# VERRIGTINGS

van die

37ste KONVENSIE

7de tot 10de Mei, 1963

te Margate

DIE VERENIGING VAN MUNISIPALE ELEKTRISITEITS-ONDERNEMINGS VAN SUIDELIKE AFRIKA

# PROCEEDINGS

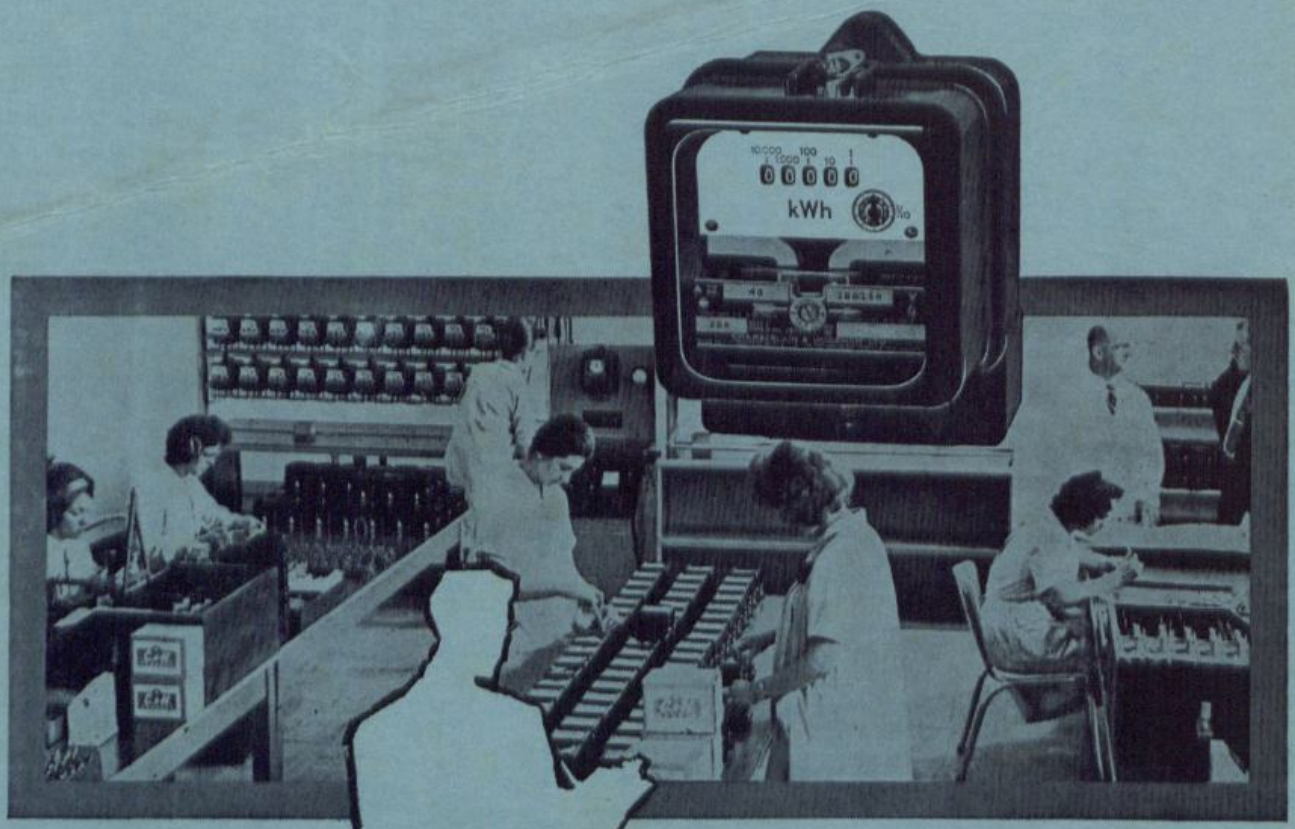
of the

37th CONVENTION

7th to 10th May, 1963

at Margate

THE ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA

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# PROCEEDINGS

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# VERRIGTINGS

## van die

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## 7de tot 10de Mei, 1963

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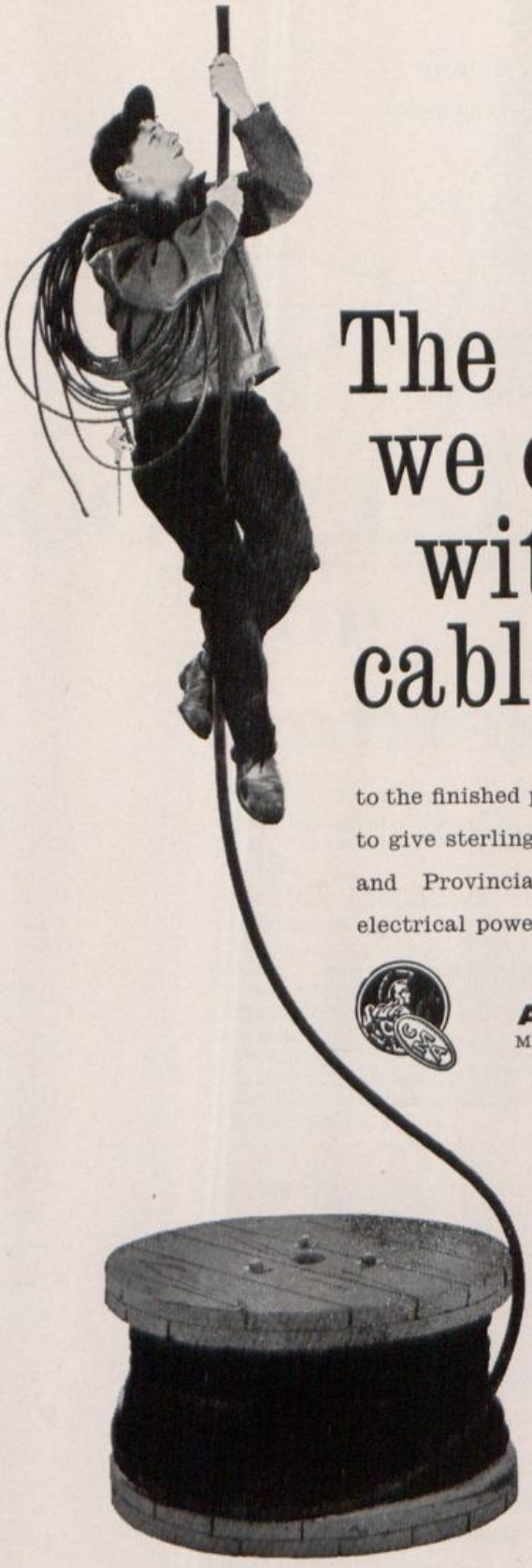

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*All correspondence to be addressed to:*

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1957 (1944) Bradley, D. A., 9, Target Kloof Road, Port Elizabeth (Past President).

1960 Castelyn, F. J. C., 1a Arboretum Avenue, Bloemfontein.

1963 (1947) Downie, C. G. Tshayile, 5, Hillside Road, Fishhoek, C.P. (Past President).

1960 Davies, L. P., 49, Union Street, Springs.

1951 (1922) Eastman, H. A., Torwood, Parel Vallei, Somerset West, C.P.

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1955 (1944) Fraser, J. C., 26, Grace Road, Mountain View, Johannesburg (Past President).

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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.

1956 Jaffray, A. Morton (Alderman), 8, Fairbridge Avenue, Salisbury.

1962 (1948) Mitchell, J. E., P.O. Box 819, Kitwe, N.R. (Past President).

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).

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1946 (1917) Aliwal North, C.P., Municipality, P.O. Box 46.
1948 (1934) Alberton, Tvl., Municipality, P.O. Box 4.
1948 Barberton, Tvl., Municipality, P.O. Box 33.
1935 (1926) Beaufort West, C.P., Municipality, P.O. Box 9.
1961 Bedfordview, Tvl., Village Council P.O. Box 3.
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1945 (1927) Brandfort, O.F.S., Municipality, P.O. Box 13.
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1953 Dewetsdorp, O.F.S., Municipality, P.O. Box 13.
1962 Dundee, Natal, Borough, P.O. Box 76.
1935 (1919) East London, C.P., City Council, P.O. Box 134.
1936 (1916) Ermelo, Tvl., Municipality, P.O. Box 48.
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1957 Empangeni, Natal, Town Board, P.O. Box 2.
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1948 (1915) Newcastle, Natal, Borough, P.O. Box 21.
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1935 (1915) Pietermaritzburg, Natal City Council, P.O. Box 321.
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1936 (1934) Port Alfred, C.P., Municipality, P.O. Box 13.
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1959 Peri-Urban Areas Health Board, P.O. Box 1341, Pretoria.

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1944 (1919) Winburg, O.F.S., Municipality, P.O. Box 26.
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1960 Walvis Bay, Village Council, P.O. Box 2.

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1959 Beard, G. R., City Electrical Engineer, P.O. Box 176, Grahamstown, C.P.

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1948 Barton, R. W., Electrical Engineer, P.O. Box 708, Welkom, O.F.S.

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1959 Billington Eales, A., Town Electrical Engineer, P.O. Box 2, Stutterheim, C.P.

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1948 Cherry, J. R., Municipal Electrical Engineer, P.O. Box 139, Randfontein, Tvl.

1946 Craig, J. S., Borough Electrical Engineer, P.O. Box 21, Newcastle, Natal.

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, C.P.

1956 Dawson, J.D., Municipal Electrical Engineer, P.O. Box 45, Uitenhage.

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1954 De Villiers, S. de V., Municipal Electrical Engineer, P.O. Box 44, Ceres, C.P.

1945 De Wet, D. P., Municipal Electrical Engineer, P.O. Box 15, Willowmore, C.P.

1944 Downey, J. C., 10 Jessop Rd., Selection Park, Springs, Tvl. (President).

1957 Dreyer, H. C., Electrical Engineer, P.O. Box 12, Paarl, C.P.

1959 Durr, H. R., Electrical Engineer, Peri-Urban Areas Health Board, P.O. Box 1341, Pretoria, Tvl.

Du Toit, A. A., Municipal Electrical Engineer, P.O. Box 19, George.

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.

1952 Futcher, L., Municipal Electrical Engineer, P.O. Box 13, Kempton Park, 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.

1945 Gericke, J. M., Municipal Electrical Engineer, P.O. Box 99, Klerksdorp.

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, S.R.

1960 Gresse, U. B., Town Electrical Engineer, P.O. Box 94, Krugersdorp, Tvl.

1944 Gripper, H. J., Municipal Electrical Engineer, P.O. Box 21, Knysna, C.P.

1954 Hafele, C. F., Deputy City Electrical Engineer, P.O. Box 288, Bloemfontein, O.F.S.

1953 Haig-Smith, D., Municipal Electrical Engineer, P.O. Box 24, Cradock.

1949 Halliday, K. W. J., Municipal Electrical Engineer, P.O. Box 5, Port Shepstone, Natal.

1927 Harvey, A. Q., Town Electrical Engineer, Warmbaths, Transvaal.

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.

1956 Hobbs, I. L., Town Electrical Engineer, P.O. Box 156, Virginia, O.F.S.

1938 Hugo, D. J., City Electrical Engineer, P.O. Box 423, Pretoria, Tvl. (Past President).

1944 Inglis, J. I., Town Electrical and Water Engineer, P.O. Box 111, Pietersburg, Tvl.

1959 Jooste, R. K., Municipal Electrical Engineer, P.O. Box 255, Oudtshoorn.

1958 Joslin, H. C., P.O. Box 6, Delmas, Tvl.

1946 Kane, R. W., General Manager, Electricity Department, P.O. Box 699, Johannesburg (Past President).

1962 Kinsman, A. D., Deputy City Electrical Engineer, P.O. Box 147, Durban.

1949 Kirberger, M. N., Town Engineer, P.O. Box 3, Bethal, Transvaal.

1949 Kruger, M. J. C., Municipal Electrical Engineer, P.O. Box 13, Port Alfred, C.P.

1959 Koeslag, H. J., Electrical Engineer, P.O. Box 29, Riversdale, 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., Deputy General Manager, Electricity Department, P.O. Box 699, Johannesburg.

1956 Lewis, L., Town Electrical Engineer, P.O. Box 59, Windhoek.

1947 Lombard, C., City Electrical Engineer, P.O. Box 145, Germiston, Tvl. (Past President).

1944 Lotter, G. A., Town Electrical Engineer, P.O. Box 96, Louis Trichardt, Tvl.

1955 Lynch, E. C., City Electrical Engineer, P.O. Box 73, Salisbury, S.R.

1953 Macques, J. A., Municipal Electrical Engineer, P.O. Box 42, De Aar, C.P.

1948 McIntyre, H. A., Asst. Town Elec. Eng., P.O. Box 35, Vereeniging.

1948 Mathews, J. A., City Electrical Engineer, P.O. Box 194, Kimberley, C.P.

1945 Meintjies, P. A., Municipal Electrical Engineer, P.O. Box 16, Rustenburg, Tvl.

1929 Mocke, T. M., Town and Electrical Engineer, P.O. Box 23, Piet Retief, Tvl.

1934 Muller, G. J., City and Electrical Engineer, P.O. Box 288, Bloemfontein, O.F.S. (Past President).

1954 McNeil, J. L., Borough Electrical Engineer, P.O. Box 72, Stanger, Natal.

1952 Millen, T. J., Town and Electrical Engineer, P.O. Box 24, Tzaneen, Tvl.

1955 Nobbs, D. M., City Electrical Engineer, P.O. Box 369, Port Elizabeth.

1957 Paull, R. A., Municipal Engineer, P.O. Box 57, Umtata, Tembuland.
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.
1960 Pretorius, J. W., Assistant Electrical Engineer, P.O. Box 23, Nigel.

1961 Rattey, W. P., Electrical Engineer, P.O. Box 34, Orkney, Transvaal.
1957 Rautenbach, G. F., Electrical Engineer, P.O. Box 99, Klerksdorp.
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 197, Ndola.
1962 Steele, E. E., Town Electrical Engineer, P.O. Box 197, Ndola, N.R.
1934 Stevens, F. Borough Electrical Engineer, P.O. Box 29, Ladysmith, Natal.
1956 Sulter, F. J., Assistant Electrical Engineer, P.O. Box 145, Germiston, Tvl.
1962 Surtees, E. H., Electrical Engineer, P.O. Box 76, Dundee, Natal.
1962 Summers, H. E., City Electrical Engineer, P.O. Box 1803, Bulawayo.
1947 Thackwray, W. G., Town Electrical Engineer, P.O. Box 8, Kokstad, E.G
1945 Theron, W. C., Municipal Electrical Engineer, P.O. Box 37, Worcester, C.P.
1946 Theron, G. C., Town Electrical Engineer, P.O. Box 3, Vanderbijlpark, Tvl.
1931 Turner, H. T., Town and Electrical Engineer, P.O. 121, Umtali, S.R.
1950 Turnbull, A. F., Town and Electrical Engineer, P.O. Box 35, Vereeniging, Tvl.
1962 Te Brugge, E. J., Town Electrical Engineer, P.O. Box 42, Mafeking.

1955 Van der Merwe, F. J., Municipal Electrical Engineer, P.O. Box 20, Stilfontein, Tvl.
1959 Van Heerden, B. G., Mun. Elec. Eng., P.O. Box 48, Ermelo, Tvl.
1957 Van Heerden, W. J. B., Elec. Eng., P.O. Box 201, Heidelberg, Tvl.
1956 Van Meerdervoort, J. K. L., Pompe, Town Electrical Engineer, P.O. Box 43, Harrismith, O.F.S.
1962 Van Niekerk, J. D., Town Electrical Engineer, P.O. Box 4, Alberton.
1945 Vergottini, P. L., Municipal Electrical Engineer, P.O. Box 15, Brakpan, Tvl.
1951 Verschoor, D. R., Town and Electrical Engineer, P.O. Box 36, Fort Beaufort, C.P.
1955 Vorster, P. J., Municipal Electrical Engineer, P.O. Box 3, Witbank, Tvl.
1957 Von Ahlfton, J. K., Town Electrical Engineer, P.O. Box 60, Sasolburg, 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.
1952 Ward, H. V., Borough Engineer, P.O. Box 71, Greytown, Natal.
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.
1961 Wiehahn, G. D., Town Engineer, P.O. Box 551, Bethlehem, O.F.S.

1956 Yodaiken, J., Municipal Electrical Engineer, P.O. Box 115, Que Que, S.R.

1959 Zausmer, H., Municipal Electrical Engineer, P.O. Box 20, Hermanus.

## ASSOCIATES/GEASSOSIEERDERS:

1959 Bester, J. H., Town Electrician, P.O. Box 15, Vensterdorp, Tvl.
1959 Carpenter, B. F., Town Electrical Engineer, P.O. Box 206, Aliwal North, C.P.
1963 Coetzee, J. C. Town Engineer, P.O. Box 2, Makwassie.
1962 De Witt, F., Electrical Engineer, P.O. Box 38, Adelaide, C.P.
1963 Du Plessis, W. C., Electrical Engineer, P.O. Box 90, Thabazimbi.
1960 Flint, V. G., Acting Electrical Engineer, P.O. Box 14, Middelburg, Tvl.
1962 Huysamen, G. A., Electrical Engineer, P.O. Box 5, Postmasburg, C.P.
1959 Jordaan, J. H., Municipal Electrical Engineer, P.O. Box 35, Vryburg, C.P.
1959 Laas, C. P., Electrical Engineer, P.O. Box 15, Kenhardt.
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.
1962 Ploos-van Amstel, Electrical Engineer, P.O. Box 37, Viljoenskroon, O.F.S.
1959 Ross, M. J., Town Electrical Engineer, P.O. Box 13, Brandfort, O.F.S.
1959 Schoombee, G. T. van W., Town Electrical Engineer, P.O. Box 61, Lydenburg, Tvl.
1962 Sweetman, A. A., Town Electrical Engineer, P.O. Box 21, Tarkastad, C.P.

## ASSOCIATE MEMBERS/VERBONDE LEDE:

1946 Andrew, W. M., 7, Tainton Avenue, Bonnie Doon, East London, C.P.
1951 Attridge, W. A., P.O. Box 306, Sasolburg, O.F.S.
1944 Burton, C. R., 54, Memorial Road, Kimberley, C.P.
1952 Bailey R. V., P.O. Box 255, Oudtshoorn, C.P.
1956 Barnard, F. J. W., c/o. Electricity Supply Commission, P.O. Box 12, Springs.
1933 Campbell, A. R., P.O. Box 3, Impendhle, Natal.
1929 Clinton, J. S., P.O. Box 4648, Johannesburg (Past President).
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.
1948 De Wit, T., P.O. Box 44, Brits, Tvl.
1960 Ford, W. P., P.O. Box 40, Lusaka, N.R.
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 Vicoria, S.R.
1962 Honiball, G. T., 35 End St., Rowhill, Springs.
1933 Jones, G. E. H., 29, Ennisdale Drive, Durban North, Natal.
1962 Liebenberg, S. J., Electrical and Mechanical Engineer, Dept. of Bantu Admin. and Development, P.O. Box 384, Pretoria.
1949 Lutsch, W. J. F. S., c/o. Faculty of Engineering, University of Stellenbosch, C.P.
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.
1959 Petersen, G. R., Federal Power Board, P.O. Box 630, Salisbury.
1934 Phillips, J. W., P.O. Box 1731, Bulawayo, S.R.
1934 Rossler, A., P.O. Paddock, South Coast, Natal.
1953 Rothman, J. L., P.O. Box 606, Kimberley.
1927 Simpson, H. G., Engineering Department, Searles Ltd., Great Brak River, C. P.
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 Tvl.

## AFFILIATES/GEAFFILEERDES:

1959 AEG South Africa (Pty.) Ltd., P.O. Box 10264, Johannesburg.
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, Johan-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.
1960 African Lamps (Pty.) Ltd., P.O. Box 75, Industria.
1960 Associated Electrical Industries C.A. (Pvt.) Ltd., P.O. Box 1979, Salisbury, S.R.
1960 Associated Electrical Industries (Pty.) Ltd., P.O. Box 7755, 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 & Partners (Rhodesia), Floor Five, Century House, Baker Ave., Salisbury, S.R.
1957 British General Electric Co. of C.A. (Pvt.), Ltd., P.O. Box 845, Salisbury, S.R.
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.
1963 W. R. Burnett (Pty.), Ltd., P.O. Box 358, Johannesburg.

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 Contactor (Pty.) Ltd., Zuider Paarl, C.P.
1957 Crompton Parkinson S.A. (Pty.) Ltd., P.O. Box 4236, Johannesburg.

1957 Davidson & Co. (Africa) (Pty.) Ltd., P.O. Box 616, Springs, Tvl.
1957 Dowson & Dobson Ltd., P.O. Box 7764, Johannesburg.
1959 Ian Drewett, P.O. Box 35, Johannesburg.

1959 Electrical Contractors' Association (South Africa), P.O. Box 5327, Johannesburg.
1957 Enfield Cables (S.A.) Ltd., P.O. Box 5289, Johannesburg.
1959 English Electric Co. (C.A.) (Pvt.) Ltd., P.O. Box 2191, Salisbury.
1957 English Electric Co. S.A. Ltd., P.O. Box 2387, Johannesburg.

1961 Farad (Pty.) Ltd., P.O. Box 220, Jeppestown.
1957 First Electric Corp. of S.A., P.O. Box 3961, Johannesburg.

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.
1957 W. T. Glover & Co. Ltd., P.O. Box 1386, Johannesburg.
1957 E. Green & Son S.A. (Pty.) Ltd., 406 Barclays Bank Buildings, Kruis Street, Johannesburg.

1959 Henley-Simplex Africa (Pty.) Ltd., P.O. Box 100, Jeppe, Johannesburg.
1957 Heinemann Electric (S.A.) Ltd., P.O. Box 99, Bramley.
1957 Hopkinsons S.A. (Pty.) Ltd., P.O. Box 11029, Johannesburg.

1957 James Howden & Safanco (Africa) (Pty.) Ltd., P.O. Box 9501, Johannesburg.

1957 Hubert Davies & Co. Ltd., P.O. Box 1386, Johannesburg.

1960 Hawker Siddeley Brush (Southern Africa) Ltd., P.O. Box 75, Booysens, Tvl.

1957 International Combustion Africa Ltd., P.O. Box 5981, Johannesburg.

1962 A. Jackson, P.O. Box 4814, Cape Town.
1957 John Thompson (S.A.) (Pty.) Ltd., P.O. Box 3570, Johannesburg.
1957 Johnson & Phillips S.A. (Pty.) Ltd., P.O. Box 552, Germiston.
1957 R. T. Jones, Esq., 43, The Avenue, Orchards, Johannesburg.

1957 G. H. Langler & Co. Ltd., P.O. Box 3762, Johannesburg.
1961 Lodge-Cottrell (Africa) (Pty.) Ltd., P.O. Box 6070, Johannesburg.

1957 Harold Marthinusen & Co. (Pty.) Ltd., P.O. Box 469, Johannesburg.
1957 L. H. Marthinusen Ltd., P.O. Box 25664, Denver, Tvl.
1957 Merz & McLellan, P.O. Box 11578, Johannesburg.
1959 Mitchell Engineering Group S.A. (Pty.) Ltd., 63 Harrison Street, Johannesburg.

1959 N.V. Nederlandsche Kabelfabrieken Ltd., P.O. Box 3513, Cape Town.
1957 Oerlikon S.A. (Pty.) Ltd., P.O. Box 132, Jeppestown.

1957 C. A. Parsons & Co. (S.A.) (Pty.) Ltd., P.O. Box 3425, Johannesburg.
1959 Patrick Murray (Pty.) Ltd., P.O. Box 1541, Durban.
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.
1960 A. Reyrolle & Co. (Rhodesia Ltd.), P.O. Box 1975, Salisbury.

1957 Rice & Diethelm Ltd., P.O. Box 930, Johannesburg.
1963 Rhodesia Congo Border Power Corporation Ltd., P.O. Box 819, Kitwe, N.R.
1957 Samuel Osborn S.A. (Pty.) Ltd., P.O. Box 19, Denver.
1957 Scottish Cables (S.A.) Ltd., P.O. Box 2882, Johannesburg.
1957 Shell Co. of S.A. Ltd., P.O. Box 2231, Cape Town.
1960 Siemens S.A. (Pty.) Ltd., P.O. Box 4583, Johannesburg.
1958 Siemens Edison Swan (Pty.) Ltd., P.O. Box 7404, Johannesburg.
1957 Standard Telephones & Cables Ltd., P.O. Box 286, Boksburg.
1957 Stamcor (Pty.) Ltd., P.O. Box 6107, Johannesburg.
1957 Stewards & Lloyds of S.A. Ltd., P.O. Box 1195, Johannesburg.

1957 S.A. General Electric Co. Ltd., P.O. Box 1905, Johannesburg.

1957 S.A. Philips (Pty.) Ltd., P.O. Box 7703, Johannesburg.
1957 Superconcrete Pipes (Pty.) Ltd., P.O. Box 92, Roodepoort, Tvl.
1957 Switchcraft (Pty.) Ltd., P.O. Box 6444, Johannesburg.
1960 South Wales Electric (Pty.) Ltd., P.O. Box 2180, Johannesburg.
1957 Southern African Cable Makers Association, P.O. Box 2258, Johannesburg.

1957 Union Steel Corporation S.A. Ltd., P.O. Box 48, Vereeniging, Tvl.

1957 Wilson & Herd (Pty.) Ltd., P.O. Box 3093, Johannesburg.

1957 Yarrow & Herd (Pty.) Ltd., 201 Geldenhuys, 33 Jorissen Street, Braamfontein, Johannesburg.
1959 Yorkshire Transformers (S.A.) (Pty.) Ltd., P.O. Box 44, Paarden Eiland, C.P.

## LIST OF MEMBERS, COUNCIL MEMBERS AND VISITORS ATTENDING THE 37th ANNUAL CONVENTION OF THE ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS.

## LYS VAN LEDE, RAADSLEDE EN BESOEKERS—37ste JAARLIKSE KONVENSIE VAN DIE VERENIGING VAN MUNISIPALE ELEKTRISITEITSONDERNEMINGS

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Futcher, L.

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Rule, Cr. Rev. P. C.
Rossler, W.

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Van Niekerk, G.

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te Brugge, E. J.

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Pretorius, D. R.

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Van der Merwe, F. J.

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UITENHAGE:
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Dawson, J.

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Paull, R. A.

UMTALI:
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Turner, H. T.

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Maré, Cr. F. K.
Ploos van Amstel, W. F.

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Baron, Cr. S. T.
Hobbs, I. L.

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Van der Walt, J. L.
Turnbull, A. F.

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Willis, Cr. W. A.
Waldron, F. R.

WESTONARIA:
Dreyer, L.

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Meyer, Cr. W. F.
Barton, R. W.

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Engelbrecht, J. L.
Reyneke, G. M.

WINDHOEK:
Davis, Cr. S.
Honiball, G. T.

WITBANK:
Vorster, P. J.

WARMBATHS:
Lanser, Cr. A. H.
Harvey, A. Q.

WORCESTER:
Theron, W.

## OTHER MEMBERS

Burton, C. R. (Associate Member), Kimberley.

Campbell, A. R. (Associate Member), Impendhle, Natal.
Conradie, D. J. R. (Associate Member), Bloemfontein.

Ford, W. P. (Associate Member), Lusaka.
Fraser, J. C. (Honorary Member), Johannesburg.

Gill, G. B. (Associate Member), Zululand.

Kinsman, C. (Honorary Member), Durban North.

Marchand, B. (Associate Member), Witbank.

Magowan, J. M. (Associate Member), Salisbury.
McGibbon, J. (Associate Member), Carletonville.
Milton, W. H. (Honorary Member), Johannesburg.
Mitchell, J. E. (Honorary Member), Kitwe.

Peterson, G. R. (Associate Member), Salisbury.

Rossler, A. (Associate Member), Cradock.

Sibson, A. R. (Honorary Member), Bulawayo.

Van der Walt, J. L. (Honorary Member), Vereeniging.
Wiliams, J. T. (Associate Member), Pretoria.

## A.M.E.U. OFFICIALS

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

K. P. Hollis (Representing the Secretaries), Johannesburg.

Mrs. H. G. Lee (Convention Proceedings Clerk), Johannesburg.

