PROCEEDINGS

of the

TECHNICAL MEETING

2nd May, 1966

at BLOEMFONTEIN

THE ASSOCIATION OF MUNICIPAL ELECTRICITY
UNDERTAKINGS OF SOUTHERN AFRICA

VERRIGTINGS

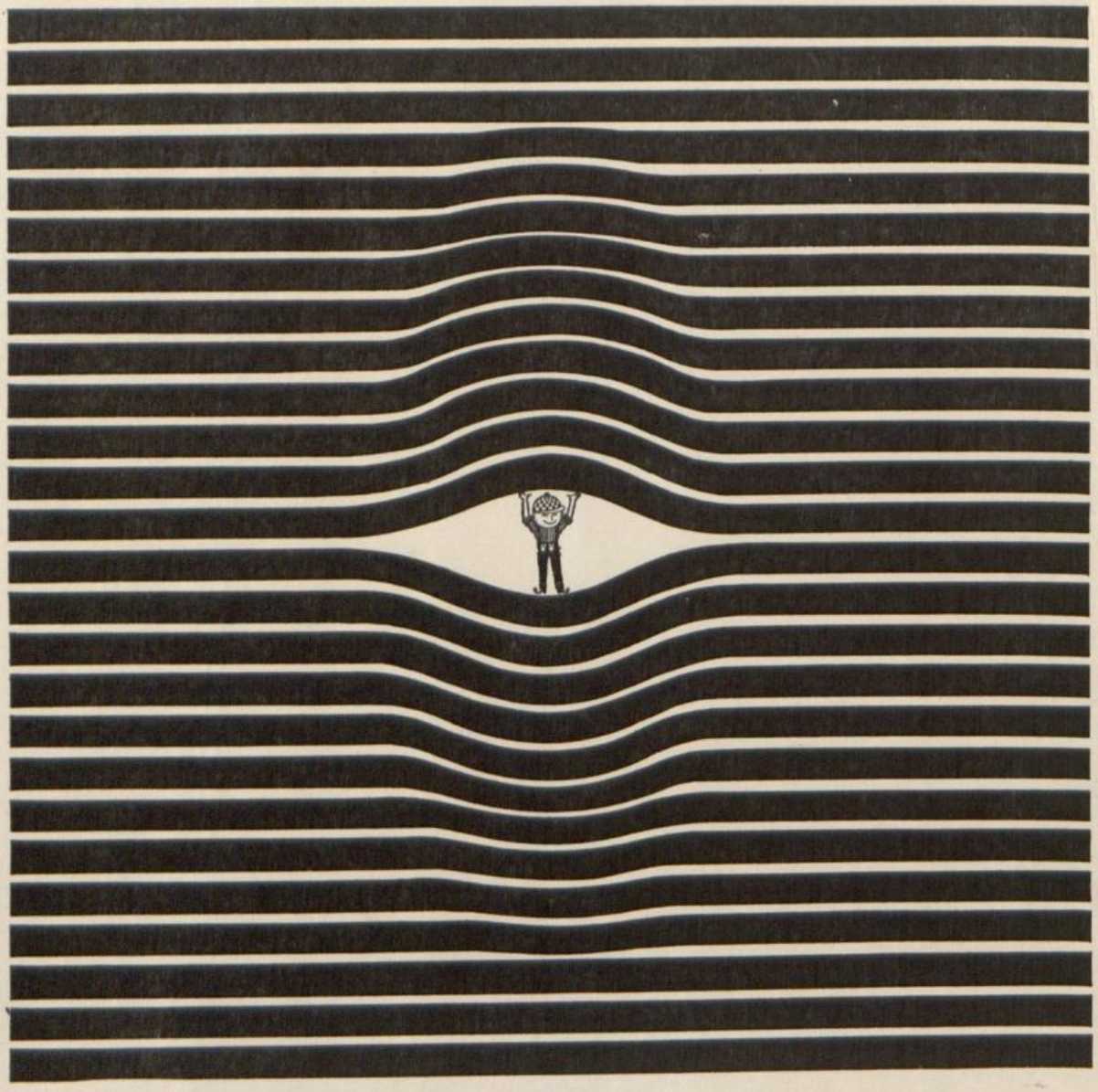
van die

TEGNIESE VERGADERING

2 Mei, 1966

te BLOEMFONTEIN

DIE VERENIGING VAN MUNISIPALE
ELEKTRISITEITSONDERNEMINGS VAN SUIDELIKE AFRIKA



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ELEKTRISITEITSONDERNEMINGS VAN SUIDELIKE AFRIKA

LIST OF ADVERTISERS
LYS VAN ADVERTEERDERS

EXECUTIVE COUNCIL 1965 - 1967

President:
D. MURRAY NOBBS (Port Elizabeth).

President Elect:
G. C. THERON (Vanderbijlpark).

Immediate Past Presidents:
R. W. BARTON (Welkom).
P. A. GILES (East London).

Engineer Members:
R. LEISHMAN (Johannesburg).
H. T. TURNER (Umtali).
E. E. DE VILLIERS (Bloemfontein).
J. C. WADDY (Pietermaritzburg).
C. LOMBARD (Germiston).
L. LEWIS (Windhoek).

Co-opted Members:
J. K. VON AHLFTEN and Cr. F. F. DEYSEL (Springs).
A. C. T. FRANTZ and Cr. G. E. FERRY (Cape Town).

Cities or Towns Represented:
JOHANNESBURG - UMTALI - VANDERBIJLPARK BLOEMFONTEIN - PIETERMARITZBURG - PORT ELIZABETH - EAST LONDON - WELKOM - GERMISTON.

Chairmen of Regional Branches:
Natal: J. S. Craig (Newcastle) from September, 1966.
Cape Eastern: V. E. O. Barratt (Queenstown) from July 1966.
Highveld: L. Dreyer (Westonaria) from May, 1966.
Good Hope: H. C. Dreyer (Paarl) from August, 1965.
Rhodesia: H. T. Turner (Umtali) from August, 1965.

Secretaries:
DAVIDSON & EWING (PTY.) LTD.
P.O. Box 7462, Johannesburg.

Standing Committee:
D. Murray-Nobbs (President), R. W. Barton (Past President), G. C. Theron (President elect), the Councillor Representatives of Port Elizabeth, Welkom, Vanderbijlpark and the Secretaries "ex officio".

Sub-Committees:
Papers: D. Murray Nobbs (President), G. C. Theron (President Elect), P. A. Giles and C. Lombard.
Finance: R. Leishman (Convenor) and C. Lombard.
Recommendations Committee for New Electrical Commodities: C. Lombard (Convenor) and R. W. Barton (Alternate).
Erection of Rural Electrification Power Lines within Road Reserves: D. R. Verschoor (Convenor), W. Rossler and J. G. F. Erikson.
Technical Training:
G. C. Theron (Convenor), C. Lombard and R. Leishman.
Rights of Supply and Generation: (Incorporating Rights of Supply, Industrial Consumers sub-committee and the Orange River Hydro-Electric Project sub-Committee)
P. Giles (Convenor), C. Lombard, E. de Villiers, R. Leishman, CC. Frantz, D. Murray-Nobbs, D. Hugo, W. Rossler and R. M. O. Simpson.

UITVOERENDE RAAD 1965 - 1967

President:
D. MURRAY NOBBS (Port Elizabeth).

Aanstaande President:
G. C. THERON (Vanderbijlpark).

Voormalige Presidente:
R. W. BARTON (Welkom).
P. A. GILES (Oos Londen).

Ingenieurslede:
R. LEISHMAN (Johannesburg).
H. T. TURNER (Umtali).
E. E. DE VILLIERS (Bloemfontein).
J. C. WADDY (Pietermaritzburg).
C. LOMBARD (Germiston).
L. LEWIS (Windhoek).

Gekoöptiëerde Lede :
J. K. VON AHLFTEN en Rdl. F. F. DEYSEL (Springs).
A. C. T. FRANTZ en Rdl. G. E. FERRY (Kaapstad).

Stede of Dorpe Verteenwoordig:
JOHANNESBURG - UMTALI - VANDERBIJLPARK BLOEMFONTEIN - PIETERMARITZBURG - PORT ELIZABETH - OOS LONDEN - WELKOM - GERMISTON.

Voorsitters van Streekstakke:
Natal: J. S. Craig (Newcastle) vanaf September, 1966.
Oostelike Kaap: V. E. O. Barratt (Queenstown) vanaf Julie, 1966.
Hoëveld: L. Dreyer (Westonaria) vanaf Mei, 1966.
Goeie Hoop: H. C. Dreyer (Paarl) vanaf Augustus, 1965.
Rhodesië: H. T. Turner (Umtali) vanaf Augustus, 1965.

Sekretariaat:
DAVIDSON en EWING (EDMS.) BPK.
Posbus 7462, Johannesburg.

Dagbestuur:
D. Murray-Nobbs (President), R. W. Barton (Voormalige President), G. C. Theron (Aanstaande President), die Raadslede van Port Elizabeth, Welkom en Vanderbijlpark en die Sekretaris „ex officio".

Onder-Komitees:
Verhandelinge: D. Murray Nobbs (President), G. C. Theron (Aanstaande President), P. A. Giles en C. Lombard.
Finansies: R. Leishman (Sameroeper en C. Lombard.
Aanbevelings oor Nuwe Elektriese Toerusting: C. Lombard (Sameroeper) en R. W. Barton (Plaasvervanger).
Oprigting van Landelike Elektrifikasiekraglyne langs Padreserwes: D. R. Verschoor (Sameroeper), W. Rossler en J. G. F. Erikson.
Tegniese Opleiding:
G. C. Theron (sameroeper), C. Lombard en R. Leishman.
Regte van Voorsiening en opwekking: (Ingelyf Regte van Voorsiening, Industriële Verbruikers sub-komitee en die Oranje Hidro Elektriese Skema sub-komitee)
P. Giles (sameroeper), CC. Lombard, E. de Villiers, R. Leishman, C. Frantz, D. Murray-Nobbs, D. Hugo, W. Rossler en R. M. O. Simpson.

Constitution sub-Committee:
R. Leishman, G. C. Theron and Councillor W. F. Meyer.

Representatives:

Electrical Wiremen's Registration Board: C. Lombard.
Wiring Regulations Committee: R. Leishman.
Co-ordinating Representative on S.A.B.S. sub-committees: G. C. Theron.
Sub-committee for High Voltage Laboratory Facilities: W. A. Nash (Johannesburg).
S.A. National Committee of the International Electro-Technical Commission: D. Hugo and J. Wilson (Alternate).
S.A.I.E.E. Committee to revise the Code of Practice for Overhead Lines for conditions prevailing in South Africa: C. Lombard.
World Power Conference: R. W. Barton.
Electrolysis: Witwatersrand Main Committee: R. W. Leishman. Durban Sub-Committee: R. M. O. Simpson. Cape Town Sub-Committee: A. C. T. Frantz.
Hot-Dip Galvanised Zinc Coatings Sub-Committee: P. A. Giles.

Konstitusie sub-komitee:
R. Leisman, G. C. Theron en Raadslid W. F. Meyer.

Verteenwoordigers:

Raad vir Registrasie van Draadwerkers: C. Lombard.
Bedradingsregulasie Komitee: R. Leishman.
Ko-onerende verteenwoordiger op S.A.B.S. sub-komitees: G. C. Theron.
Sub-komitee vir Hoëspanning-Laboratium-fasiliteite: W. A. Nash (Johannesburg).
S.A. Nasionale Komitee van die Internasionale Elektrotegniese Kommissie: D. Hugo en J. Wilson (Plaasvervanger).
S.A.I.E.I. Komitee belas met die Hersiening van die Gebruikskode vir Bogrondse Geleidings: C. Lombard.
Wêreld Krag Konferensie: R. W. Barton.
Elektroliese: Witwatersrandse Hoof Komitee: R. W. Leishman. Durbanse Sub-komitee: R. M. O. Simpson. Kaapstadse Sub-komitee: A. C. T. Frantz.
Versinking volgens die warm Dompelmetode: P. A. Giles.

Past Presidents/Oud-Presidente:		**Secretary and Treasurer/Sekretaris en Tesourier:**
1915-17	J. H. Dobson, Johannesburg*	F. T. Stokes, E. T. Price
1917-19	J. Roberts, Durban*	E. Poole*
1919-20	B. Sankey, Port Elizabeth*	E. Poole*
1920-22	T. C. W. Dod, Pretoria*	L. L. Horrell*
1922-24	G. H. Swingler, Cape Town*	H. A. Eastman
1924-26	J. Roberts, Durban*	E. Poole*
1926-27	B. Sankey, Johannesburg*	R. G. Tresise
1927-29	J. M. Lambe, East London*	P. Adkins*
1929-31	R. Macauley, Bloemfontein*	E. Poole*
1931-33	L. L. Horrell, Pretoria*	E. Poole*
1933-34	L. F. Bickell, Port Elizabeth*	F. A. P. Perrow
1935-36	G. G. Ewer, Pietermaritzburg*	E. Poole*
1936-37	A. Rodwell, Johannesburg*	E. Poole*
1937-38	J. H. Gyles, Durban*	E. Poole*
1938-39	H. A. Eastman, Cape Town	E. Poole*
1939-44	I. J. Nicholas, Umtata	E. Poole until December, 1940*
1944-45	A. Rodwell, Johannesburg*	L. L. Horrell, January, 1941*
1945-46	J. S. Clinton, Salisbury	L. L. Horrell*
	J. W. Phillips, Bulawayo	L. L. Horrell to November, 1945*
1946-47	G. J. Muller, Bloemfontein	A. T. Taylor, December, 1945*
1947-48	C. Kinsman, Durban	A. T. Taylor*
1948-49	A. Foden, East London	A. T. Taylor*
1949-50	D. A. Bradley, Port Elizabeth	A. T. Taylor*
1950-51	C. R. Hallé, Pietermaritzburg.	A. T. Taylor*
1951-52	J. C. Downey, Springs	A. T. Taylor*
1952-53	A. R. Sibson, Bulawayo	A. T. Taylor*
1953-54	J. C. Fraser, Johannesburg	A. T. Taylor*
1954-55	G. J. Muller, Bloemfontein	A. T. Taylor to 30th June, 1955*
1955-56	D. J. Hugo, Pretoria	Arthur Tingey, Ewing & Co., 1st July, 1955.
1956-57	J. E. Mitchell, Salisbury	Davidson & Ewing (Pty.) Ltd., 1st July, 1956.
1957-58	J. L. van der Walt, Krugersdorp	Davidson & Ewing (Pty.) Ltd.
1958-59	C. G. Downie, Cape Town	Davidson & Ewing (Pty.) Ltd.
1959-60	R. W. Kane, Johannesburg	Davidson & Ewing (Pty.) Ltd.
1960-61	R. M. O. Simpson, Durban	Davidson & Ewing (Pty.) Ltd.
1961-62	C. Lombard, Germiston	Davidson & Ewing (Pty.) Ltd.
1962-63	P. A. Giles, East London	Davidson & Ewing (Pty.) Ltd.
1963-64	J. C. Downey, Springs	Davidson & Ewing (Pty.) Ltd.
1964-65	R. W. Barton, Welkom	Davidson & Ewing (Pty.) Ltd.

*Deceased/Oorlede.

All correspondence to be addressed to:
The Secretaries,
Davidson & Ewing (Pty.) Ltd.,
P.O. Box 7462, Johannesburg,
Telegrams: "Minute" Phone 834-3021

Rig alle korrespondensie aan:
Die Sekretariaat,
Davidson en Ewing (Edms.) Bpk.,
Posbus 7462, Johannesburg,
Telegramme: „Minute" Foon 834-3021

LIST OF MEMBERS/LYS VAN LEDE 30-6-66

Honorary Members/Ere-Lede:

1949 Bradley, D. A., 9 Target Kloof Road, Port Elizabeth.
1950 Castelyn, F. J. C., 1a Arboretum Avenue, Bloemfontein.
1963 (1944) Downey, J. C., 10 Jessop Road, Selection Park, Springs.
1963 (1947) Downie, C. G., 25 Rectory Gardens, Broadwater, Worthing, Sussex.
1951 (1922) Eastman, H. A., Torwood, Parel Vallei, Somerset West, C.P.
1955 (1944) Fraser, J. C., 26 Grace Road, Mountain View, Johannesburg (Past President).
1948 (1938) Foden, A., 4 Hardy Road, Selborne, East London (Past President).
1958 (1944) Hallé, C. R., P.O. Box 399, Pietermaritzburg (Past President).
1956 Jaffray, A. Morton (Alderman), 8 Fairbridge Avenue, Salisbury.
1964 (1946) Kane, R. W., 21 Kernick Avenue, Melrose North, Johannesburg (Past President).
1954 (1938) Kinsman, C., 7 Highgate Place, Durban North (Past President).
1956 (1939) Milton, W. H., c/o Electricity Supply Commission, P.O. Box 1091, Johannesburg.
1962 (1948) Mitchell, J. E., P.O. Box 819, Kitwe, N. R. (Past President).
1964 (1934) Muller, G. J., 35, Wilcocks Road, Bloemfontein.
1962 (1935) Sibson, A. R., P.O. Box 9074, Hillside, Bulawayo, S.R. (Past President).
1962 (1949) Van Der Walt, J. L., P.O. Box 35, Vereeniging (Past President).

Council Members/Raadslede:

1962 (1935) Adelaide, P. O. Box 38.
1946 (1917) Aliwal North, P.O. Box 46.
1948 (1934) Alberton, P.O. Box, 4.
1948 Barberton, P.O. Box 33.
1935 (1926) Beaufort West, P.O. Box 9.
1961 Bedfordview, P.O. Box 3.
1935 (1917) Benoni, P.O. Box 45.
1950 (1919) Bethal, P.O. Box 3.
1944 (1915) Bethlehem, P.O. Box 130.
1939 (1917) Bloemfontein, P.O. Box 288.
1964 Bloemhof, P. O. Box 18.
1936 (1915) Boksburg, P.O. Box 215.
1945 (1927) Brandfort, P.O. Box 13.
1938 (1927) Bulawayo, P.O. Box 591.
1948 Brakpan, P.O. Box 15.
1948 Brits, P.O. Box 106.
1962 Broken Hill, P.O. Box 24.
1949 Bothaville, P.O. Box 12.
1935 (1915) Cape Town, P.O. Box 298.
1935 (1916) Craddock, P.O. Box 24.
1935 (1916) Cradock, P.O. Box 24.
1960 Carletonville, P.O. Box 3.
1964 Carolina, P.O. Box 24.
1949 Ceres, P.O. Box 44.
1953 (1933) De Aar, P.O. Box 42.
1935 (1915) Durban, P.O. Box 147.
1953 Dewetsdorp, P.O. Box 13.
1962 Dundee, P.O. Box 76.
1935 (1919) East London, P.O. Box 134.
1935 Eshowe, P.O. Box 37.
1948 Edenvale, P.O. Box 25.
1952 Estcourt, P.O. Box 15.
1957 Empangeni, P.O. Box 2.
1935 (1927) Fort Beaufort, P.O. Box 36.
1965 Fort Victoria, P.O. Box 17.
1936 (1922) George, P.O. Box 19.
1952 Germiston, P.O. Box 145.
1964 Gobabis, P.O. Box 33.
1935 (1934) Graaff-Reinet, P. O. Box 71.
1936 (1924) Grahamstown, P.O. Box 176.
1947 (1915) Greytown, P.O. Box 71.
1963 Gwelo, P.O. Box 278.
1948 (1915) Harrismith, P.O. Box 43.
1949 Heidelberg, P.O. Box 201.
1959 Hermanus, P.O. Box 20.
1935 (1915) Johannesburg, P.O. Box 1049.
1965 Kakamas, P.O. Box 23.
1964 Keetmanshoop, P.O. Box 25.
1952 Kempton Park, P.O. Box 13.
1935 (1917) Kimberley, P.O. Box 194.
1935 (1916) Klerksdorp, P.O. Box 160.
1935 (1934) Kokstad, P.O. Box 8.
1951 Komgha, P.O. Box 21.
1965 Koppies, P.O. Box 14.
1945 (1916) Kroonstad, P.O. Box 302.
1935 (1917) Krugersdorp, P.O. Box 94.
1954 Kenhardt, P.O. Box 15.
1960 Knysna, P.O. Box 21.
1935 (1915) Ladysmith, P.O. Box 29.
1945 Louis Trichardt, P.O. Box 96.
1937 (1927) Ladybrand, P.O. Box 64.
1959 Lydenburg, P.O. Box 61.
1963 Makwassie, P.O. Box 2.
1935 (1926) Mafeking, P.O. Box 42.
1935 Matatiele, P.O. Box 35 .
1964 Meyerton, P.O. Box 9.
1965 Messina, P.O. Box 44.
1939 (1929) Middelburg, P.O. Box 55.
1935 (1926) Middelburg, P.O. Box 14, Tvl.
1954 (1929) Mossel Bay, P.O. Box 25.

1963 Mooi River, P.O. Box 47.
1965 Moorreesburg, P.O. Box 3.
1945 Nelspruit, P.O. Box 45.
1948 (1915) Newcastle, P.O. Box 21.
1914 N'Dola, P.O. Box 197.
1936 Nigel, P.O. Box 23.
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1959 Orkney, P.O. Box 34.
1944 (1915) Oudtshoorn, P.O. Box 255.
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1935 (1920) Pietersburg, P.O. Box 111.
1935 (1915) Pietermaritzburg, P.O. Box 321.
1936 Piet Retief, P.O. Box 23.
1936 (1934) Port Alfred, P.O. Box 13.
1935 (1915) Port Elizabeth, P.O. Box 116.
1936 Port Shepstone, P.O. Box 5.
1948 (1915) Potchefstroom, P.O. Box 113.
1944 Potgietersrust, P.O. Box 34.
1935 (1915) Pretoria, P.O. Box 440.
1951 Parys, P.O. Box 39.
1953 Postmasburg, P.O. Box 5.
1959 Peri-Urban Areas Health Board, P.O. Box 1341, Pretoria.
1935 (1915) Queenstown, P.O. Box 113.
1948 Que Que, P.O. Box 15.
1935 (1929) Randfontein, P.O. Box 139.
1935 (1929) Robertson, P.O. Box 52.
1935 (1926) Roodepoort-Maraisburg, P.O. Box 217, Roodepoort.
1944 (1920) Rustenburg, P.O. Box 16.
1956 Riversdale, P.O. Box 29.
1965 Saldanha, P.O. Box 22.
1935 (1926) Salisbury, P.O. Box 990.
1956 Sasolburg, P.O. Box 60.
1935 (1916) Somerset East, P.O. Box 21.
1948 (1927) Somerset West, P.O. Box 19.
1935 (1916) Springs, P.O. Box 45.
Stanger, P.O. Box 72.
1938 (1916) Stellenbosch, P.O. Box 17.
1935 (1915) Standerton, P.O. Box 66.
1959 Stilfontein, P.O. Box 20.
1959 Stutterheim, P.O. Box 2.
1959 (1927) Tarkastad, P.O. Box 21.
1949 The Strand, P.O. Box 3.
1957 Tzaneen, P.O. Box 24.
1963 Thabazimbi, P.O. Box 90.
1936 (1920) Uitenhage, P.O. Box 45.
1936 (1927) Umtata, P.O. Box 57.
1935 (1927) Umtali, P.O. Box 121.
1960 Vanderbijlpark, P.O. Box 3.
1949 Ventersdorp, P.O. Box 15.
1935 Vereeniging, P.O. Box 35.
1955 Virginia, P.O. Box 156.
1947 (1929) Vrede, P.O. Box 155.
1935 Vryburg, P.O. Box 35.
1948 (1920) Vryheid, P.O. Box 57.
1960 White River, P.O. Box 2.
1935 (1934) Walmer, P.O. Box 5010.
1955 Warmbaths, P.O. Box 48.
1956 Wellington, P.O. Box 12.
1953 Welkom, P.O. Box 708.
1953 Westonaria, P.O. Box 19.
1946 Willowmore, P.O. Box 15.
1944 (1919) Winburg, P.O. Box 26.
1945 (1924) Windhoek, P.O. Box 59.
1955 (1927) Witbank, P.O. Box 3.
1936 (1922) Worcester, P.O. Box 37.
1960 Walvis Bay, P.O. Box 2.
1964 Wolmaransstad, P.O. Box 17.

Dates in brackets initial membership as or by Engineer. Membership not necessarily continuous.

