word mens tot die gevolgtrekking gedwing dat die bestaande reserwes nie lank sal hou nie. In hierdie verband is dit van belang om te weet in watter rigting mens moet werk, afgesien daarvan dat daar vir nuwe reserwes op die uitkyk moet wees. As Suid-Afrika, byvoorbeeld, laegraadse uraanerts kan ontgin wat tot by .1 lb uraan per ton erts kan lewer i.p.v. .25 lb of .3 lb, soos tans, dan sal die toestand vir sover dit reserwes aangaan aanmerklik verander.

Kernkrag word bepaald al meer belangrik in gevalle waar nie net krag nie maar ook vars water nodig is. Op die Geneva-konferensie was daar heelwat diskussie oor die sogenaamde nuwedoelstellingsstasies wat gebruik kan word vir

than half the power generated, if coal was to be preserved for other purposes. It was definite that something had to be done to move into the nuclear field fairly soon.

Regarding nuclear fuels other than uranium and Thorium, it seemed that progress was being made in principles rather than practice and that it would probably be the end of the present century before fusion would yield something practical. After that the problems would be solved as far as fuel was concerned.

Concluding the report on the Lausanne Sectional Meeting it was stated that two papers from South Africa had been presented — namely,

a) Economic Utilisation of Energy in the Transvaal and Orange Free State Gold Mines, by M. R. Gericke and W. Fenwick.

b) Experience with the Hydraulic Stowage of Power Station Ash in an Adjacent Coal Mine and the Utilisation of the Transporting Water to Carry Coal from the Mine to the Power Station, by G. J. N. Limebeer.

sowel kragopwekking as die ontsouting van seewater.

Verdere diskussie het die mening voortgebring dat steenkoolreserwes tot diep in die volgende eeu sal hou. Teen die einde van die huidige eeu sal kernkrag, egter, meer as die helfde van die opgewekte krag moet verskaf as ons steenkool vir ander doeleindes wil bewaar. Dit is duidelik dat daar na die kernkrag veld beweeg sal moet word en dat daar redelik gou iets daaromtrent gedoen sal moet word.

Betreffende kernkragbrandstowwe ander dan uraan en Thorium wil dit voorkom as-of die vordering eerder in prinsiep as in praktyk geskied en dat fusie eers teen die einde van hierdie eeu iets prakties sal oplewer. Daarna sal die probleme in verband met brandstof opgelos word.

Ter afsluiting van die verslag oor die Lausanne Seksiebyeenkoms is daar gemeld dat twee verhandelings uit Suid-Afrika voor die vergadering gelewer is:

a) Ekonomiese aanwending van energie in die Transvaalse en Vrystaatse Goudmyne — deur M. R. Gericke en W. Fenwick.

b) Ondervindings met die Hidroliese Berging van Kragstasie-as in 'n nabygeleë steenkoolmyn en die Aanwending van die Water waarin die As Vervoer word vir die Terugvoer van Steenkool na die Kragstasie — deur G. J. N. Limebeer.