## AFFILIATES

| *ORGANISATION* | *NAME* | *TOWN* |
|---|---|---|
| Associated Electrical Industries (Pvt.) Limited. | C. R. Deglon. | Salisbury. |
| Arthur Trevor Williams (Pty.) Ltd. | J. A. Barnett. | Johannesburg. |
| | J. T. Williams. | |
| Asea Electric S.A. (Pty.) Ltd. | V. F. Checketts. | Pretoria. |
| | C. Stengard. | |
| Aycliffe Cables Ltd. | C. A. Rist. | Johannesburg. |
| | M. Frankle. | |
| Aberdare Cables (Africa) Ltd. | J. C. Sutherland. | Port Elizabeth. |
| Adams, Symes & Partners. | K. Adams. | Johannesburg. |
| African Cables Ltd. | V. H. Woods. | Vereeniging. |
| | R. W. Lord. | |
| African Explosives & Chemical Industries Ltd. | W. J. Maxwell. | Johannesburg. |
| African Wire Ropes Ltd. | T. N. D. Griffin. | Johannesburg. |
| Associated Electrical Industries S.A. (Pty.) Ltd. | D. W. Stanley. | Johannesburg. |
| | C. G. Watkins-Ball. | Johannesburg. |
| African Lamps (Pty.) Ltd. | J. Duffield. | Johannesburg. |
| | E. C. Crole. | |
| Alcan Aluminium of S.A. Ltd. | E. B. Martin. | Johannesburg. |
| | J. B. Colam. | |
| Babcock & Wilcox of Africa Ltd. | H. J. Kroon. | Vereeniging. |
| | H. Bieber. | |
| British Insulated Callender's Cables S.A. (Pty.) Ltd. | A. W. Allen. | Johannesburg. |
| | R. F. Weaire. | |
| | N. R. Price. | |
| British General Electric Co. Ltd. | N. Holmes. | Johannesburg. |
| Chloride Electrical Storage Co. S.A. (Pty.) Limited. | A. C. Tilley. | Johannesburg. |
| | N. D. Jones. | |
| | S. J. Coman. | |
| Construction Electric Co. (Pty.) Ltd. | R. C. Jordan. | Johannesburg. |
| Ian Drewett. | I. H. M. Drewett. | Johannesburg. |
| Enfield Cables S.A. (Pty.) Ltd. | A. E. Torrance. | Johannesburg. |
| | W. P. H. Luck. | |
| English Electric Co. S.A. (Pty.) Ltd. | H. Prins. | Johannesburg. |
| | W. G. H. Jarvis. | |
| Electrical Contractors Association | Charlton Cambell. | Johannesburg. |
| Farad (Pty.) Limited. | G. Berber. | Johannesburg. |
| | E. Baumann. | |
| W. T. Glover & Co. Ltd. | M. Suthers. | Johannesburg. |
| Hawker Siddley Brush | J. Davison. | Johannesburg. |
| | P. Vickerman. | |
| Henley-Simplex (Pty.) Ltd. | J. A. Morrison. | Johannesburg. |
| Hubert Davies & Co. Ltd. | W. N. Powell. | Johannesburg. |
| A. Jackson. | A. Jackson. | Cape Town. |
| John Thompson S.A. (Pty.) Ltd. | P. J. Atkinson. | Durban. |
| Johnson & Phillips. | F. W. Dixon. | Johannesburg. |
| | H. L. Dawe. | |
| Harold Marthinusen & Co. (Pty.) Ltd. | G. Roeske. | Johannesburg. |
| | C. Coetts. | |
| Merz & McLellan. | T. R. J. Bishop. | Johannesburg. |
| | T. K. A. Douglas. | Salisbury. |
| Patrick Murray (Pty.) Ltd. | M. E. Walsh. | Durban. |
| Nederlandsche Kabelfabrieken Ltd. | G. H. van Harten. | Johannesburg. |
| | W. I. Louw. | |

| *ORGANISATION* | *NAME* | *TOWN* |
|---|---|---|
| Reunert & Lenz Ltd. | T. K. Adams. | Johannesburg. |
| | T. C. Marsh. | " |
| | R. Jordan. | Durban. |
| A. Reyrolle & Co. (S.A.) (Pty.) Ltd. | W. J. Gibbons. | Johannesburg. |
| | D. A. Anderson. | |
| A. Reyrolle & Co. (Pvt.) Ltd. | N. Kirschner. | Salisbury. |
| Rhodesia Congo Border Power Corporation Limited. | J. E. Mitchell. | Kitwe, N.R. |
| Rhotec Sales (Pvt.) Ltd. | R. Jackson. | Salisbury. |
| C. A. Parsons & Co. S.A. | T. R. Strawson. | Johannesburg. |
| S.A. General Electric Co. Ltd. | F. W. de Zeeuw. | Johannesburg. |
| | P. M. S. van Coller. | Durban. |
| Siemans Edison Swan (Pty.) Ltd. | M. C. W. Miller. | Johannesburg. |
| | S. Thomas. | Durban. |
| Siemans S.A. | A. Bieler. | Johannesburg. |
| | E. M. Krantz. | |
| Samuel Osborn S.A. (Pty.) Ltd. | D. E. Soper. | Johannesburg. |
| Scottish Cables S.A. Ltd. | D. G. Sutherland. | Pietermaritzburg. |
| | A. C. Grant. | Johannesburg. |
| | W. E. L. Tonkinson. | Durban. |
| S.A. Cable Makers Association | J. A. Morrison. | Johannesburg. |
| Shell Co. of S.A. Ltd. | G. Phillips. | Cape Town. |
| | R. K. Aldridge. | |
| Standard Telephone & Cables | R. E. Griffin. | Boksburg. |
| South Wales Electric (Pty.) Ltd. | C. L. de Beer. | Johannesburg. |
| Super Concrete Pipes (Pty.) Ltd. | A. C. Nel. | Roodepoort. |
| Switchcraft (Pty.) Ltd. | M. H. Froling. | Johannesburg. |
| Union Steel Corp. S.A. Ltd. | N. G. Beveridge. | Vereeniging. |
| | H. Holton. | |
| Wilson & Herd (Pty.) Ltd. | S. J. Fletcher | Johannesburg. |
| Yarrow Africa (Pty.) Ltd. | C. W. Suckling. | Johannesburg. |
| | G. S. Brown. | |

## VISITORS

| *NAME* | *ORGANISATION* | *TOWN* |
|---|---|---|
| Alexander, H. P. | Electricity Supply Commission, Natal Undertaking. | Durban. |
| Anderson, G. | Northern Electricity Supply Corporation. | Lusaka. |
| Anderson, J. P. | Chief Electrical Engineer, S.A. Railways. | Johannesburg. |
| Baker, Cr. R. L. | His Worship the Mayor. | Margate. |
| Baxter, J. D. C. | Northern Cape Regional Electrification Board. | Kimberley. |
| Burger, A. P. | Also representing Institute of Town Clerks, Pretoria. | Parow. |
| Cassidy, C. S. | Public Works Department. | Maseru. |
| De Jager, J. P. J. | Electricity Department. | Pretoria. |
| Dunkley, Cr. E. | Town Council. | Margate. |
| Du Plessis, W. C. | Thabazimbi Health Committee. | Thabazimbi. |
| Vergottini, P. | Institute of Certificated Mechanical & Electrical Engineers. | Johannesburg. |
| Fothergill, E. R. | Under-Secretary for Power. | Salisbury. |
| Gilmour, R. R. | Electricity Department. | Cape Town. |
| Groenewald, J. J. | Chief Inspector of Factories (Engineering) Dept. of Labour. | Pretoria. |
| Halstead, B. | | Ramsgate. |
| Hooley, L. J. | Chief Electrical Engineer, Ministry of Power. | Salisbury. |
| Herrmann, G. | Public Works Department. | Salisbury. |
| Hutton, L. J. J. | Electricity Department. | Salisbury. |
| Kemp, Prof. P. | | Port Shepstone. |
| Lategan, P. N. | Chairman, Transvaal Coal Owners Association. | Johannesburg. |
| Levitt, D. H. | Levitt, Dowdle & Company. | Margate. |

| *NAME* | *ORGANISATION* | *TOWN* |
|---|---|---|
| Lineker, A. W. | Rand Water Board. | Johannesburg. |
| Markus, A. F. | Secretary, Electricity Control Board. | Pretoria. |
| Mullin, C. G. | | Southport. |
| Munnik, J. H. G. | Magistrate. | Port Shepstone. |
| Mackenzie, Cr. G. | Town Council. | Margate. |
| Middlecote, A. A. | S.A. Bureau of Standards. | Pretoria. |
| Molyneux, G. C. | Rhodesian Railways. | Bulawayo. |
| Mourant, G. C. | Town Clerk. | Margate. |
| O'Connor, T. P. | Electricity Supply Commission, Natal Undertaking. | Durban. |
| Pinson, H. A. | | Port Shepstone. |
| Prins, F. J. | S.A. Bureau of Standards. | Pretoria. |
| Reed, T. W. | | Southport. |
| Sluit, Maj. I. T. | S.A. Police. | Port Shepstone. |
| Straszacker, Dr. R. L. | Chairman, Electricity Supply Commission. | Johannesburg. |
| Smith, M. | Rotary Club of Margate. | Margate. |
| Throssell, R. C. | Federated Chamber of Industries. | Durban. |
| Taylor, H. T. | Zululand Electrical Utility Company. | Zululand. |
| Van der Merwe, I. W. | Hibiscus Coast Chamber of Commerce. | Margate. |
| Van der Spuy, M. | Council for Scientific and Industrial Research. | Pretoria. |
| Van der Walt, I. D. | Electricity Supply Commission, Natal Undertaking. | Durban. |
| Van Schalkwyk, A. P. | Electricity Department. | Bloemfontein. |
| Van Wyk, J. D. N. | Council for Scientific and Industrial Research. | Pretoria. |
| Watkins-Ball, C. G. | S.A. Institute of Electrical Engineers. | Johannesburg. |
| Wulff, Cr. R. A. | Town Council. | Margate. |

## LADIES

| *Name* | *Town* |
|---|---|
| Adams, Mrs. K., | Johannesburg. |
| Adams, Mrs. C. H., | Somerset West. |
| Alexander, Mrs. H. P. , | Durban. |
| Allen, Miss O. M., | Johannesburg. |
| Anderson, Mrs. D. A., | Johannesburg. |
| Anderson, Mrs. J. P., | Johannesburg. |
| Atkinson, Mrs. P. J., | Durban. |
| Bailey, Mrs. R. V., | Robertson. |
| Baker, Mrs. E. L., | Margate. |
| Barnett, Mrs. J. A., | Johannesburg. |
| Barton, Mrs. R. W., | Welkom. |
| Baumann, Mrs. E., | Johannesburg. |
| Baxter, Mrs. J. D. C., | Kimberley. |
| Beard, Mrs., G. R., | Grahamstown. |
| Beveridge, Mrs. N. G., | Vereeniging. |
| Bishop, Mrs. T. J. R., | Johannesburg. |
| Bishop, Miss J., | Johannesburg. |
| Bodenstein, Mrs. J. C., | Britz. |
| Botes, Mrs. P. J., | Roodepoort. |
| Bozyczko, Mrs. W., | Edenvale. |
| Brown, Mrs. G. S., | Johannesburg. |
| Buchanan, Mrs. E. G., | Barberton. |
| Burton, Mrs. C. R., | Kimberley. |
| Burton, Miss, J., | Kimberley. |
| Campbell, Mrs. A. R., | Impendhle. |
| Cassidy, Mrs. C. S., | Maseru. |
| Checketts, Mrs. V. F., | Pretoria. |
| Colam, Mrs. J. B., | Johannesburg. |
| Coman, Mrs. S. J., | Johannesburg. |
| Davis, Mrs. S., | Windhoek. |
| Davison, Mrs. J., | Johannesburg. |
| Dawe, Mrs. H. L., | Johannesburg. |
| De Beer, Mrs. C. L., | Johannesburg. |
| Deglon, Mrs. C. R., | Salisbury. |
| De Jager, Mrs. J. P. J., | Pretoria. |
| De Klerk, Mrs. F. S., | Kempton Park. |
| De Lange, Mrs. R. L., | East London. |
| De Villiers, Mrs. E. E., | Carletonville. |
| De Wet, Mrs. G. D., | Pietersburg. |
| De Wet, Mrs. J. C., | Stellenbosch. |
| Deysel, Mrs. F. F., | Springs. |
| Dixon, Mrs. E. W., | Johannesburg. |
| Dixon, Miss, J., | Johannesburg. |
| Downey, Mrs. J. C., | Springs. |
| Drewett, Mrs. I. H. M., | Johannesburg. |
| Dreyer, Mrs. L., | Westonaria. |
| Durr, Mrs. H., | Pretoria. |
| Duffield, Mrs. J., | Johannesburg |
| Dunkley, Mrs. E., | Margate. |
| Du Plessis, Mrs. W. C., | Thabazimbi. |
| Du Toit, Mrs. P. J. C., | Sasolburg. |
| Engelbrecht, Mrs. J. L., | Winburg. |
| Fisher, Mrs. K. M. | Bedfordview. |
| Fletcher, Mrs. S. J., | Johannesburg. |
| Ford, Mrs. W. P., | Lusaka. |
| Fohren, Mrs. H., | Eshowe. |
| Frankle, Mrs. M., | Johannesburg. |
| Franklin, Mrs. H. C., | Pietermaritzburg. |
| Fraser, Mrs. J. C., | Johannesburg. |
| Froling, Mrs. M. H., | Johannesburg. |
| Futcher, Mrs. L., | Kempton Park. |
| Geldenhuys, Mrs. S. J. J. v. V., | Pretoria. |
| Gibbons, Mrs. W. J., | Johannesburg. |
| Giles, Mrs. P. A., | East London. |
| Gill, Mrs. G. B., | Zululand. |
| Gowans, Mrs. B., | Durban. |
| Grant, Mrs. A. C., | Johannesburg. |
| Gripper, Mrs. H. J., | Knysna. |
| Halstead, Mrs. B., | Margate. |
| Haigsmith, Mrs. D., | Cradock. |
| Holmes, Mrs. N., | Johannesburg. |
| Hollis, Mrs. K. P., | Johannesburg. |
| Hooley, Mrs. G. F., | Salisbury. |
| Holton, Mrs. H., | Vereeniging. |
| Hugo, Mrs. H. J., | Roodepoort. |
| Hutton, Mrs. L. J. J., | Salisbury. |
| Hyam, Mrs. A., | Cradock. |
| Inglis, Mrs. J. I., | Pietersburg. |

*Name* *Town*

Jackson, Mrs. A., Cape Town.
Jackson, Mrs. R., Salisbury.
Jackson, Miss D., Salisbury.
Jarvis, Mrs. W. G. H., Johannesburg.
Jawno, Mrs. L., Kimberley.
Jones, Mrs. N. D., Johannesburg.
Kinsman, Mrs. C., Durban.
Kirschner, Mrs. N., Salisbury.
Klopper, Mrs. A. M. L., Germiston.
Kok, Mrs. J. A., Robertson.
Koeslag, Mrs. H. J., Riversdale.
Kroon, Mrs. H. J., Vereeniging.
Lategan, Mrs. J. E., Stellenbosch.
Lees, Mrs. D., Benoni.
Levitt, Mrs. D. N., Margate.
Lineker, Mrs. A. W., Johannesburg.
Lotter, Mrs. G. A., Louis Trichardt.
Lord, Mrs R. W., Vereeniging.
Lombard, Mrs. C., Germiston.
Louw, Mrs. I. W., Johannesburg
Luck, Mrs. W. P. H., Johannesburg.
Luckhoff, Mrs. H. J., Orkney.
Magowan, Mrs. J. M., Salisbury.
Marais, Mrs. D. J., Johannesburg.
Marsh, Mrs. T. C., Johannesburg.
Martin, Mrs. E. B., Johannesburg.
Mathews, Mrs. J. A., Kimberley.
McGibbon, Mrs., J., Carletonville.
McGibbon, Miss D., Carletonville.
McNeil, Mrs. J. L., Stanger.
Millen, Mrs. T. J., Tzaneen.
Miller, Mrs. M. C. W., Johannesburg.

*Name* *Town*

Mitchell, Mrs. J. E., Kitwe.
Milton, Mrs. W. H., Johannesburg.
Moolman, Mrs. H. J., Alberton.
Morrison, Mrs. J. A., Johannesburg.
Muller, Mrs. B., Pretoria.
Muller, Mrs. G. J., Bloemfontein.
Mullin, Mrs. C. G., Southport.
Mussett, Mrs. B. H., Umtali.
Molyneux, Mrs. G. C., Bulawayo
Mourant, Mrs. G. C., Margate.
Nel, Mrs. A. R., Roodepoort.
Peterson, Mrs. G. R., Salisbury.
Phillips, Mrs. G., Cape Town.
Potgieter, Mrs. N. A., Britz.
Pretorius, Mrs. E. de C., Potchefstroom.
Prins, Mrs. F. J., Pretoria.
Prins, Mrs. H., Johannesburg
Randles, Mrs. T. L., Klerksdorp.
Rattey, Mrs. W. P., Orkney.
Reed, Mrs. T. W., Southport.
Reyneke, Mrs. G. W. M., Winburg.
Roeske, Mrs. G., Johannesburg.
Ross, Mrs. J. W., Potgietersrust.
Rossler, Mrs. A., Cradock.
Rossler, Mrs. W., Kroonstad.
Rist, Mrs. C. A., Johannesburg.
Sibson, Mrs. A. R., Bulawayo.
Simpson, Mrs. R. M. O., Durban.
Smit, Mrs. E., Pretoria.
Smith, Mrs. E. L., Boksburg
Stanley, Mrs. D. W., Johannesburg.
Stanton, Mrs. R. J. G., Ndola.

*Name* *Town*

Stevens, Mrs. F., Ladysmith.
Straszacher, Mrs, R. L., Johannesburg.
Strawson, Mrs. T. R., Johannesburg.
Suckling, Mrs. C. W., Johannesburg.
Sutherland, Mrs. D. G., Pietermaritzburg.
Sutherland, Mrs. J. C., Port Elizabeth.
Surtees, Mrs. E. H., Dundee.
Taljaard, Mrs. D. H., Edenvale.
Thackwray, Mrs. W. G., Kokstad.
Theron, Mrs. G. C., Vanderbijlpark.
Thomas, Mrs. J., Durban.
Thomas, Mrs. S., Johannesburg.
Tonkinson, Mrs. W. E. L., Johannesburg.
Van Ahlften, Mrs. J. K., Sasolburg.
Van der Berg, Mrs. C. J., Louis Trichardt.
Van der Merwe, Mrs. I. W., Margate.
Van der Merwe, Mrs. D. U., Margate.
Van der Westhuizen, Mrs. A., Carletonville.
Van Heerden, Mrs. W. J. B., Heidelberg.
Van Niekerk, Mrs. J. D., Alberton.
Venter, Mrs. H. L., Potchefstroom.
Vickerman, Mrs. P. N., Johannesburg.
Van Schalkwyk, Mrs. A. P., Bloemfontein.
Viljoen, Mrs. J., Kenhardt.
Waddy, Mrs. J. C., Pietermaritzburg.
Waddy, Miss., Pietermaritzburg.
Walsh, Mrs. M. E., Durban.
Watkins-Ball, Mrs. C. G., Johannesburg.
Weaire, Mrs. R. F., Johannesburg.
Wilson, Mrs. J., Pretoria.
Wiehahn, Mrs. G. D., Bethlehem.
Williams, Mrs. J. T., Johannesburg.
Woods, Mrs. V. H., Vereeniging.
Yodaiken, Mrs. J., Que Que.

## NOTICE OF

## 37th ANNUAL CONVENTION, MARGATE.

Notice is hereby given that the 37th Annual Convention of the Association will be held in the Casino, Margate, from the 7th MAY, to the 10th MAY, 1963, both days inclusive.

Davidson & Ewing (Pty.) Ltd.
per R. G. EWING,
Secretaries.

## KENNISGEWING VAN

## 37ste JAAR KONVENSIE, MARGATE.

Hiermee word kennis gegee dat die 37ste Jaarlikse Konvensie van die Vereniging van 7 tot 10 MEI 1963 in die Casino, Margate, gehou sal word.

Davidson & Ewing (Edms.) Bpk.
per R. G. EWING,
Sekretarisse.

## AGENDA AND PROGRAMME

**Monday, 6th May, 1963.**

9.30 a.m.—4.30 p.m. Meeting of Executive Council to be held at the Margate Hotel.

6.00 p.m.—Civic Cocktail Party.

**Tuesday, 7th May, 1963.**

| | |
|---|---|
| 8.45 a.m. | Registration. |
| 9.30 a.m. | Welcome to Margate by His Worship the Mayor of Margate.<br>Welcome to the Convention by His Worship the Mayor of Springs.<br>Official Opening of the Convention by Dr. R. L. Straszacker, Chairman of the Electricity Supply Commission, Republic of South Africa.<br>Election of President.<br>Venue of next Convention.<br>Election of Vice-President. |
| 10.30 a.m. | Refreshment Interval. |
| 11.00 a.m. | Apologies and Greetings. |
| 11.15 a.m. | Presentation of Past President's and Honorary Members' Medals and Certificates. |
| 11.30 a.m. | Election of Executive Council. |
| 11.45 a.m. | Presidential Address. |
| 12.30 p.m. | Luncheon Adjournment. |
| 2.30 p.m. | Paper by R. R. Gilmour, Cape Town City Council, on "Electrical Accidents". |
| 3.30 p.m. | Refreshments. |
| 4.00 p.m. | Discussion on Paper. |
| 4.45 p.m. | Adjournment. |
| 5.00 p.m. | Executive Council Meeting. |

## AGENDA EN PROGRAM

**Maandag, 6 Mei 1963.**

9.30 vm.—4.30 nm. Vergadering van die Uitvoerende Komitee in die Margate Hotel.

6.00 nm. Burgerlike Skemerpartytjie.

**Dinsdag, 7 Mei 1963.**

| | |
|---|---|
| 8.45 vm. | Registrasie. |
| 9.30 vm. | Verwelkoming in Margate deur Sy Edele die Burgemeester van Margate.<br>Verwelkoming op Konvensie deur Sy Edele die Burgemeester van Springs.<br>Amptelike opening van Konvensie deur Dr. R. L. Straszacker, Voorsitter van die Elektrisiteitsvoorsieningskommissie, Republiek van Suid-Afrika.<br>Verkiesing van President.<br>Vergaderplek van volgende Konvensie.<br>Verkiesing van Vise-President. |
| 10.30 vm. | Verversings. |
| 11.00 vm. | Verskonings en groete. |
| 11.15 vm. | Presentasie — Aftredende President en Erelede se Medaljes en Sertifikate. |
| 11.30 vm. | Verkiesing van Uitvoerende Komitee. |
| 11.45 vm. | Presidentsrede. |
| 12.30 nm. | Middagete. |
| 2.30 nm. | Referaat deur R. Gilmour, Stadsraad Kaapstad: "Elektrisiteitsongelukke". |
| 3.30 nm. | Verversings. |
| 4.00 nm. | Bespreking van referaat. |
| 4.45 nm. | Verdaging. |
| 5.00 nm. | Vergadering van Uitvoerende Komitee. |

**Wednesday, 8th May, 1963.**

9.30 a.m. Convention Resumes.
Communications from Council.
Paper: "Economics of Distribution Planning" by Mr. J. P. J. de Jager of the Staff of the Electricity Department, Pretoria.

10.30 a.m. Tea.

11.00 a.m. Paper by Mr. A. P. van Schalkwyk, a member of the staff of the Bloemfontein Electricity Department on "Some Practical Aspects of 11Kv Distribution Lines".

11.30 a.m. Discussion on Papers.

12 Noon Luncheon Adjournment.

Afternoon Visit to Oribi Gorge or Golf and Bowls Tournament.

8.15 p.m. Members' Forum — venue: Town Hall.

10.00 p.m. Refreshments and announcement of winners of Golf and Bowls Tournament.

**Thursday, 9th May, 1963.**

9.30 a.m. Convention Resumes.
Communications from Council.
Annual Report of Secretaries.
Appointment of Auditors.
Discussion on Reports of Sub-Committees and Representatives.

10.30 a.m. Tea.

11.00 a.m. Paper by Mr. L. J. J. Hutton, of the Salisbury Municipality on "Meter Reading Methods in Salisbury".

12 Noon Luncheon Adjournment.

2.30 p.m. Paper: "Some Aspects of the Statutes Relating to Electricity Supply", by A. P. Burger.

3.30 p.m. Tea.

4.00 p.m. Discussion on papers.

5.00 p.m. Adjournment.

6.30 p.m. Informal Dinner (lounge suits) — Margate Hotel. Followed by a theatrical show at the Casino Theatre. Proceed to the Palm Grove for Coffee and informal dancing.

**Friday, 10th May, 1963.**

9.30 a.m. Convention Resumes.
Communications from Council.
Discussion regarding papers, Reports, etc.

10.30 a.m. Tea.

11.00 a.m. Closing Session.

12 Noon Meeting of Executive Council.

**Woensdag, 8 Mei 1963.**

9.30 vm. Konvensie word hervat.
Berigte van Komitee.
Referaat: "Ekonomie van Distribusiebeplanning" deur Mnr. J. P. J. de Jager van die personeel van Elektrisiteitsafdeling, Pretoria.

10.30 vm. Teepouse.

11.00 vm. Referaat deur mnr. A. P. van Schalkwyk, 'n personeellid van die Bloemfonteinse Elektrisiteitsafdeling oor die onderwerp „Sommige Praktiese Aspekte van 11Kv. Distribusielyne".

11.30 vm. Bespreking van referate.

12.00 middag Middagete.

Namiddag Besoek aan Oribi Gorge of Gholf- en Rolbaltoernooi.

8.15 nm. Ledeform — vergaderplek: Stadsaal.

10.00 nm. Verversings en aankondiging van Gholf- en Rolbaltoernooiwenners.

**Donderdag, 9 Mei 1963.**

9.30 vm. Konvensie word hervat.
Berigte van Komitee.
Jaarverslag van Sekretarisse.
Aanstelling van ouditeure.
Bespreking van verslae deur onder-komitees en verteenwoordigers.

10.30 vm. Teepouse.

11.00 vm. Referaat deur mnr. L. J. J. Hutton van die Munisipaliteit, Salisbury, oor „Meterlesings Metode in Salisbury."

12.00 middag Middagete.

Referaat deur A. P. Burger oor „Sommige Aspekte van die Elektrisiteitsvoorsiening Verwysings."

3.30 nm. Teepouse.

4.00 nm. Bespreking van referate.

5.00 nm. Verdaging.

6.30 nm. Informele Dinee (dagpakke) — Margate Hotel gevolg deur 'n skouburgvertoning in die Casinoteater. Na Palm Grove vir koffie en informele dans.

**Vrydag, 10 Mei 1963.**

9.30 vm. Konvensie word hervat.
Berigte van Komitee.
Bespreking van referate, verslae ens.

10.30 vm. Teepouse.

11.00 vm. Afsluitingsessie.

12.00 middag Vergadering van Uitvoerende Komitee.

## LADIES' PROGRAMME

**Monday, 6th May, 1963.**

6.00 p.m. Civic Cocktail Party.

**Tuesday, 7th May, 1963.**

8.45 a.m. Assemble for Registration and Official Opening.

10.30 a.m. Refreshment Interval.

11.00 a.m. Apologies and Greetings.

11.15 a.m. Presentation of Past President's and Honorary Members' Medals and Certificates.

11.30 a.m. Election of Executive Council.

11.45 a.m. Presidential Address.

4.00 p.m. Mannequin Parade to be held in the main lounge of the Margate Hotel.
Free Evening.

**Wednesday, 8th May, 1963.**

Free Morning.

Afternoon Visit to Oribi Gorge or Golf and Bowls Tournament.

8.15 p.m. Members' Forum — venue: Town Hall.

10.00 p.m. Refreshments and announcement of winners of Golf and Bowls Tournament.

**Thursday, 9th May, 1963.**

Morning Tea with the Lady President. The Mayoress and wives of the Councillors will be guests.

6.30 p.m. Informal Dinner — Margate Hotel. Followed by a theatrical show at the Casino Theatre.
Proceed to the Palm Grove for Coffee and informal dancing.

**Friday, 10th May, 1963.**

10.30 a.m. Assemble for Tea and Closing Session.

All delegates and visitors are advised that admission to the dinner at the Margate Hotel on Thursday, 9th May, and to the entertainment to be provided thereafter at the Casino will be controlled by the display of the official Conference badges.

It will be appreciated that the wearing of these badges on this occasion is absolutely essential and the door-keepers will be instructed to exclude persons not wearing their badges.

## PROGRAM VIR DAMES

**Maandag, 6 Mei 1963.**

6.00 nm. Burgerlike Skemerpartytjie.

**Dinsdag, 7 Mei 1963.**

8.45 vm. Kom byeen vir registrasie en amptelike opening.

10.30 vm. Verversings.

11.00 vm. Verskonings en groete.

11.15 vm. Presentasie: Aftredende President en Erelede se medaljes en sertifikate.

11.30 vm. Verkiesing van Uitvoerende Komitee.

11.45 vm. Presidentsrede.

4.00 nm. Modeparade in die hoofsitkamer van die Margate Hotel.
Nag vry.

**Woensdag, 8 Mei 1963.**

Oggend vry.

Namiddag Besoek aan Oribi Gorge of Gholf- en Rolbaltoernooi.

8.15 nm. Ledeforum — vergaderplek: Stadsaal.

Verwysings en aankondiging van Gholf- en Rolbaltoernooiwenners.

**Donderdag, 9 Mei 1963.**

Oggendtee in geselskap van die Presidentsvrou. Die Burgemeestersvrou en Raadslede se vrouens sal gaste wees.

6.30 nm. Informele Dinee — Margate Hotel. Daarna 'n bioskoopvertonin gin die Casino-teater. Gaan na die Palm Grove vir koffie en informele dans.

**Vrydag, 10 Mei 1963.**

10.30 vm. Vergader vir tee en afsluitingsessie.

Alle afgevaardigdes en besoekers word meegedeel dat toegang tot die ete by die Margate Hotel op Donderdag, 9 Mei, en tot die onthaal daarná voorsien by die Casino, beheer sal word deur die vertoning van die amptelike Konfensiekentekens.

Dit sal waardeer word dat die dra van hierdie kentekens by hierdie geleentheid noodsaaklik is en die deurwagter sal opdrag gege word om toegang te weier aan enigeen sonder kentekens.

The Thirty-Seventh Convention of the Association was opened in the Casion Margate, by Dr. R. L. Straszacker, Chairman of the Electricity Supply Commission, at 9.30 a.m. on Tuesday, 7th May, 1963.

Attendance at the Convention was as follows:—87 Councils represented by 60 Councillors and 91 Engineers and Associates; 6 Honorary Members (not representing Councils or Affiliates); 11 Associate Members; 84 representatives of 53 Affiliates; 45 Visitors (representing Government Departments, Public Utilities and other organisations); 176 Ladies; 3 A.M.E.U. Officials—a total of 476 persons.

# FIRST DAY

THE PRESIDENT: Ladies and gentlemen, it is my very great pleasure to greet you this morning of the Thirty-Seventh Annual Convention of the A.M.E.U. of Southern Africa, and especially do I greet our distinguished first citizens of their respective towns, the Mayor of Margate, the Mayor of Springs, and our honoured guest, Dr. R. L. Straszacker, Chairman of the Electricity Supply Commission.

We esteem it a very great privilege and wish to extend our cordial appreciation to these gentlemen for being with us today to take part in the proceedings, and to lend their good offices to the Association on this occasion.

I will now call upon the Mayor of Margate to welcome you to this town, which is widely regarded as the gem of the South Coast. Councillor Baker. (Applause)

COUNCILLOR R. L. BAKER, His Worship the Mayor of Margate: Mr. President, ladies and gentlemen, having had the privilege of meeting you all individually last night makes my function here this morning a very pleasant one indeed.

First of all I would like to welcome my colleague, the Mayor of Springs, Clr. Deysel. We are very happy indeed to have him here with us.

Some years ago, when you saw fit to hold your annual conference here, and a return was taken by myself and my council to represent the compliment, particularly in view of the fact that we do not have an electrical engineer ourselves, and we have no official connection with electricity services in the Borough.

I understand, therefore, that the position is almost unique, and Margate is proud of the fact that for the second time you have chosen to come here as the venue for your conference, and we believe that we have all the facilities required for staging a successful conference.

Hierdie is een van die grootste munisipale kongresse wat jaarliks in die Republiek word gehou, en aan diegene was nog nie vantevore hier was nie, sê ek baie hartlik welkom en verseker u dat ons in Margate alles in ons vermoeë sal doen om u verblyf tydens hierdie kongres 'n leersame en genotvolle een te maak.

I would like to extend a very special and hearty welcome to our delegates from across the borders. We are indeed very pleased to have them here with us once again. At the moment along the coast we have many hundreds of people from the Rhodesias on holiday and I am quite certain that the delegates here this morning will meet them during the course of this conference.

We have done our best to provide you with entertainment during the limited time you are here and our sincere wish is that you will look back upon this conference as one of the happiest and most enjoyable you have experienced.

A very hearty welcome to you, Mr. President, and your executive and to the members and delegations to this conference.

Thank you. (Applause.)

THE PRESIDENT: Thank you very much indeed Mr. Mayor for the warmth of your welcome and the happy sentiments you have expressed towards the Association.

I now call upon the Mayor of Springs to welcome you to the Convention on behalf of that very progressive town situated in the golden heart of the mine fields of the Transvaal.

Clr. F. F. DEYSEL, M.P.C., Mayor of Springs: Mnr. die President, sy edelagbare die Burgemeester van Margate, Dr. Straszacker, dames en here:

Dit is vir my 'n aangename voorreg en 'n besondere eer om u almal hier teenwoordig, namens Springs, tot hierdie 37e konvensie van die Vereniging van Munisipal Elektrisiteitsondernemings van Suidelike Afrika, hartlik welkom te heet.

U sal u herinner dat ek u verlede jaar in Oos--Londen namens Springs uitgenooi het om u volgende kongres, onderhewig aan die goedkeuring en samewerking van die plaaslike Stadsraad hier in Margate te kom hou. Ek wil dus van hierdie geleentheid gebruik maak om die Burgermeester van Margate, en deur hom die Stadsraad van Margate, hartelik te bedank vir hulle gulhartige samewerking wat dit vir Springs moontlik gemaak het om aan verlede jaar se uitnodiging uitvoering te gee.

Springs is 'n ideale plek om 'n kongress van hierdie aard te hou. Ons spog graag met ons baie nywerhede, ons moderne straatbeligting, ons groot parke, verskeie golfbane, rolbalbane, swembaddens, teaters, en alles wat nodig is om 'n kongres by uitnemendheid te laat slaag. Daar is egter twee probleme wat ons tot dusver nog nie heeltemal kon oplos nie. Die een is die feit dat Springs nie by die see geleë is nie, en die ander baie groot nadeel is die feit dat die see nie by Springs geleë is nie.