Engineer Members/Ingenieurslede:

1947 Aalbers, C., Municipal Electrical Engineer, P.O. Box 12, Wellington, C.P.
1933 Adams, C. H., Municipal Electrical Engineer, P.O. Box 19, Somerset West, C.P.
1949 Asselbergs, P. C., Town and Electrical Engineer Phalaborwa, Tvl.
1964 Bailey, R. V., Electrical Engineer, P.O. Box 55, Middelburg, Cape.
1962 Baillie, T. H., Town Electrical Engineer, P.O. Box 24, Broken Hill, Zambia.
1965 Barnard, H., Town Electrical Engineer, P.O. Box 15, Brakpan, Tvl.
1948 Barratt, V. E. O., Municipal Electrical Engineer, P.O. Box 113, Queenstown, C.P.
1964 Barrie, J. J., Municipal Electrical Engineer, P.O. Box 25, Edenvale, Tvl.
1948 Barton, R. W., Electrical Engineer, P.O. Box 708, Welkom, O.F.S. (Past President).
1959 Beard, G. R., Town Electrical Engineer, P.O. Box 176, Grahamstown, C.P.
1959 Billington Eales, A., Town Electrical Engineer, P.O. Box 2, Stutterheim, C.P.
1957 Booysens, L., Town and Electrical Engineer, P.O. Box 155, Vrede, O.F.S.
1960 Boshoff, J. J., Assistant Electrical Engineer, P.O. Box 3, Vanderbijlpark, Tvl.
1962 Boshoff, M. H. L., Assistant Electrical Engineer, P.O. Box 45, Uitenhage, C.P.
1959 Botes, P. J., Municipal Electrical Engineer, P.O. Box 217, Roodepoort, Tvl.
1958 Brown, D. C., Municipal Electrical Engineer, P.O. Box 3, The Strand, C.P.
1965 Buchanan, E. G., Town Electrical Engineer, P.O. Box 21, Empangeni, Natal.
1948 Cherry, J. R., Municipal Electrical Engineer, P.O. Box 139, Randfontein, Tvl.
1955 Clarke, M. P. P., Municipal Electrical Engineer, P.O. Box 21, Somerset East, C.P.
1956 Craig, J. S., Borough Electrical Engineer, P.O. Box 21, Newcastle, Natal.
1965 Cronje, W. F., Electrical Engineer, Peri-Urban Areas Health Board, P.O. Box 1341, Pretoria, Tvl.
1956 Dawson, J. D., Municipal Electrical Engineer, P.O. Box 45, Uitenhage, C.P.

1965 Dernier, W., Electrical Engineer, P.O. Box 46, Aliwal North, C.P.
1955 De Villiers, E. E., City Electrical Engineer, P.O. Box 288, Bloemfontein.
1964 De Villiers, S. de V., Municipal Electrical Engineer, P.O. Box 44, Ceres, C.P.
1957 Dreyer, H. C., Electrical Engineer, P.O. Box 12, Paarl, C.P.
1950 Dreyer, L., Municipal Electrical Engineer, P.O. Box 19, Westonaria, Tvl.
1957 Dunstan, R. S., Deputy City Electrical Engineer, P.O. Box 369, Port Elizabeth.
1963 Du Plooy, D. P., Electrical Engineer, P.O. Box 45, Nelspruit, Tvl.
1963 Du Toit, A. A., Municipal Electrical Engineer, P.O. Box 19, George, C.P.
1963 Edwards, H., Municipal Electrical Engineer, P.O. Box 55, Middelburg, C.P.
1950 Erikson, J. G. F., Borough Electrical Engineer, P.O. Box 15, Estcourt, Natal.
1944 Fisher, K. M., Municipal Electrical Engineer, P.O. Box 3, Bedfordview, Tvl.
1957 Fohren, H., Borough Electrical Engineer, P.O. Box 37, Eshowe, Zululand.
1961 Frantz, A. C. T., City Electrical Engineer, P.O. Box 82, Cape Town, C.P.
1952 Futcher, L., Municipal Electrical Engineer, P.O. Box 13, Kempton Park, Tvl.
1965 Fraser, D. H., Deputy City Electrical Engineer, P.O. Box 147, Durban, Natal.
1945 Gericke, J. M., Municipal Electrical Engineer, P.O. Box 99, Klerksdorp, Tvl.
1939 Giles, P. A., City Electrical Engineer, P.O. Box 529, East London, C.P. (Past President).
1936 Grandin, P. C., Municipal Electrical Engineer, P.O. Box 114, Gatooma, Rhodesia.
1944 Gripper, H. J., Municipal Electrical Engineer, P.O. Box 21, Knysna, C.P.
1954 Hafele, C. F., Deputy City Electricity Engineer, P.O. Box 288, Bloemfontein, O.F.S.
1953 Haig-Smith, D., Municipal Electrical Engineer, P.O. Box 24, Cradock, C.P.
1949 Halliday, K. W. J., Municipal Electrical Engineer, P.O. Box 5, Port Shepstone, Natal.
1927 Harvey, A. Q., Town Electrical Engineer, P.O. Box 96, Louis Trichardt.
1953 Hatwich, A. H. J., Town and Electrical Engineer, P.O. Box 13, Dewetsdorp, O.F.S.
1953 Heunis, G. B., Town and Electrical Engineer, P.O. Box 66, Standerton, Tvl.
1965 Heydenrych, J. E., Electrical Engineer, P.O. Box 14, Middelburg, Tvl.
1956 Hobbs, I. L., Town Electrical Engineer, P.O. Box 156, Virginia, O.F.S.
1965 Hosking, N. G., Deputy General Manager, Electricity Department, P.O. Box 699, Johannesburg.
1938 Hugo, D. J., City Electrical Engineer, P.O. Box 423, Pretoria, Tvl.
1944 Inglis, J. I., Town Electrical and Water Engineer, P.O. Box 111, Pietersburg, Tvl.
1949 Kirberger, M. N., Town Engineer, P.O. Box 3, Bethal, Tvl.
1959 Keoslag, H. J., Electrical Engineer, P.O. Box 52, Robertson.
1949 Kruger, M. J. C., Municipal Electrical Engineer, P.O. Box 13, Port Alfred, C.P.
1931 Lategan, J. F., Town Electrical Engineer, P.O. Box 17, Stellenbosch, C.P.
1953 Lees, D., Town Electrical Engineer, P.O. Box 45, Benoni, Tvl.
1944 Leishman, R. W., General Manager, Electrical Department, P.O. Box 699, Johannesburg.
1956 Lewis, L., Town Electrical Engineer, P.O. Box 59, Windhoek, S.W.A.
1947 Lombard, C., City Electrical Engineer, P.O. Box 145, Germiston, Tvl (Past President).
1944 Lotter, G.A., Town Electrical Engineer, P.O. Box 34, Potgietersrust, Tvl.
1955 Lynch, E. C., City Electrical Engineer, P.O. Box 73, Salisbury, Rhodesia.
1953 Macques, J. A., Municipal Electrical Engineer, P.O. Box 42, De Aar, C.P.
1966 MacHutchon, Asst. Electrical Engineer, P.O. Box 82, Cape Town.
1948 Mathews, J. A., City Electrical Engineer, P.O. Box 194, Kimberley, C.P.
1948 McIntyre, H. A., Assistant Town Electrical Engineer, Box 35, Vereeniging, Tvl.
1954 McNeil, J. L., Borough Electrical Engineer, P.O. Box 72, Stanger, Natal.
1945 Meintjies, P. A., Municipal Electrical Engineer, P.O. Box 16, Rustenburg, Tvl.
1952 Millen, T. J., Town and Electrical Engineer, P.O. Box 24, Tzaneen, Tvl.
1929 Mocke, T. M., Town and Electrical Engineer, P.O. Box 23, Piet Retief, Tvl.
1955 Nobbs, D. Murray, City Electrical Engineer, P.O. Box 369, Port Elizabeth, C.P.
1964 Odendaal, M. W., Town Electrical Engineer, P.O. Box 4, Alberton, Tvl.
1957 Paull, R. A., Borough & Elec. Engineer, P.O. Box 57, Vryheid.
1963 Peters, A. G., Town Electrical Engineer, P.O. Box 278, Gwelo, Rhodesia.
1966 Pike, E. B., Town and Electrical Engineer, P.O. Box 8, Kokstad.
1952 Potgieter, N. A., Municipal Electrical Engineer, P.O. Box 106, Brits, Tvl.
1951 Pretorius, D. R., Town Electrical Engineer, P.O. Box 39, Parys, O.F.S.
1952 Pretorius, E. de C., Electrical Engineer, P.O. Box 113, Potchefstroom, Tvl.
1960 Pretorius, J. W., Assistant Electrical Engineer, P.O. Box 23, Nigel, Tvl.
1957 Rautenbach, G. F., Electrical Engineer, P.O. Box 99, Klerksdorp, Tvl.
1965 Reichert, W. J., Town Electrical Engineer, P.O. Box 25, Keetmanshoop, S.W.A.
1948 Reyneke, G. M., Town Electrical Engineer, P.O. Box 26, Winburg, O.F.S.

1962 Rishworth, D. L., Town Electrical and Mechanical Engineer, P.O. Box 21, Odendaalsrus, O.F.S.

1954 Ross, J. W., Municipal Electrical Engineer, P.O. Box 34, Potgietersrust, Tvl.

1935 Rossler, W., Town Electrical Engineer, P.O. Box 302, Kroonstad, O.F.S.

1944 Rush, W., Town Electrical Engineer, P.O. Box 47, Mooi River, Natal.

1954 Simpson, A. C., Municipal Electrical Engineer, P.O. Box 5010, Walmer, C.P.

1953 Simpson, R. M. O., City Electrical Engineer, P.O. Box 147, Durban, Natal (Past President).

1937 Smith, E. L., Municipal Electrical Engineer, P.O. Box 215, Boksburg, Tvl.

1962 Stanton, R. J. G., Deputy Town Electrical Engineer, P.O. Box 255, Oudtshoorn, C.P.

1934 Stevens, F., Borough Electrical Engineer, P.O. Box 29, Ladysmith, Natal.

1965 Strauss, J. C., Town Electrical Engineer, P.O. Box 60, Sasolburg, O.F.S.

1956 Sulter, F. J., Assistant Electrical Engineer, P.O. Box 145, Germiston, Tvl.

1962 Summers, H. E., City Electrical Engineer, P.O. Box 1803, Bulawayo, Rhodesia.

1962 Surtees, E. H., Electrical Engineer, P.O. Box 76, Dundee, Natal.

1962 Te Brugge, E. J., Town Electrical Engineer, P.O. Box 42, Mafeking, C.P.

1947 Thackwray, W. G., Town Electrical Engineer, P.O. Box 8, Kokstad, E.G.

1946 Theron, G. C., Town Electrical Engineer, P.O. Box 3, Vanderbijlpark, Tvl.

1945 Theron, W. C., Municipal Electrical Engineer, P.O. Box 37, Worcester, C.P.

1966 Trautmann, E. P. E. W., Town Electrical Engineer, P.O. Box 61, Lydenburg.

1950 Turnbull, A. F., Town and Electrical Engineer, P.O. Box 35, Vereeniging, Tvl.

1931 Turner, H. T., Town and Electrical Engineer, P.O. Box 121, Umtali, Rhodesia.

1964 Van den Berg, A. J., Town Electrical Engineer, P.O. Box 94, Krugersdorp, Tvl.

1955 Van der Merwe, F. J., Municipal Electrical Engineer, P.O. Box 20, Stilfontein, Tvl.

1957 Van Heerden, W. J., Electrical Engineer, P.O. Box 201, Heidelberg, Tvl.

1956 Van Meerdervoort, J. K. L., Pompe, Town Electrical Engineer, P.O. Box 43, Harrismith, O.F.S.

1965 Van Niekerk, G., Municipal Electrical Engineer, P.O. Box 57, Vryheid, Natal.

1965 Van Wyk, A. A., Town Electrical Engineer, P.O. Box 9, Meyerton, Tvl.

1966 Van Wyk, Schoombee, Electrical Engineer, P.O. Box 12, Bothaville.

1945 Vergottini, P. L., Town and Electrical Engineer, P.O. Box 48, Warmbaths.

1951 Verschoor, D. R., Town and Electrical Engineer, P.O. Box 36, Fort Beaufort, C.P.

1957 Von Ahlften, J. K., Town Electrical Engineer, P.O. Box 45, Springs, Tvl.

1955 Vorster, P. J., Municipal Electrical Engineer, P.O. Box 3, Witbank, Tvl.

1954 Waddy, J. C., City Electrical Engineer, P.O. Box 399, Pietermaritzburg, Natal.

1952 Waldron, F. R., Municipal Electrical Engineer, P.O. Box 86, Walvis Bay, S.W.A.

1952 Ward, H. V., Borough Engineer, P.O. Box 71, Greytown, Natal.

1961 Wiehahn, G. D., Town Engineer, P.O. Box 551, Bethlehem, O.F.S.

1952 Williams, A. H., Assistant Electrical Engineer, P.O. Box 45, Springs, Tvl.

1938 Wilson, J., Assistant City Electrical Engineer, P.O. Box 423, Pretoria, Tvl.

1956 Yodaiken, J., Municipal Electrical Engineer, P.O. Box 197, Ndola, Zambia.

Technical Associates/Tegniese-Geassosieerders:

1965 Barnard, W., Assistant General Manager (Technical Administration) Electricity Department, P.O. Box 699, Johannesburg.

Associates/Geassosieerders:

1965 Clarke, J., Municipal Electrical Engineer, P.O. Box 115, Que Que, Rhodesia.

1963 Coetzee, J. C., Town Engineer, P.O. Box 18, Bloemhof, Tvl.

1965 De Bruyn, Town Electrical Engineer, P.O. Box 15, Willowmore, C.P.

1965 De Jager, M. J., Electrical Engineer, P.O. Box 90, Thabazimbi, Tvl.

1962 De Witt, F., Electrical Engineer, P.O. Box 38, Adelaide, C.P.

1960 Flint, V. G., Town Electrical Engineer, P.O. Box 14, Koppies, O.F.S.

1962 Huysamen, G. A., Electrical Engineer, P.O. Box 5, Posmasburg, C.P.

1959 Jordaan, J. H. Municipal Electrical Engineer, P.O. Box 35, Vryburg, C.P.

1966 Jooste, P.M., Electrical Engineer, P.O. Box 44, Messina.

1959 Laas, C. P., Electrical Engineer, P.O. Box 15, Kenhardt, C.P.

1959 Lochner, J. van S., Town Electrical Engineer, P.O. Box 64, Ladybrand, O.F.S.

1956 McNamara, A. B., Electrical Engineer, P.O. Box 21, Komgha, C.P.

1962 Ploos-van Amstel, W. F., Electrical Engineer, P.O. Box 37, Viljoenskroon, O.F.S.

1962 Van der Schyff, G. W., Town Engineer, P.O. Box 24, Carolina, Tvl.

1965 Wilson, A. McD., Town Electrical Engineer, P.O. Box 17, Fort Victoria.

Associate Members/Verbonde Lede:

1946 Andrew, W. M., 7 Tainton Avenue, Bonnie Doon, East London, C.P.

1951 Attridge, W. H., P.O. Box 412, Sasolburg, O.F.S.

1944 Burton, C. R., 54 Memorial Road, Kimberley, C.P.

1956 Barnard, F. J. W., c/o. Electricity Supply Commission, P.O. Box 12, Springs, Tvl.

1960 Bozyczko, W. B., P.O. Box 133, Bramley, Tvl.
1948 Conradie, D. J. R., P.O. Box 1009, Bloemfontein, O.F.S.
1954 Coetzee, F. J., P.O. Box 21, Evaton, Tvl.
1939 Dalton, G. A., 111 Eckstein Street East, Observatory Extension, Johannesburg, Tvl.
1934 Dawson, C., Electricity Supply Commission, P. O. Box 2408, Durban, Natal.
1965 De Wet, D. P., P.O. Box 19, Groot Brakrivier, C.P.
1948 De Wit, T., P.O. Box 44, Brits, Tvl.
1960 Ford, W. P., P.O. Box 40, Lusaka, Zambia.
1960 Gill, G. B., Zululand Electrical Utility Co. (Pty.) Ltd., P.O. Box 29, Gingindhlovu, Natal.
1936 Heasman, G. G., P.O. Box 77, Fort Victoria, Rhodesia.
1962 Honiball, G. T., 35 End Street, Rowhill, Springs, Tvl.
1962 Liebenberg, S. J., Electrical and Mechanical Engineer, Department of Bantu Administration and Development, P.O. Box 384, Pretoria, Tvl.
1960 McGibbon, J., P.O. Box 92, Carletonville, Tvl.
1926 Marchand, B., P.O. Box 223, Witbank, Tvl.
1946 Mole, E. W., P.O. Box 118, Bramley, Johannesburg.
1926 Muller, H. M. S., P.O. Box 112, Upington, C.P.
1961 Magowan, J. M., Southern Rhodesia Electricity Supply Commission, P.O. Box 377, Salisbury.
1934 Rossler, A., 3 Greenwood Road, Pietermaritzburg, Natal.
1953 Rothman, J. L., P.O. Box 606, Kimberley, C.P.
1966 Thackwray, W. G., c/o Mountbatten Hotel, 44 Soper Road, Berea, Johannesburg.
1948 Woolridge, W. E. L., P.O. Box 24, Harding, Natal.
1947 Williams, J. T., P.O. Box 1617, Pretoria, Tvl.
1946 Wylie, R. J. S., c/o. E.S.C., Rand Undertaking, P.O. Box 103, Germiston, Tvl.
1957 Zeederberg, T. D., Private Bag No. 1, P.O. Pyramid, Northern Transvaal.

Affiliates/Geaffileerders:

1959 AEG South Africa (Pty.) Ltd., P.O. Box 10264, Johannesburg, Tvl.
1957 Aberdare Cables (Africa) Ltd., P.O. Box 494, Port Elizabeth.
1957 Adams, Symes & Partners, P.O. Box 1498, Johannesburg.
1957 African Cables Ltd., P.O. Box 9909, Johannesburg.
1959 African Explosives & Chemical Industries, Ltd., P.O. Box 1122, Johannesburg.
1962 African Wire Ropes, Ltd., P.O. Box 72, Cleveland, Tvl.
1957 Allenwest S.A. (Pty.) Ltd., P.O. Box 6168, Johannesburg.
1957 Alcan Aluminium of S.A. Ltd., P.O. Box 2430, Johannesburg.
1957 Arthur Trevor Williams (Pty.) Ltd., P.O. Box 2873, Johannesburg.
1959 Asea Electric (Pty.) Ltd., P.O. Box 691, Pretoria.
1957 Aycliffe Cables Ltd., Hargreaves Works, Main Road, Eastleigh, Edenvale.
1963 A. E. I. Henley Africa (Pty.) Ltd., P.O. Box 7404, Johannesburg.
1960 African Lamps (Pty.) Ltd., P.O. Box 75, Industria.
1960 Associated Electrical Industries C.A. (Pvt.) Ltd., P.O. Box 1979, Salisbury, Rhodesia.
1960 Associated Electrical Industries (Pty.) Ltd., P.O. Box 7755, Johannesburg.
1965 Ballenden & Robb, P.O. Box 4648, Johannesburg.
1963 Bell, Harold E., (Pty.) Ltd., P.O. Box 6906, Johannesburg.
1957 Babcock & Wilcox of Africa Ltd., P.O. Box 4561, Johannesburg.
1957 Brian Colquhoun O'Donell & Partners (Rhodesia), 10th Floor, Chester House, Speke Ave., Salisbury.
1957 British General Electric Co. of C.A. (Pvt.) Ltd., P.O. Box 845, Salisbury, Rhodesia.
1957 British General Electric Co. Ltd., P.O. Box 2406, Johannesburg.
1959 British Insulated Callender's Cables S.A. Ltd., P.O. Box 2827, Johannesburg.
1936 W. R. Burnett (Pty.) Ltd., P.O. Box 358, Johannesburg.
1964 Cohen, S., Ltd., P.O. Box 215, Windhoek, S.W.A.
1957 Chloride Electrical Storage Co. S.A. (Pty.) Ltd., P.O. Box 7508, Johannesburg.
1957 C.M.B. Engineering Co. (Pty.) Ltd., P.O. Box 55, Denver, Johannesburg.
1959 Construction Electric Co. (Pty.) Ltd., P.O. Box 10100, Johannesburg.
1959 Contractor (Pty.) Ltd., Zuider Paarl, C.P.
1964 Crawford Clinkscales, Maughan-Brown & Partners, P.O. Box 196, Port Elizabeth.
1957 Crompton Parkinson S.A. (Pty.) Ltd., P.O. Box 4236, Johannesburg.
1965 Cullinan Refractories Ltd., P.O. Olifantsfontein, Tvl.
1957 Davidson & Co. (Africa) (Pty.) Ltd., P.O. Box 616, Springs, Tvl.
1957 Dowson & Dobson Ltd., P.O. Box 7764, Johannesburg, Tvl.
1959 Ian Drewett, P.O. Box 35, Johannesburg, Tvl.
1959 Electrical Contractors' Association (South Africa), P.O. Box 5327, Johannesburg.
1966 Electrical Protection Co., P.O. Box 570, Benoni.
1957 Enfield Cables (S.A.) Ltd., P.O. Box 5289, Johannesburg, Tvl.
1959 English Electric Co. (C.A.) (Pvt.) Ltd., P.O. Box 2191, Salisbury, Rhodesia.
1957 English Electric Co. S.A. Ltd., P.O. Box 2387, Johannesburg, Tvl.
1961 Farad (Pty.) Ltd., P.O. Box 220, Jeppestown, Tvl.
1957 First Electric Corp. of S.A., P.O. Box 3961, Johannesburg, Tvl.
1957 F. W. J. Electrical Industries Ltd., P.O. Box 58, Alberton, Tvl.
1958 George Kent S.A. (Pty.) Ltd., P.O. Box 7396, Johannesburg, Tvl.
1957 W. T. Glover & Co. Ltd., P.O. Box 1386, Johannesburg, Tvl.
1957 E. Green & Son S.A. (Pty.) Ltd., 406 Barclays Bank Buildings, Kruis Street, Johannesburg.
1957 Heinnemann Electric (S.A.) Ltd., P.O. Box 99, Bramley, Tvl.
1957 Hopkinsons S.A. (Pty.) Ltd., P.O. Box 11029, Johannesburg, Tvl.
1957 James Howden & Safanco (Africa) (Pty.) Ltd., P.O. Box 9501, Johannesburg, Tvl.