Dit is ook 'n instelling dat die kongres elke jaar in Meimaand gehou word, 'n tyd van die jaar wanneer ons hoëveldsewinter-klimaat nie baie bevoordelik is vir die uiteenlopende kongresaktiwiteite wat so onontbeerlik vir 'n geslaagde kongres is nie.

Omdat ons die algemene welsyn van al die lede van die Vereniging van Munisipale Elektrisiteitsondernemings van Suidelike Afrika op die hart dra, en omdat dit ons innige begeerte is dat hierdie 37e konvensie 'n aangename sukses moet wees, daarom het Springs u hier na Margate genooi en daarom is ons vandag hier in Margate en nie daar in Springs nie.

Dit is natuurlik alles gereël in oorleg met die Stadsvaders van Margate en dis hulle deel van die ooreenkoms om daarvoor te sorg dat ons aangename, gunstige, sonnige en ideale weersomstandighede sal hê, en ook dat die haaie nie te dikwels aan die verkeerde kant van die net kom kuier nie.

Ek het nou nog nie 'n enkele woord oor elektrisiteit gesê nie, en ek is ook nie van plan om u te vertel wat elektrisiteit nou eintlik is nie, en wel om die eenvoudige rede dat al die Raadslede wat hier teenwoordig tog weet wat elektrisitiet is, en die Elektrotegniese ingenieurs sal weer nie verstaan as ek dit aan hulle probeer verduidelik nie.

Mnr. die President, aan u almal, baie hartlik welkom, en mag, hierdie 37e konvensie 'n baie aangename, baie genotvolle en baie vrugbare konvensie wees.

Baie dankie. (Applous.)

THE PRESIDENT: Thank you very much indeed Mr. Mayor, for your cordial references to the Convention, and may I on behalf of the Association thank the Town Council of Springs for their generous contribution and help which has been afforded us. I shall be glad if you will take our sentiments back to your Council, Mr. Mayor.

It is now my very great pleasure to present to you Dr. Straszacker, who, despite the many calls on his time, has found the opportunity to come along and open this Convention.

Dr. R. L. STRASZACKER, Chairman of the Electricity Supply Commission: Mr. President, in accepting your kind invitation to open this 37th Convention of your Association, I presumed that this honour was bestowed on me in view of my having joined the big family of undertakings providing the life blood of the countries of Southern Africa in the form of electricity. I feel myself very much as an in-law in this family who still has to pass some hurdles before being finally admitted. The organisation I represent, I am sure, has long been given full status. This, as families go, would imply that it sometimes may have quarrels with other members of the family. Perhaps my best chance for legitimate admittance would be to use my efforts in smoothing out such quarrels and to help us all to live in harmonious matrimony. On the whole, I think I can say that your Association and Escom—and may I also include the Electricity Control Board—have co-operated very well in the past, and, speaking for Escom, I shall certainly endeavour to keep this so in the future.

My knowledge of the Convention of the A.M.E.U. has until recently been mainly drawn from the remarks overheard as an ordinary ratepayer from members of municipal electricity committees and electrical engineers to the effect that this is a gathering to which they were always most keen to go. I could never quite make out whether this was because of the eagerness to listen to some good technical papers or to participate in the various social events including the fairer sex. But having now seen the details of the extensive agenda and the large number of participants gathering in such pleasant surroundings to deliberate and exchange views in formal and, I am sure, many informal meetings on the most important subject of electricity, I understand this urge not to miss the Convention and regret all the more that I shall only be here this morning and not be able to benefit from further discussions during the next few days.

Mnr. die president, ek wil u veral gelukwens met die goeie verskeidenheid en hoë standaard van die referate wat by hierdie Konvensie gelewer sal word. Dit doen my dosentehart ook goed om onder die referente een van my oudstudente te sien, nie alleen omdat dit aangename herinneringe aan Stellenbosch opwek nie maar veral omdat hy deur sy referaat 'n goeie antwoord lewer op die kritiek wat so dikwels nog teen die ingenieur geslinger word, naamlik, dat hy van ekonomiese en organisatoriese faktore te min kennis het. Verder is dit verblydend om, tenspyte van die Afrikaanse opleiding, die goeie vaardigheid in die tweede landstaal in hierdie referaat te vind. Sou dit te veel wees om hier en daar blyke van dieselfde vaardigheid in teenoorgestelde rigting te verwag, alhoewel dit natuurlik by hierdie samekoms nie vanpas sou wees nie, waar ons besoekers van buite die Republiek het?

Onder die verskillende onderwerpe wat aandag by hierdie Konvensie sal geniet vind ek dele van die vyfde interim ver-

slag van die sogenoemde Borckenhagen Komitee. Graag sal ek in verband daarmee 'n paar gedagtes aan u stel.

At the start, Mr. President, should like to make it quite clear that the recommendation of the Borckenhagen Committee that "it appears to the Committee that the main task of meeting the country's requirements of electricity should be undertaken by Escom and that further expansion of municipal generating stations in areas which could be supplied by Escom should be discouraged" was not suggested by Escom. This Committee of Enquiry had to consider matters having a bearing on the finances of local authorities and amongst these the generation and distribution of electricity would, of course, play an important role. Having collected evidence from all bodies most directly connected with this subject, the Committee saw fit to make certain recommendations, couched in somewhat general terms, which it will behove all of us to scrutinise very closely, particularly where implementation could have far reaching effects on the activities of many municipalities. This examination, I feel, should be carried out in the spirit of the final recommendation of the Committee which reads:

"The Committee wishes to emphasise that the greatest benefit for all can only be achieved by the closest co-operation and mutual understanding between local authorities and Escom and, in most cases, without recourse to the legal powers of the Electricity Control Board."

I fully subscribe to this view and wish to stress that we from Escom will at all times be ready to implement this recommendation. In offering some remarks on certain trends which have become evident the world over in power supply, I hope that they may contribute to the co-operation referred to above, in order that all of us can get as complete a picture as possible before commencing to make a dispassionate evaluation of all factors influencing any particular situation.

At the recent World Power Conference which I attended in Australia in October last year, reports from all participating countries underlined very emphatically the trend towards ever increasing size of the generating unit in modern power stations. This goes concurrently with increasing size of the interconnected system, which again has become possible because of the remarkable developments in the field of high voltage engineering over the past decade, whereby large blocks of power can be transmitted economically and reliably over long distances. This tendency is the result of a whole series of technical improvements which have eventually led to economic advantages inherent in the larger items of equipment.

Some of these engineering feats include:

1. New methods of cooling the stator and rotor of generators whereby the size of unit could be increased to the present level of 500 MW being already applied in the United Kingdom and America, while sizes of up to 1,000 MW are already being installed in America.

2. Improvements in efficiency of the larger turbo-alternators and boilers owing to the use of better materials in order to gain the advantage pertaining to higher pressures and temperatures.

3. Developments in transformer, switchgear and transmission line design, again made possible by improved materials such as special alloys and better insulators, which have led to voltages of transmission of over 700 kV in America and reputedly over 800 kV in Russia.

4. The availability of modern electronic computing equipment which is extensively used not only in optimising design parameters but also for the most economical operation of large extensive networks.

5. Progress made in nuclear power reactors by the application of new materials and techniques and stricter quality control in the manufacture of more orthodox equipment. This has resulted in large units of the order of at least 200 MW which are gradually becoming a competitor of conventional station units in countries where these have to contend with high fuel costs.

6. Improved methods of manufacturing in welding, grinding, shaping of intricate parts, surface finishing, etc., by modern machine tools often electronically controlled.

The overall result of all this has been that the thinking power suppliers has been radically affected by the economic implications of the development. The capital cost of power stations per kW of installed capacity has according to Escom's experience decreased from about R110 for a 30 MW unit to R95 for a 60 MW and down to about R70 for a 200 MW set. The Central Electricity Generating Board of Great Britain has reported the same trend although their prices are generally about R20 per kW higher than ours. Furthermore, this reduction is extended to the maintenance and operating costs of the larger units in view of the fact that the number of operating staff and the time for repair and overhaul are only slightly affected by the size of the unit. These costs on a per kW basis are thus appreciably lowered.

The economic advantages just outlined clearly point to using the maximum practicable size of generating unit with its ancillary equipment. This, however, is directly dependent on the size of the interconnected system. In allowing for possible outages, planned maintenance and scheduled overhaul, optimum operation can only be achieved if the largest single machine is not more than a certain percentage of the total system capacity. It is, therefore, advantageous to make the system as large as possible. High voltage transmission has solved this, as clearly evidenced by what is happening in Europe and the United States of America. Not only has the entire network of Great Britain been interconnected, but most of the Western European nations have tied up their systems and plans for connecting Britain to this whole scheme and have reached an advanced stage. In North America, where power supply is often in the hands of a large number of private firms they all tie into centralised networks which are becoming more and more interconnected.

In South Africa, Escom has gained the same benefits by erecting an extensive 275 kV network in the Transvaal and Natal and a number of 132 kV interconnectors in various parts of the country. For the Camden Power Station with its eventual capacity of 1600 MW (8—200 MW units) power will be transmitted at a maximum of 400 kV and injected into the 275 kV network. In this way full advantage of using the larger units will be obtained.

Another important result of the advent of long distance high voltage transmission of power is the effect it has on the siting of a power station. Escom's detailed analyses of a number of widely differing cases have proved conclusively that pit-head stations have a clear advantage over stations situated nearer the load centres, owing to the extra cost of

hauling coal to the station. The extra transmission costs are often only a small fraction of the coal costs, such siting, e.g. at Komati, Camden, Ingagane stations thus resulting in large savings.

Everything I have thus far said is in principle true for any power supply organisation, namely, that the larger the unit adopted the more economic does it become. However, it will also be clear that fuller advantage of any savings will be achievable for the larger networks of Escom than for any other undertaking of smaller overall size. The logical corollary to this is the question whether the savings so effected are big enough to offset the additional transmission costs inherent in Escom's standard tariffs, so that it would be to the advantage of even the bigger municipalities to take supply in bulk from Escom rather than generate the power themselves?

Whilst it is true that at a particular instant this question can be answered by looking at the likely costs of installing new equipment and to compare these with the costs that Escom's tariffs would entail, I make bold to say that on a long-term view the advantages I have attempted to outline briefly should go a long way to proving that the view of the Borckenhagen Committee on this point is well worth implementing.

So far I have not touched on other matters which, although of a secondary nature in the above comparison of costs, are nevertheless important. I shall just, in concluding, mention two. The first is the question of diversity of load. This to the layman is rather obscure, but can perhaps best be stated in a simplified way by saying that for a diversity factor of 2 a bulk consumer receives twice the amount on maximum demand charge which he himself has to pay on this score. This would be possible, for example, if there were an industrial load during the day equal to the same domestic load in the evening. When looking to the future, this aspect of diversity needs careful evaluation as it may be a contributing factor towards reducing generating costs for the consumers connected to a large system.

The second point is the reliability of supply which depends to a large extent on standby equipment. In a large system working under good conditions of load factor such standby equipment will in general be smaller and thus available at lower cost, since the most modern methods for optimised operation can be built into the system.

With these few remarks, I have tried to impress on you that in taking decisions in the field of power supply there are many factors which are reasonably calculable. On top of these there are, however, some which can only be estimated by inspecting broad trends and these should not be overlooked when considering what is best for the whole country.

As always the status quo in any sector of a country's activity has been reached by the devious paths of history. Escom's general policy is to supply power as cheaply and reliably as possible to all kinds of consumers. Historical development has dictated that for the sake of the consumer's benefit it has had to function as bulk supplier in some cases and as distributors in others. While it is by virtue of the Electricity Act bound to safeguard the interests of its existing consumers, I at present have the feeling that Escom should, in a broad way gradually move in the direction of becoming more of a wholesaler and less of a retailer of electricity than at present excepting, of course, in large rural schemes. By doing this it will, in my opinion, make the best use of the trends I have just sketched to you.

Your Association, Mr. President, stands in the middle of this problem and can do much to throw further light on some of the facets thereof. I trust that our mutual co-operation will contribute vitally to coming to the best long-term solution most advantageous to all concerned.

I have now much pleasure in declaring this 37th Convention of the Association of Municipal Electricity Undertakings of Southern Africa open en ek spreek daarmee die vertroue uit dat u beraadslagings besonder vrugbaar mag wees. (Applause.)

THE PRESIDENT: Thank you very much indeed Dr. Straszacker, for your most interesting address. We electrical engineers are better informed now on the general policies of the Commission; you have given us a fascinating glimpse of advanced engineering techniques, and the hard economic facts which underlie some of the Commission's actions.

Thank you very much indeed. (Applause.)

Ladies and gentlemen, we now come to the next phase of our proceedings. The Convention has now been opened, and it is necessary to elect a new president. I call for nominations for President for the ensuing year.

Mr. R. W. KANE (Johannesburg): Mr. President, ladies and gentlemen, I wish to propose the customary elevation of our Vice-President to the office of President.

Jack Downey is well known to most of us here today and apart from his wife, I think J. C. Fraser and myself can claim to have known him longest of all.

Jack was born in Devon on Christmas Day 1900 and consequently he is one of those unfortunate people who never know whether they are receiving a Christmas present or a birthday present and in the majority of cases lose on the deal.

He arrived in South Africa at East London in 1904 and his first Municipal appointment was with the Johannesburg Electricity Department in November, 1928, but he left in 1939 to join the Springs Municipality. His immediate chief was on active service during the Second World War and Jack acted as Electrical Engineer for a considerable period and attended quite a number of the Advisory Committee meetings of this Association that functioned then under the late Arthur Rodwell.

His first Convention that he attended as an official delegate was in 1944 and in 1946 he was elected to our Executive Council in his own right and has since served for a continuous period of 17 years. From records available and certainly since the 1936 change of constitution when we became a Municipal Association, he has had the longest continuous service of any engineer on the Executive. Our old friend Dirk Hugo has served at least 20 years, but not continuously.

Coming from the relatively small town of Springs, which has been known over the years to make some astounding claims—for example, street lighting of a special quality claiming Johannesburg as a suburb and more recently has been

actively engaged in a take-over bid for Dunottar, it is interesting to note that this very active town that we hope to honour today together with Jack, stands ninth in population size of our members and thirteenth in sale of units.

Jack was elected President in 1951 at a Convention held in Cape Town and this was the first occasion in our history as

Studying the Presidential photograph of that year it shows signs of the earlier good looks of the Downey family, but in one aspect he has not changed. He even then was no flourishing source of revenue to the local barber.

If you accept the proposal placed before you today Jack will join the group of past presidents who have held office on two occasions, namely, Messrs. Roberts of Durban, Sankey of Port Elizabeth and Johannesburg, Rodwell of Johannesburg and Muller of Bloemfontein.

Added to this is the fact that he is at present the President of the S.A. Institute of Electrical Engineers and also Chairman of the S.A.N.C.I. which in all is rather unique.

Mr. President and gentlemen, on behalf of your Executive I formerly propose Mr. J. C. Downey as your President for 1963/64 and wish him a very successful year of office. (Applause.)

THE PRESIDENT: Thank you, Mr. Kane. Would anybody care to second Mr. Kane's proposal?

Raadslid F. F. DEYSEL (Springs): Meneer, die President, dames en here, laat my toe om die voorstel van Mnr. R. W. Kane van Johannesburg te sekondeer. Dit is baie paslik dat die voorstel van Johannesburg gekom het, maar ek wil tog net daarop wys dat dit meru moto is en nie van weë totalitêre druk van Springs op een van sy kleinere voorstede nie!

Springs is trots en dankbaar om 'n man met so 'n indrukwekkende loopbaan soos Mnr. Jack Downey as elektrotegniese ingenieur te hê. Saam met u is ons bly om aan hom hierdie welverdiende eer te betoon, veral aangesien dit sy laaste kongres as ingenieur-lid sal wees.

Sy aftrede aan die einde van hierdie jaar sal sekerlik nie 'n kersgeskenk aan Springs wees nie, en op die skouers van sy opvolger rus 'n byna bomenslike taak as hy in die voetspore van Jack Downey wil volg.

Graag maak ek van hierdie geleentheid gebruik om Mnr. Downey 'n aangename en voorspoedige ampsjaar toe te wens.

Mnr. die President, dit doen my nou genoeë om die voorstel dat Mnr. Jack Downey van Springs tot President verkies word formeel te sekondeer. (Applous.)

THE PRESIDENT: Are there any further nominations for the office of President?

In the absence of further nominations, I have very great pleasure in declaring Jack Downey President for the ensuing year. (Applause.)

(The Chain of Office was presented to Mr. J. Downey).

Mr. Downey I have very great pleasure in installing this chain of office, and I wish you a very successful year.

(Mr. Jack Downey took the Chair.)

Mr. J. DOWNEY (Springs): Ladies and gentlemen, I thank you most sincerely for this honour of electing me as your President of the A.M.E.U. I realise that it is on very rare occasions that an engineer member ever becomes elected a second time President of this Association.

I also realise that the work of this Association is far greater today than it was in 1951, and that the duties are far more onerous, but I will do everything I can to assist and to foster the aims and objects of this Association in the best interests of every one of you.

Ek wil u in alle nederigheid baie hartlik bedank vir die groot eer wat u aan my bewys het deur my as President van hierdie vereniging vir die komende jaar te kies. Ek besef dat dit maar selde gebeur dat so 'n groot eer 'n persoon twee keer te beurt val, dus waardeur ek dit des te meer. Ek wil u verseker dat ek te alle tye sal streef om hierdie amp waardig te wees en om die belange van ons vereniging te bevorder. Ek vertrou dat ek u nie sal teleurstel nie. (Applause.)

THE PRESIDENT: Ladies and gentlemen, we now come to the venue of the next Convention. I think Councillor Davis has something to say in this matter.

Clr. S. DAVIS (Windhoek): Mr. President, ladies and gentlemen, it is really a pleasure to have this privilege of inviting the Association to come to Windhoek, not only as an old resident of Windhoek, but also as a former resident of Natal.

When I first went up to Windhoek, the first thing we used to do was to say, "Have you seen our cemetery?" Since those days, apparently we have risen from the dead—we don't mention the cemetery any more, but show you many other things.

Seriously, though, I think the time has arrived for our friends in the Republic, and believe me we are one large family, Mr. President, and irrespective of what might be said elsewhere (I am not introducing politics, but am merely stating a fact), South West Africa's future lies with South Africa, and it behoves all of you to come and have a look.

We have said to other people in other places, "Come and see. We have nothing to hide." As you have no doubt read and heard, they have come, they have seen, they have realised, we have nothing to hide, and try as they might, they have not succeeded in confirming the somewhat lurid and wild tales that are told about our part of the world.

But, ladies, and gentlemen, we do feel that it is the responsibility of people like yourselves, members of local authorities, officials, to come up and see and to assess your responsibilities there.

We have, in the past few years, developed considerably from the rather wild country that many of you, I think, and a lot of your fathers knew, when the R.D.L.I. and Carbineers were there in the 1914 campaign—it is today a wonderful country with a wonderful future, and we will be very happy to have you there.

Dames en here, ons sal baie bly wees om julle almal daar te verwelkom. Ons is een groot familie, en Suid-Wes Afrika is vandag julle verantwoordelikheid, en ek hoop julle sal almal daar kom kuier.

Vir die dames daar is iets wat ons kan julle ook belowe, ons het karakulvelle daarso; ek weet nie of die mans sal so bly wees oor daardie inligting . . . but seriously also for the ladies there is much we can show them there—our semi-precious stones, and there is also something unique in South West Africa, that is we claim our "continental atmosphere" I believe that the congress next year will be in May.

At the beginning of May an unusual transformation takes place in Windhoek. We have what is called "Carnival". You may or may not have heard about it. It is quite a unique occasion. This year I had to come down to conference, and I missed it. I may have a clearer head, but I have many regrets!

Ladies and gentlemen, we cannot promise you "Carpio Coffee" but we can promise you many other interesting experiences there and I do hope that the Association will accept our invitation.

Various suggestions have been made, if the conference will be held in Windhoek, to make your stay an interesting one. Again I don't want to broach the subject of politics, but there are very interesting developments foreshadowed in South West Africa, which will be of vital interest to your Association.

The Odendaal Commission's report is coming out in the near future. The Honourable the Minister of Foreign Affairs, Mr. Eric Louw, is at present in Portugal discussing the question of the water of the Kunene River, and the Okavango with their envisaged hydro-electric schemes offer for you gentlemen, the technical members of this congress, an enormous field of interest.

Mr. Chairman, on behalf of the Council of Windhoek Municipality, I formally invite the 38th Congress of the Association to take place in Windhoek. Thank you. (Applause.)

THE PRESIDENT: Ladies and gentlemen, I take it by acclamation, you accept the invitation for the next convention to be held in Windhoek. (Applause.)

Thank you, Clr. Davis. I would be pleased if you will convey to your Council our sincere appreciation and thanks for their very fine offer and gesture.

We now come to the next item on the Agenda, and that is the election of a Vice-President, and I call for nominations for Vice-President for the ensuing year.

Mr. C. LOMBARD (Germiston): Mr. President, ladies and gentlemen, before I nominate our new Vice-President, I would like to take this opportunity to congratulate you on your election as President of this Association, and I wish you a successful year of office.

Mr. President, ladies and gentlemen, I have great pleasure in nominating as Vice-President of the Association for the ensuing year, Mr. Bob Barton, Town Electrical and Mechanical Engineer of Welkom.

After Bloemfontein, which is of course a city, Welkom is, I understand, the largest town in the Orange Free State, and I have noticed that it lives up to its name by welcoming the unwary visitor with a horde of traffic inspectors well versed in the intricacies of speed trapping!

However, I don't think we should hold that against Bob, because, although his duties as town electrical and mechanical engineer include the control of the Electricity Department, Mechanical Workshops, the Passenger Transportation Department, and the Fire Department, he has, as far as I know, not yet taken over the control of the Traffic Dept.

Bob has been associated with Municipal Electricity undertakings since 1947, when he became Edenvale's first qualified electrical engineer. He attended his first A.M.E.U. convention in 1948 and has not missed one since that date.

In 1949 he went to Welkom as its first town Electrical and Mechanical Engineer for the Anglo-American Corporation and in 1953 when the Village Management Board took over the services from Anglo-American he was transferred to this body which became a municipality in 1961.

In 1947 he first made acquaintance with a body which later became the Rand Association of Municipal Electrical Engineers, and we thought so much of him that he was made Chairman in 1960. Incidentally, Bob was the only member that the Electrical Wiremen's Registration Board considered to be suitably qualified to do wiring in his own house.

By this I mean that he was the only member who had a Wireman's Registration Certificate.

Bob has served on the A.M.E.U. Executive Council since 1961. He took over the job of Quizmaster from our friend Jimmy Mitchell in 1962, and he has acquitted himself so well of this task that I think he has got himself a permanent job.

Mnr. die President, dames en here, ek dink dit is onnodig vir my om te sê dat ons in Mnr. Bob Barton 'n man het wat nie 'n uiters bekwame ingeniery is nie, maar ook 'n man wat uitstekende dienste aan hierdie vereniging gelewer het en wat die amp van Vise-President op 'n waardige en bekwame wyse sal beklee.

Dit is dus vir my baie aangenaam om Mnr. Bob Barton van Welkom te nomineer as Vise-President van hierdie vereniging vir die komende jaar, en tussen hakkies, Mnr. die President, om nie vir Welkom te na te kom nie, moet ek darem sê dat die dorp se verkeers konstabels uiters beleefd is. Dankie. (Applous.)

THE PRESIDENT: May we have a seconder to the nomination?

Raadslid W. F. MEYER (Welkom): Mnr. die President, voordat ek die voorstel wil sekondeer, laat my toe om u geluk te wens met u verkiesing as President, en mag u in hierdie jaar baie aangename gewaarwordinge beleef en ook 'n suksesvolle jaar in die tuig hê.

Mnr. die President, dames en here, dit is vir my 'n eer en 'n voorreg om die voorstel van Mnr. Chris Lombard wat hy op so 'n voortreflike wyse gedoen het te sekondeer.

Bob Barton was born in Johannesburg on 25th May, 1919. He studied at the Witwatersrand Technical College where he obtained the National Engineering Diploma, and his certificate of Competency he obtained with the assistance of Veasey's Engineering College.

Hy het sy vakleering kontrak uitgedien by Hubert Davies, daarna het hy onder andere vier jaar as elektriese-werktuigkundige by Crown Mines en later drie jaar by die Suid-Afrikaanse Spoorweë gewerk.

He also worked for two electrical contractors, and as you heard from Mr. Chris Lombard, he obtained the Wiremen's Certificate—and it is one of his most prized possessions; and amongst members of the Highveld Branch it is considered as something unique.

Up to 1947 Bob Barton was a bit of a rolling stone. However, in 1947 he joined the ranks of the better paid engineers, and he became electrical engineer of Edenvale. In 1949 he came to Welkom as its first, and so far only, Town Electrical and Mechanical Engineer.

In January 1953, when the Village Management Board took over from Anglo-American he was transferred to the V.M.B. and he later stayed on as the electrical and mechanical engineer of the municipality.

Ek voel dat dit ook noodsaaklik is om iets te sê aangaande die statistieke van my dorp, en die grootte van die onder-

neming was deur Bob Barton beheer word. The population as at the 31st March, 1963, Europeans 30,000, non-Europeans 28,000, units sold 72,290,866. You can see that Bob is a very valuable client to Escom. Maximum demand 19,188 kW. Installed transformer capacity, 47,600 KVA. Total distance of high tension and low tension underground mains, 300 miles. Street lighting, main roads only, 17 miles. Income, 1962/63 R789,000—Expenditure R721,000. Surplus, 1963, R67,000.

Bob is also manager of the Transportation Department, and believe it or not the bus service is being run at a profit! He is also head of the Mechanical Workshops which maintain all the Council's mechanical equipment, and he is also head of the Fire Department.

He has done a fair amount of committee work in the educational field, and he has been Chairman of the Welkom Public Library since its inception in 1951. He has been Chairman of the Central Region of the National Occupational Safety Association for the past three years.

Mr. Bob Barton is a softly spoken man, and has a good sense of humour. He is like his tea—he is at his best when he gets into hot water—and then he cools himself down by eating six balls of ice-cream.

Mr. President, ladies and gentlemen, I think he is a good choice as Vice-President of your association for the ensuing year. I would like to second the proposal with these remarks. (Applause.)

THE PRESIDENT: Are there any other nominations? If there are no other nominations, I duly declare Mr. Bob Barton elected Vice-President for the ensuing year. Mr. Barton will you kindly take your position on the rostrum. (Applause.)

Mr. R. W. BARTON (Welkom): Mr. President, your Worships, Dr. Straszacker, ladies and gentlemen: I would like to express very sincere appreciation for what you have just done to me.

I am sorry you had to listen to so many intimate details. I feel rather like a chicken that has been stripped of its feathers, but I'll try to live it down as quickly as possible.

Aan almal teenwoordig, baie dankie vir u vriendelikheid. (Applous.)

THE PRESIDENT: Ladies and gentlemen, we will now adjourn for tea.

ADJOURNMENT FOR TEA.

(Convention Announcements were given before adjournment for tea.)

*On resuming after tea*:

THE PRESIDENT: Ladies and gentlemen, on the Agenda we should now have Apologies and Greetings, but I propose to leave that over until this afternoon.

We therefore now come to the item of the Presentation of the Past President's and Honorary Members' Medals and Certificates.

I now call upon Past President, Percy Giles, to come up to the platform please.

As a mark of appreciation and respect and thanks from the Association, I present you with this as a mark of indication of the service you have rendered to this Association during the past year. I want to thank you too for all you have done for this Association. (Applause.)

Mr. PERCY GILES (East London): Thank you very much indeed, Mr. President. I must say that I thoroughly enjoyed my year of office, and I relinquish my chain with great satisfaction!

THE PRESIDENT: We come to one other item, gentlemen —your executive have recommended that Mr. Chris Downie be elected an honorary member of this association. Do you approve? (Applause.)

I accept by the applause to mean that you are in entire agreement with your executive. Thank you, ladies and gentlemen.

The certificates and medals will be handed out this afternoon.

We now come to the election of the Executive. There must be five Provincial representations, Cape, Transvaal, Natal, Orange Free State, and the Federation. Messrs. Giles, Lombard, and Barton are not to be elected. The following are the retiring engineer members:

Messrs. Kane, Turner, Simpson, Muller, Hugo and Theron. On the back of your voting paper you will notice the instructions. Only those of you who have received voting papers are entitled to vote.

I'll now call for nominations for six engineer members, five of whom must have Provincial representation.

The following members were nominated:
Mr. D. Murray Nobbs—Port Elibabeth.
Mr. R. M. O. Simpson—Durban.
Mr. G. J. Muller—Bloemfontein.
Mr. J. K. van Ahlften—Sasolburg.
Mr. H. T. Turner—Umtali.
Mr. R. W. Kane—Johannesburg.
Mr. J. I. Inglis—Pietersburg.
Mr. A. C. T. Frantz—Cape Town.
Mr. W. Rossler—Kroonstad.
Mr. J. A. Matthews—Kimberley.
Mr. G. C. Theron—Vanderbijlpark.
Mr. J. M. Gericke—Klerksdorp.
Mr. J. Dawson—Uitenhage.
Mr. W. Beesley—Livingstone.
Mr. J. C. Waddy—Pietermaritzburg.
Mr. U. B. Gresse—Krugersdorp.
Mr. D. J. Hugo—Pretoria.
Mr. H. Durr—Peri-Urban Board.
Mr. A. F. Turnbull—Vereeniging.

THE PRESIDENT: Now you will proceed to vote for six Provincial representation—so if you register all your six engineer members only, bearing in mind that they must have votes in the Transvaal, you'll only have one that can be elected, so you must nominate for each Province.

I will now ask Mr. de Beer and Mr. John Morrison if they will act as scrutineers. (Agreed.)

I suggest that you present your results after lunch! (Sorry to spoil your lunch hour.)

I will now ask the Vice-President, Mr. Barton, to take the chair while I deliver my Presidential Address.

Mr. Barton took the Chair.

THE CHAIRMAN: Ladies and gentlemen, I have pleasure in calling upon our President to present his Presidential Address. (Applause.)

# Presidential Address

by J. C. DOWNEY
Town Electrial Engineer, Springs.

## THE FUTURE METROPOLIS

### 1. PREAMBLE

In electing me to be your President for the ensuing year you have done me a great honour and one to the town I serve. It is an award which I shall treasure not less because it comes to me in the last year of my service as Town Electrical Engineer of Springs.

It has been my privilege to serve as President on a previous occasion. I am all the more conscious therefore of the need for help from my colleagues, from you all and the sustaining example of past presidents of the A.M.E.U. Before the time comes to say farewell as a full member, I trust I shall have lived up to your expectations of the manner in which the post of President should have been undertaken. I can assure you I shall give of my best.

### 2. SUBJECT OF MY ADDRESS

In what must be my last address to you, I have chosen to deal briefly and speculatively with the future cities of our land. If, in my predictions of our needs in the years ahead and of the duties we owe succeeding generations, I seem to you to err, may I place on record it is my aim merely to stimulate study of the problem by you all, not to dictate solutions. I believe the need for a greater awareness of the problem is the important aspect of my talk.

In 1565 Michel Montaigne in one of his essays wrote these words—

> "The beginnings of all things are weak and tender. We ought therefore to be clear-sighted about beginnings for as in their buddings we detect not the dangers so in their full growths we perceive not the remedies."

At this stage I should like you to pause and to reconsider these prophetic words—

> "for in their full growths we perceive not the remedies."

It needs so little conscious deliberation to be convinced that soon the full growth of our towns, of the complexes around our cities and their environs will be a metropolis. The scale of each future metropolis may not reach, for many years, that of present day cities like New York, Tokyo, Paris, London or Los Angeles. That their problems will be those of the foregoing cities in scale and variety nobody will gainsay. The resources of this country of ours, many as yet undeveloped, should cause us all to do what we can to detect in the beginnings the dangers of the organisational structures we create to deal with the problems of the increasing size of our agglomerations.

Do we regard ourselves as Municipal Electrical Engineers? Are we conscious of the implications of the qualification "Municipal". I cannot help drawing the inference from my observations over a long municipal career that many of us tend to stick to being engineers and avoid the real responsibilities of what "Municipal" implies. We love to write "technical treatises" much better suited to our technical institutes. There they would be subjected to a bigger engineering audience with wider experiences than we possess. If presented there we should get criticism free from the inherent bias of anyone close to the subject of his talk. We seem to prefer, moreover, to handle technical projects rather than employ outside help from specialist firms or contractors. We appear to live in our worlds overlooking the bases of our free economic system. The precepts of capitalism that made our western civilisation such a material success seem to be ignored by many of us. I have in mind the division of labour, the concept of specialisation as growth comes upon us. These are but a few of the dangers I fear and in our fuller growth have we not overlooked our specific responsibilities—the Municipal duties, those that are particularly ours.

I wish therefore to address myself to you in the closing year of my Municipal career on a problem close to every municipal engineer. It is we who hold the key to the casket of knowledge. We should busy ourselves with the tasks that fall to our lot. We should be leaders of thought in our communities. Solutions should not be thrust upon us by others less closely associated with the administration of our cities but interested and affected nonetheless. To do so we should adjust our approach and the way we parcel out our available time to those jobs we can do better than anyone else and to leave to our colleagues in other spheres of activity what we can offload usefully on them.

The future metropolis presents a challenge to every municipal engineer. Today I can place before you only a few of the problems it will present. I shall have done my duty successfully if my remarks bear the fruit of your studies.

### 3. THE CITY OF THE PAST

Long before the devision of labour as a necessity of our economic system and before specialisation as a part of the capitalistic creed were inevitable, men had gathered together in clusters. In the 5,000 years that they have done so, towns and cities have undergone changes. Because change is unavoidable it would be a useful study to follow the history of development of cities over the last 5,000 years. In the cities of Mesopotamia, the ancient towns of the Indus valley, in Egypt and the Orient men developed cities to suit their different needs and purposes.

Our forbears existed in cities different from our own even when the scale, as in Rome with its million souls, was in measureable distance of the size of present metropolitan complexes. The early walled cities of Mesopotamia contained their temples and residential areas grouped around the public buildings in the central area. In Egypt the settlements grew around the temple, the palace and the tomb.

In Greece the metropolis tended to be limited both in size and character. Decentralisation seemed to be the key-note of many towns like Syracuse.

The medieaval cities covered areas of about 125 acres and small towns from 10 to 25 acres. The houses contained therein tended to be workplaces and living quarters. Streets came to possess system and function. The renaissance brought in

the fortified city. It also introduced city planning schemes with geometrical patterns.

We come eventually to the city of modern times, the complex brought into being by the industrial revolution. And to these cities come the masses from the countryside. In the words of an old song "How yo gonna keep 'em down on the farm, after they've seen Paree" the drift is not entirely on economic grounds however much a component it might be.

With the growth in the world's population, how do we propose to meet the challenge. Is it likely the cities of tomorrow will cope with the situation. Do we realise what is growing up around us. Before bigness blinds us to the solution should we not try to learn from the past and the present. Should we not set up study groups within our midst not to treat the symptoms but to detect the dangers in our growth.

In our own country we have the conglomerations that signify the metropolis of tomorrow. The Reef, Cape Town and its environs and many other examples bid us beware of the situations that already confront us. It is we who are closest to the problem, we and our colleagues in the Municipal sector. Instead of using our time, our training and our experience to advantage we tend to invade the territory of specialists who can be employed to do many of our mundane tasks for for us, perhaps even better but certainly to relieve us for those purely municipal duties in which we can claim to be the specialist.

When we look at the past we must surely ask ourselves why people live in cities, what are those needs of our societies that only a city can provide and finally what needs can be filled elsewhere or in another manner.

## 4. INCREASE AND MULTIPLY

In our work the populations of our towns and cities have a big bearing upon its scope and responsibilities. In fact it would be true to say that the extent of our undertakings' needs for capital and income derive from the numbers of people in our midst or in the country as a whole. If we export we need men and women to man the machines. What we export from town to town or to other countries comes from the demands of people. The population explosion over the globe as well as in our own midst is important therefore. It is something we have to consider in any review of our duties. We cannot merely observe the phenomenon. We have to prepare our undertakings for the growing needs of our peoples.

While we are conscious and alert to the demands of the population on each undertaking, the provisions that have to be made for equipment to supply electricity to the consumers there is a bigger task before us. In the study and exercise of what we have to do to supply these users we surely ought to consider the shape of the future cities. We need to know how such shape affects our undertakings. We need to help in the task of shaping them. I suggest our approach should be not merely a pedestrian one, we should also be farsighted in viewing the manner in which cities can be moulded for the needs of our future generations. Do we have plans for the decay of parts of a city or the obsolescence that comes into play? In our decision taking do we observe the changing pattern of cities and its effect on investment policies or technological possibilities? Do we shape our course or are we being shaped by events around us?

To understand the magnitude of the problem that the population explosion will create one needs to study its trends. Today more than 20% of the people of the world exist in communities of 20,000 souls. They make up probably 500,000,000 people. 13% live in communities of 100,000 and over. What is a staggering fact is that there were only ten cities in 1900 of 1,000,000 people and today there are 61. It is estimated, by the year 2050, nine people of every ten will live in cities of 20,000 and more inhabitants. It can be assumed, with a reasonable degree of accuracy, in many parts of the world within a period of no more than 50 years most of the population will be concentrated in vast metropolitan complexes probably of 20 million people. In our own case the expansion of our cities territorially is not only inevitable but already evident.

We cannot, in the face of these statistics, remain indifferent to the problems that they postulate. How will we house the people. Can the cities of today cope with the problem. Can they be adapted to handle the geometrical progressive increase of numbers of people invading the towns. Do we need radical solutions and if so, what part of them will we form. In what way do solutions to these questions affect our undertakings and in turn they affect the solution.

Have we taken any significant part in analysing methods, institutional advices, new ideas and solutions that will create a framework for a different organisational structure that affects us municipal electrical engineers and our undertakings.

I do not mean to infer that we as electrical engineers should set ourselves up as experts on city design. I do, however, challenge anyone to deny that we have a big part to play in association with our municipal colleagues in other spheres of local government administration. We have a special part to play in giving the service of electricity to these metropolitan areas.

## 5. THE FORM OF THE CITY AND THE METROPOLIS

To many of us it has become apparent for a long time that pressures to limit growth seem doomed. Yet in our evolutionary system there has been a constant battle to contain things. Men are a certain size for a variety of reasons. Germs are small for definite purposes.

We have a need, I suggest, to consider whether unrestricted growth from town to city and to a metropolis is inevitable. If vast metropolitan complexes have to be accepted what should we be doing in the control and regulation of their growth and form.

Are the limitations to growth likely from the supplies of electricity, water, refuse and waste?

There have been many proposals put forward to control form and growth. Italian and Soviet experiences have been put forward to prove that efforts to restrict the drift to major cities or to a metropolis will fail. But the pattern of flow of people depends, it has been shown as well, on a variety of causes. People can be diverted for reasons of economic oppor-

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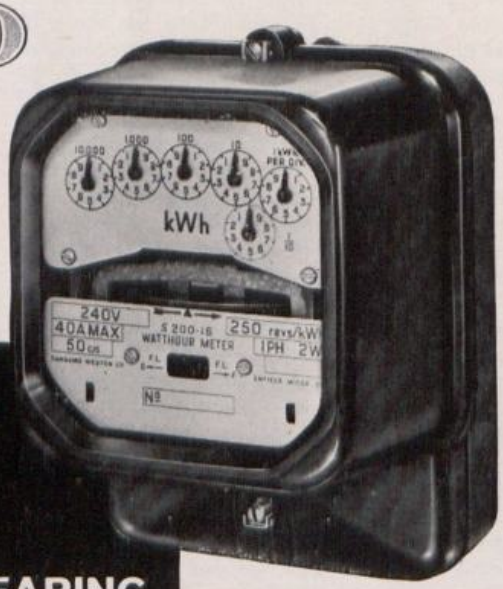


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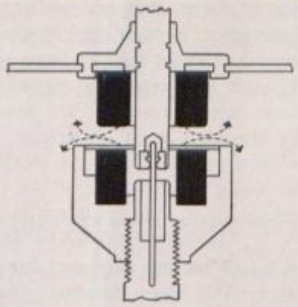

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tunity. They can be influenced by the transportation system or community services. Towns can be restricted to academic needs.

Planning can be a source of idle dreaming, but it can be made to serve a useful purpose if, in its pursuits, we have factual evidence and stores of data to help it along.

In our speculations we need to isolate the problem to be sure that certain forms of growth such as the metropolis are inevitable. Thereafter we should strive to formulate the objectives and human desires that the metropolitan area must fulfil.

Many patterns have been suggested as the form of a metropolitan area. Other writers regard the needs of a region as the starting point. From the grain of a city to its focal organisation we have to add accessibility. In the text of specialised studies we can glean much. The galaxies of the future region may take the form of designs such as the hexagonal star, the ring or the coreless city. All of these perhaps have particular applications. Certainly they all predicate that we should know how the various proposals, that are current thought among city planners, affect the citizen in regard to the supplies of electricity. We can be of great assistance if in our work we have shaped tools the designer can use. We should be designing the tools, collecting the data, comparing costs and organisational structures all to fit into one or another of these patterns.

## 6. OUR CONTRIBUTION TO THE FUTURE

In the text that has gone before I have mentioned duties that we should perform. Our studies of current problems should go hand in hand with speculations of probable change. As our towns grow, as the inevitable accretions consolidate existing metropolitan complexes, ought we not to take part in many of the spontaneously interacting pressures that are arising.

Once we engineers justified a public monopoly to supply electricity over London because it seemed so "obvious" that competing companies supplying users on opposite sides of a road was "senseless". The obvious and the senseless, however, are such relative terms. Today we have similar situations arising everywhere not with two companies but sometimes three or more publicly owned concerns reaching the same or overlapping boundaries. Have we not passed the stage when existing organisational frameworks called for a comprehensive review. If so, how much more likely is a plan for future needs. For instance how easily we can be submerged, our time absorbed in the mundane executive functions of town management; take the case of transport. The policy makers are never out of the grip of costs and deficits. Their duty in my opinion is to rid themselves of encumbrances such as transport and many other executive functions. Instead they should be concentrating on matters which are the real concern of the policy makers. The more important aspect of transport to the community, coming before costs and fares, is its impact on urban density, form and growth. Investments in communications, transport and other services can give a variety of choice. The same reasoning applies to the provision of electricity. A well run organisation in the private sector uses specialist suppliers. The large motor corporations purchase many components from the specialist. The pump supplier rarely owns a foundry. Ought we not to learn from these examples. In lighting up our roadways is our task not that of policy making or guiding our policy makers and not the provision of the installation or even perhaps its design. Ought we not to see the difference between wood and trees. It is in these spheres we of the municipalities should be devoting study and experiment not in the mechanics of running transport as a case in point. And I don't mean merely a bus service, but the all embracing term transport from the taxi to all mechanical forms and means for the carriage of people or goods. Wedded merely to a bus service lends a special bias to the policy makers who manage it. We ought to resolve some of the provoking paradoxes, full buses and constant deficits. Off peak traffic that is now diverted to the suburbs. Do we need to divert commuters, can we use the powers of a metropolitan board to achieve diversity? Do we need comprehensive regional or metropolitan organisations that transcend existing central or local government agencies? Will palliatives serve the mass needs of metropolitan complexes that may hold 20 million or more people. While the problem of transport or any allied communal service may not be specifically ours, the solutions are interlinked because of their impact upon our own responsibilities. We ought therefore to be clearsighted about them as well as our own specialised tasks.

From a study of organisational frameworks it must follow that the technical problems of distribution of electricity must be tackled. Rising loads may cause greater overlapping of networks than we know at present or impose radically different courses. These may restrict or even support the breaking up of many long held views on established rights to operate electricity undertakings. The cession of rights to supply as well as to generate electricity will be at stake in these exercises.

I have tried to show from a few remarks on population growth that the problems will become increasingly complex within the foreseeable future. Environment and city planning lag behind in the various sectors of public enterprise. They are hampered by established and vested interests. We in the public services often bemoan the selfishness and profit-seeking of the self perpetuating ratepayer but try to turn the beady eye of criticism on our own reactions. Search your own hearts for the reactions that such a move rouses. Are we less selfish, less power seeking, do we lust for huge organisations in a spirit different from those who hamper our aims?

It seems to me all the possible solutions to the problems that lie ahead will involve greater co-operation between local authorities and other public bodies, greater interchange or amalgamations of responsibility, often great loss of existing rights if we are to do the job aright. Manipulation and horse trading will not provide solutions. They will involve radical changes and much objective thinking.

The growth of cities into huge metropolitan complexes will introduce fiscal as well as organisational problems. With

these we ought to be concerned. If there is to be a gradual or radical change in the organisations to supervise communities, there may well be metropolitan bodies overriding certain of the present responsibilities of local government for electricity as well as other services and midway between local and provincial tasks. Are we prepared to debate the change? Have we any view on the fiscal needs or policies of raising taxes? Can we give a lead that is based on more than speculation? The job of sorting out a solution to these problems is one that involves us as well as our colleagues the Town Clerk, the Town Treasurer, the Town Engineer and others.

In studying the growth of cities I believe we need to keep axiomatic principles of our capitalistic economy in mind. Growth of an industry rarely, if ever, predicates concentration in one huge corporation. Imagine Chrysler, General Motors and Ford combined in a merger. The analogy, surely, should be a group of manufacturers, a large collection of wholesalers and a multitude of retailers. If growth demands these subdivisions, must we not concede the tree-like surgery that removes branches to bear better fruit in our orchards. Should we not have ideas when pruning is desirable, at what stage and mostly which functions should be placed in other hands. Ought we not to be debating these solutions not merely as theoretical possibilities but on real grounds of case histories. For case histories we need records and these, I suggest, are lacking. Give up more of your mundane duties and become truly great municipal engineers, not merely visionaries, but men whose feet are on the sound foundations of knowledge and experience. We must have the facts. What density, per sé, involves, what safely realisable densities of human congregation can be attained and the effect on human performance and against all these the constant danger of inflating the cost of rendering services.

In an effort to bring our specialised knowledge and experience to the task we need to devote, individually, and collectively as an association a great deal of energy to the accumulation of data. For example in the denser city areas we hand over to the office or flat block owner responsibilities for the vertical distribution of electricity to each level of occupation, but in residential areas we reticulate only to ground level. Do we make any effort to correlate the capital costs involved in these two zones? Are we able to help the Town Planner in his efforts to design a city with easily presented facts? Are we in a position to tell our policy makers what electricity will cost in a particular form of a metropolis? Ought we not to be able to do so? For example, study the rising costs of supplying electricity in many of our existing organisations. Would we have adopted them if we had known they would bring about increased charges? Do we really believe the rise is merely a corollary of increased prices of plant and material? I trust we are not all that naive. Our policy makers are entitled to know what their decisions will mean to the price of electricity. If they shape a city the price to the citizen should be known before they decide upon its form. Can we help them in their task. Do we as a body in a central bureau sift the information. Do we do enough in the presentation of data to bring into the limelight matters of common concern. We require the comparisons of cost, of structural form and of organisational framework to enable us to adapt a pattern to suit particular combinations. I see no sign that we are preparing such data.

If the problem were, as yet, a distant flash of warning I could ascribe a reason for our ignoring it. The situation, however, faces almost every embryonic metropolitan area in the country. It is a matter of concern to all of us. It would be well for us to keep in mind whom it is we serve. Our duty lies not in the maintenance of our own hierarchy but in serving the welfare of the citizens.

In order to determine the destiny of local government we need more than sentiment, tradition or emotional attachments to justify its continued form. Surely we ought to be gathering relative administrative costs of different forms. Ought we not to establish policies only after a careful assessment of the advantages of the different organisational forms that suggest themselves for our particular set of circumstances.

For example, although the electricity supply industry in the Netherlands is publicly owned it is not nationalised in the manner adopted in Great Britain or here. Electricity is produced and distributed by companies owned by the Provinces and Municipalities. The trend is towards the elimination of the very small municipalities.

Production is concentrated in eleven undertakings. The situation in the Netherlands embodies a considerable amount of decentralisation of the activities of the electricity supply industry.

Before we need adapt ourselves to radical changes we have ample scope to examine the results of areas boards in Great Britain, of the results in the Netherlands and the many other organisational forms adopted in other countries. In my humble opinion the method followed in the Netherlands offers great scope for its introduction in this country. Before we make comparisons we ought to know a great deal more about ourselves and our own performances in the field of the supply of electricity.

## 7. CONCLUSION

I mentioned earlier that this year sees the end of my municipal career. To an old member of the A.M.E.U. you have listened with patience, for which I thank you, to some of the doubts and fears I have expressed concerning our Association's future. Most elder statesmen tend to be censorious. I trust you will bear with me if I place on record the fear of other men, old when I was a young member. This is, and ought to be, a specialist concern rightly labelled "Municipal". As such it is concerned with things "Municipal".

I have endeavoured to draw to your attention today the problem that faces all of us in municipal service. It is of vital importance to the people we serve and integrated in our country. We are on the verge of developments that must change the complexion of every town.

In our search for solutions should we not know more about the virtues of private, public or mixed organisations. I mentioned earlier the Netherlands Municipalities own companies to run the electricity supplies. Have we the data upon which to voice our views?

I suggest we know little concerning the usual ratios of cost of electricity, transport or communications to the cost of shelter in cities of different size. We ought, I suggest, to

be able to foretell how the ratio changes for different types of city, a university town like Stellenbosch or a special case like Sasolburg, grown to many times their present size. How will these ratios alter if the scale of the town-become-city-become-metropolis increases.

There are many other ratios, whose importance may be relevant, that come to mind. Total capital investment in shelter to other facilities, total manpower employed for cities of different scales, the ratio of telephone calls and written messages; all these may be of help to determine what range of values can be acceptable or what are the desirable proportions. How much improvement in well being can we afford, for example, to reduce traffic so that we get to office in half the time. Should electricity be so priced as to inhibit dense regions in a city. To do so we require to know the overall cost of everything that is involved from the power stations to the flat tenants installation.

The problem concerns the following needs of every community—

(a) Metropolitan growth; is it controllable; should its scale and character be the end product as in evolutionary processes of a multitude of separate decisions by firms and families. Can we guide it into a preferred pattern.

(b) Can dispersion be achieved. About 50% to 70% of the total capital investment goes into community overhead. Many of the costs are probably higher in the bigger cities. Do we know this?

(c) Does the self generating force of a large conglomeration increase returns sufficiently to diversify its economy and justify its higher costs. Research into these ideas may give us clues.

(d) The husbanding of capital by the decision makers so that it is neither frittered away in dispersed efforts nor expended on over-costly urban services.

(e) Do we need professional specialists to do the research into these problems. With the growth can we adapt our organisational framework to meet the challenge of change.

(f) Do we need a new level of government before the provinces and the towns to cover aspects of metropolitan growth.

It is not my purpose in my address to you to submit remedies nor propound solutions. They will be the task of you who follow me. All I want to achieve is to make you aware of the special task of the Municipal Electrical Engineer and this Association. It is concerned with the well-being of local government. If you will ponder over the problem, what you should do will become clearer to you. To survive, local government must endure change.

Perhaps electrical engineers in general lack certain basic incentives that a different training or education might have instilled in them. We are engineers first; let us not be only engineers. The pioneers of our profession were men of wide knowledge, learned in its many spheres and men of the world around them. Today we tend to isolate ourselves in a cocoon, talking jargon we alone follow.

I have thrown out a problem and a challenge. May I conclude by repeating Montaigne's words —

> "The beginnings of all things are weak and tender. We ought therefore to be clear-sighted about beginnings for as in their buddings we detect not the dangers so in their full growths we perceive not the remedies."

Need I add they can be your inspiration to help to give the world better cities; cities that can be compact yet provide the open spaces for which we long, places that can be both orderly and yet flexible enough to meet changing needs; cities that offer privacy and can provide for social intercourse among men of like desires. But cities nevertheless in which the cost of services such as electricity do not become increasingly dearer as a price, perhaps, for these advantages. You will have a great part to play in guiding the decision makers of the next decade.

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THE CHAIRMAN: Thank you Mr. President. Ladies and gentlemen, we are privileged to have with us today Mr. van der Walt, the Town Clerk of Vereeniging. He is no stranger to us. He is a Past President of this Association, and there is no doubt his heart is with us most of the time—in fact, I think he only left us for more money!

Mr. van der Walt, you are very specially welcome with us today, and I have great pleasure now in calling upon you to propose a vote of thanks to our President's address.

Mr. J. L. VAN DER WALT (Vereeniging): Thank you very much for calling upon me.

Mnr. die Voorsitter, dames en here, voordat ek 'n mosie van dank vir die rede van die President instel, laat my toe om my persoonlike gelukwensing aan Mnr. Downey oor te dra met sy verkiesing tot President van hierdie belangrike liggaam van ons, asook President van die S.A. Instituut van S.A. Elektrotegniese Ingenieurs, seker die twee hoogste ere wat 'n lid van ons beroep te beurt kan val.

Hierdie dubbele presidentskap strek hom tot eer, maar kom hom toe, want ons ken hom almal as 'n baie harde werker.

Mag hierdie laaste jaar van diens Mnr. Downey, dan ook vir u een van die genotvolste wees — een van die baie jare wat u tot ons diens was. Mag dit dan ook vir u die soetste herhinneringe bring, wanneer u afgetree het en so sit en peins. Ek kan Mnr. Downey egter nie op 'n rystoel indink nie — nie so 'n immer-groen, lewenslustige parmant soos wat hy is nie. Dus sal die soete herhinneringe maar moet wag tot baie later in sy lewe.

Ek het onlangs die eerste konferensie van die sfeer van my nuwe loopbaan ondervind. Daar is dit die gebruik dat die Rede van die President vir bespreking oopgestel word en dan trap hulle die man net lekker uit. As ons President dan in sy rede soveel vrae wil vra, kan hierdie liggaam gerus sy prosedure verander en die rede vir bespreking oopstel.

Maar ons geëerde President is al lank in die land en ook baie slim. Nou mag ons volgens gebruik nie sy rede bespreek nie.

I think this Association should adopt the same principle as the Institute of Town Clerks and throw the Presidential Address open for discussion, then probably our President would not have asked so many questions.

Forgive me if I inadvertently reply to some of them. The metropolitan system, as it is known overseas today, is not as yet required in South Africa, but our President has been daydreaming, I presume, more than two decades ahead. We have a few very widely dispersed densely populated complexes, like the Pretoria-Witwatersrand-Vereeniging complex, the Durban-Pinetown-Kloof complex, the Port Elizabeth-Uitenhage complex, the Cape Peninsula-Belville-Paarl complex. The complexes fall within three different Provinces, controlling the metropolitan or peri-urban development differently.

In many instances the characteristics of metropolitan development for certain services are applied, e.g. regional water boards, electricity supply, and also native urban area development.

The Government appreciates the problem and it is one of the functions of the Natural Resources Development Council to design an orderly development. I believe their report on the Pretoria-Witwatersrand-Vereeniging area is about to be published. We have all been looking forward to this report.

Our President is correct when he sounds a warning that we must find time to ponder over future problems of our dynamic development, a typical example being the Witwatersrand. In 1951 one million people lived within a circle within a 20 mile radius from Johannesburg. In 1960 2-million people lived within the same area. Yet, by European standards, this is still a very low figure.

If metropolitan development is carried too far, our future problem may be to humanise organisations and not to organise humanity.

This reminds me of the soldier who had a cut finger. He went up to his sergeant and asked where he could get first aid assistance, and the sergeant told him to go to the casualty section. When he got there, there were two doors, one marked "Illness' and one marked "Injuries". He thought, "Well mine is injury", so he went through the "Injury" door. When he got inside that door, there were two more doors, one marked "Head and body" and the other one "Limbs". So he thought "Well, mine is a limb" and went through that door. When he got there there were two doors again, and one said "Upper limbs" and the other "Lower limbs". He thought, "Mine is an upper limb" so he went through that one. He came in front of two doors again, one saying "Major" and the other "Minor". He thought "Well, mine is a minor one", and he went through that one, and he found himself outside again!

So he went back to the sergeant. The sergeant said "Did you get fixed up?" He said, "No sergeant, but by golly are those people organised!"

We must, however, not get the impression that with the metropolitan system, all local authorities would lose their autonomy.

As I pointed out at East London last year, it appears more beneficial to the communities if their electricity distribution systems remain autonomous — but we should not discuss the address, Mr. Chairman.

This Conference should heed the President's warning that we should not be only engineers. We should study humanity and dispel the old idea that engineers are technical barbarians. Allow me to say to such believers that it is just as uncivilised to be innumerate as it is to be illiterate.

We again should heed that we are not classed as "Experts" a popular definition of which is, "An 'ex' is a 'hasbeen' and a 'spert' is a 'drip under pressure'." (Laughter).

Mr. Chairman on behalf of this conference I wish to congratulate our Persident on his dual election, his double presidency of tw such august bodies at that. May the last year of service to his fellowman be a pleasant one, which will bring back pleasant memories when he has retired, but can you ever picture this ever-green, lively and cheeky Jack in retirement.

That reminds me of Lord Beaverbrook's words on his 83rd birthday when he said, "I have destroyed completely the foolish maxim that the good die young!"

And now I wish to congratulate him on his philosophical address — a new role to him. I have always considered him a man of action. Now he has proved that he is also a philosopher — a man of many trades — in fact, Jack of all trades, but master of many.

His address has again contributed in keeping the standard of this conference high — very high indeed.

It gives me very great pleasure in proposing a vote of thanks to our President Mr. Jack Downey, for this very interesting Presidential address.

Namens hierdie vergadering, baie dankie mnr. Downey vir hierdie stimulerende rede. (Applaus.)

THE CHAIRMAN: Dankie Mnr. van der Walt. Ladies and gentlemen, I now have very great pleasure in calling upon another Past President, Mr. Ronnie Simpson, of Durban to second the vote of thanks so ably proposed by Mr. van der Walt.

Mr. R. M. O. SIMPSON (Durban): Mr. President, Mr. van der Walt, Ladies and Gentlemen, it gives me great pleasure to second the vote of thanks which has been so ably proposed by my old friend and colleague Van. It would appear from the way he dealt with this particular subject, that .his

experience as a Town Clerk has increased his already well known stature as a public speaker. This must be greatly to his advantage when he has to handle Councils in his capacity of Town Clerk. I have no doubt that the methods he applies today must be quite different to those he applied as an engineer.

Reverting to my pleasant duty of thanking our President, Mr. Jack Downey for his most interesting address, I am well supported in my assumption that he is rapidly earning the reputation of a person who sheds light on public matters, public streets and public places. Today he has made a break with precedence and has given us, from his wealth of experience, an insight into the realms of the future from an engineer philosopher's point of view.

I would like to thank him and in doing so to strongly support the theme throughout his address, that is, we must have the vision and the courage to plan in a large way and on the widest possible basis: this to me is the message that our President, who is now in his last year of Municipal Service, has endeavoured to pass on to us and it is one that we must take great cognizance of. Inadequacy of planning has shown us all to frequently that it did not comply with the above theme. In advocating planning on a wide basis he does not mean that it is just a case of spending more money but that inadequate vision dictated the wrong approach. For those of us who have had the privilege of seeing the development in cities in other countries that are further advanced than our own, we have been able to see a picture of what our own city is likely to be in a few years time and if we can take advantage of learning the lessons that these people have learnt in meeting this growth we can well avoid many problems that will undoubtedly beset us in the future.

Mr. Downey has mentioned the terrific growth of world population that will have to be met in the future. This undoubtedly will have a very great bearing on engineering matters and failure to provide to meet this teriffic growth will undoubtedly cause great trouble to future generations. The curve of world population growth over the next, say 100 years may well be described as a population explosion as the present population of about 2,800,000,000 will increase to over 30,000,000,000,00 by the year 2,050.

These figures, I am sure will indicate the necessity for courage and vision in planning for the future so we must take notice of Mr. Downey's warning and plan on the widest possible basis if we are to be successful in maintaining a reasonable balanced economy in the future. Another problem that will undoubtedly beset us from this enormous growth of population is that we can expect the intelligence quotient to drop as the years go by, as the greatest growth of population will and is undoubtedly taking place in the underprivileged people of the world.

This may be an even greater danger to the future of our present civilisation and one that can only be met and countered by wise and courageous planning.

There are many other aspects of his paper on which I would like to comment, particularly in relation to the growth of metropolitan areas in our country and the need for careful and courageous planning in handling the growth of the services required in these areas but time does not permit for further comment.

Mr. President, Gentlemen, with these remarks I would again like to thank our President, Mr. Jack Downey, very much indeed for his most interesting address which I am sure all engineers will endeavour to the best of their ability, to absorb and benefit from.

It now gives me great pleasure to heartily second the vote of thanks proposed by Mr. van der Walt. (Applause.)

THE CHAIRMAN: Thank you Mr. Simpson, I would now ask our President if he would like to thank his proposer and seconder, and perhaps get his own back in one or two respects?

THE PRESIDENT: Thank you Mr. Chairman. At this stage I would just like to thank Mr. van der Walt and Mr. Simpson for their very kind remarks and the way they have helped to elucidate the Presidential Address.

I hope it has given you some thought — and it appears as if my proposer and seconder have been doing their homework.

Thank you ladies and gentlemen.

THE CHAIRMAN: Ladies and gentlemen, there is no question at all that we have listened to a most stimulating address from our President, and a most interesting talk from both Mr. van der Walt and Mr. Simpson, and I would like you to express your appreciation to all three of these gentlemen in the usual manner. (Applause.)

Thank you. I'll now ask our President to resume the Chair.

THE PRESIDENT: Thank you Mr. Barton.

(CONVENTION ANNOUNCEMENTS FOLLOWED).

CONVENTION ADJOURNED FOR LUNCHEON.

*Convention resumed at* 2.30 *p.m.*

THE PRESIDENT: I now call on Mr. R. R. Gilmour of Cape Town to present his paper.

# Electrical Accidents

by R. R. GILMOUR, A.M.I.E.E.; M.(S.A.)I.E.E.;
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ELECTRICITY DEPARTMENT, CAPE TOWN

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## 1. INTRODUCTION

Many papers and lectures relating to electrical accidents have already been presented and much useful data has been revealed. However, as these accidents still occur periodically, infrequent as they are as compared with accidents from other causes, it is advisable from a professional standpoint alone that investigation, research and discussion in this connection should continue, particularly if the confidence of the consumer is to be retained.

Technical knowledge alone cannot solve this problem. It requires the support of published statistics and experience gained from detailed investigations if any further reduction in this accident rate is to be achieved.

Accidents persist in occurring and in spite of voluminous legislation aimed at reducing accidents, they will probably never be eliminated entirely. Careless and foolhardy persons are difficult to legislate against. In any case electricity is intangible and the danger of its abuse or misuse is not appreciated by the average user.

About 4% of all accidents reported in Great Britain during 1961 were associated with electricity, the major cause being due to the human element. Out of a total of 338 fires, excluding bush fires reported in Cape Town during 1961, 17% were alleged to be due to electrical causes, as follows:

| | |
|---|---|
| (a) Short circuits in motor vehicles | 4½% |
| (b) Carelessness | 4 % |
| (c) Short circuits etc. in buildings | 5½% |
| (d) Overheating motors | 3 % |
| | 17% |

Cause (c) is almost invariably due to illegal extensions such as flexible cords attached to wood backing with staples etc.