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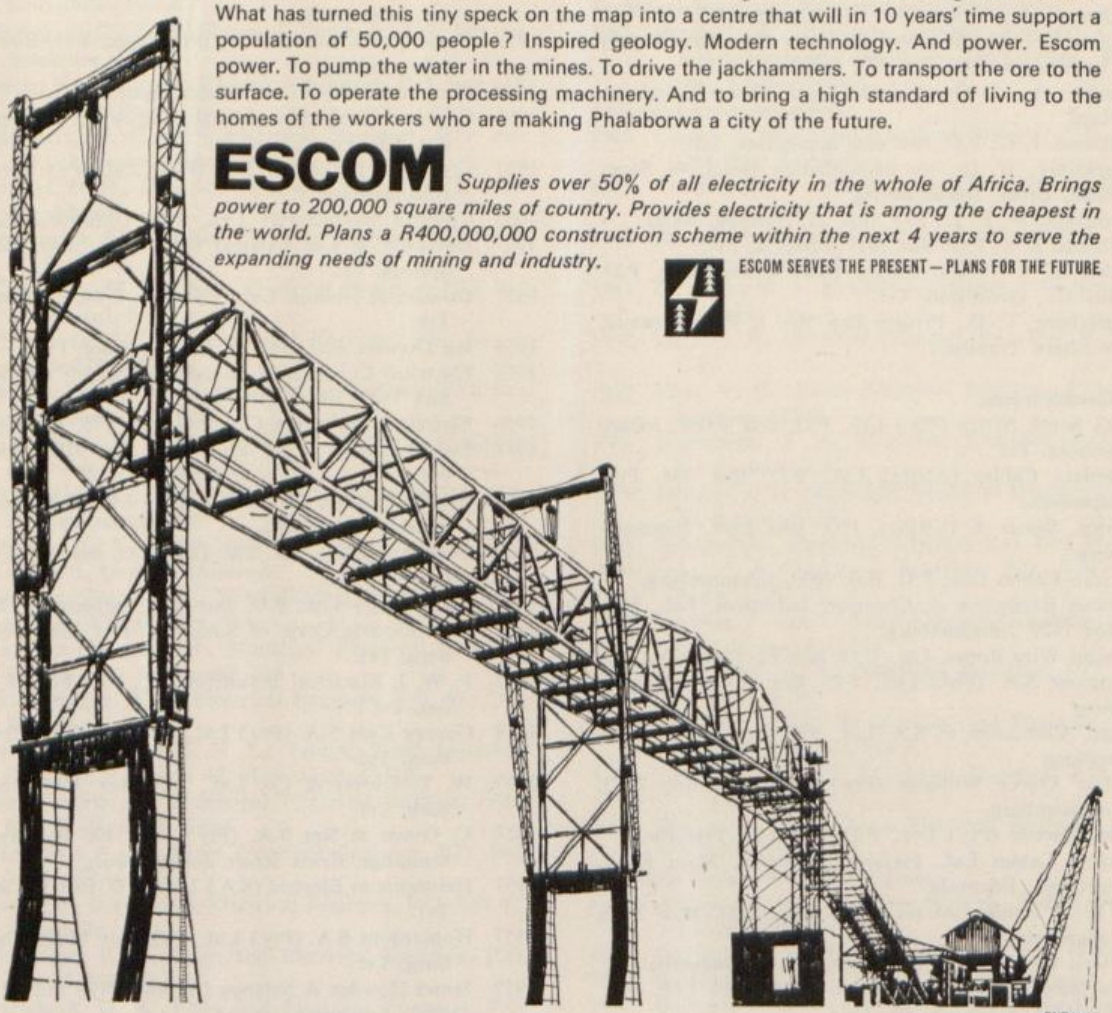

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1957 Hubert Davies & Co. Ltd., P.O. Box 1386, Johannesburg, Tvl.
1960 Hawker Siddeley Brush (Southern Africa) Ltd., P.O. Box 67, Germiston.
1957 International Combustion Africa Ltd., P.O. Box 5981, Johannesburg, Tvl.
1962 A. Jackson, P.O. Box 4814, Cape Town, C.P.
1957 John Thompson (S.A.) (Pty.) Ltd., P.O. Box 3570, Johannesburg, Tvl.
1957 Johnson & Phillips S.A. (Pty.) Ltd., P.O. Box 552, Germiston, Tvl.
1957 R. T. Jones, Esq., 43 The Avenue, Orchards, Johannesburg, Tvl.
1957 G. H. Langler & Co. Ltd., P.O. Box 3762, Johannesburg, Tvl.
1961 Lodge-Cottrell (Africa) (Pty.) Ltd., P.O. Box 6070, Johannesburg, Tvl.
1957 Harold Martinusen & Co. (Pty.) Ltd., P.O. Box 469, Johannesburg, Tvl.
1957 L. H. Martinusen Ltd., P.O. Box 25664, Denver, Tvl.
1957 Merz & McLellan, P.O. Box 11578, Johannesburg.
1965 Minnesota Mining and Manufacturing Co. (S.A.) (Pty.) Ltd., P.O. Box 10465, Johannesburg.
1957 Mitchell Engineering Group S.A. (Pty.) Ltd., 63 Harrison Street, Johannesburg, Tvl.
1959 N.V. Nederlandsche Kabelfabrieken Ltd., P.O. Box 3513, Cape Town, C.P.
1965 North and Robertson (Pty.) Ltd., P.O. Box 309, East London.
1957 Oerliken S.A. (Pty.) Ltd., P.O. Box 132, Jeppestown, Tvl.
1957 C. A. Parsons & Co. (S.A.) (Pty.) Ltd., P.O. Box 3425, Johannesburg, Tvl.
1959 Patrick Murray (Pty.) Ltd., P.O. Box 1541, Durban, Natal.
1963 Pratley Manufacturing and Engineering Co. (Pty.) Ltd., P.O. Box 55, Luipaardsvlei, Tvl.
1957 Rhotec Sales (Pvt.) Ltd., P.O. Box 2356, Salisbury.
1957 Reunert & Lenz Ltd., P.O. Box 92, Johannesburg.
1957 A. Reyrolle & Co. Ltd., P.O. Box 9677, Johannesburg, Tvl.
1960 A. Reyrolle & Co. (Rhodesia) Ltd., P.O. Box 1975, Salisbury, Rhodesia.
1957 Rice & Diethelm Ltd., P.O. Box 930, Johannesburg, Tvl.
1963 Rhodesia Congo Border Power Corporation Ltd., P.O. Box 819, Kitwe, Zambia.
1957 Samuel Osborn S.A. (Pty.) Ltd., P.O. Box 25619, Denver, Tvl.
1957 Scottish Cables (S.A.) Ltd., P.O. Box 2882, Johannesburg, Tvl.
1960 Siemens S.A. (Pty.) Ltd., P.O. Box 4583, Johannesburg, Tvl.
1957 Standard Telephones & Cables Ltd., P.O. Box 286, Boksburg, Tvl.
1957 Stamcor (Pty.) Ltd., P.O. Box 6107, Johannesburg.
1957 Stewarts & Lloyds of S.A. Ltd., P.O. Box 1195, Johannesburg, Tvl.
1957 S.A. General Electric Co. Ltd., P.O. Box 1905, Johannesburg, Tvl.
1957 S.A. Philips (Pty.) Ltd., P.O. Box 7703, Johannesburg, Tvl.
1957 Superconcrete Pipes (Pty.) Ltd., P.O. Box 92, Roodepoort, Tvl.
1957 Switchcraft (Pty.) Ltd., P.O. Box 6444, Johannesburg, Tvl.
1960 South Wales Electric (Pty.) Ltd., P.O. Box 2180, Johannesburg, Tvl.
1957 Southern African Cable Makers Association, P.O. Box 2258, Johannesburg, Tvl.
1965 T.P.H. Engineering (Pty.) Ltd., P.O. Box 118, Bramley, Tvl.
1965 G. D. Wiehahn, P.O. Box 664, Bethlehem, O.F.S.
1957 Wilson & Herd (Pty.) Ltd., P.O. Box 3093, Johannesburg, Tvl.
1957 Yarrow & Herd (Pty.) Ltd., 210 Geldenhuys, 33 Jorissen St., Braamfontein, Johannesburg, Tvl.
1959 Yorkshire Transformers (S.A.) (Pty.) Ltd., P.O. Box 43, Bedfordview, Tvl.

LIST OF MEMBERS, COUNCIL MEMBERS AND VISITORS ATTENDING THE 1966 TECHNICAL MEETING OF THE ASSOCIATION OF MUNCIPAL ELECTRICITY UNDERTAKINGS

LYS VAN LEDE, RAADSLEDE EN BESOEKERS — 1966 TEGNIESE VERGADERING VAN DIE VERENIGING VAN MUNISIPALE ELEKTRISITEITSONDERNEMINGS

ADELAIDE:
F. de Wit

BEAUFORT WEST:
S. Mostert

BETHLEHEM:
A. A. du Toit

BLOEMFONTEIN:
P. J. Theron
E. E. de Villiers
One Senior Engineer of Bloemfontein Mun.

BOTHAVILLE:
Cr. W. A. Hoopes
G. P. van Wyk Schoombee

BRAKPAN:
H. Barnard

BULAWAYO:
H. E. Summers

CARLETONVILLE:
J. A. Loubser

CRADOCK:
D. Haig-Smith

DEWETSDORP:
A. Hatwich

DURBAN:
R. M. O. Simpson

EAST LONDON:
P. A. Giles

ESTCOURT:
J. G. F. Erikson

FORT BEAUFORT:
D. R. Verschoor

GERMISTON:
C. Lombard

GRAAFF-REINET
A. Y. Carmichael

HARRISMITH:
W. G. Rush

HEIDELBERG, Tvl.:
W. J. B. van Heerden

JOHANNESBURG:
R. Leishman

KEMPTON PARK:
L. Futcher

KLERKSDORP:
G. F. Rautenbach

KROONSTAD:
W. Rossler

KRUGERSDORP:
A. Gerber

LADYSMITH:
F. Stevens

LADYBRAND:
J. van S. Lochner

LYDENBURG:
E. P. E. W. Trautmann

MAFEKING:
E. J. Te Brugge

MEYERTON:
A. A. van Wyk

MIDDELBURG, Cape:
R. V. Bailey

MOOI RIVER:
R. F. Hewett

NELSPRUIT:
D. P. du Plooy

NEWCASTLE:
J. S. Craig

ODENDAALSRUS:
J. J. de Beer

ORKNEY:
P. L. du Toit
Councillor represented

OUDTSHOORN:
R. J. G. Stanton

PIETERMARITZBURG:
D. H. White-Cooper
J. C. Waddy

PIETERSBURG:
J. I. Inglis

PORT ELIZABETH:
D. Murray-Nobbs

PORT SHEPSTONE:
K. W. J. Halliday

POTCHEFSTROOM:
C. de Kock
E. de C. Pretorius

POTGIETERSRUS:
G. A. Lotter

PRETORIA:
T. C. Stoffberg

QUEENSTOWN:
V. E. O. Barratt

ROBERTSON:
H. S. Bucholz
W. J. van der Merwe
H. J. Koeslag

ROODEPOORT:
P. J. Botes

RUSTENBURG:
P. A. Meintjies

SALDANHA:
A. C. MacLachlan

SASOLBURG:
J. C. Strauss

SOMERSET EAST:
P. P. Clarke

SPRINGS:
F. F. Deysel
J. K. van Ahlften

STANDERTON:
N. A. Potgieter

STANGER:
J. L. McNeil

STILFONTEIN:
F. J. van der Merwe

UMTALI (Rhodesia):
H. T. Turner

UMTATA:
S. Harris
R. A. Paull

VANDERBIJLPARK:
L. Jamneck
G. C. Theron

VEREENIGING:
A. F. Turnbull

VIRGINIA:
I. L. Hobbs

WALMER:
J. K. Murphy

WELKOM:
R. W. Barton

WINBURG:
G. M. Reyneke

WINDHOEK:
L. Lewis

Other Members/Ander Lede:

Andrew, W. M. (Associate Member/Verbonde Lid), East London.

Burton, C. R. (Associate Member/Verbonde Lid), Kimberley.

Muller, G. J. (Honorary Member/Ere-Lid), Bloemfontein.

Williams, J. T. (Associate Member/Verbonde Lid), Pretoria.

A.M.E.U. Officials/V.M.E.D. Amptenare:

R. G. Ewing (Representing the Secretaries), East London.

Brewin, Miss E. R. (Representing the Secretaries), Johannesburg.

Affiliates/Geaffileerdes:

Adams, Symes and Partners.
K. A. H. Adams and D. C. Ripley, Johannesburg.

A. E. I. Henley Africa (Pty.) Ltd.
J. A. Morrison, Johannesburg.

F. W. Electrical Industries (Pty.) Limited.
D. Baker, R. Parry, L. A. Brown, G. R. Hain, Johannesburg.

Electrical Protection Company (Pty.) Ltd.
H. P. Smith, M. R. Marot, Benoni.

Heinemann Electric (S.A.) Ltd.
E. Tarchalski, W. Bozyczko, Johannesburg.

Associated Electrical Industries S.A. (Pty.) Ltd.
V. N. N. Pougnet, Johannesburg.

Ballenden & Robb.
D. A. Robb, Johannesburg.

British Insulated Callender's Cables (S.A.) (Pty.) Ltd.
R. B. Pyman, Johannesburg.

D. J. R. Conradie.
D. J. R. Conradie, Bloemfontein.

English Electric Co. of S.A. (Pty.) Ltd.
H. Prins, Johannesburg.

A. Jackson.
A. Jackson, Cape Town.

Lodge-Cottrell (Africa) (Pty.) Ltd.
J. L. Eastbrook, Johannesburg.

Merz & McLellan
C. E. R. Langford, Johannesburg.

Minnesota Mining & Manufacturing Co. (S.A.) (Pty.) Limited.
A. Block, Johannesburg.

Oerlikon South Africa (Pty.) Ltd.
C. E. Weber, Johannesburg.

Reunert & Lenz Limited.
I. B. van Rensburg, C. R. MacDonald, Bloemfontein.

Siemens S.A. (Pty.) Limited.
A. Biehler, Johannesburg.

South Wales Electric (Pty.) Ltd.
J. R. Bates, Johannesburg.

Yarrow (Africa) (Pty.) Ltd.
I. C. Fraser, Johannesburg.

Visitors/Besoekers:

Baxter, J. D. C., Northern Cape Regional Electrification Board, Kimberley.

Black, N. G., Department of Posts and Telegraphs, Divisional Engineer, O.F.S. and Northern Cape.

Conradie, D. J. J., Pretoria.

De Villiers, H. J., Electricity Supply Commission, Deputy General Manager, Johannesburg.

Griessel, Divisional Inspector of Labour, Department of Labour, Bloemfontein.

Jooste, R. K., South African Bureau of Standards.

Middlecote, A. A., South African Bureau of Standards.

Page, T. H. D., Chief Electrical Engineer, South African Railways.

Troost, N., Deputy Chief Engineer, Electricity Supply Commission, Johannesburg.

van der Spuy, M., Head of the Department for Power & Engineering, C.S.I.R., One Assistant C.S.I.R.

Wannenburg, J. G., Chief Inspector of Factories, Department of Labour, Pretoria.

The 1966 Technical Meeting of the Association was held in the City Hall, Bloemfontein, on Monday, 2nd May, 1966. Attendance at the Meeting was as follows:-
62 Councils, represented by 9 Councillors and 67 Engineers and Associates; 1 Honorary Member (not representing Councils or Affiliates); 26 representatives of 19 Affiliates; 12 Visitors (representing Government Departments, Public utilities and other organisations) 2 A.M.E.U. Officials — a total of 117 persons.

Die 1966 Tegniese Vergadering van die Vereniging was gehou in die Stadsaal, Bloemfontein, op Maandag 2 Mei 1966. Bywoning by die Vergadering was soos volg:-
62 Munisipaliteite verteenwoordig deur 9 Raadslede en 67 Ingenieurslede en ge-assosieerde lidmate, 1 Ere-lid (nie 'n vertenwoordiger van 'n Munisipaliteit of van 'n ge-affilieerde lid nie) 26 Verteenwoordigers van 19 ge-affilieerde lidmate, 12 Besoekers (Verteenwoordigers van Regerings-departemente, Nutsmaatskappye en ander Organisasies), 2 V.M.E.O. Amptenare — 'n Totaal van 117 persone.

The President greeted those at the Meeting and expressed pleasure at the large and representative gathering. He referred to the fact that circumstances had compelled the Association to adopt a system of bi-annual Conventions intersparsed with a Technical Meeting each alternate year.

The Agenda item "Earthing" was proceeded with and Mr. F. Stevens, Ladysmith, presented his paper entitled "Earthing by means of Conductors under Foundations" which was published with the Agenda of the Meeting. He referred to the following errors in the text page 9 second line of the ninth paragraph following the sub-heading Earthing Conductors under Foundations insert the words 'of soil' between the words 'amount' and 'increased'. Same page under the section headed 'Copper Conductors' in trenches for 100 ft. on the second last line should read 10 ft.

Mr. Stevens proceeded to supply the following additional information and explanation:-

Die President groet die vergadering en spreek sy tevredenheid uit oor die groot en verteenwoordigende byeenkoms. Hy het verwys na die feit dat omstandighede die Vereniging gedwing het om 'n sisteem van twee-jaarlikse Konvensies aan te neem met 'n Tegniese vergadering elke alternatiewe jaar.

Die Agenda item „Aarding" is 'n aanvang mee gemaak en mnr. F. Stevens, Ladysmith, het sy referaat "Earthing, by means of Conductors under Foundations" gelewer, wat gepubliseer was in die Agenda van die vergadering.

Hy verwys na die volgende foute in die teks, bladsy 9 die 2de lyn van die 9de paragraaf moet die woorde „of soil" tussen die woorde „amount" en „increased" ingevoeg word. Op dieselfde bladsy onder die hoof „Copper Conductors in Trenches for 100 ft." moet in die 2nde laaste lyn „10 ft." lees.

Mnr. Stevens het voortgegaan en die volgende addisionele inligting en verklarings gelewer:-

"The instruments we have used for these tests are well-known makes of mega-earth testers. The correctness of the tests I consider to be plus minus 20%. The reason for the uncertainty is that according to the maker of the instruments, three tests should be carried out on each occasion, involving shifting one of the three earth spikes. This was not done on account of the total number of tests to be made and the difficulties experienced in making even one test.

The difficulties I refer to are finding points far enough apart where the pegs can be driven in on account of the closeness of the houses, the hardness of the ground in places, not knowing the position of water mains in gardens to avoid testing too near to them, and not being able to drive pegs in the street.

Although all present know that the weather must have a bearing on the results to be expected because of rain precipitation affecting the moisture content of the ground, it may not be realised to what extent it does so.

It is claimed that by halving the amount of moisture of the soil, resistivity may be increased 30 times. Normally the average moisture content of the soil for the greater part of South Africa is, I would imagine, only about 10%. We were not able to determine the average amount of moisture in the ground in the Ladysmith area, not having suitable equipment; using earth pegs has not always been practicable, for reasons already stated.

From my observations it is evident that there is a tendency for moisture to accumulate under foundations, and concrete or stone slabs, due to condensation occurring underneath. As an illustration of this, I have at my home a large grape vine which grows from under a concreted over back yard. Consequently its roots receive little or no water from above. Further, you may have noticed that lawn grass often thrives best when grown in crazy paving.

From this supplementary information given you this morning in connection with my paper, some idea will be had on how earthing values may change from time to time, and that in connection with loop tests, the loop impedance test tends to rise and fall with the resistance of the foundation test, which of course is to be expected and is useful as a guide to the person carrying out tests.

A question put to me at times is, "What of the size of earth wire required for under foundations?"

So long as a conductor is large enough to carry the earth volt current long enough (i.e. without heating up unduly and dissipating the moisture in the ground surrounding it), and the protective device operates satisfactorily, there is no purpose in having a larger conductor, unless for mechanical reasons, or to allow for chemical or electrolytic decay.

Finally, I have made no attempts to compare the results we are getting with other forms of earth connections, on account of the labour involved and the costs of copper rods or wire for trenches.

In Ladysmith we provide an earth wire with each overhead house service as non-metallic water pipes are being laid in the town for all mains and connections, and of course the number of earth connections to water taps found disconnected from time to time.

These connections I feel are less likely to occur with conductors under foundations. What does concern me is: Who is responsible in the event of an overhead earth wire becoming disconnected, and the local earth connection being proved to have been unreliable for some time in the event of a fatal accident.

I am of the opinion there is justification for a thorough investigation being carried out into the need for having earth conductors under foundations, which should be carried out by a recognised authority, such as the Bureau of Standards or the Council for Scientific and Industrial Research, with a view to this practice being adopted as a standard.

In addition, I would like to mention that in carrying out these tests, I think to date we have put in about R4,000 copper under the various houses we have been testing so it has cost quite a bit, and as I said in my concluding remark here, I feel that investigations should be carried out."

On introducing discussion on Mr. Stevens' paper Mr. M. van der Spuy (C.S.I.R.) offered the following comments:-

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"Mr. Stevens has made an important investigation in the field of earthing — that field which is of the greatest importance to all practising engineers. Allow me to congratulate Mr. Stevens on the effective way in which he has carried out his investigations.

These investigations are of a similar nature to one of our research projects at the C.S.I.R. and, as mentioned by Mr. Stevens, the main factors concerning the resistivity of soil are: the moisture content of the soil, and the concentration of salts dissolved in the moisture in any one area; the problem remains basically one of moisture content of the soil.

Resistivity at first falls rapidly, as the moisture content is increased, but after a value of about 14 to 18% of moisture the rate of decrease becomes much less — for example a typical soil would reduce resistivity from 200,000 ohm meters with a 4% moisture content to 40,000 ohm meters with a 12% moisture content. After that this tails off and it would only drop to about 10,000 ohm meters with a 32% moisture content.

Because of this dependency of the earth resistance on the moisture content of the soil, efforts have been made to determine the most favourable conditions to retain this moisture around our earthing systems, especially during the seasonal drying out periods.

Investigations carried out over a period of years have shown that the following moisture migration patterns occur under buildings and roads — i.e. roads with tarmac or sealed covers, or any other waterproof slab placed on the ground.

Firstly, after building, equilibrium conditions are reached in a period of time depending on the climatic and soil conditions. In other words, in areas where the water table is near to the surface, e.g. the western Cape, equilibrium is not disturbed by providing a slab cover, and moisture variation under the building takes place as it does outside in the virgin soil.

Mnr. M. van der Spuy (W.N.N.R.) het die bespreking van die referaat deur mnr. Stevens gelewer, ingelui met die volgende kommentaar:-

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In areas where constant water table conditions prevail with the water table say 20ft. down, as encountered in certain western Cape coastal regions, and coastal regions in Natal, equilibrium conditions are reached fairly rapidly, in a matter of months.

In the Highveld areas, as found in the Karroo, the Free State, and certain areas of the Transvaal and Natal, equilibrium with outside conditions may take considerably longer, and periods of up to 7 years have been registered before the moisture variation under the building will follow a trend similar to the variation in the outside soil. The important factor, however, when viewed from a point of view of maximum moisture conditions, is that after rainfall, depending of course on the type of soil, there will be a lag of up to say 2 weeks, before there is a measurable increase in soil moisture content under the building itself. This takes about two weeks to migrate from outside underneath the foundations. But — and this is important — the migration of that moisture again, from underneath that building to outside, when the outside soil dries, takes a fact of 10 longer to occur.

In other words, in the same type of soil it would take up to 20 weeks for the same amount of moisture to get out from underneath the building again to outside.

And that occurs because the two mechanisms of moisture migration are completely different. The water gets in much more easily underneath, and would take 10 times longer to get out again from underneath any covered slab.

Over a period of years it will always remain wetter for longer underneath a building, or covered road. Measurements in Vereeniging showed a 20 — 24% increase in moisture content under buildings, as compared to outside ground conditions.

In the Springs, Witbank, Standerton areas, the moisture content under the tarmac cover of roads is 15 to 30% higher than that found in the open veld.

These findings led to investigations of the possibility of obtaining better all-the-year-round earth conditions by making use of earths under buildings, tarmac roads, and under covered slabs, in the same way that the work done by Mr. Stevens has led him to suggest a new approach to municipal earthing.

Our work is continuing in this field and we would very much like to co-operate with Mr. Stevens and the A.M.E.U. members in these investigations.

The curves shown on page 12 by Mr. Stevens, indicating the decrease in rate of resistance drop with the increase in the length of wire, are of normal character; in other words showing a marked saturation of decrease of resistance with further increase in length of buried wire. You don't seem to get value for money! This is completely normal, although no indication is given of the final configuration of the wire under the foundations, the curves obtained approximate the resistance obtained by calculation of wires buried in a right angle configuration.

The improvement of earth resistance values over a period of time, as found by Mr. Stevens, is in agreement with the moisture migration pattern found in our investigations. The small percentage of cases where the resistance is increased with time, may be due to the fact that equilibrium has not yet been reached with outside conditions, or, as suggested by Mr. Stevens, that initial conditions were not normally moist due to operations while building.

The discrepancy between the earth resistance test figures and the phase loop impedance tests may be due to errors in the measurement of the resistance of the earth system to the general mass of earth as mentioned by Mr. Stevens.

In making resistivity measurements it is essential to see that the resistance area of the auxiliary electrodes does not overlap that of the main earth system which is under measurement.

For normal calculations the equivalent hemisphere of the system to be measured has to be obtained to determine the spacing of those electrodes for measuring.

In the case of a house of dimensions of say 50 ft by 50 ft, the maximum dimension would be the diagonal of that squared — in other words, approximately 70 ft. The equivalent hemisphere would be approximately 50% of this, in other words, 35 feet. From the tables, the required spacing of the electrodes would be 260 ft to the potential electrode and 420 feet to the current electrode.

I think you will all appreciate the difficulty in a built-up area, and in areas where there are other services, (water pipes, cables, and houses), in obtaining these ideal conditions, and it would be of interest to learn whether these spacings were indeed used to measure the earth resistance, since, if they were not, it would conceivably explain the difference between the earth resistance test figures and the phase loop impedance tests done by Mr. Stevens.

The measurement of moisture content of the soil is also of extreme importance when resistance measurements are made. Making resistance measurements without knowing the moisture content of the soil at the time they were made nullifies the importance of taking these measurements.

To make moisture content determinations is fairly simple. An instrument is available which will give accuracies of 1 or 2% and it works on an extremely simple basis.

I think most members will remember the old carbide lamps. All that happens in this case is: you have a container, take a measured sample of a quantity of soil, put it in the container, put an excess of carbide with it and shake it up. The carbide will react with only the moisture present in the soil, and this in turn is indicated on a pressure gauge, indicating the pressure of the acetylene involved which is a direct measurement of the moisture content of the soil. It is the type of thing apprentices usually take out to do the measurement with.

Finally, further investigations into the use of conductors under foundations, not only to determine the best material to use, the length, size, and shape required, and also to determine the current flow patterns and the fault and lighting conditions which might occur, are of importance.

And the advice; valuable practical experience and co-operation of members of this organization is earnestly requested to carry out these investigations to a fruitful conclusion."