Fatalities, injuries and fires are considered in the paper. Most of the cases cited were investigated by the author personally particularly in respect of electrical measurements. Much of the theoretical treatment outlined and certain opinions are the author's and do not necessarily reflect those of others or his organization.

## 2. CLASSIFICATION OF TYPES OF ELECTRICAL ACCIDENTS

2.1. *Fire*: Although many fires have been attributed to electrical causes either directly or indirectly, it is often merely an assumption as, except when the seat of a fire has been detected at an early stage, it is usually difficult to determine the cause.

Not only leakages cause fires; many cases are on record where loose connections at the terminals of meters, cut-outs etc. have been responsible for fires when these components were mounted on wood boards.

2.2. *Damage to apparatus and property*: Dewirements in overhead traction systems where these are located near to low-voltage a.c. reticulation systems have caused considerable damage to buildings and electrical apparatus — apart from fire.

Failure of feeder protection has caused severe damage to switchgear, busbars etc. and explosions arising from ignited oil or gas in circuit-breaker tanks is another serious hazard. On one occasion this wrecked a switch house in Cape Town causing the death of a police constable on duty outside the building.

2.3. *Personal — shock, injury and death.*

2.3.1. *Shock*: Sometimes the effect of an electrical accident is similar to any other accident which requires subsequent shock treatment.

A current of say 20 milliamperes may cause the chest muscles to contract and unless artificial respiration is commenced within a reasonable short time the victim may die of asphyxia.

2.3.2. *Injury*: Apart from burns, injury is usually caused by falling or articles being dropped etc. as a result of the victim's temporary loss of control over his movements. A Meter Tester once came in contact with 380 volts (between hands) and in jerking backwards lost his balance and struck his head on the test bench behind him.

2.3.3. *Death*: This is usually caused by sustained flow of current through the body producing either asphyxia or ventricular fibrillation of the heart i.e. the heart is rendered inefficient as a pump. Excessive currents paralyse the heart completely (tetanus condition) and any damage to the brain tissues is usually fatal.

## 3. LIMITS OF SAFETY

This is something which is difficult to assess with confidence. It is reasonable to assume that while no circuit or machine

is defective or overloaded, the risk of fire is remote.

With regard to earth faults, obviously the earth-loop impedance determines the magnitude of the fault current, assuming that the fault resistance is negligible. If this current is too small to operate the protection devices it may be assumed that the circuit is not overloaded provided it is correctly proportioned. Under these circumstances it would appear that there would be little risk of fire. However, the conduits, and earthing leads may rise in temperature and reports of shocks may be expected.

Telephone authorities and explosives regulations usually specify a maximum earth-electrode resistance of 10 ohms for protection against lightning strokes.

It is well known that the amount of current and duration of contact required to produce harmful conditions vary with different persons. However, from the data suggested by D. F. Dalziel who has done a lot of work in this field it seems that currents up to 10 milliamperes are generally considered safe for adults. This means that involuntary muscular contraction is unlikely and the victim will "let go" or break contact unaided.

Generally, a current in excess of $(0.17 \times 10^3 \times T^{-0.5})$ milliamperes may be considered dangerous (Ref. 7), where in the expression T is the duration of the "shock" in seconds. A current of say 15 milliamperes is capable of causing asphyxia and, say, 100 m.a. sustained for 3 seconds may cause ventricular fibrillation of the heart.

From the results obtained by the above and other experimenters together with the author's experience it would appear that a voltage of 40 volts i.e. the value associated with specifications for earthing in wiring regulations, may be regarded as a limit for safety. Hence, assuming the correct use of appliances, it may be said that if an installation is in accordance with relevant safety regulations, the earthing arrangement adopted should be such that under fault conditions the voltage of the casing of appliances etc. must not exceed 40 volts with respect to the general mass of earth.

## 4. NOTES ON THE EFFECTS OF VOLTAGES BELOW THE SAFE LIMIT

Animals, particularly horses and cattle, are usually more sensitive to electric shock than human beings and their "step" voltage is higher. They are seldom exposed to any danger arising from defective electrical appliances but they have been killed by coming in contact with electrically charged fences and poles.

Where the neutral conductor on overhead lines is directly connected to the pole this danger is practically eliminated. However, when the neutral conductor carries current, a voltage equal to the drop along the conductor may appear between pole and ground, or water-taps and ground.

These voltages are generally within the safe limit and are usually a nuisance rather than a danger. This may explain why other authors do not appear to have referred to this point. Any inherent danger arises from fear induced in sensitive or nervous persons who are prone to imagine danger when they experience only a slight shock. Their consequent reaction sometimes has had unfortunate repercussions which may have been avoided if they realized that the mere fact of "letting go" voluntarily indicates a safe condition.

Under these circumstances it has often been found an advantage to bond waste-pipes and steel sinks to the water-pipes.

A servant once complained of receiving a shock when she touched the kitchen water-tap. As a result she saw a doctor who recommended that she be granted sick leave. The investigation revealed that the kettle was standing on a steel drainboard at the time and 2 core flexible cord was used. Although the insulation resistance, hot, was found to be 100 megohms and the electrostatic capacity about 700 picofarads to earth, a voltage of 40 volts was measured between the sink and tap using a valve voltmeter. However, the voltage was only 10 volts according to a conventional rectifier-type voltmeter. According to the evidence nothing serious should have happened to the girl. However her employer erred in providing an unearthed kettle and was therefore responsible for his servant's absence from duty.

## 5. EARTHING IN RELATION TO PROTECTION OF LIFE AND PROPERTY

It is unnecessary to deal with earthing and associated measurements in detail here since many relevant papers have already been presented and published.

The following table lists the usual objects of earthing:—

| *Branch of Engineering* | *Objects of Earthing* |
|---|---|
| Generation of Electricity | Protection of apparatus against faults and lightning. |
| Distribution of Electricity | As above, including effective earthing of low-voltage neutral at source. |
| Installation of Electrical equipment and Mining | Protection of electricity consumers or users — life and property. |
| Telephones etc. | Protection of lines, apparatus and personnel against lightning and acoustic shock. |
| Radio | Protection against lightning; also effective propagation of radio waves eg. Sommerfield relation etc. |
| Traction and Civil | Protection against lightning and damage by electrolysis. |
| Explosives | Protection against lightning strokes. |

The common objective is the prevention of accidents.

It has sometimes been suggested that if reticulation systems were operated with unearthed neutrals, the electrical accident rate may be lower. This is something which cannot be assessed with any degree of confidence. Capacitance effects and deterioration of insulation contribute towards lowering the impedance to earth of any system.

Permanent solid-earthing of low-voltage reticulation neutrals is thus advisable and should be accepted as the rule and this means that contact with any line or unearthed pole completes a circuit.

From the usual concept of earth, earth-potential etc. the voltage to "earth" of a given point in an electrical installation

may mean the voltage to an earth-bar or to the general mass of earth.

If the earth-electrode which is connected to the bar is hemispherical, its resistance to earth (infinite)

$$= \frac{s}{2\pi a} \text{ ohms}$$

where s = soil resistivity in ohm-cms
and a = radius of the hemisphere in centimeters

Thus its voltage to earth for a current, I amperes

$$= \frac{Is}{2\pi a} \text{ volts}$$

Since the density of the current in the earth decreases as the distance from the electrode increases, the impedance of an earth circuit is concentrated in the immediate neighbourhood of the electrode. Consequently most of the voltage drop is concentrated there also. This gradient determines step and touch voltages. This point is illustrated in Fig. 1 and it will be noted that within a distance of 10 times the dimension of the electrode 90% of the resistance and therefore the greater part of the voltage drop may be expected.

It is understood that in Germany (Ref. 8) the zone in which the relatively steep voltage gradient exists is accepted as being generally within 20 metres (say 65 feet), particularly where effective operation of earth leakage circuit breakers is concerned. Any point outside the resistance zone may be considered as being at true earth potential.

This recalls an accident which was reported some time before neutral conductors were connected to the steel poles of overhead lines. A pool of water surrounded a particular pole and 3 cows were electrocuted in succession when drinking from the pool. A similar accident occurred recently when a child touched a telephone pole while a severed power line conductor was resting on its stay.

Consider a relatively thin conducting surface-layer such as a situation encountered on a part of Table Mountain where a layer of soil lies on rock, or say a wet cement floor, or a sheet of water on soil of high resistivity.

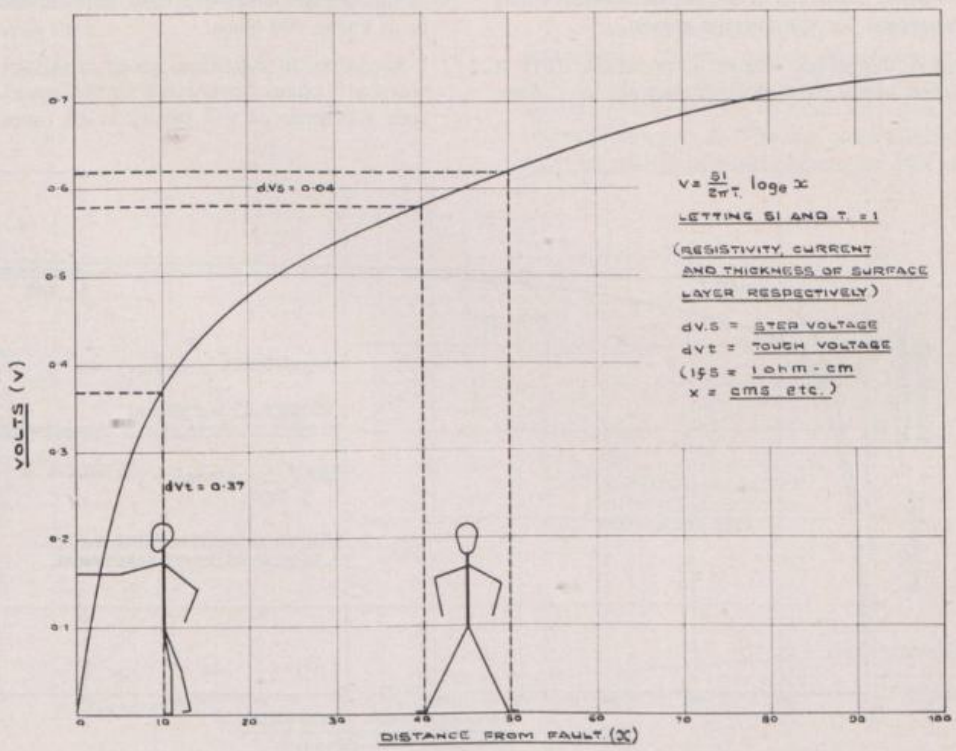
Assume that m is a point in the centre of such a surface and is in contact with a live wire due to a dewirement or a steel pole which is alive.

Let x = the distance of some other point from m in cms
t = thickness of the conducting layer in cms
s = resistivity of the material constituting the layer in ohm-cms
I = current passing from source to the layer in amperes.

The point at distance x lies on the circumference of a circle = $2\pi x$, where cross-sectional area = $2\pi xt$. sq. cms.

If i = the current density at this point, the total fault curren, I, = $2\pi x$ ti from which

$$i = \frac{I}{2\pi xt}$$




VOLTAGE GRADIENT WITH RESPECT TO POSITION OF AN EARTH FAULT

and the voltage drop per unit distance is

$$\frac{sI}{2\pi xt} \text{ volts}$$

and the voltage drop between the two points is therefore,

$$V = \int_{o}^{x} \frac{sI}{2\pi x t} dx \text{ volts}$$

and since V = o when x = 0

$$V = \frac{sI}{2\pi t} \log_e x \text{ volts}$$

Putting s, I and t = 1 then the curve shown in Fig. 2 is obtained which shows the relative step and touch voltages to be expected. If the fault or earth-leakage current is too small to operate the protective devices then this shock hazard will persist.

It has been established that soil resistivity generally decreases with rising temperature. However, it is then likely that any moisture present will be driven out and since endosmosis does not occur with alternating current, only capillary action can cause any lost moisture to be replaced. Unless the rate at which the moisture is replenished is high enough the advantage of reduced soil resistivity may be lost and the voltage drop at the electrode may either diminish, increase with time or even remain unchanged.

Consider now a person whose body resistance is R ohms touching the casing of a defective appliance with a fault, or insulation, resistance of y ohms. On the basis of the information referred to earlier, a current of say 11 milliamperes may be considered dangerous for the average person.

The corresponding dangerous voltage is, therefore, 0.011 R volts and the current in the parallel earth-electrode of r ohms, is

$$\frac{0{\cdot}011R}{r} \text{ amperes}$$

and the total fault current is

$$\frac{0{\cdot}011R}{r} + 0{\cdot}011 \text{ amperes}$$

The voltage across the fault itself is

$$y\left(\frac{0{\cdot}011R}{r} + 0{\cdot}011\right) \text{ volts}$$

If the supply voltage is 220 volts, then

$$220 = y\left(\frac{0{\cdot}011R}{r} + 0{\cdot}011\right) + 0{\cdot}011R$$

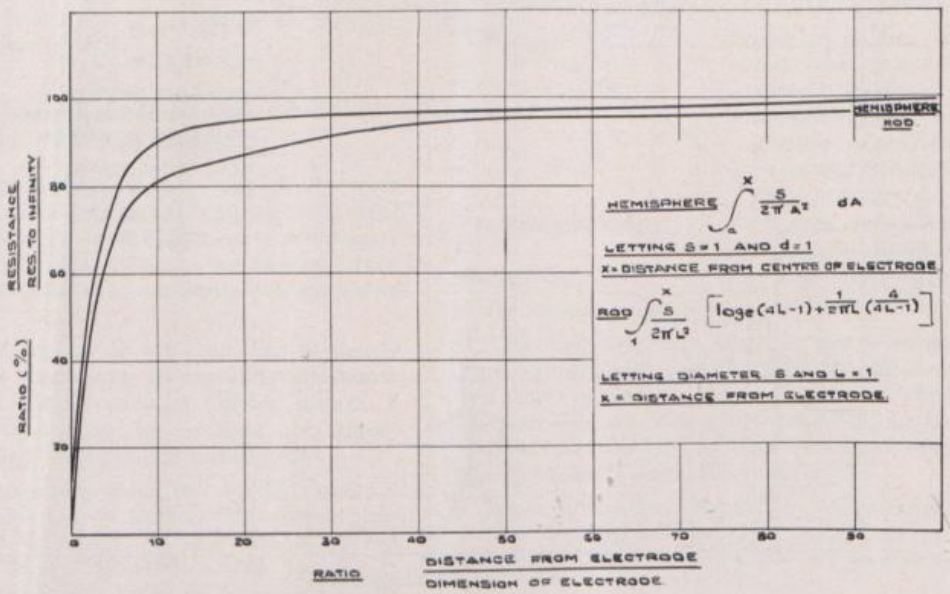
$$\text{thus } y = \frac{r\,(20{,}000 - R)}{R + r} \text{ ohms}$$

which is the lowest value of fault resistance which can be tolerated with safety for a given resistance of earthing electrode. See Fig. 3.

According to the results of numerous tests, the resistance of electrodes which have been installed for many years is frequently of the order of 50 ohms. For a body resistance of 5000 ohms the limit of fault resistance for safety is therefore 150 ohms.

A current of 11 milliamperes would have to be sustained for about 4 minutes theoretically to produce ventricular fibrillation but by this time asphyxia would probably have occurred. However, the resistance of the body appears to vary inversely as the voltage; under the most unfavourable conditions it may be as low as 500 ohms.

According to definitions given in certain wiring regulations, "earthed" means "connected to the general mass of earth in such a manner as will ensure at all times an immediate dis-




RESISTANCE TO EARTH OF HEMISPHERICAL & ROD ELECTRODES

charge of electrical energy without danger". Two significant words are "immediate" and "danger".

In protective multiple neutral earthing systems, faults are converted to short circuits and most of the current returns to the source via the neutral conductor. Very little current is therefore normally discharged into the general mass of earth. Thus in current practice the literal meaning of the definition is significant only when the neutral conductor fails to return the current efficiently. As mentioned earlier, voltage drop along the neutral conductor can be troublesome, especially when water-taps are connected to it.

In the design of transmission lines conductor cross-section is usually equated to cost and interest on borrowed capital in accordance with Kelvin's law. Now where an installation is fed with a relatively long low-voltage line as often happens in rural areas, it may be an advantage to equate cross-section of the neutral conductor to the safety limit, viz. 40 volts. This hazard does not appear to have been considered before. Mr. Taylor (Ref. 8) however, merely states multiple neutral earthing should not be used with line conductors less than 0.05 sq. in.

The resistance, R, of a conductor is given by the elementary expression

$$R = \frac{sL}{A} \text{ ohms}$$

where s = specific resistance of conductor material in ohm-in.
L = length of conductor in inches
A = cross-sectional area sq. inches.

If the maximum current which could be expected in the neutral is I amperes, then

$$R = \frac{40}{I} \text{ ohms}$$

$$\therefore \frac{sL}{A} = \frac{40}{I}$$

$$\therefore A = \frac{sLI}{40}$$

$$= \frac{0.57\ LI}{10^6} \text{ sq. in. for copper conductors when L is in yards.}$$

Neglect of this consideration has led to frequent complaints of shocks from taps in certain sub-economic housing schemes in the vicinity of Cape Town. Children are usually bare-footed and the surrounding ground is often wet at the time.

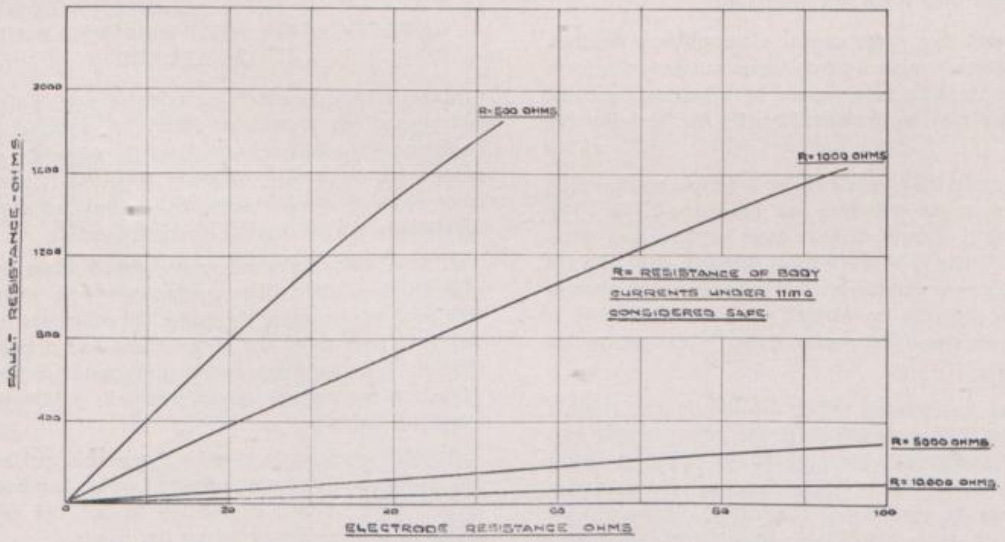
In one such installation the resistance of the 12 ft. x 1 inch rod electrode was found to be 40 ohms from which the soil resistivity was assessed as 14 x $10^3$ ohm-cms.

Assuming that this value holds for a considerable depth and that a resistance of 10 ohms would reduce the voltage to an acceptable or comfortable value, then the length of rod electrode required would be about 60 ft. according to Newton's formula. As rods of such length or trench earthing systems were not practical in this case, the cross-section of the neutral conductor, to which the electrodes are connected, was increased which cured the trouble.

In some instances where the low-voltage system conductors are supported by the same poles carrying also a high voltage transmission line, the "ground" wire has been connected to the low-voltage neutral conductor.

The following tests were made on such an overhead line where the 11 kV transmission and the low voltage lines were carried on the same poles. The object of the test was to determine whether a dangerous condition would result from a fault between say a 11 kV phase conductor and a cross-arm.

The line was earthed through a 5-ampere fuse a number of times and a Duddell pattern electromagnetic oscillograph was used to record the magnitude and duration of any voltage appearing between the ground wire and an electrode in the surrounding ground. The test point selected was several miles from the source of supply where the star point is permanently




RELATION OF FAULT RESISTANCE TO ELECTRODE RESISTANCE FOR OPTIMUM SAFE CONDITIONS ON 220 VOLT SYSTEM.

connected through an 8 ohm resistor to an earth electrode.

Voltages varying in magnitude between 475 volts peak and 720 volts peak were recorded and the mean clearing time 3 cycles. Thus if someone had touched a water-tap which was connected to the neutral conductor, at the time, and if the body resistance was as low as 500 ohms at these voltages a harmful shock was possible. It is therefore advisable to keep the "ground" wire separate from the low-voltage neutral conductor.

Insulated systems are not possible in practice and sound earthing arrangements are a necessary inclusion in wiring or any regulation having for its object the prevention of electrical accidents.

## 6. INCIDENTAL EFFECTS OF EARTHING

It is now necessary to consider hazards which may arise from earthing. Under certain conditions a compromise is necessary which renders effective earthing difficult.

Although many authors showed concern over possible severed neutrals and grounded phase wires, multiple neutral earthing has nevertheless proved to be reliable and no record has been found of any serious accident which could be attributed to this system of earthing. It is well known that telecommunication engineers were opposed to multiple earthing. Accordingly this method could not always be practised freely and in some countries there was legislation against it. However, it has since been conceded that the effects are not as harmful as at first anticipated but acoustic shock from high-voltage lines still causes concern however.

In high voltage systems 3rd harmonic current has been found to be considerable. Measurements made by the author in a large power station revealed that about 12 kilowatts at triple frequency was dissipated in a single earthing resistor (9.5 ohms) when four 33kV 40MVA alternators were connected to the bus-bars. Thus for single-point earthing the circuit completed by electrostatic capacity circulates considerable current at this frequency. Accordingly, the primary windings of receiving-end transformers are left unearthed.

It has been found that under certain circumstances multiple earthing of the neutral conductor may cause noises in the form of a hum, either in radio receivers or by vibrating conduits. These phenomenae may be explained briefly by the following considerations:

The total magnetic field produced by a simple transmitting aerial is the sum of the radiation and induction fields. The former is a function of both distance from antenna and wavelength, while the latter is a function of distance only. As the distance between power conductors and antenna in the average dwelling is small, and the wavelength of the current wave is very long, the induction field predominates in the vicinity of the radio receiver.

A voltage may be induced either directly in the receiver coils or the aerial if it is parallel with the power supply conductors. The electrostatic coupling may be sufficient in the latter case, but when current is returned through an earth path instead of entirely by the neutral conductor, the theories of Carson, Haberlund, Pollaczek, Foster et. al. for determining mutual inductance between parallel lines with earth return would apply.

Considering Haberlund's empirical formula (Ref. 1) for determining mutual inductance in such cases, then for a parallel aerial 1 metre away from the conductors

$$M = 14 \times 10^{-4} \text{ Henrys per kilometre}$$

thus the voltage induced in say a 15 ft. receiving aerial for a line current of 10 amperes (50 cycles)

$$= wMIL = 20 \text{ millivolts, say,}$$

which will be found to be about 4 times the value for unearthed conditions when the distance of one conductor from the aerial is $\pm$ 16% of the other.

As the circuits in a radio receiver are designed for frequencies very much higher than power frequencies, the only chance the latter has of passing through the stages is by means of a form of modulation. Thus in the absence of a radio frequency carrier, no hum will be detected.

With regard to vibrating conduits, consider a 40 ft. run of $\frac{1}{4}$" x 1/16" conduit protecting a 7/.036 earth-lead. Suppose that on account of relatively high neutral-conductor resistance, the return current is diverted and the earth lead carries a current of 10 amperes.

The magnetizing force is approximately 20 Oerstedts. Considering magnetostriction alone, the strain at this intensity is about 5 parts in $10^6$ and in a longitudinal direction this amounts to about 0.06 mm in this case.

Another incidental effect of multiple neutral earthing is corrosion of earthing electrodes and water pipes when under certain conditions the neutral conductor is a carrier of stray direct current.

Where continuous metallic water mains have been used for earthing in single-point earthed neutral areas, fatalities have occurred when the continuity of the pipes was broken for example by plumbers effecting repairs to the pipes. Thus the method adopted for earthing must not introduce worse hazards than it is intended to eliminate.

## 7. A REVIEW OF SOME ACCIDENTS OR SHOCK CASES INVESTIGATED WITH SOMEWHAT UNUSUAL FEATURES.

Motor vehicle accidents continue in spite of changes in rules and regulations so it must surely be expected that electrical accidents will also occur, particularly when the relevant regulations are repeatedly violated. However it may be inferred from some of the accidents to be described that the existing regulations are inadequate to ensure safety.

A man once sustained severe shock when he withdrew a plug from a kettle. The connections were correct but while one hand was grasping the kettle the other was in contact with the earth tongue on the plug. There was a leakage from the element and the earth connection parted before the others. This is a weakness in design and falls within the scope of a Standards Bureau.

Another accident involved a 5 year old girl who picked up one end of a radio receiving-aerial which had become detached from a mast. Shock caused her to fall and injure her head and burns were discovered on her hands.

In the course of the subsequent investigation 220 volts was measured with a high-impedance voltmeter connected between

aerial and earth and a similar voltage was observed between the metal cabinet in which the receiver is housed and earth. The aerial circuit included the input coil and a 0.1 microfarad condenser connected to the chassis. The receiver was a 110 volt transformerless model but a 220/110-volt mains voltage reducing auto-transformer was in use at the time of the accident but by rearranging the transformer connections, the voltage to earth was reduced to zero.

At a frequency of 50 cycles per second this condenser cannot normally pass more than about 7 milliamperes at 220 volts. For small children however this current may be lethal. The insulation resistance of the condenser was found to be 10 megohms but obviously if the insulation had failed a very dangerous condition could have arisen.

In another case children complained of receiving shocks when touching a wire trellis. This was caused by the antenna of one of these receivers being haphazardly attached to the trellis. These incidents indicate unsatisfactory features in the design of apparatus which are not covered by the existing regulations.

A dangerous situation was discovered on one occasion when 125 volts was measured between the conduit on an outside wall of a house and ground. A rod electrode and the water-pipe were used for earthing. The resistance of the rod was found to be over 100 ohms and the water-pipe 4 ohms, the earth-loop impedance being 12 ohms. The live wire of the overhead service connection was in contact with the conduit and the fault current was unable to rupture the pole fuse.

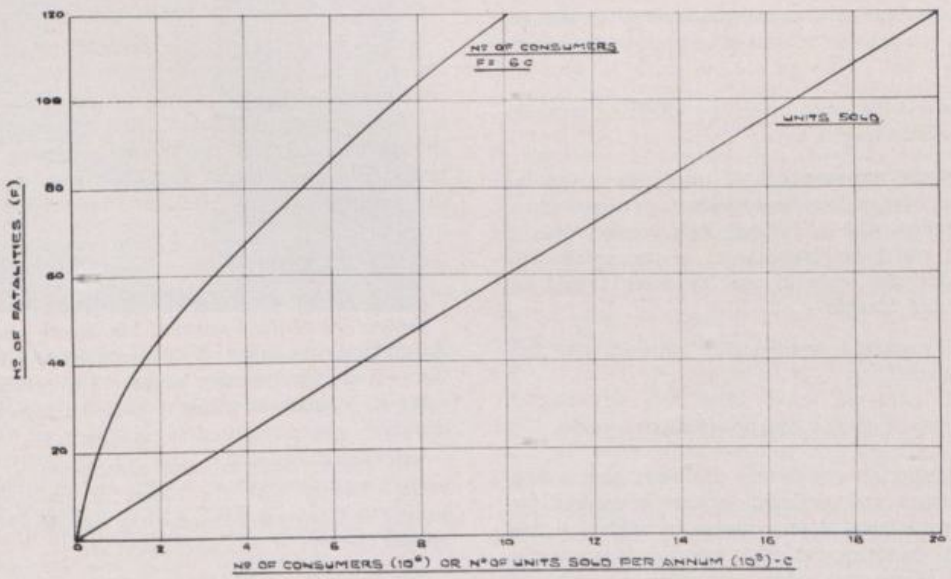
Another dangerous condition was discovered in a house where the occupants reported severe shocks while using the washing machine. Full mains voltage was measured between the case of the machine and earth. After a lengthy investigation it was found that the conduit associated with the socket outlet was unearthed and the insulation of the live conductor had failed. Thus in effect the earth and live terminals of the socket outlet were common.

Sewing-machine motors with foot control are invariably supplied with 2 core flexible cords. These machines may be more dangerous than other appliances under certain conditions. On one occasion a woman complained of receiving a severe shock when touching her sewing machine. It was discovered that although 3 core cord had been used the earth connection had become detached from the metal clad pedal unit which was defective. The machine itself was earthed at the time.

A boy climbed a lattice pylon carrying a 33kV line and came in contact with the line. As frequently happens with high voltage he was thrown clear. In spite of his fall he recovered and explained that he wanted to show his friends that such a climb was possible and thought the line was dead during the day.

From experience and statistics available it seems that the incidence of electrical accidents in factories is relatively low. This is no doubt due to the requirements of the Factories, Mines and Works Act and there are fewer amateurs in factories. However, the accident rate of personnel associated with electricity supply undertakings is relatively high. Supervisors, linesmen, electricians and sub-station fitters and their mates seem to be somewhat prone to electrical accidents. This is supported by the accident statistics reported in Great Britain during 1960. Out of 691 electrical accidents, 365, or 53%, involved personnel listed above (Ref. 6). It was also reported that ignorance, negligence, forgetfulness and inadvertence, grouped together, and falling under the category of the "human element", is the predominant cause of electrical accidents. However, they usually have to work under emergency conditions and also in close proximity to live equipment where they naturally do not have the benefit of the safety features protecting the normal consumer.

Poor phasing techniques often cause serious accidents including burns and impaired eyesight apart from damage to apparatus.




ELECTRIC SHOCK FATALITIES

An electrical fitter who was doing maintenance work on an outdoor 33kV transformer was called to the telephone as his wife wished to speak to him. On returning to resume his work, he went to an adjacent transformer which was in commission, presumably while in a state of mental aberration. He was electrocuted, his body being very badly burnt also.

Apart from his own carelessness it was unfortunate that access to a live transformer was so easy. At least, his mate should have remained on the alert. The tragedy confirms that employees should not be called to the telephone or disturbed particularly while engaged on this class of work.

## 8. INDICATIONS OF DEFECTS OR DANGER

It is generally either impossible or impractical to be warned of impending danger. Lightning strokes are unpredictable and relevant statistics in this respect can not be relied on. As regards carelessness, there is little that can be done effectively.

A common indication of defective installations which is seldom recognized as such is noisy radio reception. Most listeners leave their receivers tuned to local broadcast transmitter frequencies so that the strong signals swamp atmospheric noise. Thus, provided the receiver itself is in order and together with antenna is correctly installed, any random crackle etc. is usually caused by loose connections or a defect in an installation or appliance.

If the interference is in the form of a hum, appearing only when the receiver is tuned to a radio signal, this is usually caused by current returning via earthing leads etc. This arises when neutral and earth connections have been transposed somewhere, or from a badly jointed or open neutral conductor in multiple earthed systems, or leakage from certain stove elements etc. Serious consequences due to voltage displacement in a 3-phase system have accordingly been averted as a result of investigating the cause of this type of interference.

With the introduction of frequency-modulated broadcast transmitters the only apparent advantage of noisy radio reception may be lost.

Flickering lights and the noise caused by vibrating conduits also indicate that something is amiss.