Discussion proceeded on Mr. Stevens paper and the following contributed thereto:-

Mr. J. C. van Alphen, S.A.B.S.
Mr. R. W. Barton, Welkom
Mr. A. A. Middlecote, S.A.B.S.
Mr. C. Lombard, Germiston
Mr. R. Leishman, Johannesburg
Mr. R. M. O. Simpson, Durban
Mr. H. S. Bucholz, Robertson
Mr. J. G. Wannenburg, Department of Labour
Mr. E. E. de Villiers, Bloemfontein
Mr. J. K. Murphy, Walmer
Mr. H. E. Summers, Bulawayo
Mr. D. Haig-Smith, Cradock

In the course of discussion the following points were made:-

Bespreking van die referaat deur mnr. Stevens gelewer is mee voortgegaan en die volgende persone het bydraes gelewer:-

Mnr. J. C. van Alphen, S.A.B.S.
Mnr. A. A. Middlecote, S.A.B.S.
Mnr. R. Leishman, Johannesburg
Mnr. H. S. Bucholz, Robertson
Mnr. E. E. de Villiers, Bloemfontein
Mnr. H. E. Summers, Bulawayo
Mnr. R. W. Barton, Welkom
Mnr. C. Lombard, Germiston
Mnr. R. M. O. Simpson, Durban
Mnr. J. G. Wannenburg, Departement van Arbeid
Mnr. J. K. Murphy, Walmer
Mnr. D. Haig-Smith, Cradock

Gedurende die besprekings is die volgende feite genoem:-

1. In regard to lightning protection it is essential to have proper contact between the Conductor and the Earth and reinforcement Steel which may be incorporated with the building.
2. In areas of small rainfall a better investment than under foundation earthing might be the provision of an overhead earthing conductor.
3. With regard to bonding, this can be hazardous where the earth is inclined to be ineffectual.
4. The practice of putting Calcium Chloride and other substances chosen to increase conductivity around earth conductors is not to be recommended in places where the earth is not properly maintained, the reason being that whilst a good earth may be obtained initially, after a number of years has passed it may degenerate to an alarming extent.
5. With multiple neutral earthing a hazardous position can develop as a result of a broken conductor even without a fault.

In replying to discussion on his paper Mr. Stevens commented as follows:-

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"There appears to have been only one question asked, and that is whether we had attempted to salt the trench before the concrete was put in. That we did not do. I do think that would have some good effect. On the other hand, it might have some detrimental effect in causing corrosion, and after all, if that earthing conductor does come to any harm, it is going to be a difficult matter to replace it at a future date, so one has to decide whether one is going to take any steps for the sake of improving the value, or rather forego that and retain the life of the conductor.

I would, however, just like to make this point, which is not in answer to a question. Mr. Middlecote finally said what I was out to do was to simply find a means of earthing and not whether one should earth or not earth. To find a means of earthing is not always easy and one must realise that pegs cannot be driven in in the major part of this country, certainly not in Ladysmith. You cannot drive pegs in the ground; because of the smallness of building plots you cannot put in trench earths, and if you cannot do that, you certainly cannot dig holes big enough to put radiators in. Then with the advent of composition water mains in the street, and now polythene water connections to houses, and not only that, the owner of the house being able to use polythene piping throughout his installation, except to the stand pipes, one finds polythene pipes throughout the garden. Consequently you can't even use that. It does seem to me that this idea of foundation earth is all that is left, and the point I want to make, too, is the need, to my mind of having a local earth. If one has a PMR system — fine. That is what we have. But if you have good local earths, all those local earths adding up will ensure that the PME system can be relied on that much more, because the overall earthing resistance will be dropped, one might say, accordingly, and because of the increased number of good local earths, all connected to that earth wire that is brought in from the street mains on to the house."

Mr. P. J. Botes, Roodepoort, next presented his paper which was published with the Agenda of the Meeting — 'Earthing': as defined in the Factories, Machinery and Building Works Act", and in doing so commented as follows:-

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Ek sal graag net kortliks hier oor die laaste aspekte in my verslag wil uitwei.

Aarding, soos omskryf onder Regulasie C.61 van die Wet op Fabrieke, Masjinerie en Bouwerke is in twee groepe verdeel, naamlik:

1. Aarding van alle metaaldakke, geute, geutpype en vuilwaterpype;
2. Aarding van alle toeganklike metaaldele van elektriese installasies of toestelle wat, hoewel hulle

1. Met verwysing na beveiliging teen weerlig is dit noodsaaklik om 'n goeie verbinding tussen die geleier, die aarde en die staalversterking wat in die gebou gebruik is, te hê.
2. In gebiede met lae reënval is 'n beter besteding die voorsiening van 'n bogrondse aard-geleier teenoor om onder die fondasie te aard.
3. Met verwysing na deurverbinding, kan dit gevaarlik wees waar die aarding geneig is om oneffektief te wees.
4. Die praktyk om Kalsium Kloried en ander chemikalieë te gebruik om die geleiding om aard-geleiers te verbeter, word nie aanbeveel waar die aarding nie goed instand gehou word nie. Die rede is dat terwyl 'n goeie aard oorspronklik verkry kan word, dit na 'n aantal jare na 'n gevaarlike peil kan versleg.
5. Met 'n veelvuldig ge-aarde neutraal kan ook 'n gevaarlike toestand ontstaan as gevolg van die breek van 'n geleier selfs sonder 'n fout.

In antwoord op die bespreking van sy referaat het Mnr. Stevens die volgende kommentaar gelewer:-

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Mnr. P. J. Botes, Roodepoort het vervolgens sy referaat wat gepubliseer was in die Agenda van die vergadering, naamlik, „Aarding soos gedefinieer in die Wet op Fabrieke, Masjinerie en Bouwerke," gelewer en as volg verslag gedoen:-

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normaalweg nie deel van 'n elektriese kring uitmaak nie, per ongeluk lewendig mag word.

In die geval van geboue geleë op persele waar masjinerie gebruik word en waaraan elektrisiteit verskaf word, berus die toesien dat die aarding onder bogenoemde twee groepe gedoen is by die gebruiker, soos omskryf in Regulasie C.61 1(a) en (b). Waar die leweransier wel die gebruiker is, soos munisipale geboue waar masjinerie gebruik word en elektrisiteitsnetwerk, moet die aarding soos onder Regulasie C.61 1(a) en (b) omskryf wel uitgevoer word.

Die bepalings soos omskryf onder Regulasie C.61 2(a) word ook uitgesluit vir geboue of persele waar masjinerie gebruik word, maar die bepaling soos omskryf onder Regulasie C.61 2(b) sluit nie geboue of persele waar masjinerie gebruik word uit nie.

Onder Regulasie C.61 2(b) het die leweransier dus sekere verantwoordelikhede insake aarding, soos omskryf hierbo. Onder albei groepe in geboue geleë op persele waar masjinerie gebruik word. Die bedraging van die persele moet egter eers deur die leweransier getoets word voordat die toevoer aangeskakel kan word, en normaalweg word toevoer nie verskaf voordat die bedrading wel tot die tevredenheid van die leweransier uitgevoer is nie.

Onder die toets van bedrading is die toets van aarding een van die belangrikste aspekte en volgens hierdie Regulasie is dit toelaatbaar om in gevalle waar die bedrading bevredigend uitgevoer is, maar die aarding nie, of geheel en al nie uitgevoer is soos omskryf onder bogenoemde twee groepe nie, die toevoer aan te skakel en die eienaar/bouer dus 30 dae vergunning gee waarin die aarding wel uitgevoer moet word. Dit is vir my 'n eienaardige toedrag van sake.

Gewone huishoudelike aansluitings: Dit is interessant om te let dat die gebruiker van huishoudelike persele wat nie geklassifiseer word as geboue wat geleë is op persele waar masjinerie gebruik word, nie hoef toe te sien dat die metaaldakke, geute, ens. geaard moet word nie, Regulasie C.61 1(a), maar wel moet toesien dat die aarding van die installasie uitgevoer is. Regulasie C61 1(b). Onder die bepalings van Regulasie C.61 2(a) mag die leweransier bogenoemde verbruikers nie aansluit voordat die aarding volgens die vereistes gedoen is nie, of aankoppel nadat so 'n aansluiting ontkoppel is vir die doel van aanbouings of herstelwerk aan elektriese bedrading aleer die aarding volgens die vereistes uitgevoer is nie. Indien, onder die vervanging van verweerde, bogrondse diensaansluitings so 'n perseel ontkoppel is gedurende die uitvoering van die vervanging van die bogrondse aansluiting, wat ook moontlik insluit die vervanging van eindklem-aansluitingskas, mag so 'n gebruiker nie aangekoppel word aleer die aarding volgens die vereistes uitgevoer is nie. Dit bring mee 'n uiters onaangename taak, en is die leweransier dus verplig om 'n toets op die perseel insake aarding uit te voer, en indien die aarding nie volgens die vereistes is nie, die eienaar versoek om binne 'n vasgestelde tyd soos omskryf is onder Regulasie C.61 2(b), die aarding uit te voer. Hierna, kan die verandering van bogrondse diensaansluitings of die vervanging van bogrondse diensaansluitings met ondergrondse aansluitings eers deur die leweransier uitgevoer word. In Roodepoort word die diensaansluitings egter eers vervang en daarna word die eienaar die vasgestelde tyd gegee om die aarding uit te voer, sonder om die perseel te ontkoppel.

Mr. J. G. Wannenburg, Department of Labour, submitted the following observations:-

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"I would just like to point out a few things which probably are not properly understood.

The first one is that the Electrical Wiremen and Contractors Act is not binding on the State, whereas the Factories, Machinery and Building Work Act is binding on the State.

Section 56 specifically reads: 'This Act shall bind the

Dan wil ek net graag verder verwys na die vergelyking van Artikel 19:1 van die Wet op Elektrotegniese Draadwerkers en Aannemers. Onder Artikel 19:1 van bogenoemde Wet mag geen gebruiker draadwerk verbind of toelaat dat dit verbind word tensy die draadwerk ondersoek, getoets, en goedgekeur is nie, met uitsluiting van draadwerk uitgevoer ten behoewe van die Regering, met inbegrip van die Spoorwegadministrasie en Provinsiale Administrasie. Nou moet daarop gelet word dat dit gebruik is by die meeste munisipaliteite om in hierdie gevalle net te toets of alle metaaldakke, geute, geutpype en vuilwaterpype geaard is. Dit is verkeerd, soos duidelik blyk uit die bepaling van Regulasie C.61 2(a), naamlik dat alle metaaldakke, geute, geutpype en vuilwaterpype van die gebou en alle ontblote metaaldele van die elektriese installasie geaard is. Die algehele aarding van die bedrading van hierdie huise moet dus deur die voorsieners getoets word.

Indien sover gegaan word kan net sowel die hele bedrading getoets word. Die argumente wat as gevolg hiervan kan ontstaan tussen die voorsiener, aannemer en die betrokke administrasie van die Regeringsinstansie is legio. Oor hierdie aspek voel ek dat hierdie vereniging vertoë moet rig om aan die betrokke instansie wat die wetgewing daar gestel het, om meer definitiewe en algemene gebruik vas te stel, of om dieselfde uitsluitsels in albei wetgewings daar te stel. Daar moet ook op gelet word dat die aarding van 'n hystoestel of roltrap ook getoets moet word.

Hierdie vereniging se lede verteenwoordig die oorgrote meerderheid van instellings wat moet toesien dat die bepalings van hierdie wetgewing uitgevoer word, en daar is nie genoeg samewerking tussen hierdie vereniging en die owerhede nie met die opstelling van wetgewings.

Hier wil ek spesifiek verwys na die bepaling onder Regulasie C.55 van die Wet op Fabrieke, Masjinerie en Bouwerke, waar die gebruiker verplig word om brandblussers in transformator — en skakelgeboue te installeer.

Na 'n proklamasie van die regulasies word links en regs uitsluitsels toegelaat deur die Departement van Arbeid aan owerhede wat aansoek doen om kwytskelding van hierdie verpligting. Ek verwys spesifiek na hierdie regulasie omdat dit vir my net fantasties is dat so-iets gedoen kan word; waar wetgewing gemaak word en later kwytskelding gegee word.

Mnr. die President, ek wil my verstout om te sê dat van owerheidsweë hierdie vereniging nie genoegsaam geraadpleeg word nie, en rakende die verpligting van aard-lekrelais in nuwe persele, hierdie vereniging se sienswyse wel deeglik oorweeg sal word.

Mnr. die President, my dank aan u vir die voorreg om hierdie referaat aan die vereniging te kon voorlê, en ook my dank aan die Stadsraad vir die vergunning aan my verskaf om hierdie referaat te kon opstel en voorlê."

Mnr. J. G. Wannenburg, van die Departement van Arbeid het die volgende kommentaar gelewer:-

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Crown except in respect of the activities of the Railway Administration'.

Now it is a legal principle that a regulation cannot be more than the Act, and if anything that is promulgated in the regulations is in conflict with the Act, then the Act takes precedence.

Similarly I would like to point out that the Electrical Wiremen and Contractors Act is a specific Act to cover wiring of premises, and by virtue of that fact, the Electrical Wiremen's and Contractors Act takes precedence over any other Act, even the Factories Machinery and Building Work Act.

Those are legal principles which should be really understood.

Briefly, Section 19 of the Electrical Wiremen's Act appears to be in conflict with Regulation 61. From what I have just said the Electrical Wiremens Act takes precedence over Regulation 61, and as things stand to-day, Municipal Authorities would be expected to abide by Section 79 of the Electrical Wiremen and Contractors Act.

> I would like to read from Mr. Botes' article, as follows: „Onder Regulasie C.61(a) moet die Gebruiker toesien dat alle metaaldakke, geute, geutpype en vuilwaterpype van geboue gelee op ‚persele waar massjinerie gebruik word' . . ."

Mr. President, I must concede that that is rather vaguely stated. It could be implied that a building where machinery is situated on the premises would be a factory, but then also you could think, for instance, of a butchery where you would have a bandsaw, and that is classed as machinery. Strictly then, being machinery in a building or on premises, municipal authorities would not be in a position to do any testing of wiring there.

> I don't think that was the intention of the legislator. Also:
>
> „Dit is nog verpligtend vir die Leweransier om die aarding ‚op persele waar masjinerie gebruik word', te toets en is dit nie uitgesluit uit die verpligtings van die Leweransier nie".

There I must point out that in Regulation 61 Buildings where Machinery is situated are definitely excluded. In other words, take it that it means a factory. Where it comes to a factory the municipal authorities would not be called on to test for earthing of roofs etc. which is, I believe, the consensus of opinion, too.

Insofar as Regulation 62(a) and (b) are concerned. 2(a) reads:

> "No supplier shall connect an electric supply to a building other than a building on premises where machinery is used, or re-connect such a building which was disconnected for the purpose of extension or repairs to electrical installation, before he has satisfied himself that all metal roofs, gutters, downpipes and waste pipes of the building and all exposed metallic parts of the electrical installations are earthed".

And then (b) goes on:

> "If through a test by the supplier of any electrical installation in a building . . ."

and there it should be remembered that (b) and (a) both have to do with exactly the same type of building, so even though it might sound under 2(b) that it is in conflict with 2(a) it is not the case, because 2(b) might just as well have read, "If a test is carried out on a building other than a building where machinery is situated". So it is exactly the same, and the one is not in conflict with the other.

The regulations were last amended and promulgated in 1963. As in anything, you must have teething troubles, and believe me we have had a lot of them with these regulations. At the present moment we are busy again with amendments on various sections of the regulations where we have found loopholes, pinpricks, and what-have-you.

Concerning Mr. Botes' unkind remark that there is no tie between this Association and the Department of Labour, I don't think that is the case. I think I can call on one person who would bear me out and that is Mr. Lombard from Germiston, that there are definite ties, and a couple of months ago (I think it was in October last year), I wrote a circular letter to your Association in which I suggested certain things. Up to the present, I have not had a reply to that. I am positive that if the Department were to be approached by this Association on any matter it would receive immediate attention.

For the meantime, that is all I have to say. I just wanted to clear up these points. I may have something to say later on again.

Mr. C. Lombard, Germiston, offered the following comment:-

„In die eerste plek wil ek net 'n opmerking maak in verband met hierdie saak wat aangeroer is, d.w.s. die beaarding van dakke. Ek is nie so seker dat die beaarding van dakke beradings werk is so as omskry in die Wet nie. As dit nie bedrading is nie, dan glo ek nie is daar enige teenstrydigheid nie. Ek dink dat is 'n sakie wat aandag behoort te geniet.

Tweedens wil ek graag 'n misverstand deur die opsteller van hierdie referaat uit die weg ruim. Dit is terloops ook deur mnr. Wannenburg genoem, dat daar wel samewerking is

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Mnr. C. Lombard, Germiston het die volgende kommentaar gelewer:-

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tussen die Departement van Arbeid en hierdie vereniging. Hierdie vereniging het 'n verteenwoordiger op die Registrasieraad en die vereniging was ook in die geleentheid gestel om die wysigings van die Fabriekswet, dit is die konsepwysigings, om daar kommentaar oor te lewer. Die enigste kritiek wat miskien uitgebring kan word is dat ons tyd was betreklik beperk, maar hierdie vereniging het wel destyds vertoë gerig, en het die geleentheid gehad om sodanige vertoë te rig.

Dan mag ek ook net noem, mnr. die President, dat ons vereniging alreeds ook vertoë gerig het aan die Departement

van Arbeid in verband met die toets en inspeksie van dakke van regeringsgeboue en die meer, waar hierdie teenstrydigheid nou bestaan, en ek neem aan dat hierdie probleem opgelos sal word.

Verder mag ek ook net noem dat die vereniging vertoë gerig het om voorsieners vry te stel van die nodigheid om aanlegte te toets waar daar 'n gediplomeerde ingenieur in diens van 'n onderneming wat 'n fabriek het, is, wat die verantwoordelikheid kan neem. Ek dink dit sal een van die probleme waarmee ons vandag te doen het, uit die weg ruim."

Clarifying a point made by Mr. Lombard, Mr. J. G. Wannenburg, Department of Labour, commented as follows:-

"Mr. President, I would just like to clear up this point: Mr. Lombard said that earthing could not be considered as wiring work, and I think if you read the interpretation of 'earthing' it includes installation, operation, repair, and testing of conduit, cables, fittings and conductors, etc.

If an earth wire is not a conductor, then I do not know what a conductor is and what an earth wire is! It is definitely included in wiring work.

Secondly, somebody spoke about 'effective' earthing. That is a word in English that should never have existed as far as law is concerned, 'effective', 'adequate', or anything like that. These are very dangerous words to use in law, and that I can say from personal experience in court.

What is effective to one person is ineffective to another one; what is adequate to one is inadequate to another one."

Discussion proceeded on Mr. Botes paper and the following contributed thereto:-

Mr. J. K. van Ahlfden, Springs
Mr. P. P. Clark, Somerset East
Mr. R. W. Barton, Welkom
Mr. T. C. Stoffberg, Pretoria
Mr. E. deC. Pretorius, Potchefstroom.

Replying to a question asked by Mr. Pretorius, Mr. J. G. Wannenburg, Department of Labour, replied as follows:-

„In verband met die aarding van dakke: die vorige spreker het gevra hoekom ‚gebou' nie as sulke gedefinieer is in die Wet nie.

Ek wil daar net baie graag wys op die moeilikheid wat daar sal wees om so 'n definisie in die Wet in te sit. Hoe gaan 'n mens 'n ‚gebou' definieer? Daar is duisende soorte van geboue en om ‚gebou' te gaan definieer in die Wet, streng,

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Mr. P. J. Botes, Roodepoort, replied to the discussion on his paper as follows:-

„Mnr. die President, dit lyk vir my elke keer as ek my mond hier oopmaak dan steek ek my kop in 'n bynes.

Dit is verblydend om te weet dat Seksie 19 van die Wet op Elektriese Draadwerkers en Aanemers hierdie regulasies, ‚overrule' soos die Engelsman sal sê.

Regulasie C.61 2(a) en (b) — dit kan so gelees word dat

Om die stelling wat mnr. Lombard gemaak het te verklaar, het mnr. J. G. Wanneburg — Departement van Arbeid, die volgende kommentaar gelewer:-

The interpretation of these words has lead to many drawn out arguments in court.

En dan wat die laaste betref mnr. die President, iets in verband met die verandering van bogrondse geleidings. Ek glo nie dat daar een munisipaliteit is wat kan sê dat hulle deur die Dept. Arbeid gedruk word in hierdie opsig nie. Ek het 'n brief uitgestuur van Hoofkantoor na al die distrikte, en gevra dat munisipaliteite darem immers net vir ons 'n program moet gee en moet sê, kyk, ons het vanjaar 'n 100 huise se geleidings verander en reggestel. Nou, daardie besonderhede waarvoor gevra is kom baie-baie drupsgewys in, indien dit van die meerderheid van munisipaliteite ooit inkom. So, ons weet nie waar ons staan nie, maar die dag gaan wel kom dat 'n mens sal moet druk van bo af om daardie dinge reg te kry, en dit as gevolg van die aantal ongelukke wat voorkom as gevolg van elektrokusie met bogrondse oorhoofse dakgeleidings. Meer in verband hiermee 'n bietjie later.

Bespreking van die referaaat deur mnr. Botes gelewer is voortgesit en die volgende persone het kommentaar gelewer:-

Mnr. J. K. van Ahlften, Springs
Mnr. R. W. Barton, Welkom
Mnr. E. de C. Pretorius, Potchefstroom
Mnr. P. P. Clark, Somerset Oos
Mnr. T. C. Stoffbërg, Pretoria

In antwoord op 'n vraag van mnr. Pretorius het mnr. J. G. Wannenburg, Department van Arbeid, as volg kommentaar gelewer:-

sal 'n baie moeilike taak wees. Wat die afdak betref, ek sou sê dat as 'n afdak teenaan 'n huis staan, of 'n gebou, dan vorm dit tog immers gedeelte van daardie gebou, net soos wat 'n gewone stoep van 'n oumodiese gebou wat ons het, wat nog metaaldakke op die stoep het, kan 'n mens nie sê die stoep is nie gedeelte van die gebou nie."

Mnr. P. J. Botes, Roodepoort antwoord op die bespreking van sy referaat soos volg:-

dit op dieselfde gebou betrekking het, maar in die Regulasie C.61 1(a) en 1(b) word dit spesifiek genoem, elke keer word dit uitgesluit, en onder Regulasie C.61 a(a) word ook persele waar masjinerie gebruik word uitgesluit, maar nie onder C.61 2(b) nie. Dit is natuurlik 'n kwessie van die interpretasie daar — ek sal nie daaroor uitwei nie.

In verband met die samewerking tussen die Departe-

ment van Arbeid en hierdie Departement, ek het nie gesê daar is geen samewerking nie, maar ek dink darem, mnr. die President, dat daar op verbeter kan word.

In verband met mnr. Clark se vraag, watter waardes daarna gestreef word in Roodepoort, wil ek dit net noem dat bogrondse pale, waar dit nou spesifiek laagspanning is, word die neutraal aan die paal gekoppel en die paal word dan aan die kouewatermpype geaard, of verbind. Sodat, waarna daar gekyk word is eintlik watter verbindingswaarde daar is tussen die paal en die kouewaterpyp in die straat. Daar word nie spesifiek aarddrade gelê nie. Die waardes, daar is, ons het getoets, maar dit is verskriklik moelik om 'n goeie aarde te kry, vernaamlik in strate, en die waardes variëer van 20 tot sê 50 ohms, wat baie hoog is. Maar dit is net 'n kwessie daar, dat as jy moet aangaan om aardrade te lê dan sal die koste van jou installasie definitief baie hoog wees, en 'n mens moet daar die middeweg volg, en ek voel dat hierdie metode om net aan die kouewaterpype te aard, jou goeie beveiliging gee.

In verband met mnr. Wannenburg se kommentaar dat dit nie die idee van die Departement was om al die bogrondse aansluitings binne dertig dae te doen nie; ek het dit nie so bedoel nie. Wat ek bedoel het is eintlik dat wanneer jy 'n sekere perseel se bogrondse geleidings wil verander in terme van die interpretasie, kon jy die aansluiting vervang, maar dan moes jy dadelik afgesluit het totdat die kêrel dit reggemaak het, of jy moes eers die aarde getoets het en daarna die persoon dertig dae kans gegee het, voordat jy die aarding kan doen. Ek het nie gesê dat alles in een maand gedoen moet word nie.

Mnr. die President, ek dink dit is al wat ek te sê het."

Mnr. J. G. Wannenburg (Dept. van Arbeid).

„Mnr. die President, ek is jammer dat ek weer mosterd na die maal is, maar Mnr. Botes en ek is ongelukkig van dieselfde munisipaliteit, en dit is daarom dat ons twee vandag met mekaar staan en baklei.