Apart from periodic measurement of resistance of insulation and earth electrodes, it may be an advantage to provide a differential transformer with a milliammeter connected to a spill winding. It could be installed in a convenient but prominent place and the scale of the instrument could be marked say "safe" and "danger".

Investigation of increased consumption of electricity has often revealed leakages.

## 9. PREVENTION OF ELECTRICAL ACCIDENTS

Adherence to appropriate regulations obviously goes a long way in this direction and periodic lectures sponsored by approved bodies are suggested as a means of achieving this end. Well managed factories and other organizations appoint competent officials to see that safety regulations are adhered to. If such a practice could be applied in the home then domestic electrical accidents could be greatly reduced and householders should therefore be encouraged to have their electrical wiring installations and appliances etc. checked regularly by an Electrical Contractor.

The ways in which the above objects may be achieved can be summarized as follows:

(a) Screening of appropriate films in schools, meetings sponsored for the purpose and in bioscopes as part of the programme.

(b) Periodic articles in the press, prepared by competent authors.

(c) Some form of control on the publication of speeches or opinions on important subjects such as electricity in order to avoid misleading the public. A newspaper once reported a statement by a commercial man to the effect that 2 prong plugs are not dangerous.

(d) Supply authorities could provide applicants for electricity with pamphlets stressing the dangers that arise from tampering with or neglecting electrical equipment. At the same time it should also be stressed that electricity is a safe form of energy if treated with the respect it demands, otherwise its use may be unnecessarily discouraged.

(e) Test installations whenever a transfer is applied for.

Some authorities sponsor safety training courses for their staff including those in a supervisory position. For instance, the Electricity Council in London employs safety officers in an established branch for the purpose.

Experience has shown that multiple neutral earthing is generally sound in respect of safety.

The Butcher system, which constitutes an installation in the form of a ring main with local earth loop and earth leakage circuit breaker, was developed for the use of portable equipment and may have possibilities in a modified form for isolated domestic installations where the earth-loop impedance is relatively higher.

Double insulation for appliances has often been proposed.

Water meters should be bridged electrically in view of the non-conducting gaskets which are inserted at the pipe connections. Where iron and copper pipes are both used a a local voltaic cell may be formed, particularly with chlorinated water. However, any corrosion which may arise from the closed circuit would be very slow and outweighs the disadvantages of high earth-loop impedance.

In view of the number of fires caused by overheating refrigerator motors it may be advisable to insist on some form of thermal protection such as fusable links.

Section 79 of the Factories, Machinery and Building Works Act holds the supplier of electricity responsible for the insulation of overhead service mains. This protects workmen on roofs etc., but to be effective periodic inspection and prompt attention where required is necessary.

The author designed and constructed a simple recording valve-voltmeter with the object of assisting electricity consumers in tracing a leakage when they experience shocks. The special features of this instrument are,

(a) Range 0 — 220 volts.

(b) Exponential scale i.e. the range 0—40 volts is displayed over the major portion of the 5 inch chart. The readings are very contracted between 40 and 220 volts as accuracy is not

important. The deflection (D) may be represented by the equation

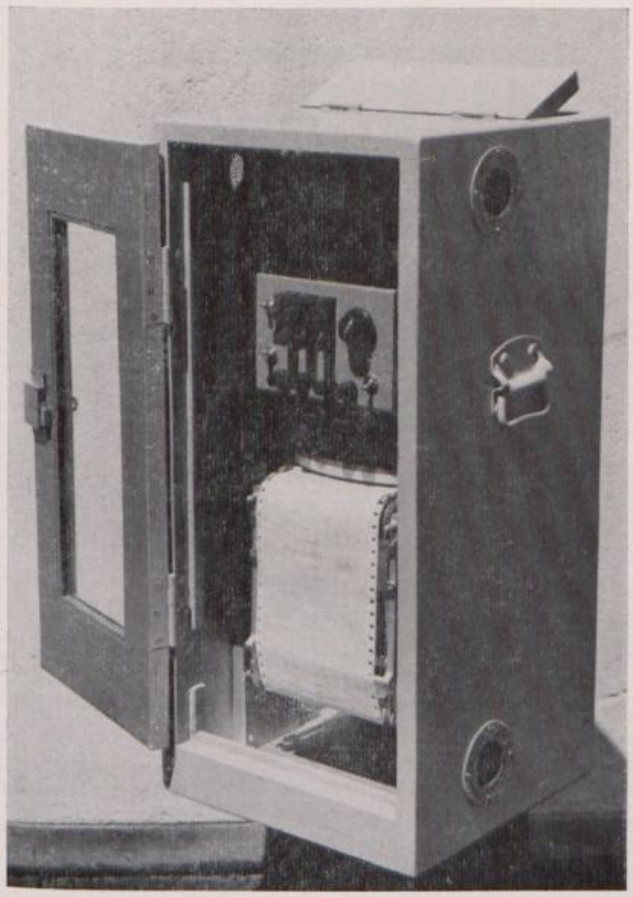
$$D = A (1 - e^{-Bc})$$

where A and B are constants and c is the voltage;

$$e = 2.718.$$

(c) High impedance ($\pm$ 20 megohms).

The instrument is usually connected between the point of contact concerned and earth. Apart from the magnitude of the voltage, the record also provides a guide as to the nature of the source of the trouble e.g. refrigerator motor, water heater or steady leakage etc.



It seems advisable to control also the installation of radio apparatus and discourage the use of auto-transformers and cord resistors, particularly in view of the number of V.h.f. antennas which may be expected now.

Amateur radio stations are subject to regulations administered by the Post Office and in respect of transmitting aerials (Reg. 37) no direct potentials or potentials at power supply frequency dangerous to life shall exist on the aerial. Further, the aerial system shall conform to any by-laws laid down by municipal or other local governing bodies. If these requirements could apply to receivers also then supply authorities would be in a better position to control hazards resulting from defective radio equipment.

## 10. CONCLUSIONS

There is no doubt that the majority of electrical accidents are due to foolhardiness, carelessness and ignorance. These causes are difficult to cure but intensive publicity and campaigning is suggested.

The ordinary domestic consumer of electricity probably takes it for granted that if anything goes wrong with an installation or appliance a fuse will operate. Unfortunately this is not always the case and this is probably the greatest inherent source of danger. Thus, apart from the above suggestions, tact is required to convince these consumers of the real danger without causing fear and destroying confidence in the use of electricity. Further, the consumer often defeats protective schemes by misuse but this is undoubtedly due to lack of technical appreciation of the risk they incur by doing so. The significance of the Contractors and Wiremen's Act, and all relevant regulations should be impressed on these consumers.

Indiscriminate sales of 2 core cords and dangerous adaptors or plugs should be discouraged or preferably prohibited.

Design of cords and the associated fittings probably still leaves a lot to be desired; according to statistics supplied by a number of countries defective cords appear to be mainly responsible for electrical accidents in the home. An Australian undertaking for example, reported that out of 27 such accidents during 1960—1961, 11, or 41%, were caused by defective cords. Lawn mowers in particular require superior cords.

There is little else to mention now except to quote from a talk broadcast by Mr. C. G. Downie, a former City Electrical Engineer, Cape Town.

"The incidence of accidents that arise from using electricity is far less than it is in the use of motor vehicles. In fact, far more people are killed by drowning, over-drinking, motoring and even eating. When one considers how many times and how often electrical appliances are used by housewives and their servants during the course of any day — hundreds of thousands of times in a City like Cape Town — without accident, then the safety record of electricity becomes obvious".

According to statistics available including those supplied by Insurance Companies, Mr. Downie's contention is correct. The death rate arising from domestic electrical accidents is only 6 per $10^5$ consumers per annum approximately or generally 6 per $10^9$ kWh sold per annum (Fig. 4).

It will be seen that the death-rate is a linear function of units sold but is of an exponential form with respect to the number of consumers, particularly for the first 3 million consumers. This is probably due to a variable ratio of actual users of electrical apparatus to registered consumers.

In factories and small towns the ratio is usually much higher than for domestic conditions in large cities where probably more than 80% of the units sold are used for domestic purposes.

Considering the observations in Holland say (Ref. 5 — discussion) the incidence of fatal electric-shocks may be reduced by about one-seventh if the supply voltage is halved. At the present rate then the effect of such a step would be to almost eliminate fatalities, which appears unlikely. Further, as the electrical fire accident rate (say 20% of total) which is far higher than that for electrocution, is most unlikely to be

reduced by a reduction in voltage, the costs involved in such a change are unlikely to be justified but it may be worth considering in densely populated countries.

The fatal electric-shock rate is low and the present rate must surely in some way be a credit to the electrical-engineering profession. The fact that only about 5% of electrical accidents prove fatal is probably due to the necessity of a number of conditions occurring simultaneously. It is well known that these include an earth-fraught situation, severed earth-wire, the condition of victim and the absence of assistance at the time to break contact and apply artificial respiration immediately.

## 11. AKNOWLEDGEMENTS

The author wishes to record his appreciation to the Cape Town City Council, Mr. C. G. Downie, Mr. A. C. T. Frantz (past and present City Electrical Engineer respectively) for the opportunity to prepare and present this paper, and for the use of data obtained from many relevant investigations carried out.

Thanks are also due to Mr. L. A. Corney, Chief Safety Officer, Electricity Council London, for supplying useful statistical data relating to his Country and the functions of his Department.

Information supplied by certain insurance companies is also acknowledged.

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Mr. J. J. GROENEWALD (Dept. of Labour, Pretoria): Mr. President, ladies and gentlemen, we have had the pleasure of listening to an interesting paper on a subject which I am sure concerns everyone here today. The engineer delegates to this convention will no doubt realise their professional responsibilities in relation to the safe use of electricity as this is inherent in their appointments as municipal electrical engineers. To the rest of us the safe use of electricity is of personal interest, in view of the extent to which we all use electricity in our daily lives.

Mr. Gilmour is therefore to be congratulated on his choice of subject, although I feel, if I may say so sir, that perhaps the title reminds one of rather the distressing aspects in the use of electricity.

Electrical accidents remind one of human suffering, accident enquiries, disruption of electricity supply — all rather distressing.

I think reference to "safety in the use of electricity" would have been more appropriate to the constructive approach of the municipal electrical engineer.

Mr. Gilmour in his closing remarks states that electrical accidents still occur periodically, although infrequently as compared with accidents from other causes. This statement may be correct if the reference to "other causes" included for example road accidents, but if we consider the statement in relation to the industrial field in which the engineer is concerned there can be no justification for complacency.

In considering the electrical accident position, Mr. President, I am excluding mines and activities of the railways—we find that in the Republic of South Africa, during 1962, there were 40 persons electrocuted out of a total of 183 persons fatally injured in all industrial accidents. That is over 20%. If we compare this further with the position in the United Kingdom, we find that where, for the same period, they had a total number of electrocutions of the order of 166. I think the figure of 40 locally is rather high.

If we compare this with the relative population involved, bearing in mind the large section of the local population that is not affected by the use of electricity, it does appear that the incidence of electrocution is high.

Electrical accidents fall into two categories. We have electrocutions occurring in industry, including the generation and distribution of electricity, and electrocutions occurring in the domestic use of electricity. Considering the industrial aspect, we find that during the immediate post-war year of 1946 there were 13 persons electrocuted in relation to some 8,000 registered factories.

If we compared this with the year 1962 when the number of factories had increased to more than 17,000 there were 16 persons electrocuted, which is an increase of only 3 although the factory concerns had more than doubled.

The relative reduction in the incidence of electrocutions occurring in this field, where there is control by responsible engineers, and where installation and maintenance are carried out by qualified persons is gratifying. It is pleasing to note that Mr. Gilmour ascribes this fact as in part due to the provisions of the Factories Act.

A study of the individual accidents falling in this category, however, makes it clear that the position could be further considerably improved by more detailed attention to safety procedure, especially where skilled artisans and routine electrical operations by qualified personnel are concerned.

When we consider the domestic use of electricity the picture is rather different. For the same period referred to 10 persons were electrocuted in private homes in 1946, as against 24 during 1962.

Although it is conceded that the domestic use of electricity has increased considerably, it does appear that the increase is relatively much higher than in the industrial field.

I would like to mention, Mr. President, that for the current year there have already been 13 electrocutions out of which 8 have occurred in private homes. A very distressing feature of these domestic accidents is the number of young persons and small children involved. During 1962 for instance, 11 children, ranging in ages from 22 months to 16 years were electrocuted.

I do think that if we view the picture as a whole there is reason for apprehension, and if we bear in mind that the rapid development in Bantu and other housing schemes, where electricity is being made available domestically to persons that have had no previous experience of electrical appliances, then it becomes clear that particular attention will have to be given to safety in the use of electricity.

The Municipal Electrical Engineer has a real responsibility in this respect, as he is the engineer most directly in contact with all users of electricity. If these engineers wil conscientiously ensure that the reticulation and such domestic installations as fall within their legal field of control are installed and maintained in a safe state, with emphasis on the routine testing of domestic installations as far as is reasonably possible, then they will render an important service to the community.

I would like to mention, Mr. President, that the Department of Labour is watching the development locally of earth leakage devices of a high order of sensitivity suitable for the protection of domestic installations with much interest.

If these devices are found to be reliable in practice, then there may be an important application in the prevention of domestic electrical accidents, especially in relation to defective appliances, and defective unauthorised wiring, which account largely for domestic electrocutions.

I do not wish to refer to the technical aspects of Mr. Gilmour's paper, except that where it is stated that multiple neutral earthing is generally sound in respect of safety, a note of caution should be sounded to engineers contemplating this system.

Particular attention must be given to ensure that under all reasonable conditions, metal parts of electrical apparatus required to be earthed are in fact earthed as prescribed by regulation.

Mr. Gilmour in describing certain accidents, draws the inference that the existing regulations are inadequate to ensure safety. It appears, however, that in certain of these accidents no covering legislation exists. And in the rest of the cases it was not the inadequacy of the legislation but the fact that the provisions thereof were not being complied with, that resulted in such accidents.

It would be of interest to know, Mr. President, whether Mr. Gilmour considers that additional legislation is necessary, as I was of the opinion after reading the Agenda of this Convention, that there may be a tendency in the opposite direction.

In fact, Mr. President, when we come to the Members' Forum it may be suggested that no legislation at all is necessary!

Mr. President, I have much pleasure in proposing a vote of thanks to Mr. Gilmour for an interesting paper on a very interesting subject. (Applause.)

Thank you.

Mr. R. W. BARTON (Welkom): Mr. President, Gentlemen, listening to Mr. Gilmour's paper one is impressed by the scope of the subject. In fact I think it would be quite easy to write another paper in proposing or seconding a vote of thanks to his. I see he even touches on an item of interest to medical aid societies, the question of a doctor giving sick leave to a servant who experienced slight electric shock. It is a very common practice which worries some of us who are connected with medical aid societies.

The author obviously is a specialist in his subject, and one cannot argue in any way with his conclusions. They are all sound and wise.

The one point that occurs to me is the question of earthing as distinct from bonding, and one wonders whether one should be so insistent on earthing when really what one intends is a return path for fault currents back to the start point of the transformer, and it is really a matter of bonding, not earthing.

Earthing, I think, is largely impossible in this country, where we have such high earth resistance values.

Another thing the author mentioned, which I think is very timely — his warning about the cross section of neutral conductors, particularly where multiple neutral earthing is in use. It is very timely because in underground cable systems one depends on the neutral and one depends very considerably also on the lead sheath in the cable. The tendency today with PVC insulation is to eliminate the lead sheath, and I think that every useful and very necessary form of earth bond is therefore lost, and I think people using that type of cable should consider very seriously whether the neutral is adequate as an earthing conductor as well as a neutral.

Another point which has been touched on by Mr. Groenewald is the question of earth leakage relays, and I wonder if the author perhaps has omitted any mention of these devices by design, if not by accident . . . They are controversial to some extent. Personally I think that they are a wonderful invention and the sooner they are brought into regular use the better for all concerned. There are people with different ideas, however, and I would like to hear what th author has to say on that particular subject, if he wouldn't mind sticking his neck out!

I think otherwise that the paper was of very great interest, and certainly warrants detailed study. I have very much pleasure in seconding the vote of thanks to Mr. Gilmour's paper.

THE PRESIDENT: Thank you Mr. Barton. The paper is now open for discussion.

Mr. A. A. MIDDLECOTE, Pretoria (Bureau of Standards): Mr. Gilmour has given a very interesting resume of factors to be considered when regarding electrical accidents—all the more plausible because he has in his closing remarks indicated the fact that electricity is not only useful—it is safe.

Figures have been quoted by the author and other speakers to show the seriousness or otherwise of the electric accident rate. At the risk of also being classed as an Alice in Wonderland, who made figures mean what she wanted them to mean, I should also like to quote some figures.

Accidental deaths appear from my examination to be remarkably consistent. Figures available from America show that the proportion of accidental deaths due to road accidents, falls, poisons, electricity are remarkably constant from year to year. The same holds for the same figures in the Republic of South Africa for the years I have covered. Giving the figures as number of accidents per million of population the following typical comparisons can be made between U.S.A.; white population of the Republic and finally total white, coloured and Asiatic population of South Africa.

| CAUSE OF ACCIDENTAL DEATH | ACCIDENTAL DEATHS PER MILLION OF POPULATION PER YEAR | | |
|---|---|---|---|
| | U.S.A. | Whites in Republic | Whites, Coloured and Europeans in Republic |
| Road accidents | 220 | 294 | 278 |
| Falls | 117 | 100 | 70 |
| Poisons | 14.5 | 16 | 17 |
| Electricity | 6 | 8.7 | 6 |

These figures show that poisons account for twice as many *accidental* deaths as electricity and falls something like 12 times as many. This figure of 6 per million population compares well with that given by Mr. Gilmour of 6 per million consumers — I think it should be per million white, coloured and Asiatics. I would also like to know whether Mr. Gilmour's figures are based on local or overseas data.

As I stated in the paper I read at the last Convention in Margate, the main reason for the very low incidence of accidental deaths due to electricity is the fact that such a death depends on the co-incidental occurrence of five necessary factors.

(1) Occurrence of a fault
(2) Failure of protection
(3) Faulty part must be touched
(4) Person touching must be earthed (or have a return path)
(5) Physical condition of person related to nature of fault must give rise to sufficient current to cause death.

Now if the probability of these factors is 1 in a, b, c, d, and e, then the probability of a death is 1 in axbxcxdxe.

(1) i.e. value a is kept reasonable by the application of safety standards and also the Standard Wiring Regulations, and the work done by the Regulations Committee of the

(2) i.e. value b, is kept reasonable by the application of the Wiring Regulations (adequate earthing and improved methods of protection such as earth leakage) and standards for protective equipment.

(3) i.e. value c is kept reasonable by design of appliances (e.g. to ensure that one will not normally touch a part which might become alive — to a certain extent double insulation applies here).

(4) i.e. value d is kept reasonable by education e.g. don't use the washing machine, allow water to spill on the floor and have bare feet. It is also controlled by the Wiring Regulations.

(5) i.e. value e cannot be controlled — other than by compelling people to wear rubber gloves.

Now the safety of electricity has been due to the work done by all to reduce the probability of the factors. Since it is always desirable to improve even a good situation continued work by improving specifications, wiring regulations, legislation and education will reduce these probabilities. If any of the factors a, b, c, d, or e can be decreased so will the probability of accidental deaths due to electricity.

However it must be realised that this condition will not hold where someone deliberately asks for trouble and "short circuits" most of these factors. Unfortunately such accidental deaths must be accepted. They are also the main type with which we have to contend.

I would like to point out one thing however. If we were to go to a fully insulated system such as is used on the Continent we would introduce a further factor by splitting (1) into two; it would become

(1) (i) Occurrence of fault on one line to earth
(1)(ii) Occurrence of fault on other line

Such additional factor of probability could be 1 in many hundreds, thus decreasing the probability of accidental deaths due to electricity to a much better value than could be done by the utmost efforts to increase the factors a b c and d which are reasonably good already.

I would not like, however, to be accused of starting a new subject of argument. I think it is hardly necessary to go to such extremes. I would just like to indicate that if an ideal is aimed at this would be the best approach.

Electricity is safe and this has been due to the diligence of all those concerned with the factors I've enumerated.

Improvement can be effected in all things and I'm certain this will be the case here.

My own opinion, and one backed up by committees of investigation overseas, is that the largest contribution towards maintaining and perhaps reducing the already low incidence of electrical fatalities, apart from changing to a fully insulated system, is to educate. By this I mean simply teaching people that they must not "fiddle" nor do such things as operate a washing machine on a damp floor with bare feet. The only real problem is how to educate the few who do these foolish things without creating the erroneous impression to the average intelligent person that electricity as a servant is dangerous.

Regarding hazards from aerials, I would like to mention that the S.A.B.S. is at present preparing a code of practice for installation of aerials. Though this is designed primarily to prevent untidiness in cities, it also covers safety aspects.

Thank you Mr. President. (Applause.)

THE PRESIDENT: Thank you Mr. Middlecote.

Mr. J. HUZLER (Uitenhage): I would merely like to make a slight contribution on this question of the lethal side of electricity. I want to be associated with what has been said in regard to education and may be the drill that is necessary to cover the human factor, so very ably distilled out of the

full address by the lecturer, Mr. J. J. Gilmour of Cape Town, of a moment ago.

I feel that it is necessary for us not to rely on this good luck that has attended some of the failure to educate the public through direct means or means of popular publicity, but to act positively in this matter and make it appear to the electricity engineer, and through his authority, to make that drill, that education, that publicity a part of the scheme to control the accident.

I feel to a certain extent that throughout our municipalities we would be tremendously interested to secure ourselves against accident if this matter were put on that footing, as apart from regulations and the insistence of various things, if actually the public were brought into this whole scheme.

I would like to point out that more and more gadgets are being used in our households, and much on the American plan in order to amuse and bemuse people; also that this matter of the Bantu introduction to electricity will have an unfavourable workout if this matter of education is not more purposefully relied on.

I would also like, sir, if I may mention it (it has nothing to do with the municipalities, except in transport departments), that I do think that factors governing, we might say "accident", burnouts and motor cars, vehicles that are used for transport, might also be combined in this education move.

I feel that very few of us, even in this audience would know how to handle a situation where a short or something like that happened in a motor accident. We would just rely on switching off, and it seems to me that even a popular approach must and should cover the critical human factor aspect which element was covered by the paper this afternoon.

This matter of security would be more safeguarded and this could happen if we attended to the education and the drill. (Applause.)

THE PRESIDENT: Are there any further contributions to the discussion?

Mr. F. J. PRINS (Pretoria): Mr. President, I would like to refer to two points raised in Mr. Gilmour's paper. The first is where he mentioned the accident where a certain gentleman removed an appliance connector from a kettle and received a shock.

Now I would like to state that it is generally accepted in all standard specifications all over the world, where you have earthing or grounding that in such an application the earth contact must make contact first, and must break contact last, no matter how you insert that appliance connector into the socket. And that particular aspect is covered in the S.A. national specification dealing with appliance connectors.

Secondly, he mentioned where the average consumer assumed that if anything happens in a circuit, or an appliance, or if something goes wrong, a fuse will blow. I think we can take it for granted that that is not an assumption by a portion of the people, but generally the public depends on the fuse or the circuit breaker for protection if something were to go wrong, and in that particular aspect, I would like to raise this point: that according to our Wiring Regulations, if you use a non-adjustable 30 ampere circuit breaker, you can have up to eight 15 ampere socket outlets on the one circuit.

Or if you have your socket outlets all confined to one room, you can have six fifteen ampere socket outlets protected by a 30 ampere fuse.

I wonder if we have given thought to the possibility of all the very light appliances being used, and the fact that when the general man in the street has to go to a shop to buy flex, he usually picks the cheapest, which is a 14/.0076 or maybe a 23/.0076.

Now you can get, and it has been mentioned to me quite recently, just over a week ago, where a 14/.0076 twisted flex was feeding some appliance, and something went wrong, and it actually caught fire and set fire to the carpet, but the 30 ampere breaker didn't come out. That is a possibility we have to bear in mind. It is a bugbear that has been with us for a long time, but it also opens another point that I'm afraid we will have to give some attention to—protection in such cases, where you are using very light flexible cords, to feed say lights or radios, using very small power.

Thank you. (Applause.)

THE PRESIDENT: Thank you Mr. Prins.

Mr. J. YODAIKEN (Que Que): Mr. President, first I would like to congratulate the author on his paper which I found of extreme interest, and I would like to deal first of all with the aspect of educating the public which has already been mentioned.

I would like to point out, as Mr. Middlecote did very briefly, the danger of too much publicity, because of the fear which would be engendered in the minds of the public regarding the use of electricity. I feel that we are rather caught here between the devil and the deep blue sea, because while we would like to provide publicity and education, there is this alternative danger which exists.

I would therefore suggest that possibly there are one or two approaches which might be made to the subject. We all know, that every member of the public who owns a motor car, regularly has that car serviced, but very few members of the public ever consider an automatic inspection of their own electrical installation.

I do suggest, therefore, that it should become common practice to insist that contractors should advise the people for whom they do work on the minimum period after which inspections should take place.

I feel this is a small step perhaps in the right direction towards educating the public, on the necessity of renovations and repairs.

The second point which I feel might go a long way towards preventing accidents, also using the analogy once more of a car, is the fact that very few of us do our own repairs to motor cars, but there are many, many amateur wiremen in the country, and possibly they are the greatest source of danger.

Whether any legislation can be brought in to prevent a man in his own home surreptitiously or quietly extending his wiring I don't know, but I feel that that is an item which might be given considerable thought.

Just in conclusion, I would just like to mention for interest, an accident which I classify as electrical which occurred a short while ago.

An aluminium ladder had been placed against a pole and there was a PVC cable running up this pole supplying a

single phase overhead line. The cable had developed a fault which had resulted in an open circuit and very good insulation to earth. An electrician climbed this particular pole to take a voltage reading on the overhead line which was dead, he found it dead, came down the pole while two Africans were holding the aluminium step ladder, and when he was half way down the pole, he fell and broke his ankle.

On investigation, when he was asked what had happened, and claimed that he had got a shock off the aluminium ladder. That wasn't correct, obviously, and further investigation showed that the sensitive ball of the left hand of the thumb had come in contact with a slightly rough portion of the ladder which was sharp, and this man imagined he had got a shock, and actually jumped off the ladder breaking his leg.

Thank you Mr. President. (Applause.)

THE PRESIDENT: Are there any other contributors to this discussion?

Mr. L. J. HOOLEY (Visitor) (Salisbury): Mr. President, I would like to thank Mr. Gilmour for his excellent paper, and I would also like to make a few points in connection with it and with remarks made by subsequent speakers.

Now I am not saying what we have done in Salisbury, that South Africa is going to do tomorrow—that might be insulting,, especially as I am only a visitor—but I will say that we have in fact produced Federal Electricity Supply Regulations and Electricity Wiring Regulations for the Minister of Power. In addition we have published Electricity Wiring Rules, based very substantially on the well-known South African Wiring Regulations. Also, we have prescribed for protective multiple earthing, and I would like to take this opportunity for stressing that multiple earthing is for protective purposes only. It is not a device which should be adopted or not, just at the whim of a distribution engineer, or whoever is responsible for the system.

Protective multiple earthing is done for one purpose only. That purpose is to improve the very poor earthing conditions which we, in Rhodesia, appear to share with you in South Africa. The Rhodesian earthing conditions are just about as bad as yours. In some areas they are virtually non-existent as an effective means for securing electrical safety. In fact, in some circumstances, they create greater dangers if relied on for earthing purposes than they are supposed to prevent.

When we talk about earthing we always think about earthing every bit of metal in sight, but I would like to commend to delegates that there are other means of obtaining the same degrees of safety.

I refer to two alternatives—one is double insulation of appliances which is quite practical, particularly, for instance, for portable appliances. One of the biggest factors causing electrical accidents in the workshop and in the home, is the use of wrongly connected or faulty appliances such as electric drills.

I would very much like to see greater use made of double-insulated electric drills to assist towards eliminating one of the causes of accidents.

The other alternative has already been favourably mentioned, and I would like to add my support. We are now considering very closely indeed, the use of earth-leakage circuit-breakers, of very sensitive core-balance types, which will trip instantly with a very small earth-leakage current. We hope that they also will provide another step forward in this common purpose aimed at improved public safety.

One of the speakers did mention that there must be a condition of a fault before an accident occurs. I must, with respect, disagree. Fatal accidents in the Federation, which are occurring at the rate of about 24 a year (a terrible record really) can be roughly split into two categories. About half of them occur in association with overhead lines, many of them where there is no fault, and the others mainly from the use of portable appliances. The question of fixed installations and the need to inspect them regularly (whilst I am not decrying the suggestion), really does not come into it at all.

The fixed installation in a house is one of the safest parts of the whole system. I would commend that more attention, especially of supply engineers, be given to overhead lines. Our experience in the Federation is that overhead lines cause, as I have already said, about half of the total number of accidents, and it does seem that a lot of them could be avoided. In many cases, an accident occurs without any fault in the system.

To quote an example of a frequently recurring type of accident—African children, herdboys, take out cattle, and then go to sleep or wander on the job. The cattle stray. One of the herdboys climbs a tree, if one is available, to look for the cattle. If there is no tree the boy invariably climbs the nearest electricity supply pole with the obvious consequence. We have had many accidents in this category.

This is one type of case and there are others where there is no fault on the system contributing to the accident.

A very similar category of accident also in association with overhead lines, occurs when an African — (and talking of education, I think this is where electrical safety education should start, gentlemen) has to carry metal parts such as irrigation pipes for temporary irrigation lines which are moved from one site to another. These metal pipes are 20 to 25 feet long.

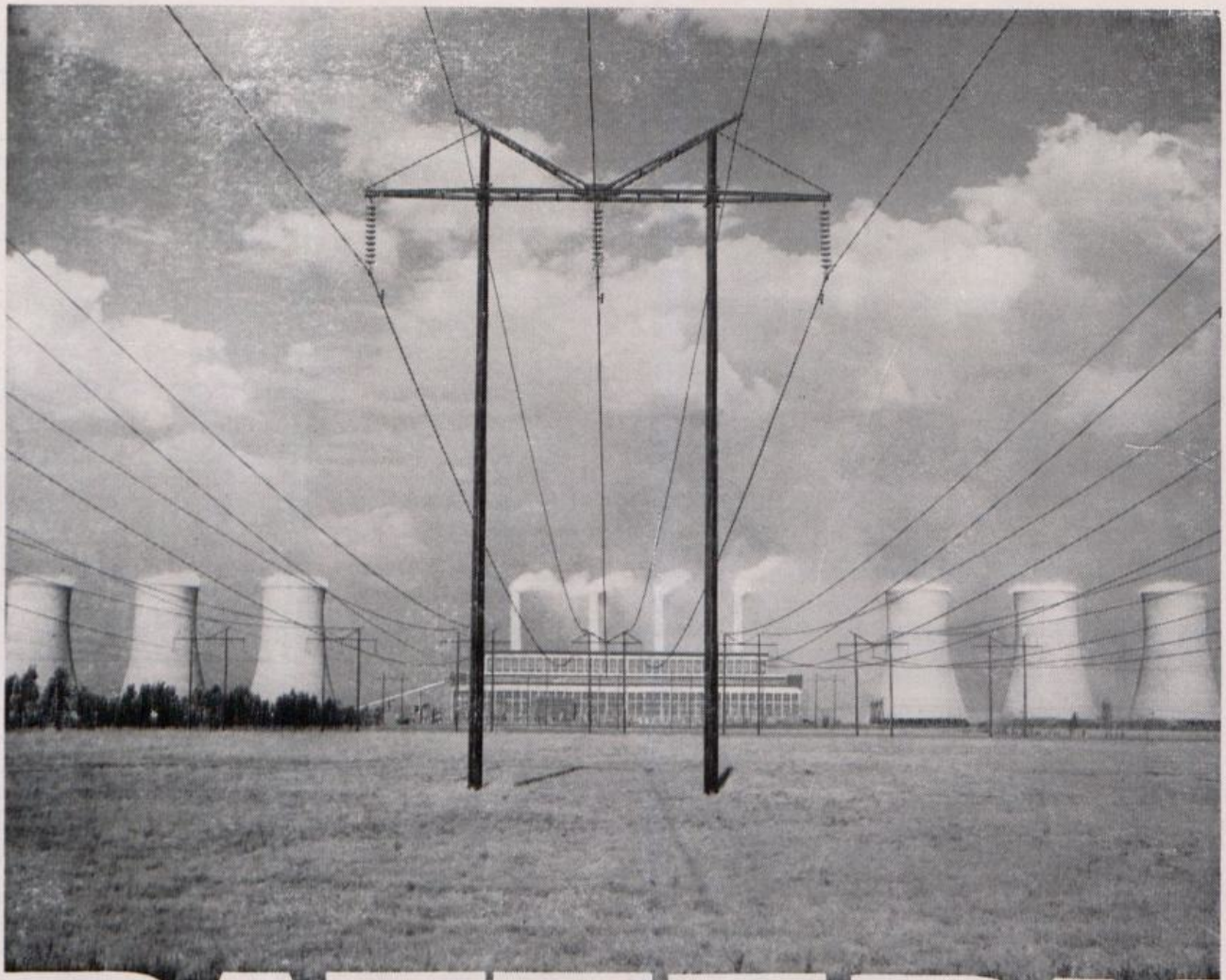
When an African carries a long pipe, he doesn't seem to do what most of us would do—put the thing over his shoulder and carry it horizontally. He invariably holds it like I am holding this microphone, vertically, as a flagstaff, and points it straight up to the sky. Immediately he comes underneath a line he makes contact and, of course, there is then another death.

Domestic electrical accidents, Mr. President, do not often occur from a faulty fixed installation (I do stress this again—it is seldom a faulty fixed installation which is the danger, . . . . it is the portable appliance or improper use of the fixed installation).

The use of the sensitive type of earth-leakage circuit-breaker, plus double insulation where possible and where practicable, plus education would, I think, go a long way to reducing accidents.

Now just one final point, Sir, if I may. We did get statistics in a paper showing that the accident rate increases with the amount of kilowatt-hours consumed, etc., but I don't think we should classify accidents in that way at all.

If one wanted to take out further statistics and demonstrate the accident rate in relation to miles of overhead lines, then



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a country lucky enough not to have any or only very few overhead lines, would have virtually an accident free record, whereas in a country such as the Federation with many miles of overhead lines (more miles of line than there are consumers in some areas) the accident record would be a very very poor one indeed, by comparison.

So I do suggest to you, Gentlemen, that you don't just forecast your accident probabilities like a football pools forecast; you should take into account other things.

Thank you very much. (Applause.)

THE PRESIDENT: The following have been elected to the Executive: Messrs. Simpson, Muller, Kane, Frantz, Turner, and Beesley. I want to notify the councillors from Durban, Bloemfontein, Johannesburg, Cape Town, Umtali and Livingstone that they will be required to join their engineers at the Executive meeting at 5 o'clock this afternoon. (Applause.)

We will now adjourn for tea.

CONVENTION ADJOURNED FOR TEA.

*On resuming at* 4.00 *p.m.*

THE PRESIDENT: Gentlemen, I would like to take this opportunity of thanking the scrutineers, Messrs. de Beer and Morrison, for the job of work they did this morning. Thank you very much indeed. (Applause.)

We will now take an item we omitted to take this morning, for the obvious reason of lack of time — Apologies and Greetings.

Mr. R. G. EWING (Secretary) gave the following greetings and apologies:

A telegram from Alan Dalton, London, with best wishes to the Convention.

Another telegram from Dave Bradley, sending greetings to you, Mr. President, and to the Convention.

From Mr. Muller, Upington, who is apparently proceeding to the Far East, and for this reason he couldn't be with us this year. He sends you best wishes, Mr. President, and sends his love to the ladies, of course!

From Clr. Lloyd, Springs — his apologies and greetings.

Apologies from Mr. Hafele, Bloemfontein, and also from the President of the S.A. Federated Chamber of Industries.

Mr. Redman asks that the Convention be advised of his transfer to the Rhodesia Congo Border Power Corporation. He hoped to be with us, and sends his very best wishes.

From Mr. G. E. H. Jones, Durban North—apologies.

Apologies also from the Municipality of Aliwal North, the Borough of Empangeni, Municipality of Graaff-Reinet, the Municipality of Middelburg, Cape, Mossel Bay, Odendaalsrus, and from R. S. Dunstan—his personal apology from Port Elizabeth. From MacIntyre, Vereeniging.

We have had apologies from the Municipality of Walmer, and the Municipality of Wellington. Bob Leishman sends his apologies, and Harold E. Bell (Pty.) Ltd. English Electric Co. Central Africa, convey their best wishes and regret their inability to be with us. The President of the Transvaal and O.F.S. Chambr of Mines regrets that he could not attend, and conveys to the Convention his greetings and best wishes. The representative of the Provincial Administration, Province of the Cape of Good Hope, and similarly the Transvaal Provincial Administration apologise.

From the Department of Labour, the Secretary of Labour regrets his inability to be with us.

The Chairman of the Industrial Development Corporation of South Africa sends his apologies. The Orange Free State Provincial Administration, as also the Natal Provincial Administration.

The Chairman of the Fuel Research Institute of South Africa regrets his inability to attend.

Then we have a letter from our friend John West of Causeway who thought up to the last minute that he would find it possible to come down to Margate; unfortunately this did not come to pass and he sends his greetings.

John Berry expresses his regret at not being with us—a visit overseas has interfered with his plans.

Mr. H. F. Aspinall sends his regrets.

Apologies have also been received from Mr. Eastman, Durban, the Town Clerk of Vryburg, Mr. Verschoor of Fort Beaufort and best wishes from Mr. Atteridge, Tsumeb.

That concludes the apologies Mr. President.

THE PRESIDENT: Thank you, Mr. Secretary. Does anybody want to make any personal greetings?

Mr. C. G. WATKINS-BALL (Johannesburg): Mr. President, on behalf of the Council, I bring you the greetings of the S.A. Institute of Electrical Engineers, and best wishes to the Association for a successful Convention.

I have also to congratulate you on your election, Mr. President, and wish you a successful year of office. As both Mr. Kane and Mr. van der Walt have already told the Conversation this morning, you are also the President of the S.A. Institute of Electrical Engineers. This is probably a unique honour Mr. President, and as it has come in your last year of municipal service, we hope that the duties will add to your happy memories.

THE PRESIDENT: Thank you Mr. Watkins-Ball.

Mr. R. M. O. SIMPSON (Durban): As Representative for the Council in Natal for the Institution of Electrical Engineers, London, I present the greetings of that Institution to you with the wish that this Convention will be very happy and successful.

THE PRESIDENT: Thank you Mr. Simpson.

Mr. P. L. VERGOTTINI (Brakpan): Mr. President, the President of the Institute of Certificated Mechanical and Electrical Engineers of South Africa is unable to attend, but I have been asked on behalf of all the members of the Institute to congratulate you on being elected as President of the A.M.E.U. for the second time, and we all hope that you will have a successful year of office.

THE PRESIDENT: Thank you, Mr. Vergottini.

Mr. A. P. BURGER (Parow): Mr. President, the Institute of Town Clerks of Southern Africa has asked me to convey their greetings to this Convention and their wish that it will be a very successful one; and on their behalf I would also like to congratulate you on your election and on the double honour that has befallen you.

THE PRESIDENT: Thank you, Mr. Burger.

Mr. A. W. LINEKER (Johannesburg): On behalf of the Rand Water Board, Mr. President, I wish you a very successful year of office, and congratulate you on your elevation to your second peerage, and hope that the Convention is very successful.

THE PRESIDENT: Thank you Mr. Lineker.

That concludes the greetings, gentlemen. We will now continue with the discussions on the paper by Mr. Gilmour.

Mr. I. D. VAN DER WALT (Escom, Natal): Listening to one of our previous speakers, he gave the impression that they were not so worried about the fiixed installations as a source of danger or accidents.

In our experience that is not quite the case. They may not have as many old installations on the system as we may have, and we find that that is, in fact, a source of accidents, and we have therefore gone over to bonding as opposed to earthing and also to getting as good an earth as possible at all installations, particularly in the coastal regions where earthing is a very difficult problem indeed. We have got to rely on both earthing and bonding to a continuous earth wire back to the transformer. In addition to that we have found it necessary now to institute periodic inspections, primarily to change meters and also to check cursorily on the wiring, and then to check on the actual earthing from a safety point of view.

We are at present investigating the use of a device to check quickly the efficiency of the earthing of the installation, or the bonding rather; we did go into the question of using these line-loop earth testers, but they are rather expensive items. In our case we would require something like 25 to 30 of them. We are now developing a miniature circuit breaker type of tester, as a quick means of plugging into an installation and testing the efficiency of the earthing and bonding.

THE PRESIDENT: Thank you, Mr. van der Walt.

Mr. H. J. GRIPPER (Knysna): Mr. President, the author mentioned the satisfactory results he anticipated or had experienced with multiple earth neutrals.

I think Mr. Frank Stevens, who is with us this afternoon, will probably be reminded that he stressed many a time the necessity for that neutral to be a ring. We all know the danger of a broken neutral in a multiple earth neutral system.

I had occasion quite recently to be called to an area in Knysna where there was a bare neutral wire lying on the ground.

The lady of the house outside which this occurred had run out and found her children looking at the wire and she said, "They must keep away from this wire. Don't let them touch it."

I said, "Madam, go back into the kitchen and be careful that nobody touches your stove."

We dashed in just ahead of her, and found that the body of the stove was in fact alive. This neutral had broken on a radial line.

Again, mention was made in the paper of a case of a man who had received a slight shock, but suffered more from hitting his head when he jumped.

I remember a case where there were two boys on the top of a tower wagon. One of them received a very nasty shock, fell to the ground, got up and ran away. His mate, out of sheer fright, also fell off the tower, and he was the one who was taken to hospital!

The author also mentioned a case where a boy, having climbed a pylon, and touched a live wire, fell to earth and recovered.

It so often happens that an electric shock anaesthetises the body. It puts one right out for a moment or two, but saves one from breaking bones, if one falls.

However, my point is that these freak occurrences get into the newspapers.

Mr. President, I fear that our discussion this afternoon will get into the newspapers, under the heading of "electrical accidents". We must see to it, if there is anybody present from the press, that the purpose of this meeting is to ensure safety, rather than to discuss accidents.

THE PRESIDENT: Thank you Mr. Gripper.

Are there any other contributors to the discussion? This will be your last opportunity, gentlemen.

Mr. W. M. MILTON (Escom): Mr. President, I am surprised that no-one during the discussion on this paper has brought up points which we have heard at the Conventions from time to time—we have dealt with safety in the past, so why don't we deal with the problem whole-heartedly now.

I am surprised that Mr. Simpson hasn't risen to deal with the little transformers that you get for model trains and things of that sort, as an introduction to the most evident desirability, which no-one seems prepared to face realistically to control the type of appliance and equipment which is on sale in the shops and the bazaars.

I think accidents which do occur can be traced, not so much to faulty fixed installations, as to the appliances. The fact that some appliances are faulty has been mentioned already. But surely it is high time that this Association took some step towards obtaining legislation on the prevention of the sale of defective appliances.

I think they should be treated in the same way as poisons. We have had mention of accidents from poisoning and legislation is in force to see that poisons, to the best of our ability, are kept away from people who can not be trusted to use them. I think the same thing should apply to some of the electrical rubbish which is sold in the shops.

THE PRESIDENT: Thank you, Mr. Milton.

Mr. R. M. O. SIMPSON (Durban): Mr. Milton referred to me in respect of problems rising out of the use of miniature trains and small transformers, in this regard I think our friend Pat Middlecote could inform us of what has been done in respect of specifications for small appliances and I am sure would tell you that in a very short time this matter will be fully under control.

The problem of safety is a difficult one, because no matter what legislation has made to improve safety, it is very difficult to stop individual people from doing foolish and careless things. In our experiences the bulk of accidents that take place have been due to the foolish action on the part of some individual. Mr. Pat Middlecote in his remarks, made reference to the possibility of endeavouring to remove the hazards and

thus reducing the possibility of an accident, this approach I feel has a lot to commend it. A reduction in the accident rate cannot be achieved by any individual approach, it can only be done by the appreciation of the many problems that go towards causing them. Some years ago we had a very nasty accident where a girl was electrocuted using an electrical iron in a room with a damp concrete floor, she unfortunately was in her bare feet and the flex was faulty which gave her very little chance of survival.

In my opinion (bearing in mind Mr. Pat Middlecote's comments), the building trades could also help to reduce the hazard by careful selection of the materials used in the building I can see no reason why the National Building Research Institute and in turn the Architectural Association, cannot assist by taking such aspects into account when floors are laid. After all today there are many suitable and serviceable materials that would help in reducing the hazard. This is only one small aspect but I hope it will make my point that no matter how careful you are with legislation, someone will always do something foolish or in some accidental manner something may break, placing themselves in an unexpected dangerous situation. If we can reduce the hazard it could be of very great benefit to all concerned.

THE PRESIDENT: Thank you Mr. Simpson.

Mr. F. STEVENS (Ladysmith): Mr. President, as Mr. Gripper mentioned, I have for some years been an advocate of multiple earthing of the neutral, providing the neutral can be positively earthed both ends and having an earth wire from the multiple earth neutral to the roof of houses and for general earthing.

What prompted me to adopt this idea was a classic case, where a consumer interfered with the earthing of his installation which very nearly cost the life three people.

I would like to relate what took place on this occasion.

My department had an SOS to say that a woman had received a severe shock from her front fence. We went up to investigate and found the house had just changed hands. The new owner decided that he didn't want the wash hand basin where it was in a room and proceeded to remove it. As it happened the main earth was connected to the plumbing of the basin and when he had finished there was no earthing of the installation. At the time of the accident, his wife had switched on the stove and as she did so there was a shout out in the street; being curious to know what was going on, she went out and saw a native boy who had been retrieving a dog from inside the fence, frozen to it, having received a shock.

What had happened is this: there was a fault on the stove, and through there being no earth, the stove became alive. Fortunately, the stove being on a wood floor the lady knew nothing about this. It so happened that the installation conduit was in touch with the roof, the roof with the down pipe, and the down pipe with the fence. When the stove was switched on the dog happened to be inside the fence and the boy was getting the dog out.

I might have mentioned earlier on, the lady attempted to save the boy while she had a baby in one arm. You can imagine what might have happened.

I am wondering whether Mr. Gilmour has any ideas about what could be done to prevent folks interfering with earthing through ignorance.

Thank you Mr. Chairman.

Mr. K. W. J. HALLIDAY (Port Shepstone): Mr. Chairman, we have heard about double insulation this afternoon. It is a matter which puts me in a little bit of a quandary, because I have a propensity for argument, and I have argued a bit with some of the commercial world about some of this double insulation, a firm mainly in the matter of cake mixers, sewing machines, and the like.

I quite appreciate that double insulation does give one belt and braces, but according to the Act you should also have a safety pin in the form of an earth wire. They claimed to me in argument that the mere fact that double insulation prevents any possibility of accident, and the third core of the flex is not necessary. I don't see anything in legislation which allows that, or exonerates them from any cause, and I for my part feel that it gives a false impression of safety, because if the lady of the house is operating a sewing machine, the needle is not insulated, or if there are insulated needles, they are not on the market down on the south coast yet. Likewise, the chuck of a drill, when a drill is inserted, is also metal and the operator can get a shock from that.

I would like Mr. Gilmour's comments on matters like that, and, when we mention educating the public, I think we should not give them a false impression of double insulation making them completely safe.

THE PRESIDENT: Thank you, Mr. Halliday. Gentlemen, if there are no further contributors to the discussion, I will ask Mr. Gilmour to reply.

Mr. R. R. GILMOUR (Cape Town): Mr. Chairman, starting with Mr. Groenewald, (I have given his comments a lot of thought, while he was drinking tea), from the figures he has given us, I have come to the conclusion that I would be quite justified in saying, "Move to Cape Town and live longer!" His figures are rather gloomy.

Anyway, the position is certainly not as bad as he painted, but I must say we in Cape Town, haven't got the mines hazard, and we have been spared the type of consumer like that; and of course what we have to do with the Railways is actually worse than having them as a consumer!

Now regarding his comments on additional regulations, and that he was hoping we were going to reduce them; I am not in favour of having any more regulations reduced, because we are fraught with these things already, but it is very, very clear that what is lacking is control in the case of radio equipment, and the control of the sales of all these fancy, cheap, bedside things we get, and the manner in which they are installed, which makes all our wiring regulations look silly.

I do feel that the sooner something is done about that the better, and again I stress, as I said in the paper, with all the fancy VHF antennae we can expect now, we will have to go ahead.

Fortunately Mr. Middlecote puts my mind at ease by saying the Bureau of Standards are introducing something, but again that is only a Code of Practice, and we may not be very much further on.

However, I don't think it is for me to decide that, but I do think it is a point that I was quite justified in raising, but certainly I don't intend to increase the regulations, but where there are shortcoming we should put them right, or scrap them completely.

Now I notice multiple neutral earthing again seems to be regarded with suspicion generally. Why, I still don't quite know, because with the experience we have had in Cape Town for over 20 years now, it has never given us any cause for alarm, and actually, to quote facts, the worst case that I had of a broken neutral occurred not so long ago; it was actually after I wrote the paper, and it was rather a queer one, this.

It involved a church where the people were baptised at the back in a big font, and every time the padré performed the baptism and touched the tap at the same time he gave the one who was obtaining salvation a nasty electric shock!

This actually had the inspectors beat, and the contractors beat. They could find nothing wrong with the installation.

But unfortunately they didn't try to measure voltages on load and on no load, which would have given them a clue right away, which is what I did when I was dragged into this. There I found that the neutral had actually severed at the point where it leaves the overhead service connection and enters into the conduit. It had severed, and all they were relying on was their own water pipe and the earth electrode. So every time the lights, or any load was switched on in the church, the only return was through the earthing system, and that was why these unfortunate people got a shock in the church.

But that was really the worst case. I plotted the voltage against load and it did become alarming beyond about 5 amperes, but fortunately the installed load in that particular church was only a matter of a few amps and under those conditions a serious condition was hardly likely to have arisen, unless a defect in the wiring installation developed.

That is the first case that I have come across like that, and it was the worst case, but nevertheless it so happened that it wasn't at that stage possible to achieve a fatal condition.

So I still feel, in view of our experience in Cape Town, we rather regard it with suspicion, which seems to be so rife in other parts of the country. I don't quite know why.

Regarding the kettle plug — I note Mr. Prins says that has been attended to, but it so happens that the plug concerned was a very old one, and quite likely they aren't obtainable today.

I note the remarks regarding educating the public. I think I stressed in the paper somewhere that that should be done with a fair amount of tact. It is not a case of getting up on a platform, or a soap box, and saying, "Electricity is dangerous, but to be safe do this and this . . ." That is not the way to do it. You do want a tactful person. Apart from being competent, he has to be very tactful to handle a situation like that.

The other thing, too, that I don't understand is the attitude generally towards death by electricity, here and outside. It rather reminds me of some trouble we had with the City Council some time ago when we wanted a pavement made up on a certain road, and the reply we got back was to the effect that on that particular road there was no bus running, and until such time as it was declared a bus route they would build no pavement. So we get run over and killed by a car, well, that's o.k. but oh, no, not by a bus!

So it seems to me, it's all right getting killed by motor cars. We read about it in the paper every day. But as soon as somebody gets killed by electricity there is an enormous fuss and outcry against it. Why I don't quite know.

Perhaps somebody can explain that.

I still feel that the figures I have given still indicate that death by electricity is not alarming at all. It is only that it is up to us, as engineers, as I said in the paper, from a professional standpoint, to do something about it, and to make it safer, then at least our conscience is clear.

Regarding the question about how we are going to prevent people from tampering with the earthing system — I don't quite know how we are going to do that, because how are you going to prevent schoolboys from tampering with electrical installations.

If you can overcome that you will probably overcome the other thing too.

All I can say against multiple neutral earthing, seeing it cropped up again, is that as far as we are concerned, there has been no danger, if anything it has just been a nuisance, when perhaps due to a high resistance in the neutral conductor some of the current has had to return through the earth lead, causing the conduit to vibrate, and also causing hum on a radio set, of course, the first one the consumer goes to is the poor electricity department, who really can't help it.

Anyway, it's things like that that make it a nuisance. As regards the control of sales of all sorts of fancy equipment, at least I do say in the paper that something should be done about the control of all these indiscriminate sales of fancy adapters, and that should really include all the fancy appliances as well.

As regards the double wound insulation that was raised, although I did mention it in the paper, it is not really my own suggestion (that comes from one of my many references), it has been suggested overseas, but whether that is really the answer or not, I don't quite know.

I can't say I'm altogether in favour of it, because eventually both layers pack up, so I'm not one for advocating that at all.

I think that as regards Mr. Simpson's remark about insulating an ironing room floor, that is quite a sound move, because no matter what you do, people will still plug irons into lighting sockets, or if there is a socket outlet they will use a piece of flex and an iron is a potential source of danger. Most ironing rooms appear to have cement floors, so I will stand by that, it is probably a good idea to have insulated floors in an ironing room.

Otherwise, gentlemen, I think I have commented on everything, except Mr. Barton's contentious matter on the earth leakage relays. I did not try and dodge anything. I didn't put it in because I did not consider that it had any direct relation to the paper because, after all, the paper is really on accidents, and not on earthing as I said in the paper (that has been dealt with adequately by other people), but it is not

a case of sticking my neck out, it has probably been pulled out.

I have made a few notes on this in case you'll think I'm scared of this. I have had quite a lot to do with the testing of these relays, and investigating of them, and the rough notes I've made are something like this:

The principle of using earth leakage relays of any form is of course always logical. Much talking about the subject goes on and on, but does not seem to get anywhere. I personally have to view the matter from a number of angles. Namely, a gadget fitted to an individual appliance would be preferable, as only one circuit would be disconnected instead of the whole installation.

Otherwise a differential type, similar to what I described in the paper, as giving a warning, using an instrument with a scale marked "safe" and "danger" — I would say a thing like that, a core balanced type of device, could be extended to have the scale, to first warn the consumer if they wanted to look; then I feel that, beyond a certain current, there should be an alarm device fitted, which starts to make an objectionable noise to warn them, and then if they still disregard the warning, switches off the installation.

So I feel a graded type of thing like that would be preferable.

And the reason that I talk like that is because I am viewing it from another angle completely inasmuch as I like to see all facilities granted to the prevention of accidents, even though we have said the accident rate is relatively low, it is right to give all encouragement to anything which gives added protection; as somebody has already said, although your house is most unlikely to burn down if it is built of brick and there is a tiled roof and so on, nevertheless, you still take out an insurance policy just in case, so that there is no reason why you shouldn't regard safety on the same principle. Install an earth leakage relay, even if it is just psychological. But you must consider the thing from the supply authority point of view, and that is what most of us are, here.

With the few that have been installed in Cape Town already, I may tell you that they are being a little bit of a nuisance, in that when they have operated, particularly when they are caused by some of these fancy stove elements we get today, with peculiar leakage currents to earth, although creating no danger whatsoever, with the stove solemnly earthed, and all that, there is no danger — these currents nevertheless have these relays, and of course the poor electricity department gets called out any time of the day or night to restore supply which actually, as far as we are concerned, hasn't failed.

It's still there, at the terminals. However, those are the two main points that I wish to comment on as far as earth leakage relay are concerned, but it seems to me that unless we are going to do something about these stoves with leaky elements, then either we must eliminate the stove completely from this earth leakage relay, or have a separate relay connected to the stove itself—a simple voltage operated relay, would probably do adequately.

So, gentlemen, I think that is all I have to say. I have answered all the questions to the best of my ability. If I have left anything out, I will be only too pleased to get up again, and comment further, but I feel again that I must stand by my conclusion, that electricity as far as I am concerned is safe, and the figures that I have obtained are not only local, . . . and as Mr. Middlecote has suggested too, it is very difficult to relate the incidence to population and consumers because sometimes it is not very clear what the figures refer to. In general the rate does really refer to population rather than consumers, but in a country like this where you have thousands and thousands of natives, if you include them as part of the population, they are certainly not electricity consumers, it does make the compiling of statistics rather difficult; but in a country like Britain you haven't got that problem, where nearly everybody uses electricity. Then I think the figures are a bit more conclusive, and those figures from Britain do tend to support the figures that I have already quoted.

I think I have now touched on all the points, Mr. President.

THE PRESIDENT: Thank you Mr. Gilmour.

Gentlemen, I think you will agree that we have listened to a very fine paper, and some very fine discussion on Mr. Gilmour's paper.

I will now ask you to show your appreciation to all the speakers in the usual manner. (Applause.)

Gentlemen, we will now adjourn the Convention until 9.30 a.m. tomorrow morning.

CONVENTION ADJOURNED.

# SECOND DAY

THE PRESIDENT: Good morning ladies and gentlemen. I will call on Mr. J. P. J. de Jager to present his paper "Economics of Distribution Planning."

# Economics of Distribution Planning

By J. P. J. DE JAGER, B.Sc.(Eng.)

INDEX



## 1. INTRODUCTION.

The opinion is widely held that Municipal Electricity Undertakings must generally be more poorly administered than private commercial or industrial concerns, who also serve the public in the supply of goods and services, but have the benefit of the profit motive as a spur to greater efficiency and their relative competitive position as a yardstick of their success.

Enlightened industrialists, however, probably do not share this view unreservedly as they look upon free competition as a mixed blessing. They also have sound arguments in support of the steps they take to limit the harmful effects of such competition. They may even have a shrewd suspicion that the profit motive is not entirely absent in the Municipal Electricity Undertaking which serves them.

A possibly more important difference between Municipal Electricity Undertakings and private industry is that the industrialist can determine in various ways exactly what the public wants, whereas the Municipal Electrical Engineer in charge of his monopolistic undertaking is obliged to serve the public in the manner which he presumptuously thinks the public desires.

The competitive baking industry have for instance established the rather surprising fact that the South African public, for the present at least, prefers to receive its bread in unwrapped loaves at 9 cents a loaf rather than hygienically wrapped in cellophane at say 10 cents a loaf.

The Municipal Electrical Engineer has no similar machinery to determine whether the public would actually prefer to have its electricity delivered by a completely underground distribution system at say 1.1 cents per unit rather than by a partly overhead system at 0.95 cents per unit.

In general, any improvement in the service must be associated with an increase in the cost of the service. Engineers are said to be especially prone to the weakness of striving towards technical perfection beyond the optimum point determined by economic factors. In connection with distribution planning, this problem arises in respect of the following questions:—

(a) What degree of reliability in the supply of electricity would the consumers be prepared to pay for, if they were placed in the position to choose.

(b) What is the optimum investment justifiable in the interests of physical safety.

(c) How much additional expenditure is justified in order to make the distribution system inobtrusive or more attractive in appearance.

(d) How can a service meeting the above requirements be provided at the lowest possible cost.

Only the last of these questions is a technical problem of the kind which the engineer is trained to solve. The other questions which lead up to it require solutions which are opposed to his nature as a perfectionist.

His inclination is to force onto the public bread wrapped in cellophane.

## 2. THE IMPORTANCE OF CAPITAL CHARGES IN RELATION TO OTHER FACTORS AFFECTING THE ECONOMICS OF A MUNICIPAL ELECTRICITY UNDERTAKING.

It is probable that any member of the Pretoria public selected at random, would be able to tell of an incident, recently witnessed by him, where two Electricity Department lorries, four electricians and six Bantu labourers were standing idle for at least ten to fifteen minutes, at the base of a pole, while only one Bantu appeared to be working. The elimination of this waste therefore appears to the public, the Council and even to Management consultants to be the obvious first step in improving the efficiency of the Electricity Department.

This almost traditional method of attempting to improve the efficiency of Municipal Departments is nothing but a struggle against Professor Parkinson's law which requires the number of employees in any undertaking to increase at the rate of approximately 5% per annum, irrespective of the rate of increase, decrease, or complete disappearance of the work to be done.

The truth of Parkinson's law is beyond question and was strikingly illustrated in a recent investigation done by the Pretoria City Engineer in connection with the design of a large new office block to accommodate all Municipal staff. From a statistical analysis of data over the period 1910 to 1956, it was determined that the number of Pretoria Municipal employees will in the year 1999, exceed the number of Pretoria inhabitants by a comfortable margin. Barring for the interference of Management consultants, this is of course to be expected as the number of Municipal employees increase at the rate of 5% per annum in obedience to Professor Parkinson, whilst the Pretoria population increases at the rate of 3% per annum only.

Despite these facts, it has been repeatedly found by impartial management consultants that Municipal Electricity Departments generally do not provide the same scope for reduction of staff as do other branches of Municipal or Government service. It has secondly been found that the staff reductions achieved do not appear to have any noticeable effect on the cost of electricity.

Although not generally realised, the underlying reasons for these rather unexpected findings are twofold and tend to deprive the Electrical Engineer of mostly undeserved credit for his apparent good showing in relation to other Municipal Departments, in an investigation by Management consultants or other impartial investigators.

The explanation of the first mentioned finding lies in the rate of increase in the demand for electricity in relation to the rate of increase in work in most other Municipal Departments. The volume of work to be handled by a City Treasurer's Department for instance, is in the main linearly related to the population of the City. The growth of population (and therefore also the rate of increase in the amount of work to be handled by the City Treasurer) is at best of the order of 3% per annum. If the number of staff is therefore allowed to increase at the natural Parkinson rate of 5% per annum, it is obvious that O. & M. investigators will be able to submit embarrassing reports at regular intervals. In the Electricity Department on the other hand, the rate of growth in the demand for electricity (and therefore the rate of increase in the amount of work to be handled by the Electricity Department) is still in the range of 7% or more in most South African Towns and Cities, although there are signs of saturation. It follows that even with staff increases at the full Parkinson

TABLE I.

**OPERATING COSTS — PRETORIA ELECTRICITY DEPARTMENT**

| COST ITEM. | AVERAGE COST — CENTS PER UNIT SOLD AND PERCENTAGE OF TOTAL COST. | | | | | |
|---|---|---|---|---|---|---|
| | 1940/41 | | 1950/51 | | 1960/61 | |
| | Cents per Unit sold | % | Cents per Unit sold | % | Cents per Unit sold | % |
| Capital charges | 0.2574 | 46.1 | 0.2978 | 50.3 | 0.3800 | 50.8 |
| Coal | 0.0887 | 15.9 | 0.0953 | 16.1 | 0.1570 | 21.0 |
| Salaries | 0.0385 | 6.9 | 0.0337 | 5.7 | 0.0366 | 4.9 |
| European Wages | 0.0642 | 11.5 | 0.0598 | 10.1 | 0.0524 | 7.0 |
| Bantu Wages | 0.0151 | 2.7 | 0.0213 | 3.6 | 0.0202 | 2.7 |
| Insurance, Pension Fund and contribution to C.T. Department | 0.0218 | 3.9 | 0.0213 | 3.6 | 0.0359 | 4.8 |
| Sundry Maintenance materials | 0.0324 | 5.8 | 0.0302 | 5.1 | 0.0322 | 4.3 |
| All other cost items | 0.0402 | 7.2 | 0.0326 | 5.5 | 0.0336 | 4.5 |
| Total cost | 0.5583 | 100 | 0.5920 | 100 | 0.7479 | 100 |
| Total units sold | 133,527,372 | | 409,826,453 | | 922,121,185 | |
| Total capital investment | R4,338,000 | | R17,722,000 | | R46,494,000 | |

rate, the staff utilisation factor must progressively improve at a praise-worthy rate of approximately 2% per annum without any particular effort on the part of the Electrical Engineer. This progressive improvement in the utilisation of staff is illustrated in Table I, when the cost of salaries and wages per unit sold is compared for the three fiscal years 1940/41, 1950/51 and 1960/61.