Ek wil net graag daarop wys dat mnr. Botes sê Regulasie C.61 2(b) verwys nie weer na die gebou nie. Nou, aan die manier wat 'n mens die Wet opstel, 61 2(a) as 'n mens dit lees, verwys dit spesifiek na die toetse wat gedoen moet word deur die leweransier, en dan sluit dit sekere geboue uit, en 2(b) gee die prosedure aan wat gevolg moet word deur die leweransier as daar enige foute gevind word. Nou dan, onder 61 2(a) is daardie selfde geboue outomaties weer nog 'n keer uitgesluit."

PRESIDENT: Thank you, Mr. Wannenburg.

If the last word has been said, we will move on to the next item on the Agenda, a brief paper by Mr. Tarchalski on "Electrical Protection with Special Reference to Earth Leakage".

Mr. E. Tarchalski (Heinemann Electrical S.A. Ltd. Affiliate) presented his paper entitled "Electrical Protection with Special Reference to Earth Leakage" which was published with the Agenda of the Meeting. He submitted the following coments:

Mnr. E. Tarchalski (Heinemann Electrical S.A. Ltd. Affiliate) lewer sy referaat getitel „Electrical Protection with Special reference to Earth Leakage", wat in die Agenda van die vergadering gepubliseer was. Hy lewer die volgende kommentaar: -

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"As an introduction to my contribution on the subject, I would like to refer to certain points which have been mentioned previously, and which is of course the purpose of this discussion today, and that is Earthing.

From the definition of the purpose of the earthing it would appear that it all boils down to one basic requirement, no matter how we look at it, and that is that the earthing is intended to prevent people from coming into contact with electrically live objects.

The methods of achieving earthing, and so forth, have been dealt with at great length, and that is all relative to the type of protection used and the rating of protection and so forth.

The question arises: what happens if, although the earthing on a fixed installation is there, in fact, and it is in good condition, yet the earthing to an offending appliance is altogether absent for any of apparent reasons, then of course the whole concept seems to be a little bit shaky, and perhaps this problem should be viewed more generally and probably a new look altogether taken at protection as such, earthing being one of the methods.

I sincerely hope that this contribution of mine will generate a useful discussion."

Mr. J. G. Wannenburg (Department of Labour) offered the following information:-

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Mnr. J. G. Wannenburg, (Department van Arbeid), het die volgende inligting verstrek:-

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"I have the annual report of the Labour Department in front of me, "Accident Statistics", and I am going to quote a few, all just on electricity.

Generation — we had no casualties during the year 1965 and no fatalities.

Transformation — there was only one casualty.

Transmission — 8 casualties and 3 of the 8 were fatalities, which represents 37%.

Distribution — 70 casualties, of which 19 were fatal. That represents about 34%.

Switchgear etc. — 41 casualties, and no fatalities.

In portable electric tools — 18 casualties, of which 8 were fatal, representing 44%.

Household appliances and installations — 28 casualties, of which 20 were fatal, which represents 71%.

Other electrical machinery (not household) 37 casualties, of which 5 were fatal, representing 14%.

I must point out that the high percentage on household appliances of 71% speaks for itself, that something along the line is definitely wrong.

From what we made out on the accident reports, and from the enquiries held into these reports, all 20 fatalities could have been avoided if earth leakage protection had been installed.

May I also read the article that it is intended to include only sockets and to cover only sockets by means of earth leakage protection? As far as I am concerned, either go the whole hog or do not do anything at all.

The reason why I say this, is for the many household instruments like washing machines, floor polishers, hair dryers, that I have seen in my life, do not work from a socket but from a light fitting. The only objection that I could see, as mentioned in the article — I cannot see that there would be any technical difficulties. I might be stupid, but I can't see that there are any difficulties. The only thing would be that if a fridge or deep freeze is loaded with meat and the resident is away and something happens, the power is switched off, then he loses something like 100 pounds of meat, if that is obtainable today. I think the person who argues that way should choose between his life and the loss of a certain amount of meat, or perishables, in a fridge.

I repeat, as far as I am concerned, and as far as the Labour Department is concerned, it is all or nothing."

Mr. A. A. Middlecote, S.A.B.S., made the following points:-

"If you set too low a level on earth leakage protection, you can get into trouble with certain fixed appliances, where in order to eliminate certain leakage currents in a practical way and still sell a stove at a reasonable cost, it just is not possible. This is due to the fact, (and Mr. Tarchalski has brought out a great advantage of an earth leakage protection system) that it does become the watchdog. If there is a deterioration of the insulation of any of your system, the earth leakage will come out.

We know there was quite a lot of trouble on earth leakage in the early days, when some were used at 5 to 7 milliamps, due to the fact that, even appliances like sewing machines, with a little carbon on the commutator giving a tracking path would trip it out. It is quite a good thing. It keeps people watching their appliances, but if set at too low a level it can be a nuisance, and that would negate the use of this very useful bit of apparatus.

When I read my paper, (I think it was 10 years ago, at Margate), I stressed the fact that round about 20/25 to 40 milliamps was quite adequate, because you nearly always have a parallel path to earth. For instance a roof gutter, in order not to trip a 20 amp relay, would have to have considerable insulation as an earth system to earth at 10,000 plus.

It means of course, that a body touching in parallel with that has a certain advantage, so even if the relay was set at 25 milliamps the body would only take 12 milliamps. But

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Mr. H. P. Smith, Benoni, gave the following information concerning development as regards high sensitivity differential protection in France:-

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"A specification for differential current balance earth leakage circuit breakers of medium sensitivity for installation on domestic consumers' switchboards was introduced in France in 1958 and the standard arising therefrom is still in force. This specification required operation at less than 650 milliamperes, but no tripping at 250 milliamperes and below. At 650 milliamperes tripping had to occur in less than 0.1 of a second. Designs on the market from various French manufacturers operate at between 300 and 400 milliamperes These

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Mnr. A. A. Middlecote, SABS, het die volgende argumente aangevoer:-

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it does protect against direct contact — Mr. Tarchalski is very correct there.

I think perhaps Mr. Wannenburg got the spirit wrong. I do not think it means that you should eliminate necessarily light circuits. I think the idea is that you could eliminate light circuits, because by regulations you are not supposed to operate appliances from lighting switches, but that would present no problem. The real point is to keep your stove away, because a stove is a fixed installation, and it is well controlled, and unfortunately, it has a habit, when you come back from holiday, of having moisture on certain parts of it, which quickly dries out, but which will give a leakage current of something of the order to trip an earth leakage relay.

One final little point that I must stress. I brought it up at Margate. Earth Leakage Protection as offered protects against practically every contingency. It is undoubtedly the best overall protection. There can be no doubt about that. But please appreciate that on a multiple neutral earthed system, it does not protect against a broken neutral. It is on the wrong side, and if the neutral breaks further along the line and you touch the neutral or your earthing point, you are in trouble and the earth leakage relay will not help that, but it is a small point; it is a point which warns you against extra precautions . . . if you have a multiple neutral earthed system make sure you secure it against a broken conductor or else, (as I say, I do not like the PME), — rather go to the continuous earth, or some other system."

Mnr. H. P. Smith, Benoni, het die volgende inligting in verband met differensiële beveiliging met hoë sensitiwiteit in Frankryk verstrek:

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give protection against indirect contact. French experience was that accidents due to indirect contacts were few compared with those due to direct contact, which accounted for 60% of the casualties.

Electricity de France accordingly began research work and a specification was prepared for highly sensitive earth leakage circuit breakers. The basis of the specification was tripping at 30 milliamperes but not at 20 milliamperes differential current. Tripping had to occur within 1 second of 30

milliamperes, 250 milli-seconds at 40 milliamperes, 100 milli-seconds at 60 miliamperes, and 30 milli-seconds at 300 milli-amperes and above.

Initial research was concluded at the end of 1960 and the interested manufacturers were consulted by Electricity de France. One manufacturer was able to produce equipment which complied with the specification and received an order for 10,000 of these units.

Electricity de France specified that these differential circuit breakers were to be provided with two settings, viz. 25 milliampere and 350 milliampere, with a provision for sealing of the unit at either sensitivity.

The reason for the 2 sensitivities was to assist Electricity de France installation team when investigating anticipated inherent earth leakage conditions in domestic premises.

The unit when first installed would be set at 25 milli-amperes, and if on closing the circuit breaker it tripped on earth leakage, the sensitivity would be changed to the three hundred and fifty miliampere setting, and the circuit breaker would be closed again. In this way Electricity de France hoped to analyse the Earth Leakage conditions prevailing in an installation.

These 10,000 units were delivered to Electricity de France in 1961 and were installed principally in the coastal areas along the English Channel, le Havre and Boulonge areas, the Mediterranean coast, Marseilles as well as in Paris.

The majority of the premises chosen for the experiments had electrical installations which were older than 10 years. The two main objects of the exercise were:

(1) to investigate the installation practice of the sensitive units which were designed to comply with the specification; and a study over a period of continuing conformity to the specifications.

(2) Demands imposed by different installations as regards climatic conditions, different applications, age of wiring and appliances, and inherent leakage of installations.

Initial findings on installation. On commissioning with the unit set at 25 milliampere sensitivity faults were found on 4% of the installations; these faults were located and it was found that two thirds were on fixed wiring, i.e. insulation failure in metal conduit, nails driven through conductors in wooden skirtings, as well as fixed connected apparatus such as switches and plug sockets, and one third of the faults were in electrical apparatus, stoves, washing machines, light fittings. These faults could be easily rectified.

In the case of installations which were successfully commissioned at 25 miliampere sensitivity, there were subsequent trippings on 150 installations. On locating the faults it was found that about 100 were in fixed wiring, and 50 in appliances. The faults in the fixed wiring were usually caused by moisture on outdoor conductors, as well as on insulated conductors behind the wooden skirtings in moist rooms, such as kitchens.

These faults manifested themselves especially in the Marseilles area after thunder storms and heavy rain.

Eventually there were 1.5% of the installations where the differential circuit breaker of 25 milliampere sensitivity could not be put into commission at all. In 12 cases even the 350 milliampere unit could not be used.

In all centres it was found that after several months, during which time a small number of faults had to be cleared, the installations were healthy and earth leakage trips were very seldom.

In certain areas a regular sensitivity test of 2000 units was conducted over a period of from 1 to 2 years. The results of these checks showed that the variation of sensitivity from the mean of 25 milliamperes was at the most plus or minus 4 milliamperes, less than 1.5% of the units tested tripped either below 20 milliamperes or above 30 milliamperes. About half of this percentage was below 20 and half over 30.

An essential but very difficult factor to establish is whether a person, when coming into direct contact with live apparatus, has been saved from electrocution or severe electric shock when the earth leakage device operates.

Persons causing tripping of the unit by unauthorised working on live wiring or apparatus will obviously not tell anybody about it. Nevertheless, during research on the units in commission, 6 cases of tripping through the contact of human beings with live equipment came to the notice of Electricity de France; two portable lamps, one was a metallic standing lamp, 1 was a socket outlet; one was a portable drilling machine, one was an electric gas lighter. The persons in question stated that they felt the electric current, which means that a current in excess of 25 milliamperes must have flowed through their body in order to cause the relays to trip. Without being sure that human lives have been saved, we are certain that the earth leakage relays performed their duty as there was no damage in after effects to any of these persons.

It can also be stated that during commission of the relays, defective appliances and installations were located and corrected, thus eliminating future possible danger to lives.

The result of the research at the present state is encouragaing, and is being continued by Electricity de France. Further units of high sensitivity have been ordered. (In September when I was over in France the figure was put at about 40,000 of the high sensitivity installations for installation on domestic premises).

In spite of the fears in certain quarters, this work has been carried out with a minimum of inconvenience to consumers. The exercise has also shown that the protecting of old instalations with earth leakage relays at high sensitivity is a practical proposition."

Mr. M. van der Spuy, C.S.I.R., amplified the remarks made by Mr. Smith by stating that Electricity de France have stipulated that no earth leakage relay is to be dependent upon a supply itself for tripping. In other words it must have some

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Mnr. M. van der Spuy, W.N.N.R., het aanvullend tot die opmerkings van mnr. Smith gemeld dat Electricity de France verorden het dat 'n aardlekrelê nie afhanklik moet wees van die toevoer om dit uit te klink nie, m.a.w. dit moet

storage device incorporated in the relay so that tripping takes place in the normal way without having to draw directly from the supply. This requirement has apparently been introduced in a number of countries.

Discussion on the paper proceeded and the following contributed:-

Mr. C. Lombard, Germiston.
Mr. G. J. Muller, Honorary Member, Bloemfontein.
Mr. E. deC. Pretorius, Potchefstroom.
Mr. D. Baker, Germiston.
Mr. G. R. Hain, Alberton.
Mr. D. Haig-Smith, Cradock.
Mr. M. van der Spuy, C.S.I.R.
Mr. J. I. Inglis, Pietersburg.
Mr. P. J. Botes, Roodepoort.
Mr. E. E. de Villiers, Bloemfontein.
Mr. F. Stevens, Ladysmith.
Mr. J. L. McNeil, Stanger.
Mr. W. Bozyczko, (Associate Member), Bramley.

The majority of the Engineer members who took part in the discussion drew attention to the various practical difficulties encountered when such protection is installed.

Mr. A. A. Middlecote, S.A.B.S., offered the following comment:-

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"Mr. President, with regard to the stoves; I think there is a little misunderstanding. I stated that on the stoves, if you go for the very sensitive you are likely to be in trouble, but there it is a matter of selecting your level.

I pointed out, I myself in Margate, stated that anything from 25 to 40 was adequate. That was my own opinion. It was subsequently lowered in committee discussions in the Bureau, but then we are democratic and we do not ourselves dictate what the levels should be. I personally feel that a higher level is warranted.

If you take the higher level you can include a stove without such a lot of nuisance tripping, but the only point is, I was warning that if you go for 5 milliamps, then it becomes almost impracticable, because, unless you go for a very expensive stove, the stove within the normal person's reach, under present circumstances, the leakage from the plates, especially if they have not been used for a week or so, are such that you can expect tripping.

That was my point; not that I ask you to eliminate stoves. If you select a sensitive earth leakage relay then naturally I think you have to exclude the stove, and I think the statistics will show very few troubles from stoves. That I must challenge.

With regard to the PME: I think the criticism was unjustified, because he said "Under certatin circumstances of load". If you have a PME there are circumstances under which you break the conductor and this earth leakage trip won't work.

een of ander ingeboude opgaartoestel hê sodat dit normaalweg sal uitklink sonder om direk van die toevoer energie te trek. Hierdie bepaling is blykbaar in heelparty lande ingevoer.

Die referaat is verder bespreek en die volgende het bydraes gelewer:

Mnr. C. Lombard, Germiston
Mnr. G. J. Muller, ere-lid, Bloemfontein
Mnr. E. de C. Pretorius, Potchefstroom,
Mnr. D. Baker, Germiston
Mnr. G. R. Hain, Alberton
Mnr. D. Haig-Smith, Cradock
Mnr. M. van der Spuy, W.N.N.R.
Mnr. J. I. Inglis, Pietersburg
Mnr. P. J. Botes, Roodepoort
Mnr. E. E. de Villiers, Bloemfontein
Mnr. F. Stevens, Ladysmith
Mnr. J. L. McNeil, Stanger
Mnr. W. Bozyczko, (assessorlid), Bramley.

Die meerderheid van die ingenieurlede wat aan die bespreking deelgeneem het, het gewys op die verskillende praktiese probleme wat ondervind word wanneer sulke beveiliging geinstalleer word.

Mnr. A. A. Middlecote, S.A.B.S., het die volgende kommentaar gelewer:-

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The question about the specification — it was purposely split by the committee because there are circumstances where you want a separate specification just for the earth leakage relay, but you might want it to operate some other apparatus. But it gives much more flexibility and really if you work it out I do not think in an engineered design it would lead to any misuse whatsoever.

When you come to these statistical figures, the trouble is that death by electricity is of a statistical nature. There are 5 circumstances which must coincide — you must have a fault, your protection must fail, you must touch it, you must be earthed when you touch it, and you must have a certain value which will either lead to death or circumstance.

There is a probability factor in all those features, and if it is 1 in 10 to each of those, then it is 1 in 10 to the lot, and that is why really electrical accidents throughout the whole world are not as bad as we, as idealists, make out. In fact more people are killed in the home taking poison accidentally than are killed by electricity but that is just to show how good we are in our approaches!

But the big point is that when you come to the analysis of the exact current you can get into trouble because you can freeze on to a circuit at some of the lower values, but that so seldom happens.

I think the experience in France has shown that the 25 milliamp 40 seems to be quite a good level, and I think it is only on statistical approaches such as those that one can fix these levels."

Diverting from the technical aspects of earth leakage protection, Mr. J. C. Wannenburg, Department of Labour said:-

"I am quite sure that all of us here would agree that if you go to the average man in the street, and you talk to him about an earth leakage protection device, he would look at you and say, "Now what is that? It it a potato or what is it?"

What I would like to ask the representatives here today — what would they do in their own municipalities to inform inhabitants in the towns what can be done to prevent accidents at home? Speaking from personal experience, people I have spoken to, don't know what it is, and I have taken many of them to my home and demonstrated what could be done and how earth leakage protection could save an electrical accident at home.

I can also tell you that I have come across many people who ask me, "Why do they always put three leads in a core,

Commenting on the remarks by previous speakers Mr. M. van der Spuy, C.S.I.R., said:-

"Mr. Wannenburg has put forward the point that we should try and put before the public the dangers of using electrical apparatus.

I agree with Mr. Middlecote who said that really it is not all that dangerous when you consider the number of fatalities, when you compare the fatalities of any other nature — 10 people per day killed in motor car accidents, etc.

There is the danger, (and this has been expressed by a number of people), that the public will become so scared of

Points in the discussion were dealt with by Mr. Smith, Benoni, who contributed as follows:-

"Firstly, Mr. McNeil's remarks re: coastal areas. If you recall from the experiments conducted in France, most of these units were installed in the coastal areas in order to determine the effect of inherent leakage in installations due to salt-laden atmosphere.

Also arising out of whether we provide sensitive current balance protection on a complete installation, or whether we limit it to the plugs only, on the theory that usually your fixed installation is well earthed, and does not represent as great a source of danger as your portables, may I be permitted to quote statistics, again from overseas, this time from England?

"The results of electric shock investigations conducted over the four year period 1960/64 by the North Western Electricity Board in England.

Mr. J. G. Wannenburg, Department of Labour, concluded his contribution as follows:-

"Mr. President, in reply to Mr. de Villiers, I would like to state that to a certain extent we have already legislated as

Mnr. J. G. Wannenburg, Departement van Arbeid, het van die tegniese aspekte van aardlekbeveiliging afgewyk en gesê:-

when the green one does not mean anything at all. When you touch it nothing happens: wheras if you touch one of the others something will happen — you get a nasty kick — and it is a damn'd nuisance, because if you couple the green with the red or the black you keep on tripping out your lights, or something like that."

It is something that should be thought of very seriously, to bring it home to the man in the street, and tell him that there is, so to say, a policy which he takes out against his own life.

If we do something like that, then we are really doing something constructive, otherwise technical talk means nothing — unless you bring it down to the man who needs the benefit of the technical talk."

Mnr. M. van der Spuy, W.N.N.R., het die volgende kommentaar gelewer op die opmerkings van vorige sprekers:-

using any electrical apparatus, that they would rather turn to gas, or other means of getting what they require, and it might be better to do it by legislation or through the engineers or the contractors, who actually do know what they are doing and what they are talking about, and to provide the necessary protection rather than leave it to the householder who, in the first instance, does not know what you are talking about. It will take a long, long time to educate them to having these installed."

Punte uit die bespreking het die volgende bydrae van mnr. H. P. Smith, Benoni, ontlok:-

"Of 1109 cases of electric shock investigated on consumers' premises, the following results are reported: Firstly the equipment from which the electric shock was obtained, and then the number of cases:

Consumers' apparatus	609
Consumers' fixed installations	454
Equipment at service position	46
More detailed examples of shock sources within the above totals are:	
Electric cookers	213
Washing Machines	133
Socket outlets	103
Electric fires	40
Lighting fittings	21
Radio and TV sets	17

Mnr. J. G. Wannenburg, Departement van Arbeid, het sy bydrae soos volg afgesluit:-

requested by him. If you read regulation C.59 it requires that no user shall permit the use of, and no person shall use a

portable electric hand tool, unless the system is fitted with earth leakage protection, or double wound isolating transformers, or high frequency source of supply, or else double insulated hand tools.

You might say that this is for factories only, but whether you use a portable hand tool like a hand drill, or a hedge cutter, which is also driven from an electric drill — whether you use it at home or at a factory or in a garage, it is exactly the same tool, so by implication I would say that we have already, in a small measure, legislated for that particular thing."

Mr. E. Tarchalski replied to the discussion as follows:-

"First of all I would like to thank the contributors for their contributions on this subject. Apparently in spite of what I said, there is still a difference of opinion about various aspects of this type of protective device, such as application, sensitivity and so forth. This is also in spite of the existence of a national specification which has been compiled by people who were fairly well versed in the subject of earth leakage protection.

First of all, Mr. Wannenburg has made the statement that he would like to see "all or nothing". I wholeheartedly agree with him; it could not please me more than to see everything protected — nothing should be excluded. But here I think we are touching on a subject which is more theoretical than practical.

When I suggested socket outlets only, I spoke from experience which I have gained in association with the firm, and I must say that I cannot agree, wholly about this being all or nothing.

In the first place we are endeavouring to increase our level of protection, and from all the records that are available, I could only conclude that most of the dangerous hazards from electricity existed with portable appliances, which were actually fed from socket outlets. I do not recollect any fatality reported in the last five years or so which took place from a fixed installation, unless the installation had been tampered with.

There were also cases reported in the newspapers where somebody was electrocuted from a stove, but on investigation it proved that the stove was actually a good earth, and some other portable appliance was actually responsible for having an exposed live metal.

It is, of course, desirable to have everything on, but once we go into whether it should or should not be, I don't think there can be any conclusion reached on the subject.

Mr. van der Spuy mentioned power independent earth leakage circuit breakers. Here again, this is something which is ideal, and which we are striving for. Does this really mean that only this type should be considered?

Let us look at it from this aspect: we do know a certain amount about dangerous potentials to an average human being. As a matter of fact, there is a B.S. specification which does treat this matter, and it is potential earth leakage circuit breakers.

From there we gather that voltages up to something like 40 volts are not considered dangerous to an average human being. Let us say that a power assisted device operates down to this level of voltage. That means that anything that is in the danger area, if the power resister device itself

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Mnr. E. Tarchalski het die volgende repliek gelewer:-

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operates below that, the voltage itself is not dangerous. This is another aspect of this problem.

Mr. Lombard asked about the nuisance tripping on the PME system, presumably where you have a lot of circulating currents of all sorts. There is one point: when we consider a typical domestic instalation, I believe that the PME is PME up to the distribution board supply point, and not beyond disribution point, it is not a PME. That means the neutral is not earthed anyway beyond the distribution point, so from that aspect, this part of distribution, which is a household distribution network, is actually a non-PME type.

Of course, any curents returning through the earthing wire do not get protected by the device.

Fluorescent lighting fittings. It always depends on the quality of the devices. There are cases where the number of fluorescent lighting fittings installed is so great that the suppressor condensors connected from light to earth amount to quite appreciable current, causing eventual tripping.

There have been cases reported where fluorescent lighting fittings trip an overload circuit breaker, let alone an earthing device which is extremely sensitive.

Mr. Smith quoted quite a few figures and ideas from Europe, particularly France. We must also realise that in Europe the conditions prevailing are considerably different as compared with South African conditions.

In the first instance, in France, cooking by electricity is rather a rarity, most of it being done by gas. Their usage of electricity is also limited. Anybody who has come in contact with these devices knows that their curent ratings are in the region of about 15 to 20 or 30 amps as a maximum. When we consider an average household installation in South Africa the main cut-outs is in the region of from 50 to 80 amps. That is quite a different story.

The French authorities have legislated from 600 milliamp units. I think that, at this point, it is necessary again to re-stress the purpose of the various earth leakage devices. In the first place, on the continent people have a lot of difficulty in obtaining a good earth which is a primary method of protection, and in consequence they have resorted to the use of current balance circuit breakers, and these have a sensitivity of something like 600 milliamps or so, or 350. Those are just figures quoted — it is neither here nor there.

The main purpose is to compensate for the lack of adequately low earthing, which is quite a different story when compared with the protection of people against direct contact with electricity, so these relays, which are also used extensively in Germany, are legislated for, and it is compulsory to have such a device on every installation. The device is to make up

for, shall I say, lack of good earthing, which is difficult and more costly to achieve. Probably economics come into this aspect, too. The two settings came about in an interesting way. They did find that in spite of all their efforts they still had cases of electrocution, and these cases arose, not because the earthing was still inadequate, but because there was no earthing on these appliances through which electrocutions occurred. Therefore they instituted this experiment. They said, "We have the insensitive unit already installed; let us make it sensitive, and if it works it will give us some idea, but if it doesn't you can de-sensitise, and the de-sensitising means is accessible to the public."

Whether they do it or not is immaterial, but it can be de-sensitised to a lower level, which is going back to the basic requirement. . . . . .

The percentages quoted in the number of nuisance outages, and so forth, while a useful guide, it can be useful only as far as we keep in mind that the practice in other countries is considerably different from the practice in this country as far as the usage and the extent of the usage of electricity is concerned.

Mr. Pretorius has mentioned one integral unit, where de-sensitising or disconnection is not possible. That is something which is very interesting, which could be discussed ad lib. It has merits, basic merits, but I maintain that the approach is something which I somehow cannot understand. We are trying to make the device foolproof, to prevent people from disconnecting these installations. After all it is a fixed installation, and the lay public should not be able to get at it.

You can make a device fool proof, you can't make it idiot proof, and anybody who intends to disconnect, even if the device itself is one unit, they can still bypass and do all sorts of funny things.

Regarding stoves on circuits. This is something, as I said before, I would like to see on, although I did not come across any cases of fatalities from stoves, except where the stove actually was a jolly good earth.

Mr. Middlecote has mentioned that probably these stoves would work quite well. Let us look at it this way: there is a specification for an appliance, and the specification states that so much leakage current is permitted per one heating unit, or per unit, and this, at times, may even accumulate, or a number of appliances may accumulate to well above the sensitivity level of a sensitive earth leakage relay, and for the sensitive relay I mean the one which is intended to give direct protection to people, and for no other reason. We must distinguish these two points.

So even if we have this condition of a stove having very low leakage currents, (I have come across fantastic stoves, something like 1.5 milliamps all in all, with 6 heating plates, and various other things), what is going to happen later on? That is the worrying question. All these things are relative. One can say that the area of danger is smaller here than there, but all this is based on statistical performance.

If you say that danger from a certain appliance is less than it is from another, you can carry this argument further, and say, "Some people can withstand more shock than others", and no matter what we do we always find places where somebody just can't take it, or some appliance is still offending.

There is no ideal solution to all our problems in one magic box. The intention is to improve wherever we can and the onus is on us to give this improvement; — to give this protection and to improve on it.

As far as the sensitivity of these units is concerned, as I said before, I think we must distinguish between the two levels, the one being the sensitivity required for an average human being, (again for an 'average' human being), against direct contact with electricity, and it was my impression that a lot has been said on this subject, and a fairly good conclusion has been reached by various bodies overseas as to the level — it boils down to something like 25 milliamps that an average human being can take; and I think that Mr. Middlecote has mentioned that he stated in a previous paper something like 40 to 50 milliamps would be acceptable.

Well, it is acceptable — up to a point. Fewer people would be able to take it, so many more people would not be able to take it. If you take a sensitivity of 15 milliamps there are still people who cannot endure this amount of current, who can't let go.

Probably there are cases, if one were able to analyse these in detail enough, where people could get hold of even 2 milliamps. We do not know. It is something which is an unknown factor, but we do know that the performance is statistical, and an 'average' case is the one which is normally taken into consideration.

Mr. Wannenburg has also mentioned about enlightening the public about earth leakage, or educating the public generally. This is also an ambitious project. I feel that something could be done, but it is a difficult project and a difficult task. There is enough difficulty in educating contractors about this type of device, and all the intricacies of its operation, let alone the public.

Then there was further mention about the degree of reliability — Mr. Stevens mentioned that. As with any new device, and particularly a device of this calibre, there are teething problems in the beginning, and these are being attended to. There are thousands of these units in operation and they have been operating successfully for years and that gives us a feeling of reliability, and I am sure a lot of you here have had a lot of personal experience with the reliability of these devices.

There was also a question earlier on about advising the public and then slowly asking the public whether they would like this earth leakage relay. I think these are completely different points. People do not know enough about this in order to express their opinion whether they want it or not. However, there is a firm in existence in Johannesburg, which puts across to the public the idea of this earth leakage protection, and does it in group fashion, by getting groups of lay public together, and explaining to them how these devices operate and so forth.

Mr. Smith also stated statistics from England and as I said previously, while they are very interesting statistics, and

I'm sure give us quite a lot of insight, I again point out that the practice is different in every country. There is one practice which is coming into this country which I believe is British originally, and that is the cooker connector, where there is a socket outlet provided on it, so you may have, in the proximity of a very good earth, which is a permanent appliance, a stove, any other such as a kettle, toaster, or food mixer, whatever it is, which very often is energised by means of two cores, without any earthing, so the first break down and livening of a metal enclosure gives you a direct hazard, because it is so near to the stove, which is a jolly good earth."

Concluding the discussion on the subject of "Earthing" the President referred to the interesting papers presented by Mr. Stevens, Mr. Botes and Mr. Tarchalski. Appreciation was expressed to them for their valuable contributions.

The Meeting proceeded to deal with item on the Agenda "Rights of Supply" and the following is a verbatum transcription of the discussion:-

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Ter afsluiting van die bespreking oor die onderwerp „Aarding" het die President verwys na die interessante referate wat gelewer is deur mnre. Stevens, Botes en Tarchalski. Waardering is teenoor hulle betuig vir hul waardevolle bydraes.

Die vergadering het hiernà na die volgende punt op die sakelys, „Voorsieningsregte", oorgegaan en die volgende is 'n woordelike weergawe van die bespreking:-

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TRANSCRIPTION OF THE RECORDED DISCUSSION OF RIGHTS OF SUPPLY AT TECHNICAL MEETING

PRESIDENT: Gentlemen we will now proceed to the next item on our Agenda — Rights of Supply. I will ask Mr. Percy Giles if he will open the discussion on this subject.

Mr. P. GILES (East London):

Mr. President, this Rights of Supply report which you see under my name is the result of a considerable amount of discussion with my colleagues on the Rights of Supply Committee, and I wish to thank them very much indeed for the assistance they have given me.

The matter of this Rights of Supply arose not at our initiative, but at the initiative of the United Municipal Executive, which we know is a body of councillors, dedicated presumably to municipal business, and they asked the Association to send along representatives while matters in reference to the Electricity Supply Commission and the Electricity Control Board were under discussion.

As a result, these notes that you see here, epitomise, as best we can, the discussions; they were very verbose some of them, but the points are enumerated and I think we have them all lined up.

They submitted to this meeting for the consideration of members, for them to pass comments and tell us if they agree with what the councillors say, what further action we should take about it, and generally to open up any questions in regard to it.

Obviously, as engineers, we have, from time to time, come across instances of some sort to which these points relate — extensions of supply, increases in costs of tariff, various factors where, apparently difficulties arise, and if any member has a special point which he wishes to raise under these various headings, the committee would be very grateful to have the information.

I leave the matter here, sir. If you wish to discuss the points seriatum, I will do so, or whatever you require from me, here onwards.

THE PRESIDENT: Thank you Mr. Giles. This matter is now open for discussion.

Dr. N. TROOST (Electricity Supply Commission):

Mr. President, I have read this report with interest, and I feel it is rather up to us to point out that this report gives the impression that ESCOM is compelling, or endeavouring to compel municipalities and other bodies to take a supply or future supplies from them.

In all fairness, I think it should be pointed out that such is not the case. When it comes to giving a supply to any authoritiy or establishing a supply in any area, ESCOM does that in free competition with other authorities.

In other words, if a municipality comes within reach of an ESCOM supply system, and wants to make up its mind whether to extend its own generating facilities, or take a supply from ESCOM, the procedure is to find out what supply terms ESCOM has to offer, compare it with the cost established by the municipalitiy's own consultants of extending the Power Station, or building a new Power Station, or whatever the case might be, and whichever is more economical, they are entirely at liberty to adopt. There is strict provision in the Act for freedom and liberty in this regard.

I do not think that this report implies that that is not so.

The second point in this report is about the enormous capital cost of the Orange River and the use of the electrical generating potential from these dams to pay for the dam, or to help to pay for the dams.

The implication here is that ESCOM, in conjunction, presumably, with the Water Affairs Department, is rather trying to get the last ounce out of this project at the highest possible price in order to assist in financing this effort.

Here again, I think the truth of the matter is that ESCOM only charges what the thing is worth; you can't sell

power unless you sell it in competition with other potential sources, and any tariff that is established on the Orange River, or from the Orange River Undertaking, will only be in comparison and guided and established by what the cost is going to be from other sources of supply. As a matter of fact the criterion that has been laid down for this, is that the cost of power in the Orange River is going to be no more than it would be if the same amount of power were transferred to the Orange River from the cheapest potential source, that is the power that is generated up in the Northern Coal Fields.

This, I think, is quite clearly brought out in the second White Paper on the Orange River, and I don't really think, Mr. Chairman, with all due deference that what is stated here really reflects that position. It seems to me to have a definite slant.

I have already spoken about the Local Authority not having any compulsion laid upon them by ESCOM, or anybody else — by the Control Board in monopolising the supply, and I think it must be emphasised under (d) that the Electricity Act of 1923 very definitely establishes this right of the Local Authorities to develop their electric supply industry in their own areas, just in the way that is stated here that it should be done. I think this is already entrenched in law.

In regard to point (e) on this: I don't know that I could really say much about that, except that ESCOM only acts as a consultant to the Provincial Administration, and as far as the legal side of it is concerned, they are only advisers, they are certainly not in a position to tell the Administration what to do. And, in fact, it is generally found, I think, that the Administration makes up its own mind what it does about ESCOM's reports as well as what it does about the municipal reports.

I think that is about all I can say in an effort to put this in a little better light from ESCOM's point of view.

THE PRESIDENT: Thank you Dr. Troost.

Mr. G. J. MULLER (Honorary Member, Bloemfontein)

While we have the Commission with us, I would like to ask a question or two.

I have been recently in the south western parts of the Free State where the towns are very small, and as a matter of fact, three of them average about 160 kilowatts.

These, I presume, will all be very soon, within the compass of the Commission's supplies. I would like to ask as a matter of principle, are the Commission against, or are they neutral to, shall we say, municipalities grouping, and taking a communal supply for three or four towns, and arranging the distribution amongst themselves as best they can. The thought behind it of course, is that the extension charge for a group supply like that must necessarily be smaller than for an individual, especially where it is so small and hardly worthwhile tapping their high voltage lines for.

If the Commission is against the principle, one would, more or less like, as a matter of information, to know what the basic thought is as to why this grouping should not be done.

Mr. H. J. DE VILLIERS (ESCOM):

Mr. President, I think I will start by replying to the last question.

The Comimssion is not prepared to operate on the basis of certain groups taking a bulk supply and then distributing it amongst themselves. Each and every consumer must take a supply. That, we feel, is in the interest of all the people concerned. Once you start grouping, you never know where it is going to end. You could get the mining industry grouping, and find industries groping, and in the end you would run into such a mess you wouldn't know where to start and stop with this grouping.

So the policy is to supply each and every consumer individually.

Dr. Troost commented on paragraph (e) that it is undesirable that ESCOM should be the advisers to the Administration. I am inclined to agree with this. I feel there should be an independent body to give this advice to the Administrator.

You have the Consulting Engineer putting forward his case; you also have, in opposition sometimes, ESCOM putting forward a proposition.

Each and every person is inclined to put his case in the most rosy possible terms he can find. You must have an independent body, but you must have an independent body with knowledge of costs — what does it cost to put up a Power Station? And until you can find such a body in this country I cannot see a change from the present position.

ESCOM I think, has the widest experience in the building of Power Stations in this country, and in the operation of them. I think that this is the body, at this stage, that can give the best advice to the Administrator.

Sometimes you have estimates that are on the low side. ESCOM is in a good position to criticise those estimates. I cannot visualise another body in this country which can do it, Mr. President; so when I say it would be the ideal position if we had an independent body to advise the Administrator, I don't think we can do better than we are doing at the present time.

Dr. Troost also mentioned that we don't insist on any Local Authority taking our supply from us. All we do is put forward a proposition. The Administrator is involved. I can put it to you this way: In nearly every case where it is a smaller power station or a diesel power station, then our offer is accepted readily. In fact, the smaller places pester us to come to their areas, full knowing that they will get a better tariff.

When we get to the bigger municipalities, they are inclined to think in terms of extending their own power stations. To me it is all just a question of pure business sense. If you can buy power elsewhere, I think this as a pure business man — why go and do something else that is going to cost you more? Why go and buy a Chev car for R3000 here if you can get it for R2000 there? It is all just a matter of £.s.d. That is how I look at it.

Now the Commission has advanced in the last 30 years,

and is building bigger and bigger power stations. We are about to issue enquiries for 350 MW generators. We have planned a network from the Eastern Transvaal, via the Reef, right down to Cape Town. I think I can make this statement right now, that anybody along that route cannot produce power for itself at the price that ESCOM can make it available.

People like the town in the north, Louis Trichardt, — they have approached us for power. It is not near our network. We can extend the network to that place, but the cost will be higher than local generation. So we tell those people. "We can bring the power there, but it is not going to be economical. You build your own power station, or extend what you have got." And this is the way we go about things.

Then you have other municipalities who want to extend new power stations. We have a power station at Kimberley which we extended. We knew 10 years ago it was not going to last a long time. We brought two sets from Durban, in fact they were in the original Alice Street, built in 1928, but we knew that Power Station was not going to last long; it is going to be shut down this year. It would not pay to run that power station. It is cheaper to run the power by wire.

Then you have another municipality, also interested in extending, which has a machine on order, which machine in my own personal view, may run for five years, and then stand for 25 years while it is being paid off, because that power by wire is going to be cheaper.

To me it is all just a question of £.s.d. I don't think there are rights involved here. (I am talking about the power supply now, not the areas of supply).

I don't think it should be considered that the municipality has a right to develop its own power. Obviously it is a right, just as you have the right, Mr. President, to go and pay R4000 for a Chev car. If you like nobody is going to stop you, but I don't think it is sound business policy.

So that is the way I see it now. Each and every municipality or local authority reaches the stage when it does not pay that local authority to generate power any longer. They are not all in that position. I did mention the town in the far north; there are others in the far west, and south east of the country. But people along the route from Cape Town to the Transvaal coal fields — I don't think any local authority can generate, with new plant, cheaper power than ESCOM can make available today Mr. President.

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

The Orange River won't generate power before 1971, but the power network is being extended from the Transvaal Coalfields to Cape Town. It will go through or near the Vanderkloof Dam, and a major step down sub-station will be at De Aar, and that power will become available in 1969.

Then we come to (h). Steps should be taken to rectify known defects in the Electricity Act. I must say that I personally don't know of many defects in this Electricity Act. I think it is a very sound piece of legislation that was brought into being — that is the original Act, many years ago — and there have been very few modifications, and those modifications were not really necessary . . . or at least that the indications were that there were not too many modifications required in the 40 years or more of its existence.

There was one other joint in (d). The desirability of developing the electricity supply in the national interest is conceded. Now this national spread we feel is going to be in the national interest, and these big major power stations we build are in the national interest, because the cost per kilowatt installed, or the operating costs are down, and where you have on the agenda, the shortage of technical manpower Mr. President, I think that having many smaller stations around this country, especially in the northern parts, each with shift engineers, and more and more staff, is not in the national interest. We should operate a few major power stations that can supply the whole country, using the least number of technical men for the purpose.

The proposal is now to augment supplies in Natal, also with a connection from the Transvaal via Newcastle to Durban. That part of the country will also be supplied from the national thread.

The next development which we hope can go through and will be in the interests of all parties concerned, is a major network link from De Aar to the Eastern Province, a point probably near Cookhouse from where it will be further distributed to the other Undertakings.

Mr. Chairman, I would just like to conclude my remarks by saying that ESCOM is doing everything it possibly can to operate at as low a price as possible. There are no profits, as you know — it is cost price. It has been mentioned here that there must be competition otherwise you won't be able to weigh up whether we are doing badly or operating economically but there are these figures from overseas organisations. All you need to do there is make allowance for the higher coal cost, and you'll get a good comparison.

ESCOM has in its employ a large number of very highly qualified engineers who know what is happening in all parts of the globe. We have, on an average, one person outside this country keeping abreast of all the major developments — on an average. We may have three one month, and two without any, but on an average it will work out to one highly qualified engineer per month. And we feel that we are giving a service to this country that is second to none.

When we advise, or put forward a proposal for a local authority, we go there because we honestly feel that this municipality can do better by taking our supply. It is not a case of our wanting to grab everything. We are not going round with sales talk, and we are not trying to eliminate all other operators, but if you were in my position, Mr. Chairman, and you get a proposal from a municipality and you know, for a fact, that the firm that you represent can do it . . . we have our standard tariffs, and we have to have certain adjustments at certain times on these tariffs for certain reasons . . . and you know you can do it better, then surely it is only right that ESCOM or myself should tell the Administrator, "This is what they can do, and this is what ESCOM can do". We don't go further than that; it is left to the Administrator. The Administrator has not already sided with us; he didn't decide

with us for the additional machine for Bloemfontein. (I can mention other occasions also). But we feel in each case we have done our duty, and in each case in future we will do our duty, and that, Mr. President, is, I feel, the way a national body like ESCOM should operate. It is not interested in any particular part of the country. We have no financial interests anywhere. We are merely carrying out the work as responsible officials as required by the Electricity Act.

Thank you Mr. President.

THE PRESIDENT: Thank you Mr. de Villiers. Is there any further discussion?

Mr. R. LEISHMAN (Johannesburg):

Mr. President, and gentlemen: I don't want to say too much on this subject, but the point in rising to my feet is to try and clarify some of the things that I have some slight fears of in South Africa.

I feel that there is no question at all that one and all of us compliment ESCOM very sincerely in the tremendous strides they have made in recent years, with their very bold planning, and the very rapid rise in the size and economy of their generating stations.

The fear I have is that a lot of the ground that has been gained can be lost by transmitting power — or distributing or reticulating power, in the tremendous and vast empty spaces of South Africa. We are a very different country to northern and western civilization; we have a very small population. I think we can say the Bantu consumes power in a very slight manner at present, and that not all of our 3 million European population are consumers — at any rate as yet.

I fear that we may get ourselves into the situation that electrical engineers are too prone to fall into — and that is to worship cost, and cost alone, without thinking of other considerations.

One of the things which is germane to this matter, is that the larger municipalities at least these days are being pressed more and more heavily to find the financial resources for their metropolitan schemes. They are becoming blotting pads of finance; these expressways, these housing schemes — not only for Bantu but also for Europeans. These civic centres and opera houses, these lush parks and parking garages that swallow the output of the expressways — and I really think that there is no sign as yet that the administration authorities are very keen to give the local authorities access to more sources of revenue.

This means that, either the rating structure in a municipality has to go up substantially, or that municipality has got to raise more funds from its trading departments.

In a municipal set of trading departments there are only about three which are likely to make a profit. The foremost is electricity, coupled with water, and the next may be sewage disposal.

You will find that other trading efforts like abattoirs, markets, gas, and such like, are completely swallowed, plus one of the three I have mentioned, by transport. Transport is a bottomless sink in municipal endeavour today.

So if I were to say, as a proposition, that, assuming all trading departments other than electricity, water and sewerage, were only to float themselves, in neither a profit nor a loss, and if I were to tell you that in a town like Johannesburg the profits on water, or on electricity, are completely swallowed by the losses in transport, you would se that we now come to the situation where the source of revenue of a municipality, is (a) rates; and (b) one of the trading departments; but only one.

Now I come to my point: If you are in a position that we are in in Johannesburg, where we have either got to buy bulk supply or build a new power station, we must be excused for thinking thus wise: if we build a new power station, we have a very much better idea of what it is going to cost us, and having spent that money, it is good for 25 years, than we have an idea of what ESCOM's tariff may be over the next 25 years.

We hear of 400 kV transmissions, of DC transmissions, of atomic power generation, of hydro-power generation These costs are fantastic for a country that has less than 3,000,000 consumers. It is a fantastic country, because of our mining endeavours, and it is becoming more so because of our industrial developments, because of our growing self-sufficiency, but the only point I want to lay before this convention is this one: I believe that the time is not ripe yet to say that all municipal endeavour should collapse by buying bulk from ESCOM. That situation, in my mind, could turn up about 1980, but I am the last man to agree that the time is ripe in 1970, because we have not yet got our large transmission lines, we have not yet got our hydro-power, we have not yet got our atomic power, and we know not yet, however intelligently we estimate, what these things are going to lead us to in such a vastly open country with such a paucity of consumers.

It is a great fear that it is possible that these costs might lead to the stepping up of the tariff of supply in the hands of the bulk supplier. What is worse, if you are buying bulk supply it has set for you the financial policy that you have got to follow in applying your own tariffs. Many of you may have noticed that, in Johannesburg, we have been a little bit unusual and bold in the method of constructing our tariffs. I I can assure you that those methods are highly successful.

I feel that, today, we electrical engineers are losing sight of other things that have arisen since the Electricity Act was promulgated in 1923. That is a mere 40 years ago, Mr. Chairman, and conditions have changed tremendously. In 1923 all of us were suppliers of light and traction. Most motive power was generated on site by steam or producer gas, and to say that we should make available a cheap and abundant supply of electricity is, in my mind, unduly worshipped today.

What are the consequences of doing this? The first consequence is that we are being forced by prodigal use of a very valuable product which is sold at profit margins far lower than any other commercial enterprise I know of, and is leading to prodigal use. And what does prodigal use lead to? It leads the supply authority and the transmission and reticulating authorities into an unnecessary rapid expenditure of capital.

I believe that we have to put restrictions on the use of

electricity, restrictions on the use of water, and restrictions on the use of transport. I think that this community of ours today is entirely irresponsible in the prodigal manner in which it is using those three very valuable products, and the tremendous capital that they are pouring in to try and keep up with the demand, and there is only one consequence, and that is inflation, where your purchasing power is "going down the drain", because you are raising more capital than is really there for you to spend.

I think too, in support of my contention that electricity is too cheap, that in any industrial enterprise, or even commercial or domestic, the cost of electricity in the total product cost is some 2 to 4% in the main; I am excluding steel melting industries, and things of that nature, but the cost of electricity in the activity is a negligible thing, and a thing in my opinion which should be increased, not lowered.

It should be increased for this purpose — it is two fold. One is to induce a state of consideration of responsibility of usage, and the second one is this: to raise some of this capital we need from our own revenue.

I therefore come to the point where I started: I think it is desirable in this decade we are facing from 1970 to 1980 to allow the local authorities some autonomy over their own other revenues than rates, because they have some very big problems on their hands, and it is only by the help of autonomous usage of the profits they may derive from the sale and free decision as to tariff policy on electricity that they are going to get the kind of development that will evolve over the 1970 to 1980 decade.

THE PRESIDENT: Thank you Mr. Leishman. Gentlemen, have we covered that subject fully, or is there any further discussion?

Dr. TROOST (ESCOM)

First of all, Mr. President, I should like to take this opportunity of thanking the A.M.E.U. for the opportunity to attend this deliberation, which we have found very interesting, and we are very honoured to be here, and to be able to say a few things as well. I am grateful too, that I can rise for the second time, and that you allow me this privilege.

I always feel very diffident about rising after a polished and able speaker like Mr. Leishman; it puts one at a complete disadvantage. However, I am sure you will bear with me. After all we can't all have the gift that Mr. Leishman has, in putting our cases so eloquently!

I must agree with Mr. Leishman to some extent. I think Mr. de Villiers has already made it adequately clear that in the next decade there won't be any possibility of ESCOM by any stretch of imagination, becoming a monopoly anyway. So I think we agree on that subject.

When it comes to the deliberate raising of the cost of electricity to cut down consumption, (I have heard Mr. Leishman on this subject before), I think it is a difficult thing to get across to some of our industrialists, some of our ratepayers, some of our consumers generally.

I happened to attend a symposium in Vereeniging last Friday, and ESCOM was under severe criticism there for not bringing down the cost of electricity further, so we are a little beyond the devil and the deep blue sea as far as this is concerned.

This point was particularly raised by the steel industry; they wanted off peak tariffs and all sort of things, which is very difficult to realise with the kind of load that we have. I think that the mining community would not be very pleased with the artificial raising of the price, although once again, I must agree with Mr. Leishman that the future raising of capital for all these things is not going to be a simple matter.

The other point where I can say I must agree with Mr. Leishman is this business of atomic power. I cannot see any justification for going into atomic power until there is an economic case to do so. I fully agree with that. If we want to wave the flag and use our own uranium just for the sake of prestige, and we have to pay more for doing so, then I feel that the government, or some other body should pay for this and not the consumer of electricity, not if, and until such time as he can get this power no cheaper any other way.

I think also Mr. de Villiers made it amply clear that there is no effort on the part of ESCOM to take away any of the autonomy that the municipalities possess in this matter of electrical authority in their own areas of electrical distribution.

However, when it comes to a matter of capital, I feel that whilst there is a shortage of capital we must use this capital to the best advantage, and I don't think there is any doubt about it, that if you have large stations and long distance transmission you come to a cheaper all round cost than if you have a multiplicity of smaller stations. This has been the experience in all countries from the one extreme of Russia to the other extreme of the United States, and I see no reason to believe that in South Africa the conditions should be any different from what they are in these countries, in this regard.

The other thing is that I do not quite follow Mr. Leishman's point about the method of designing his tariffs. Fundamentally the cost of electricity is a two-part item — the part that is dictated by the capital involved, and locked up in the provision of the service, and the other part is the variable portion which depends on the number of units generated by that generating system.

Whether or not you buy the power from ESCOM or from anybody else or generate it yourself, that fundamental set of circumstances applies and one has to work within that framework in formulating a tariff, no matter whether you buy the stuff or whether you generate it yourself. So I don't quite see that that is any argument against buying from ESCOM, or for generating on your home ground.

I once again would like to emphasise that it is the last wish that we have in ESCOM to make municipal endeavour collapse, but when we supply power in bulk and the municipality distributes it to a very large number of consumers, I think there is ample endeavour for municipal effort in this direction without necessarily worrying about the generating plant.

THE PRESIDENT: Thank you Dr. Troost. Are there any further contributions gentlemen?

Mr. H. J. DE VILLIERS (ESCOM):

Meneer die President, ek wil net hier na paragraaf (f)

verwys in die verslag waar daar sal genoem word "ondersoek" . . . moet daar nou 'n konsultasie met die plaaslike besture wees wanneer ESCOM ondersoek instel.

Ek wil net hier dit duidelik stel dat ESCOM is altyd bereid om saam te werk en om konsultasies te voer en ek wil al die here hierso hartlik uitnooi om ons te kom besoek so gou daar enige faktor of probleem is wat gediskuseer moet word.

Ons van ons kant is nie altyd of hoogte van sake wat in die land plaasvind nie; ons het nie die stawwe wat die hele wereld kan deur-ry soos verkoops-agente van oliemaatskappye nie; ons het maar 'n beperkte aantal amptenare en u moet maar nie vir ons kwalik neem nie as ons nou nie weet wat aangaan in u geweste nie, maar ek nooi u uit en u is welkom by ons, en as u ons uitnooi sal ek sorg dat daar 'n amptenaar van ESCOM na u geweste kom om sake met u te bespreek.

Dankie Mnr. die President.

THE PRESIDENT: Thank you Mr. de Villiers.

Is there any further discussion?

We have not had the response under this heading that we had under the previous one, but I must say the contributions offered on this subject have been very valuable indeed, and I am sure that we, as an Association, appreciate them very much.

We will now move on to Item 3. Shortage of Technican Manpower. This subject is now open for discussion.

The Meeting next discussed the Agenda item "Shortage of Technical Man-power". Mr. E. E. de Villiers, Bloemfontein, opened discussion with the following contribution:-

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"Mr. President, I will say a few words on the subject just to get it started, and get some ideas perhaps.

Mnr. die President, 'n paar gedagtes het in my kop gekom oor hierdie saak. Ons is almal bewus daarvan dat ons op alle lae van tegniese werksmense, sowel as professionele mense, 'n tekort vandag in ons land het. Dit is te verstaan as gevolg van die natuurlike geweldige uitbreidings wat ons land ondervind het in die verlede en tans nog ondervind.

Nou het dit in die afgelope jaar of wat baie pertinent onder my aandag gekom dat ons in die eerste plek miskien nie beskik oor die opleidings fasiliteite wat ons behoort te hê in die land nie. Maar tweedens, wat vir my die belangrikste is, is dat die persone wat eintlik die tegniese mense in diens neem voorsien nie al die nodige fasiliteite (wat dit behoort te voorsien) vir verdere en intensiewe opleiding van die mense nie.

Eintlik moet 'n mens begin, sê met jou gewone algemene werksman. Hierdie tipe persone was altyd maar geneem as 'n soort van 'n los hand — hy lei eintlik homself op deur ervaring en hy word 'n algemene werksman en u gebruik hom maar vir algemene dienswerk. Ek dink nogtans dat 'n mens alreeds daar 'n begin moet maak deur een of ander opleiding te gee vir 'n man wat algemene dienste lewer soos ploegbase en soortgelyke tipe mense.

Nou gaan 'n mens verder na jou ambagsmanne. Daar is nou al deur die jare 'n taamlike goeie tegniek ontwikkel om jou ambagsmanne op te lei. Wat ons natuurlik hoofsaaklik interesseer is die elektrisiën. Maar nou vind 'n mens dat jy oor die algemeen persone kry, dat as hy nie goed genoeg is om skoolopleiding te ondergaan nie, dan word hy maar 'n vakleerling, en ons het almal die ervaring van die tipe ambagsman wat jy uiteindelik daaruit kry. My persoonlike opinie is dat daar tot vandag toe nog geweldig baie skort met ons vakleerlingwet sodat jy nie uiteindelik die goeie gehalte ambagsman kry wat jy behoort te kry nie.

Gevolglik vind ons dat baie van die ingenieurs en baie

Die vergadering het vervolgens die volgende item op die agenda „Shortage of Technical Man-power" behandel. Mnr. E. E. de Villiers het die besprekings as volg ingelei:-

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munisipaliteite feitlik nie meer vakleerlinge in diens wil neem nie; hulle beskou 'n vakleerling eenvoudig as 'n oorlas, waar elke ingenieur en elke munisipaliteit egter sy plig behoort te doen om so veel as moontlik vakleerlinge in diens te neem vir opleiding en vir hulle deeglike opleiding te sorg.

Nou gaan ek verder na tegnici. Hier voel ek is daar ook 'n groot leemte in plaaslike besture dat daar nie spesiale aandag gegee word vir die algemene opleiding van tegnici in verskeie rigtings nie. Wat ingenieurs betref miskien wel, maar wat vir my van baie groot belang is, veral as ons kom by die hoër vlak tegnikus, is dat daar baie min aansporing is vir 'n jong man om in die ingenieursrigting vandag in te gaan. Ek sê aansporing want daarby bedoel ek in werklikheid hoofsaaklik die vergoeding wat so 'n persoon ontvang.

Mnr. die President, dit is vir my al baie duidelik geblyk dat, waar 'n mens tog in die verskillende vlakke van die lewe onderskeide of verskille maak, word daar weinig in plaaslike besture in hulle graderingskemas verskille en onderskeide gemaak tussen die verskillende lae kan ek amper sê, van hulle personeel.

Hier in Bloemfontein is daar myns insiens 'n goeie voorwaartse stap dat hulle (ek glo in ander munisipaliteite wel ook maar oor die algemeen is dit nie so nie), onderskeid maak tussen die salarisgraderingskemas van hulle werksmense, naamlik, tot en met ambagsmanne, daarna hulle ander personeel. Ek voel nogtans dat daar 'n geweldige groot leemte bestaan, in die sin, dat daar in die geval van geweldig belangrike professionele poste in munisipale diens nie onderskeid gemaak word in hulle salarisgradering teenoor die van die res van die personeel nie. Almal word saam geflans en saam gegroepeer as een geheel.

Ek voel baie sterk oor hierdie punt — naamlik dat dit baie ernstige aandag behoort te geniet op alle vlakke van die samelewing, nie net in die munisipale-diens nie, dat professionele mense heeltemaal apart behandel word wat salarisse en ander werksvoordele betref."

Mr. A. A. Middlecote, S.A.B.S., offered the following comment:-

"Mr. President, it is a very unfortunate question, this one of the shortage of technical manpower — I think it has been a hardy annual over the last 15 years — and we get no nearer the truth.

It would appear that there is, to a degree, a so-called shortage of technical manpower. If we study the growth of our country — I think the electricity supply goes up at about 7% per year, local industry in the electrical engineering field goes up at about 20% per year in many, because they are taking over from sources of overseas supply, so if you mean one can judge that you would need an increase of about 10% of, shall we say, professional engineers, or technicians at their level to cope with this growth.

This, we know, is a figure in excess of that of the universities, which I think is somewhere about 2 to 4%. Anyhow, it is well below what we need, so there is a case for the universities and other institutions to be encouraged to produce more engineers.

But then we come on to the second point and that is the encouragement for people to take up these trainings. This is a far different story.

I believe you cannot get anyone to take the scholarships offered, for instance, for technicians, because the future offered to the technician is not as good as it should be.

I think if we look into this we will find an awful mix-up. Due to our present set-up, young professional engineers are doing work which should be done by technicians, and restricting the field of scope for technicians; and technicians are probably operating a little lower, and so on. It is this point that we are doing absolutely nothing about. In fact, we are making the matter worse year by year.

I always quote the case that, before the war, a young university graduate got about one sixth of a fully experienced engineer. At the moment they are battling to get the few that come out of the university, and I think we are paying them half of what a fully trained and experienced engineer gets, and they are being used in the wrong spheres.

There is no order which says, it is more important that these boys should go into that work. Industry can attract them, and in fact industry transgresses by using fully professional engineers to design standard little distribution transformers which should be done by a technician, or even a draughtsman.

The point is, how you can get that right is another matter.

Discussion proceeded and the following contributed thereto:-

Mr. R. M. O. Simpson, Durban
Mr. J. I. Inglis, Pietersburg
Mr. W. Rossler, Kroonstad

Mnr. A. A. Middlecote, S.A.B.S., het die volgende kommentaar gelewer:-

In South Africa we probably suffer more than other countries in the world, because (let us be honest), we are more a nation of civil servants, or semi-civil servants. Most of our big organisations are either state or semi-state. Therefore we are absolutely denied the normal methods of creating some incentive in people to work in the right place. They are all accepting this idea of social security which is poisoning England at the moment.

We have had approaches from our friend Ken Adams who is trying effectively to sell emolumetrics, which you all know much about. He has published a lot of these proceedings in your municipal press. His approach is some method whereby he can at least cure the habit of people stagnating in a slough of social security. There is no incentive for people to work hard; not 'hard' even, but effectively.

As I explained to my staff at work, we burn up enough energy in 8 hours at work every day to require a certain amount of intake. Whether we sit and think of our girl friends instead of our work, we consume just as much energy, or if you think of a football match; but it is the amount of effective work which people will get out, and work in their right sphere, that we have to tackle.

Industry in some of the progressive countries overseas, are having an alternative, although I maintain subsidiary effect to Mr. Adam's emolumetrics, and that is the group incentive, where an organisation is paid a bonus, very often a deferred bonus, so as to prevent excessive turnover in personnel, but a group bonus in which everyone has to work for a share of the profits according to their salary. This gives a team spirit, it stops people watching one layer to the other, and it allows them to introduce technological advance much better — they do not look sideways at the computer, because they see that that thing will help them, whatever their group is, to earn a little bit more, and the whole organisation will go on.

How we are going to do this in our country, I do not know, because there is very rarely any measure of this output which is created by our enginering fraternity in what we must admit are mostly semi-state organisations.

It is not entirely hopeless. If they had enough courage to give each municipal electrical engineer a budget to work to, and from it to him and his staff pay a bonus on the savings per year, perhaps they would even outdo ESCOM and there would be no problem, such as we have had this afternoon.

I fear that we can talk round this matter, but we are not solving the real bad point, and that is effectively ensuring that the right people are working in the right jobs. We are employing people incorrectly."

Besprekings het gevolg en die volgende het bydraes gelewer:-

Mnr. R. M. O. Simpson, Durban
Mnr. J. I. Inglis, Pietersburg
Mnr. W. Rossler, Kroonstad

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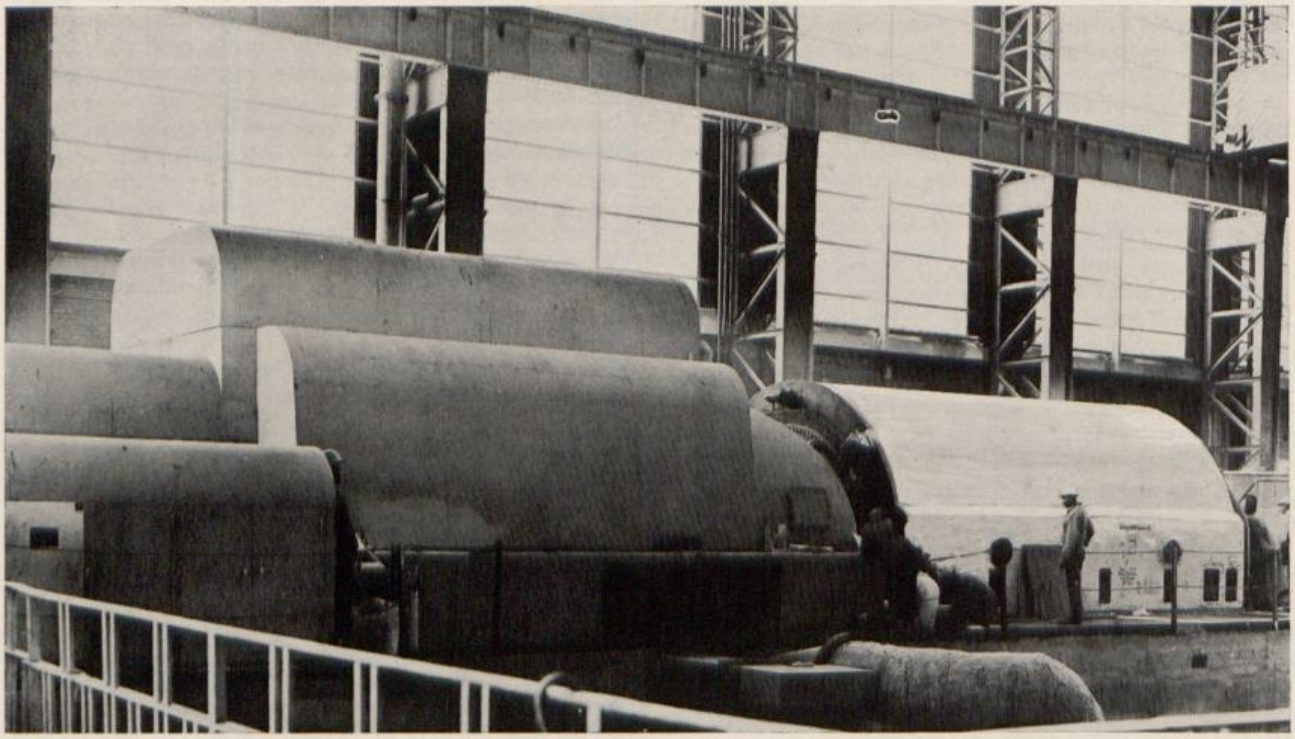

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Mr. G. A. Lotter, Potgietersrust
Mr. V. Barrett, Queenstown
Mr. A. A. Middlecote, S.A.B.S.

The contributions dealt with various aspects of the problem including the possible payment of incentives: the according of better status to those who attend College or Industry based 'Sandwich' courses for Technicians: the apparent degeneration in the approach to work by the younger generation. On the subject of incentives Mr. A. A. Middlecote, S.A.B.S., indicated that he thought the only practical hope of introducing such a system in Municipal services was on the basis of a share of the profits of the organisation pro-rata according to salaries.

The representative of ESCOM Dr. N. Troost, offered the following comment:-

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Mnr. die Presidesnt, ek is eintlik verbaas dat in al hierdie diskussie oor hierdie netelige onderwerp van gebrek aan ingnieurs en ander tegniese mannekrag, niemand nog verwys het nie na die mees gesaghebbende verslag oor hierdie aangeleentheid wat nou onlangs gepubliseer is. Ek verwys natuurlik na die Straszacker Verslag. Hierdie lywige boekdeel, of ten minste lywige boekdele (daar is twee van hulle), bevat alreeds baie van die punte wat hier vanmiddag te berde gebring is en verder nog bevat dit 'n hele aantal aanbevelings in sake wat daaroor gedoen moet word, en ek kan die gedrukte rapport aanbeveel vir al die lede en die verteenwoordiges hier, as 'n baie interessante en belangrike boekwerk, wat werklik die moeite van bestudering werd is.

Soos ek sê, die ding is nogal dik — ek glo hy kos R4 by die goewermentsdrukker — maar daar is 'n opsomming. Die opsomming is nie so vreeslik groot nie, en dit gee die meeste van die punte en almal die aanbevelings wat gedoen is en dit is 'n boekdeeltjie wat nie meer as omtrent 'n kwart duim of nog minder dik is, en as dit nog nie voldoende is nie vir die opsomming wat maar 'n paar bladsye is, en ek kan een van hierdie drie, of al drie, aanbeveel by die wat hier teenwoordig is vanmiddag.

Ek dink van die rekommendasies wat in hierdie verslag gemaak is, is party al besig om uitgevoer te word. Een van die rekommendasies is dat daar meer fasiliteite meer universiteite gestig moet word om basiese ingenieursgraadonderwys te gee.

'n Ander punt wat ek reken baie noodsaaklik die aandag op gevestig moet word wat daarin gemaak is, is die feit dat een van die redes aan die tekort van tegniese mense te wyte is aan die feit dat by matriekstandaard, veral in die Afrikaanssprekende skole, daar baie-baie studente is wat nie wiskunde neem nie, maar wat een van die ander en miskien meer makliker ook miskien meer aantreklike vakke soos sê maar boekhou, in plek daarvan neem.

Nou, ek dink dit is vir almal van ons wat enige invloed het, almal van die afgevaardigdes hier wat enige invloed het in die saak, om te probeer bewerk dat daardie verkeerde houding opgelos en verander moet word.

Maar dit lei geen twyfel dat baie van die mense van die studente, seuns en dogters, wat nie die wiskunde neem nie tog wel daartoe in staat sou gewees het as hulle gedwing was op die een of ander manier, om daardie vak te neem.

Dit word beraam van die resultaat van die verslag, van die syfers wat daarin gegee is, dat die aantal ingenieurs wat sou kan klaar maak, elke jaar met soiets van 40 of 50% vermeerder kon word as al die studente in matriek, wat daartoe in staat was, wiskunde sou geneem het."

He was followed by Mr. R. Leischman, Johannesburg, who offered the following comments:

"We engineers are always talking about the shortage, and it is we engineers who have caused it. Do you realise that we exclude 90% of all school leavers from ever becoming recruited to the technical professions?

Either you enter the engineering profession through an apprenticeship or through the university. There is no other way.

What are we doing today? We are saying to boys, "Come into the engineering profession". Those who stay at at public school say, "Oh, I'm not going to take an apprenticeship and I cannot afford to go to University, so I'm going to do something else".

What I am trying to do in Johannesburg at the moment is to get access, in the same way that all the other professions get access, to this 90% which we deliberately or unwittingly exclude from entering our profession. I am setting out on the thesis that there is room in the Electricity Supply Undertaking for people who have neither been to a university nor have served an apprenticeship, provided they will come in, preferably as matriculants, but even down to Standard VIII, in

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Hy is opgevolg deur mnr. R. Leishman, Johannesburg, wie as volg kommentaar lewer:-

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Mnr. F. Stevens, Ladysmith
Mnr. P. J. Botes, Roodepoort
Mnr. G. A. Lotter, Potgietersrust
Mnr. V. Barrett, Queenstown
Mnr. A. A. Middlecote, S.A.B.S.

Bydraes het oor verskillende aspekte van die probleem gegaan insluitende die moontlike betaling van 'n aansporing; die erkenning van verhoogde status vir diegene wat kolleges of stapel-kursusse vir Tegnici onderneem; die blykbare degenerasie in hulle opvatting teenoor werk van die jonger geslag. Oor die onderwerp van aansporing het mnr. A. A. Middlecote, S.A.B.S. aangedui dat hy van mening is dat die enigste werklike aansporing in munisipale-diens op 'n basis van 'n aandeel in die profyte van die organisasie moet geskied en wel op 'n pro-rata toedeling van die salaris.

Die verteenwoordiger van E.V.K.O.M., Dr. N. Troost, het die volgende kommentaar gelewer:-

the shape of technical assistants, technical clerks, operating assistants, and laboratory assistants.

I think that our profession has had blinkers on it all these years for not developing those three routes into our profession; because once you have got your hands on them you will start moving them around the department and showing them ad hoc what the career offers; you will give them the same privileges of going to the technical college as you give to the apprentices, i.e. you will give them day time release on full pay; you will also arrange their salary grades so that when they get NTC. 3 or ATC. 1 they are paid proportionately, just by putting barriers in their grades, and it will be possible for some of those boys to be sent to the technician's course or the university.

I feel that one of our most promising fields of curing our technical manpower shortage is to start taking in somebody other than people who have served an apprenticeship or have been to a university.

Dealing with the problem of how to attract Technical and Artisan staff NOW Mr. Leishman continued:-

Insake die probleem hoe Tegniese personeel en ambagsmanne gewerf kan word het mnr. Leishman voorts verklaar:-

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"I have just succeeded in persuading the City Council of Johannesburg to recognise that a pole painter or a house painter should not be paid the same money as a turbine fitting, transformer maintenance electrician, or somebody looking after high tension switchgear or cable jointing.

What we have done in Johannesburg is: we have taken 32% of our engineering trade establishment — for the moment we have kept our black trades and building trades and we have persuaded the council to create staff jobs for these people. It is more than 10 years that I have been argue-bargaining with unions about creating A, B, and C artisans and they have always said, "Well, there is nothing to prevent you from paying more than the basic wage, but as soon as you give Mr. Smith more than Mr. Jones, I will tell you that Smith is your favourite."

The beauty of this scheme is, that in creating staff positions you advertise them on the Board in the same way as any other staff position; the artisans apply for them; you interview them and you select the best, but you do it on the basis of creating those staff positions. For instance you want 3 turbine fitters; you want 4 transformer maintenance people; you want 5 ATKV 20 KV cable jointers. That is the way you set about it, and we have had a very good response.

Just before we went forward to get final approval of the names, I had six trade unionists in seeing me. They were a bit worried about it, but I have managed to persuade them that here they are getting something for nothing; they are getting something more than has been negotiated and it is being awarded on a fair basis, and after all they had to admit, there were certain trades which did not warrant the same responsibility as certain other trades, or the application of the individuals.

They, and I, am expecting that we will gradually expand this scheme. It has this effect: we are giving these selected artisans jobs the same pay as we presently are giving foremen.

In the Johannesburg Electricity Department (it is some 6 or 8 years ago now), we can see that foremen and chargehands in charge of people, who are out in the field, have a bigger responsibility than a foreman or a chargehand in a fixed workshop.

In this way the man who is looking after the people in the field has the responsibility of ensuring that they do the job, he is out under the live conditions more, he has to organise the materials, the transport, the native labour, and he has to see that the job is done away from close-in supervision.

Whereas a foreman or a chargehand in a workshop has all his men under his eye all the time; so what we have done in Johannesburg is that we have given the outside foremen and chargehands, superintendents and assistant superintendents a higher rate of pay than foremen or chargehands in a fixed workshop. Supplementary to that we have used these outside power stations to find posts and made staff artisans, which gives them 10% more income, it puts them under full staff privileges, (unhappily it gives them 10 more working days' leave per annum for which we do not get any service out of them); and the only distinction between their privileges today and those of the management is that they will enjoy overtime, subject to senior official certification and permission, and they still have to remain on a 44 hour week.

I commend this approaoch. It is a fair one. It is not just handing out a few cents an hour more to the blue-eyed boys. It is creating competitive posts, and we have succeeded in getting it swallowed by both the city council and the trade unions."

Mr. J. G. Wannenburg, Department of Labour, addressed the Meeting as follows:-

Mnr. J. G. Wannenburg, Departement van Arbeid het die vergadering soos volg toegespreek:-

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„Mnr. die President, ek wil ten volle aansluit en beaam wat Dr. Troost nou net gesê het. Die ondervinding wat ek gehad het met vakleerlinge indirek, het doodeenvoudig getoon dat die skoolverlatingstadium te vroeg is. 'n Vakleerling wat ingeskryf word nadat hy Std. VII-eksamen gedoen het, as hy nou na die Tegnieseskool toe gaan en hy gaan daar lesings doen, dan sal dit nie baie lank wees voordat hy een of ander tegniese probleem sal moet begin uitwerk nie, en die standaard van sy Matesis is ongelukkig dan van so 'n lae gehalte dat hy nie weet waar hy staan of wat hy daarmee kan doen nie. Dit lei tot frustrasie en dit lei tot die feit dat die persoon nie meer geïnteresseerd is in wat vir hom voorgedra word of wat hy moet leer nie, want hy verstaan dit ook eenvoudig nie.

So, ek wil dan sê dat dit reeds bewys is by sekere in-

dustrieë en by sekere myne waar daar besluit is om 'n hoër opvoedingskwalifikasie te stel voordat 'n persoon kan aangeneem word as vakleerling, daar baie beter resultate verkry is. Ek dink aan twee groot industrieë aan die Rand waar net vakleerlinge aangeneem word wat Matriek-standaard het en met Matesis as 'n vak.

Dan verder, die manier waardeur die vakleerling opgelei word. Dit is tog in die verlede sekerlik al bewys dat dit baie onregverdig is teenoor 'n arme vakleerling om hom te vat en hom oor te gee aan 'n vakman wat sy eie vak nie ken nie. Die gewone "five/eight tradesman" waaroor daar altyd in die myne gepraat word; daardie persoon maak van daardie vakleerling net gebruik as 'n handlangertjie — hy moet net gereedskap aangegee — en hy leer van die vyf/agste kennis wat die vakman het maar omtrent 'n kwart. Dan kan u nou self reken wat is die kwaliteit van die vakman wat uiteindelik aan die anderkant uitkom, as hy sy vakleerlingskap klaar gedoen het.

Wat wel bewys is om goeie vrugte af te werp, is weer die twee groot industrieë wat ek van praat aan die Rand, en ek is baie bly om te sien dat die myne uiteindelik, nadat ek soveel jare gepraat het en gesukkel het daaroor, ook nou dieselfde beginsel aanvaar, en dit is om die vakleerling in te neem en eerste, soos ek reeds gesê het, met 'n hoër opvoedingstandaard, en dan ten tweede, om hom te plaas onder die toesig van 'n behoorlik gekwalifiiseerde instrukteur, by sy werk. Dit het die voordeel dat die vakleerling word opgelei deur 'n persoon wat sy vak deur en deur baie goed ken. Enige moelikhede wat hy kry by die Tegniese kollege; probleme wat hy daar mag hê en nie kan verstaan nie, dit word teruggebring na sy instrukteur. Bo en behalwe die klasse wat daar gegee word by Tegniese Kolleges, word daar ook nog gedoseer by die werk. Die vakleerlinge word vir 'n sekere tyd in die werkwinkels gehou en vir 'n sekere tyd word daar teorie aan hulle voorgesit.

Nou, reg deur die termyn wat hy sy vakleerlingskap deurloop is daar ook nog iets anders wat altyd in die oog gehou word. Daardie persoon word op produktiewe werk gehou reg van die begin af. Dit bring by die jong vakleerling, hoe sal 'n mens nou sê, trots in sy werk. Hy voel dat die werk wat hy gedoen het, die stuk wat hy voorberei het en wat hy klaargemaak het, word nie daarna buitekant op die ashoop weggegooi nie. Hy voel reg van die begin af dat hy deel is van daardie indusrtie of wat dit ook al is, waarby hy werk.

Een besondere myn aan die verre Wes-Rand — Klerksdorp gebied — het vir my gesê dat hulle persentasie van omtrent tien persent vakleerlinge wat geslaag het in hulle ambagstoetse, opgegaan het na tot oor die 70% verlede jaar, en dit is nadat hierdie manier van opleiding vir omtrent vyf jaar in werking was. Nou, hoe prakties dit gaan wees in munisipaliteite; ek meen amper dat Johannesburg se munisipaliteit het 'n soortgelyke skema, ek praat onder korreksie, maar hoe dit by kleiner munisipaliteite gaan werk, sou ek nou nie kon sê nie. Maar waar dit moontlik is, is dit bewys dat daardie manier van opleiding baie beter vrugte afwerp as wat dit andersins is.

En nou, mnr. die President, gaan ek ook nog verder. Dit kom nie net by die vakleerling nie, maar dit kom uiteindelik by die persoon wat besluit om sy Goewermentsertifikaat van Bevoegdheid te verwerf. Dit is bitterlik jammerlik om te sien hoedat persone in daardie eksamen onderdeur gly bloot eenvoudig omdat hulle nie 'n kennis van Matesis het nie, nie eers die basiese beginsels van Matesis weet nie. Dit het soveel keer al geskied in die eksamens dat daar in die eksamenvraestelle vir die man die formule gegee word waarvolgens hy iets moet bereken en dan selfs met die formule in die vraestel, faal hy nog hopeloos, en kan hy dit nog nie uitwerk nie, want hy weet nie, tensy dat P = iets aan die anderkant staan, dan kan hy dit nie uitwerk as daar van die anderkant af gevra word wat sal daardie ding wees as P dit was nie.

So, dit kom weer daarop neer; kennis van Matesis en kennis van 'n bietjie meer as wat net hierso by Std. VI en Std. VII geleer word, is absoluut noodwendig om 'n goeie persoon uiteindelik uit te draai.

Ek moet sê dat daar persone is, en mnr. Lombard is hier en by kan sê of ek die waarheid vertel of nie wat soveel as 25 tot 30 keer agtereenvolgens die eksamen probeer slaag en dan kom hulle nooit verder as omtrent 25% van die merke nie.

Dan is daar nog iets. Ek weet net vir sover dit ingenieurs aanbetref, en ek hoop nie ek gaan op iemand se tone trap deur dit te sê nie, is die standaard van die opleiding wat gegee word deur korrespondensiekolleges, 'n bietjie na die tyd. Ons kan nie verwag dat 'n persoon hedendaags 'n ingenieurseksamen moet slaag as hy voorgesit word wat 30 of 40 jaar dié ding was nie. Daar word in die kursusse wat gegee word vir ingenieurs, te min aandag gegee aan moderne idees en daar moet onthou word dat dit die beginsel is van die Raad van Eksaminatore om die eksamen eerder 'n bietjie moeiliker te maak om deur te kom en sodoende 'n beter klas ingenieur te kry, as wat dit voorheen was. Daaroor is daar ook bedenkinge. Maar in ieder geval, ons wil ophef en ons wil nie die ingenieur se standaard laat sak sodat u naderhand sê 'n persoon kan Std. IV uitkom en dan kan hy nog ingenieur word nie."

The meeting next proceeded to discuss the item on the Agenda "Limited Demand tariffs where a circuit breaker or other device cuts off the supply when the demand reaches a pre-determined amount".

Mr. M. P. P. Clark of Somerset East reported that his Town had operated a tariff of this nature since June, 1955, without change except to increase in the demand charge from 30 cents per amp to 50 cents per amp about 5 years ago.

In this connection the tariff has been completely work-

Die vergadering het vervolgens die volgende item op die agenda bespreek „Limited Demand tariffs where a circuit breaker or other device cuts off the supply when the demand reaches a pre-determined amount."

Mnr. M. P. P. Clark van Somerset-Oos het gesê dat hulle dorp sedert Junie 1955 so 'n tarief sonder wysiging toepas, behalwe deur die aanvraags-tarief 5 jaar gelede van 30 sent na 50 sent per ampere te verhoog.

Die tarief was heeltemaal maklik om toe te pas en

able and considerable capital expenditure has been saved thereby.

From memory he quoted the improvements of load factor of between 5 and 10% but it was not possible to indicate to what extent this was due to the introduction of circuit breakers.

Mr. F. Stevens, Ladysmith, reported that his Town had introduced the circuit breaker tariff for commercial consumers 18 months previously. It had the effect of improving the load factor and in general it proved satisfactory.

Mr. G. J. Muller, Honorary Member, made the point that in Bloemfontein thought in relation to the introduction of a limited demand tariff had rather been from the angle of a fairer distribution of the demand charge that the improvement of the load factor. In relation to the smaller consumers he said:-

groot kapitale uitgawes kon bespaar word. Die lasfaktor het met tussen 5 en 10% verbeter maar hy kon nie sê of dit uitsluitlik tewyte was aan die stroombreker-tarief nie.

Mnr. F. Stevens, Ladysmith, sê dat sy dorp 'n stroombreker-tarief vir kommersiele verbruikers 18 maande gelede ingestel het. Dit het 'n verbetering van die lasfaktor tot gevolg gehad en was oor die algemeen bevredigend.

Mnr. G. J. Muller, Ere-lid, het die punt aangehaal dat in Bloemfontein die gedagte met 'n beperkende aanvraagstarief eerder was om 'n eweredige verdeling van die aanvraagsheffing te verkry as om die lasfaktor te verbeter. Met verwysing na die kleiner verbruiker het hy gesê:-

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"In other words, he never, being less privileged, gets to the low level units, whereas with the circuit breaker tariff, he can, as a small consumer, start with a comparatively small circuit breaker, and immediately get the feeling of using very low priced units, which will encourage him to make more use of the amenities provided by the City."

Mr. H. E. Summers, Bulawayo, said that his city had probably adopted load limiters first in South Africa and the system had operated satisfactorily.

Describing the tariff on which Bulawayo has operated Mr. Summers said:-

Mnr. H. E. Summers, Bulawayo, het gesê dat sy stad moontlik die eerste was om aanvraags-beperkende stroombrekers in Suid Afrika aan te wend en hierdie sisteem is heeltemaal bevredigend gevind.

Met 'n uiteensetting van die tarief het mnr. Summers gesê:-

"I have therefore taken out patents in this country and in Central Africa and the U.K. for such a limiter, which overcomes the objections raised by Mr. Stevens of Ladysmith, because a more refined limiter is based on KVA demand and therefore independent voltage, and there is a single phase version and a three phase version, and the three phase version gives you the arithmetric sum of the KVA phase, and therefore overcomes the outer balance that you get on a 4 wire system."

Replying to a question he indicated that ordinary current operators are tested very cheaply to within 3% and on the KVA type he felt sure that they could be kept within this range.

Mr. I. L. Hobbs, Virginia, raised the point that continuity of supply was one of the prime factors to maintain popularity and that load limitors might have an adverse effect in this connection.

He felt that the use of the maximum demand ammeter is probably very much better in principle "if the consumer wants to load your installation he should do so but he must pay for it and I do not like the idea of interrupting his supply".

Mr. Stevens stated that in Ladysmith the larger consumers appeared to understand and appreciate the system in operation.

Mr. G. J. Muller, Honorary Member, made the following points:-

In antwoord op 'n vraag het hy aangedui dat gewone stroombrekers goedkoop getoets kan word tot 3% en vir die KVA tipe is hy seker dat hulle binne hierdie grense gehou kan word.

Mnr. I. L. Hobbs, Virginia, haal die punt aan dat kontinuiteit van toevoer een van die belangrikste faktore is om populariteit te handhaaf en dat lasbeperkende stroombrekers in die opsig nadelig kan wees.

Hy voel dat die gebruik van die maksimum aanvraagsstroombreker heel waarskynlik beter in beginsel is en „indien die verbruikder die sisteem wil blaas dan moet hy daarvoor betaal en hy hou dus nie van die idee om die toevoer te onderbreek nie."

Mnr. Stevens meld dat groter verbruikers in Ladysmith die tarief verstaan en aanvaarbaar gevind het.

Mnr. G. J. Muller, Ere-lid het die volgende punte aangehaal:-

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„Wanneer oor die akkuraatheid van hierdie stroombrekers gepraat word, dan moet 'n mens tog darem 'n bietjie die verhouding van sake in ag neem; die alternatief, hoe akkuraat is die bepaling van die maksimum koste op die kamerbasis of op 'n tarief wat eerste soveel eenhede, teen 'n tweede groep eenhede soveel. Al hierdie tariewe is ontwerp om 'n maatstaf neer te lê om die spitsaanvraagkoste te bepaal. In die onakkuraatheid van die alternatiewe stelsels is so geweldig

ver uit, dat jy kan amper sê die vrotste stroombreker is beter as hulle. Ladysmith het natuurlik die oplossing deur net te bepaal dat die stroombreker mag nie minder dra as wat sy „rating" is nie. Die ander aspek van hierdie saak is, iemand het gesê dit is verkeerd om 'n verbruiker se stroom te verbreek as dit gebeur dat hy bokant sy balasting gaan, maar ek wonder of daardie verbruiker, as hy nou mooi oor die ding gaan dink, nie maar tevrede sal wees om net die stroombreker weer te gaan terugsit nie, en een of ander ietsie af te haal, as om aan die end van die maand uit te vind dat sy rekening veel hoër is as wat die verlede maand was nie."

Another speaker, unannounced, indicated that he could not accept the replacement of metering by "guess work".

Mr. G. J. Muller, Honorary Member, referred to the fact that a circuit breaker does not replace a meter. The meter remains and there is no "quess work".

Mr. M. P. P. Clark, Somerset East, then mentioned as follows:-

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'n Ander spreker, ongemeld, het aangedui dat hy nie die vervanging van verbruiks metings deur „raaiwerk" kan aanvaar nie.

Mnr. G. J. Muller, Ere-lid, verwys na die feit dat die stroombreker nie die meter vervang nie. Die meter word behou en daar is geen „raaiwerk" nie.

Mnr. M. P. P. Clark, Somerset-Oos, het as volg kommentaar gelewer:-

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"I think I should correct a few mis-impressions.

Obviously in Bulawayo the African consumers are being charged a flat rate via a circuit breaker without any measurement or other recognition, other than calculation, for the units they consume.

In Somerset East, and in most of the towns that this is applied to, (and I think for sure in Ladysmith), we charge for units through the conventional kilowatt hour meter and use this merely as a device for establishing the maximum demand of the consumer.

In Somerset East in addition, I must say that we have a service charge, which is a flat rate in our domestic consumers' case of R1 per month, in addition to the 20 cents per amp of maximum demand, and 1c per unit for the unit price.

I would like to add that in our experience we have had no difficulty with the accuracy of these things.

We do not establish a routine test procedure. We use the ordinary commercial instruments that are available and we have not specified special accuracies or special tests to be done by the supplier. As they have come out of the box, they have been put on the boards; they have been tested with a long test ammeter, and if they come, roughly speaking, within the limits they are supposed to come according to the graphs which the manufacturers supply, then they are accepted as being in order. We have not had any of our consumers come back with big sticks to beat us into courts of law and other places. We find generally speaking that people accept them for what they are, they realise that they have now a means of reducing their elecrticity charges. That is very significant.

In Somerset East in actual fact we have quite a number of poorer families. One municipal housing scheme has 36 houses and another has 20 houses. Some of these families are managing on 10 amp circuit breakers. That includes an electric stove and a geyser. They do not use terribly many units, (they are using perhaps four or five hundred units a month), but the fact remains that they are finding this an economic means of cooking, of lighting their homes, and getting hot water.

I would like to refer to another point here. Earlier on Mr. Leishman referred to the fact that the length of distribution mains was getting shorter and shorter, the implication being that the loads are getting bigger and bigger. Personally I think loads are going haywire. I cannot for the life of me see that we, in our undertakings, can justify supplying bigger and bigger domestic loads that are getting out of all proportion with heavier and heavier conductors, and not charging people properly and accurately for the demand that they are imposing on our systems."

Mr. J. K. Murphy, Walmer, said that his Town had approximately 3,000 consumers operating with circuit breakers and the system had been found very successful.

Replying to a question by Mr. E. E. de Villiers, Bloemfontein, Engineers of undertakings operating limited demand tariffs stated that they had not experienced a fall-off in consumption due to the installation of circuit breakers.

As no further time was available for discussions the President indicated that the Meeting would shortly be adjourned.

Others who took part in the discussion were the following:-

Dr. N. Troost, ESCOM
Mr. R. M. O. Simpson, Durban
Mr. W. B. Bozyczko, Bramley
Mr. J. I. Inglis, Pietersburg
Mr. L. Lewis, Windhoek

Mnr. J. K. Murphy, Walmer, het gesê dat sy dorp ongeveer 3,000 verbruikers het wat met stroombrekers beheer word en die stelsel is baie suksesvol gevind.

In antwoord op 'n vraag deur mnr. E. E. de Villiers, Bloemfontein, het ingenieurs van ondernemings wat die beperkte aanvraags-tarief toepas gemeld dat geen daling in verbruik ondervind is met die tarief nie.

Aangesien die tyd verstreke was het die President gesê dat die vergadering nou afgesluit sou moes word.

Die volgende het aan die besprekings deelgeneem.

Mnr. N. Troost, ESCOM
Mnr. R. M. O. Simpson, Durban
Mnr. W. B. Bozyczko, Bramley
Mnr. J. I. Inglis, Pietersburg
Mnr. L. Lewis, Windhoek

Mr. F. W. Hayne, Associated Member

Mr. J. K. Murphy, Walmer expressed appreciation of the hospitality of Bloemfontein.

Mr. Griessel (Department of Labour), addressed the meeting as follows:-

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"Ek wil ook die vereniging baie gelukwens met die besprekings hier vandag. Ek kan vir u verseker ek het al baie konferensies bygewoon, en dit is baie selde dat die lede so spontaan aan al die besprekings deelneem. Dit gebeur baie keer, soos u self ook seker weet, dat die agenda te kort is, dat hulle later nie weet hoe hulle moet verder gesels nie; maar hier is dit werklik elke onderwerp so deeglik bespreek dat daar nie veel meer oor kan gesê word, seker nie. Ek is nie 'n tegniese persoon nie, maar 'n mens kan darem van die besprekings aflei.

Ek wil net ook in verband met die kwessie van die vakleerlinge — net hier so ietsie probeer regstel, en dit is dat die vakleerlingwet — dit is 'n goeie wet, en dit het niks te doen daarmee dat daar nie genoegsame vakleerlinge of die regte tipe vakleerlinge vir hierdie bedryf te vinde is nie, maar soos u self weet, die redes is almal hier aangevoer waaroor daar nie die regte persone te vinde is nie.

Ek wil darem sê dat die departement van arbeid doen

Mr. E. E. de Villiers, Broemfontein, expressed appreciation to the Association, and those who had attended the Meeting, for coming to Bloemfontein and wished all visitors a pleasant journey home.

Mr. C. Lombard, Germiston, on behalf of the Meeting thanked the President for the able manner in which it had been conducted: "I think we can all go home, and so can you, with the thought that you have broken new ground here today, and all of us have had ample opportunity to air our views, and that this experiment has been a great success."

Concluding the proceedings the President addressed the Meeting as follows:-

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"Thank you, Mr. Lombard. Well, we are just on time. In my opinion we have had a very successful meeting. We have discussed many subjects. Much information has been disseminated, and I am sure, I agree with Mr. Lombard, that we can all leave here feeling that we have benefitted in some way or other from these discussions here today, and now I would, before concluding the meeting, like to say a few words in regard to this, the end of our first bi-ennial technical meeting.

Before doing so I would like to record my appreciation to those gentlemen who submitted papers, and to the representatives on all the committees, and the convenors of all the committees, for their sterling work during the year.

I did call for a vote of thanks to those who presented the papers, but I must express my own personal heartfelt thanks for the way they approached the job, and the discussions that they were successful in initiating.

To all members of the organisation who have attended, to affiliates and visitors who contributed so ably to discussion on the various items on the agenda, I wish also to express my

Mnr. F. W. Hayne, Mede-lid

Mnr. J. K. Murphy, Walmer het sy waardering uitgespreek vir die gasvryheid van Bloemfontein.

Mnr. Griessel (Departement van Arbeid), het die vergadering as volg toegespreek:-

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alles in sy vermoë om deur sy beroepsraadgewers die persone wat moontlik kan kwalifiseer vir die tipe opleiding wel aan te moedig, en hulle doen dit tydig en ontydig. Daar word selfs by die skote, plaaslik, word daar altyd klem opgelê dat persone wat enigsins die vermoë het om matesis wiskunde, as 'n vak te neem, dit moet neem sodra hulle dit kan neem dit is hier seker van Std. VII of Std. VI af, en daar word aanmoediging gegee, en ek wil ook iets noem, en dit is dat enige nywerheid die moet ook nie bang wees om sy eis 'n bietjie hoog te stel nie.

Ons het die ondervinding nou met die motornywerheid dat hulle het hulle laagste kwalifikasie vir 'n motorwerktuigkundigevakleerling opgeskuif, en toe het baie gedink dat hulle glad nie vakleerlinge sal kry nie. Maar die teendeel is bewys, want hulle kry nou werklik eintlik meer. Dit lyk baie asof die vakleerling wat moontlik die gedagte het om daarop in te gaan ook sien dat hulle sal 'n beter persoon begin trek in die nywerheid. Die bedryf saal 'n toekoms hê."

Mnr. E. E. de Villiers, Bloemfontein, het sy waardering uitgespreek teenoor die vereniging en aan almal wat die vergadering bygewoon het vir hulle opkoms in Bloemfontein, en wens al die besoekers 'n voorspoedige huiswaartse reis toe.

Mnr. C. Lombard, Germiston, het namens die vergadering die President bedank vir die doeltreffende wyse waarmee die vergadering gelei is.

In afsluiting het die President die vergadering as volg toegespreek:

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thanks; and also to the Secretaries for their efforts on behalf of the Association during the past year, which has been somewhat different from previous years.

To the Executive Council I would like to express my appreciation of their tolerance and assistance throughout the year, and to all others who have contributed in any way to the success of this meeting, and to our welfare during this very brief stay in the capital of the Orange Free State.

Finally I must express my gratitude and that of the Association to Mr. de Villiers, and his staff, and to the municipality of Bloemfontein for the privilege extended to us to hold our Technical Meeting in this city. The arrangements provided have been very commendable indeed, I am sure you will all agree; and no doubt these arrangements have contributed very largely to the undoubted success of this meeting.

In conclusion, may I wish you all a safe journey home, and may we all be able to look forward to meeting again at a full scale convention some time next year.

Thank you, Baie dankie."

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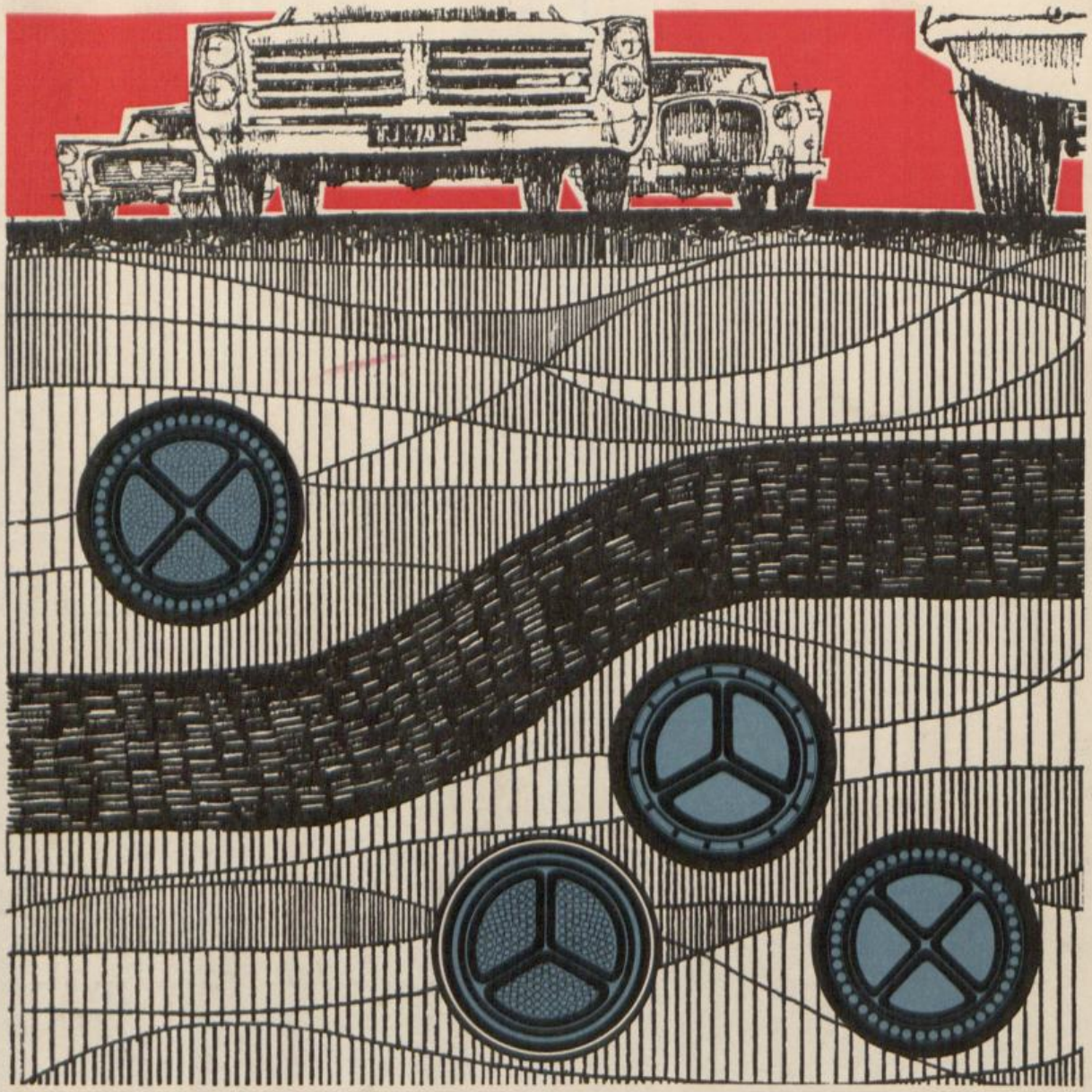

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