The reason for the second finding namely that staff reductions usually have a negligible effect on the cost of electricity, is that salaries and wages comprise a relatively small component part of the total cost, and are swamped by capital charges.

Table I gives an analysis of the operating expenses of the Pretoria Electricity Department for the three financial years 1940/41, 1950/51, 1960/61. It will be noted that European salaries and wages amounted to barely 12% of the total operating costs for 1960/61 while Bantu labour which is a favourite target of Management consultants represents a meager 3% of the total. As explained before, Parkinson's law ensures a constant improvement in these figures and any further noticeable reduction in these cost items will involve considerable effort and frustration and can only lead to negligible improvement in the cost of electricity. A spectacular improvement of 33% in the item Bantu wages would for instance be accompanied by a reduction of only 1% in the total cost.

Table I also shows that the item "capital charges" comprising interest, redemption and modest provision for renewals, accounted for more than 50% of the total operating costs during the financial year 1960/61.

Optimum application of managerial efforts towards reducing the cost of electricity obviously requires that this be the first item to receive attention and not such matters as salaries, wages and stationary. In fact it is quite conceivable that a considerable increase in these latter items may be warranted where it will lead to a reduction in the item "capital charges". Capital charges are however strangely enough, the one budget item accepted by Councillors and Management Consultants alike, without any real probing.

This cost item is however much more difficult to control, or correct, as many acts which lead to an increase in capital charges are irreversible, and their effects must be born for the full life period of the loan, whereas any waste in other operating costs can usually be eliminated as soon as the cause is recognised and acknowledged.

## 3. THE REDUCTION OF CAPITAL CHARGES.

There are two methods by which capital charges could possibly be reduced:—

(i) Improvements in the policies and procedures adopted by the City Treasurer in respect of the financing of the Electricity Department. This aspect is somewhat outside the scope of this paper but nevertheless warrants some comment.

The City Treasurer is more concerned with the finances of the Council as a whole and not so much with the impact of financial policies on individual Departments. A sound balance between the often conflicting financial requirements of different Departments can therefore only be obtained if the Electrical Engineer takes an active interest in the financial policies practiced by the City Treasurer. A typical case in point is the employment of depreciation funds and other reserves.

The fact that the City Treasurer allocates interest in respect of these funds at his disposal does not necessarily mean that the funds are being invested to the best advantage of electricity consumers. The effect of rising prices of plant and materials can for instance be largely offset by reinvesting depreciation fund accruals immediately as they become available, in similar plant or materials. This would require that depreciation fund accruals be not placed at the general disposal of the City Treasurer, but immediately reinvested in the Electricity Undertaking.

In this connection it is interesting to record that the British Government after a searching investigation determined that the expansion of nationalised industries and in particular the national electricity undertaking, should in the interest of the general public, be partly financed from surpluses. The British Government White Paper entitled "The Financial and Economic Obligations of the Nationalised Industries" now lays down minimum levels of self financing required of the various Electricity Area Boards.

Little or no such self financing occurs at present in South African electricity undertaings and if the conclusions of the relevant British White Paper are correct, the future of electricity undertakings in this country is being endangered.

From Table I it will be noted that the contribution of capital charges to the cost per unit sold, has increased by almost 50% over the two decades.

Over the same period all other costs per unit, with the exception of coal costs, have decreased on the average by 0.6%. If it is assumed that depreciation written off during this period was insufficient to maintain the assets of the undertaking, as it in all probability was, judged by price indices given in the Jubilee Issue of "Union Statistics", then the impact of the capital charges on the cost of electricity is even worse than shown up by the figures in Table I. Let it suffice to say that sound financing could have gone a long way towards arresting this disturbing trend in the component cost of electricity, represented by capital charges.

(ii) The second method of reducing capital charges lies in the more frugal employment of capital in the Electricity Undertaking and Distribution Planning plays an important role in this respect. The conceipt "Distribution Planning" is here used in the broader sense to embrace all those managerial activities concerned with the determination of the present and future electricity demands of the consumers and the taking of necessary steps to ensure that these demands will be met as and when required by the consumers.

In distribution planning, the frugal employment of capital requires not only technical proficiency but also personal courage and presumption.

The more thrifty employment of capital and resultant reduction in capital charges can in general only be obtained at the expense of some other desirable property

of the service and is therefore only justified and necessary if that which is sacrificed is not out of proportion with the possible gains.

The first stage of a new Power Station with associated primary transmission system is at present being completed in Pretoria and it is hoped to have it in commission before the onset of the 1963 winter. History has proved that the 1962 winter could be successfully weathered without the assistance of this new Power Station, mainly due to fact that all Power Station plant was available in service to meet the peak demand and the fact that the 1962 Pretoria winter was relatively mild.

These facts were not known when the final commissioning date for the new Power Station was decided upon in 1957, and the decision to set the commissioning date for early 1963 involved a certain amount of risk and courage at that time. Insofar as distribution planning was instrumental in the decision to commission the new Power Station in 1963 only, the economic value of careful distribution planning is illustrated by the fact that a decision to advance the commissioning date by one year would have cost the Pretoria consumers an extra amount in capital charges approaching R2,000,000.

Such a decision, which would not have been open to serious criticism in 1957, would therefore nevertheless have been an expensive one.

From a distribution planning point of view, the question is whether the additional insurance against interruption of supply, which would thus have been afforded to the Pretoria consumers during a few days in the winter of 1962 could be economically justified, that is, whether the consumers, if they were in the position to choose, would have elected to have the commissioning date advanced by one year, at the cost of R2,000,000.

The art of distribution planning is not to strive towards technical perfection, extreme reliability, absolute safety, maximum beauty or lowest cost, but to strike a balance between these factors, with cost as the common denominator.

## 4. THE ECONOMIC APPROACH TO DISTRIBUTION PLANNING.

As already indicated, distribution planning determines not only the amount of capital invested in the distribution system but may also affect to a large extent the capital invested in Generation Equipment.

As far as the distribution system is concerned, the capital requirements are mainly determined by the following factors:—

(a) Required System Capacity.

(b) Reliability considerations.

(c) Choice of materials and design.

(d) Load factor improvement.

Although these factors are so interrelated that it is difficult to segregate them, an endeavour will nevertheless be made to deal with them separately in discussing the underlying planning considerations which may influence the capital requirements of the final distribution scheme.

(a) *Required System Capacity.*

The distribution system must be capable of meeting the present load and extensions are only required for anticipated future loads.

As far as the existing load is concerned, the most frugal employment of capital can only be achieved by carefully weighing up factors, such as the character of the load curve, against the overload capacity of the equipment. Factors such as ambient temperature at the time of peak load and the thermal resistivity of the soil may also have an important bearing on the capital requirements. These possibilities although offering great financial advantages, are seldom if ever exploited to the economic limit mainly due to lack of staff to carry out economic investigations and research work. Very little is for instance known about the advantages to be had from the fact that in most towns and cities maximum loads occur at times when the ambient temperature is lower than the value on which the normal rating of equipment is assigned, or about the effect, on the life of the equipment, of occasional overloads in excess of the recommended values laid down in standard specifications. Similarly, few supply authorities if any would have at their disposal comprehensive information regarding soil thermal resistivities in their supply areas.

The following is an extract from a test report, by a manufacturer of oil filled cable:—

". . . . In view of the current interest in the overload capabilities of high voltage cables, it was decided that the specified type tests should be followed by similar tests at higher conductor temperatures . . . ."

". . . . With regard to the overload capability of oil filled cable, it has been demonstrated that up to 100 days at a conductor temperature of 120°C, has no significant effect on the quality of the dielectric and temperatures up to 135°C could safety be maintained for several hours on infrequent occasions during the life of the cable . . . ."

The economic importance of this statement is evident when realised that the standard current rating for such cables is based on a maximum conductor temperature of 85°C and the above quoted temperatures therefore correspond roughly to overload capacities of 20% and 33% in excess of the normal capacity at 85°C. Winters in most South African towns and cities are also such that plant will only be called upon to take overloads for a few days each year.

As far as distribution planning for future loads is concerned, it can be said that extensions to meet the anticipated growth of load should be delayed as long as reasonable reliability of supply and other factors allow. This involves the careful weighing up of the financial advantages against the risk of reduced reliability of supply taking due account of overload capacities of the equipment. The aspect of reliability of supply will be dealt with in more detail later.

The following example illustrates the economical approach to distribution problems which may dictate solutions opposed to the obvious sound technical solution.

From a technical and production point of view the distribution system to serve a new residential township can most efficiently be built if the whole system is completed in one smooth continuous operation. Under such circumstances the

ratio of idle time to productive time, and other cost elements such as planning and organising time, transport costs, etc., can be kept to a minimum.

However, unless the development of the township is very rapid, the most economic solution may well be to develop the distribution system in unison with the development of the township in spite of the fact that labour and other costs would be higher. This paradoxical statement is explained by the fact that the savings brought about by the better utilisation of capital expended may far outweigh the additional cost of an inefficient construction programme.

The courageous maximum in distribution planning is not "when in doubt, — do" but rather "when in doubt, — delay" This approach has the double advantage of resultant savings in capital charges and a reduction in the number of uncertainties, which often leads to a better decision at the later stage.

In contrast to extensions in a new residential township which may be initiated and completed in a matter of weeks, the need for transmission and primary distribution extensions must be anticipated several years before commissioning. Even here the maxim "when in doubt, — delay" only becomes irresponsible if the final decision was not preceded by careful study of the problem from both technical and economic points of view. The possible economic advantages are such that no effort or cost should be spared in preparing future load estimates.

(b) *Investment for reliability of supply.*

The capital requirements of a basic distribution system is in general increased by 50% to 100% in order to provide reliability of supply.

The extent of this additional investment is reflected in the utilisation factors, that is the ratio of actual peak load to available capacity, of distribution equipment. For the Pretoria distribution network, these factors are of the following order:—

| | |
|---|---|
| Suburban distribution transformers | 70% |
| Suburban 11,500 volt reticulation cable | 50% |
| Primary distribution feeders | 65% |
| Primary distribution transformers | 50% |

The extra investment in the Pretoria distribution network in this respect represents some R5,000,000 to R10,000,000. According to the law of diminishing returns it is almost certain that the point has already been reached in many spheres of the distribution system where any amount of additional investment to improve the reliability of supply can only have a negligible effect on the overall position as it affects the individual consumer.

The frugal employment of capital therefore requires the realistic assessment of the value of reliability of supply as well as the value of the marginal improvement in reliability afforded by any given additional investment in this respect.

The Pretoria primary distribution network includes five 20 MVA stepdown substations commissioned in 1950. Each substation is equipped with two 20 MVA transformers, one on load, the other one serving as standby. In the event of a failure of the main transformer, the standby transformer can be brought into service by remote control equipment, and the interruption of supply will be limited to a few minutes. The additional cost of this facility is approximately R300,000.

During the past 12 years these transformers have been in commission, only one supply failure which can be attributed to a (minor) transformer fault has occurred. If, instead of a standby transformer at each substation, a single standby transformer with convenient transportation and emergency commissioning facilities had been decided upon, the interruption would have lasted a few hours instead of a few minutes, with resulting inconvenience to some 5,000 consumers. The resultant saving in capital would have been approximately R225,000.

Although the author would not like to criticise outright the decision to have a standby transformer at each substation, he would nevertheless summarise the economic and reliability considerations underlying the decision as follows:—

(i) During the same period the consumers that were affected by the transformer failure in question, together with thousands of others were unfortunate enough to have two more power interruptions of several hours each. One power failure was due to a major fault at another point on the supply system and the second failure due to faulty operation of protective equipment. Both faults resulted in a partial shut down at the Power Station. Both these failures could have been avoided by the investment of a fraction of the amount spent on the standby transformers.

The failures were however due to most rare circumstances and extra cost, however small, to improve the reliability of supply in this direction was not considered warranted. The incidents were treated sympathetically by the press and the interruptions were accepted by the consumers in good spirit.

(ii) During the same period, most of the 5,000 consumers affected by the transformer failure in question, also had to face several more power failures of an average duration of an hour or two, for one or more of the following reasons: unavoidable cable faults, storm and lightning damage to distribution equipment, blown pole fuses, faulty operation of distribution protective equipment, faulty operation of the system due to human errors, occasional overloading of distribution equipment due to freak conditions etc.

(iii) The inherent reliability of power transformers are such that the chances of a second transformer fault during the next 10 to 20 years are remote. (The fault in question was due to the fact that a bolt was not provided with a lock nut in the factory).

(iv) During the period in question, the failure of the transformer only meant one extra interruption of supply to each of the individual consumers. The fact that some 5,000 other consumers were also affected did not make the experience more galling to each separate individual and possibly made it less so, than a failure of the same duration, due to the blowing of a service fuse, and tardiness in the Electricity Department's response to his telephone call.

(v) To avoid an interruption of supply to some 5,000 consumers, on the average say once in twenty years, it was decided to invest an extra amount of approximately R225,000, representing an investment of approximately R45 per consumer affected by this decision. Would not a

more beneficial investment, from a point of view of improving the reliability of supply, have been to increase the wage bill in order to provide brisker attendance to consumers' complaints?

(vi) As mentioned earlier, the Electrical Engineer perhaps does not command the necessary machinery to determine what the consumer wants and what he is prepared to pay for. The following will nevertheless illustrate what value many consumers place on reliability of supply.

It is general practice to disconnect consumers for non-payment of accounts or lack of an agreement and the associated deposit. In Pretoria three clerks and approximately 6 electricians, each with a lorry and two bantu labourers devote their full working time to this consumer service. Some 1,200 consumers are disconnected for these reasons and subsequently reconnected each month. This process usually results in an interruption of supply of the order of 8 hours.

In spite of the fact that the reconnect fee, in respect of disconnections for non-payment of accounts, was raised to R2.00, there was no marked improvement in the number of accounts in arrear. This casual attitude of the consumers (mostly domestic) towards an interruption of supply, is not explained by a lack of funds to pay the account as they invariably pay up within a few hours of disconnection. The consumers affected are also not restricted to a certain income group but would constitute a reasonable statistical sample of all domestic consumers as far as monetary wealth is concerned.

Does not this perhaps indicate that continuity of supply is of less importance to the majority of consumers than the Engineer generally thinks and provides for at great cost?

(c) *Choice of materials and design.*

In distribution planning, the engineer has to make a choice from a wide range of materials and equipment designed to perform similar electrical functions.

Some few years ago this Association collected information on the various methods used for the supply of electricity in Bantu townships. There proved to be a startling range of alternative methods and a great variation in reported costs per dwelling. This variation is not due to uncertainties in the science of electrical engineering, but due to differences in the emphasis placed by different personalities on factors such as safety, aesthetic appearance, realiability, the relative merits of lower maintenance costs against lower first cost etc.

In the design of secondary distribution systems the choice arises for instance between a completely underground system and alternative systems comprising a combination of underground high tension and overhead low tension distribution.

This choice will now be considered from the economic point of view.

Pretoria uses, for secondary distribution in urban residential areas, a combination of high tension underground and low tension overhead distribution, brief details of which are as follows:—

The 11,500 volt underground distribution comprises 0.1 square inch 3 core underground cable and 200 kVA 11,500/433/250 volt outdoor transformers mounted on H poles. Individual transformers are protected against overload on the high voltage side by means of 100 MVA oil circuit breakers which also serve as transformer isolators. Oil circuit breakers and associated equipment are housed in small steel cubicles mounted on the pavement.

The high voltage distribution cables are arranged for ring feeds from central substations each controlling from 5,000 to 10,000 kilowatts. The high voltage cables are normally operated with a break in the ring at some central point.

On the low tension side, the transformers are connected solidly to the low tension overhead mains via off-load isolating links.

The low tension overhead mains consist of 3 phase 0.1 square inch copper 4 wire lines plus a No. 8 S.W.G. lamp-line on steel poles spaced approximately 45 yards on the pavement.

The alternative scheme, comprising a completely underground system, also utilises high tension underground reticulation but with a large number of smaller stepdown transformers housed in steel cubicles mounted on the pavement. Low voltage reticulation including consumers' connections and street-lighting circuits are also done in underground cable.

This alternative scheme, for which costs have been estimated, is generally similar to that described in a paper by Mr. W. Barnard, read at the 1959 convention of this Association.

The present day construction cost of the partial overhead system as used in Pretoria, including the cost of an overhead service connection, is approximately R200 per ¼ acre stand with a street front of between 100 ft. and 120 feet. (The electricity tariff provides for either overhead or underground cable connections at nominal fees but approximately 90% of the consumers request overhead connections).

The cost analysis indicated that to provide the same facilities completely underground, would have cost between R300 and R450 per consumer, the lower figure applying to small stands in townships on soft soil and the higher figure to larger stands on rocky terrain. It was estimated that for Pretoria with a wide range in stand size and a large percentage of stands on hills and ridges where it is often necessary to blast cable trenches with explosives, the average cost per stand for a completely underground system would have been at least R150 in excess of the cost per stand for a partial overhead scheme, representing an additional total capital investment of at least R10,000,000 in respect of Pretoria's present 70,000 domestic consumers. The annual capital charges on this additional amount is approximately R800,000 or roughly R1.00 per month per consumer.

The following arguments are frequently used in support of a completely underground distribution system:—

(1) "An underground scheme affords additional physical safety."

To the author it seems ironical that this argument should be used in support of an underground scheme as the safety argument should in fact be one of the strongest arguments against underground distribution systems.

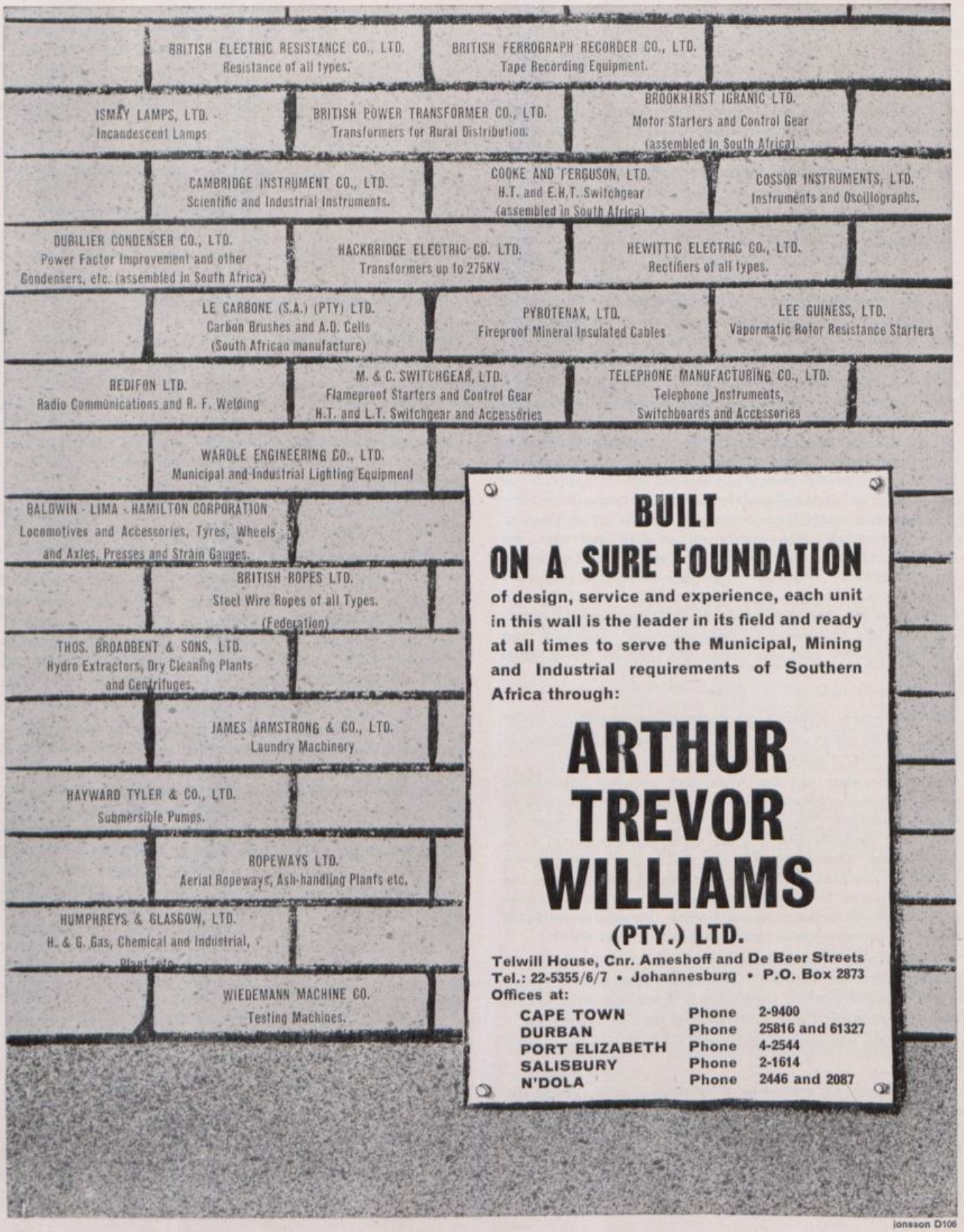
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Table II was prepared from information on electrical and industrial accidents in Pretoria for the year 1954 to 1959 inclusive, obtained from the Department of Labour, and information on road accidents contained in Special Report No. 239 of the Department of Census and Statistics.

The figures relating to Industrial and Electrical accidents are in respect of the whole area covered by the Northern Transvaal Regional Office of the Department of Labour. This area includes Metropolitan Pretoria and encompasses the whole of Transvaal north of a straight line between Mafeking and Barberton.

The Department of Labour did not have separate statistics readily available for Pretoria but it was ascertained that during the six years period, two of the fatalities attributable to low voltage overhead mains, occurred in that city.

It will be noticed that the number of accidents that can be attributed to the overhead low voltage distribution system in Pretoria comprise only a fraction of one per cent of the total number of Pretoria accidents for the period under review.

If the public of Pretoria should therefore have an amount of R10,000,000 at their disposal to promote their physical safety, one can hardly think of a more wasteful effort than spending it on the removal of the overhead low voltage reticulation system.

Any monies the public may have to spend on promotion of physical safety should preferably be spent on pedestrian bridges, subways, fly-over bridges and double carriage-ways.

If money then still remains available to combat electrical accidents as such, it should rather be spent in the first instance on equipment such as earth leakage protective devices to prevent fatal accidents where washing machines, electric drills, lead lamps and other portable appliances are used without proper earthing.

(2) "An underground system is more reliable than an overhead system."

The author unfortunately does not have available sufficient information to substantiate or dispose of this argument.

However, it can certainly be said that interruptions of supply due to failures of the overhead system are more frequent than interruptions due to failures on the underground system. On the other hand, failures on the overhead system rarely result in supply interruptions longer than an hour or two as opposed to eight or more hours in the case of an underground cable failure.

As far as the reliability of the distribution system affects the comfort of the consumer it is debatable whether the low voltage underground system has any appreciable advantage over the low voltage overhead system.

If the overall comfort of the ratepayers of Pretoria is considered and if they should instruct their Council to spend R10,000,000 on improving their standard of living, comfort and general happiness, the Author is inclined to say that an underground low voltage distribution system should not be the Council's first choice. The author would under the circumstances have preferred an air conditioner in his home.

(3) "Maintenance costs on an underground cable system are lower than on an overhead system."

Insufficient information is available to make a reliable comparison between these costs in the case of Pretoria. According to the costing section, maintenance costs on these two items of equipment in the Urban residential areas were as follows for the financial year 1960/61:—

| | |
|---|---|
| Overhead lines | R69,000 |
| Underground cable | R48,000 |

The relative lengths of overhead lines and underground cable have not been measured, but the total length of cable is certainly shorter than the total length of overhead line. It can be said in general that repairs to overhead lines are more frequent but cheaply and expeditiously done. Repairs to cables although less frequent are expensive and take up much time.

(4) "An undeground cable system is more aesthetic in appearance than an overhead system."

Certainly, few people will object to this statement. As the question of aesthetics does not directly affect the quality or the extent of the service rendered to the consumers by the Electricity Department, this statement requires a broader approach.

Should the ratepayers of Pretoria who are also the owners and consumers of their Municipal Electricity Undertaking have limitless financial resources at their disposal to satisfy all

TABLE II.

**ANALYSIS OF FATAL ACCIDENTS IN PRETORIA*, BY TYPE OF ACCIDENT, FOR THE YEARS 1954 TO 1959 INCLUSIVE.**

| TYPE OF ACCIDENT. | NUMBER OF FATALITIES. | | | | | | |
|---|---|---|---|---|---|---|---|
| | TOTAL | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 |
| Road Accidents | 414 | 46 | 56 | 70 | 85 | 83 | 74 |
| Industrial Accidents other than Electrical | 83 | 8 | 10 | 23 | 16 | 13 | 13 |
| Electrical accidents other than due to low voltage overhead wires | 27 | 2 | 0 | 4 | 11 | 4 | 6 |
| Electrical accidents due to low voltage overhead wires including service connections and wires between buildings | 4 | 0 | 0 | 1 | 1 | 2 | 0 |
| TOTALS | 528 | 56 | 66 | 98 | 113 | 102 | 93 |

*The figures relating to Road Accidents are in respect of the Pretoria Municipal Area.

their needs, the author has no doubt that the provision of a completely underground distribution system would be amongst the top items on the list of goods and services they would require their Council to provide.

But as most Councils find it difficult, year after year, to make ends meet, the author is inclined to think that if a proposal to spend R10,000,000 in various alternative ways on the general beautification of Pretoria, is put to public test, a suggestion to spend this amount on underground distribution, if not rejected will at the present time, at least meet with strong opposition from sponsors of art galleries, parks, swimming baths, etc.

In considering all the facets of the problem of choice of materials and design, it is perhaps significant that in the United Kingdom which like South Africa is served by a monopolistic electricity undertaking, the trend towards underground distribution systems started earlier and is stronger than in the U.S.A. where much of the electricity supply industry is in hands of competing private undertakings.

The reason may be that the existence of competition in the U.S.A. enables the supply undertakings to determine more accurately what the public desires and is prepared to pay for.

(d) *Improvement of the Load Factor.*

Load factor improvement is well recognised as one of the methods available to reduce the capital charges per unit sold. Several papers have been read at earlier Conventions of this Association on the possibilities of load factor improvement by the centralised remote control of water heaters and also by tariff structures which encourage off-peak use. The value of these possibilities in improving the daily load factor need therefore not be further stressed.

The possibility of improving the annual load factor by encouraging consumption during the summer months is possibly neglected in South Africa. Due to the popularity of air conditioning in the United States of America, many undertakings in that country experience summer peaks which exceed the winter load values, with resultant increases in annual load factor. It appears however that active encouragement on the part of electricity undertakings will be required to introduce domestic air conditioning in South Africa.

5. CONCLUSION.

It has been endeavoured to show that the most promising road to lower electricity costs lies in the conscientious application of economic principles in distribution planning, despite the fact that this approach is more likely to give rise to criticism than the alternative of providing, at the cost of these economic principles, a service which is technically above reproach.

Mnr. G. C. THERON (Vanderbijlpark): Meneer die President, toe ek deur u versoek is om 'n mosie van dank aan die skrywer voor te stel het ek so 'n gevoel gekry dat u 'n twee-geveg tussen die voorstaanders van bogrondse distribusielyne en diegenes wat kabels gebruik, aan die gang wil sit.

Mnr. de Jager se referaat is egter so vol prikkelende gedagtes dat ek net met 'n paar woorde die bespreking wil open en die baie ander wat op die geleentheid wag die kans wil gee om ook in die skrum in te spring.

1. MONOPOLISTIESE BEDRYF EN PROFYT MOTIEF:

Die skrywer beweer dat munisipale elektrisiteitsondernemings soos ons dit in Suid-Afrika ken monopolistiese bedrywe is waarin die profyt motief afwesig is en die ingenieur in beheer dus in 'n posisie is om soos hy dit noem „verpakte brood op die publiek af te dwing."

Ek wil dit weerlê deur aan te voer dat die diens motief op die lange duur en oor die periodes van 20 tot 30 jaar waaroor munisipale lenings strek, die verbruikers waarskynlik beter waarde lewer as die kort termyn beleid wat gewoonlik deur private ondernemings gevolg word.

Ek wil dit ook stel dat gekose raadslede baie nouer voeling met die verbruikers het as direkteure met die aandeelhouers van 'n maatskappy.

Voordat tariewe verhoog word om te betaal vir die uitgawes aangegaan deur 'n oor-ywerige ingenieur moet 9 of 12 of meer raadslede eers deurtastende ondersoek instel en oortuig word of dit wel geregverdig is anders is hulle dalk hulle setels kwyt.

En in 'n maatskappy? Geen profyt, geen diwidende, die prys van die aandele daal en kan dan opgekoop word om later, wanneer toestande verbeter, met 'n mooi wins van die hand gesit te word!

Gas tree vandag steeds meer na vore as die ideale brandstof vir sekere prosesse en na mate dit makliker beskikbaar word as 'n neweproduk van ons chemiese nywerhede sal die idee dat elektrisiteit in Suid-Afrika sonder kompetisie is ook die nek ingeslaan word. Ons Elektrotegniese ingenieurs moet dié moontlikheid wel deeglik in gedagte hou wanneer hulle kapitale verpligtinge aangaan.

2. BOGRONDSE LYNE TEENOOR KABELS:

Mnr. de Jager beklemtoon die feit dat die syfers in die berekening van die bogrondse verspreinet teenoor 'n kabel sisteem gegrond is op praktyke en omstandighede soos van toepassing in Pretoria. Dieselfde argumente hou nie noodwendig stand in alle gevalle nie en daar moet gewaarsku word teen die maak van katagoriese gevolgtrekkings.

Om maar net een punt te noem moet daarop gewys word dat dorpsbeplannnig 'n geweldige invloed het op die koste van 'n verspreinet en in baie van die nuwer dorpe met kronkelende strate is bogrondse lyn onprakties en onekonomies.

Ek gee u twee voorbeelde van die uitgawe op Vanderbijlpark. Die sekondêre verspreinet in 'n dorpsgebied van 817 erwe wat tans onder kontrak uitgevoer word (nie ramings nie!) kos R260-00 per erf, en in 'n ander gebied van 1252 standplase wat die voorsiening na 7 woonstel persele insluit, word die uitgawe op R270 per erf (nie verbruikers) beraam. Ek weet nie, maar moontlik het my Raadse beleid om alle kapitale werke deur kontrakteurs op die basis van vrye kompetisie aangewys, te laat uitvoer, 'n invloed om ons uitgawes laag te hou.

Ons totale instandhoudings uitgawes op die hele netwerk, H. S. en L.S., meters en vragbeheer relais ingesluit, beloop .04c. per eenheid verkoop. Dan het ons nog die besparing dat tot 12 meters saam in die verdeelkas in die straat gegroepeer word en daardeur die meterleeskoste verminder.

3. BEPLANNING EN KAPITAALAANWENDING:

Hier het die skrywer met baie sterk argumente bewys dat rente en delging 'n groter invloed het op die eenheidsprys van

elektrisiteit as al die ander uitgawes saam en hoe belangrik dit is dat kapitale uitgawes eers deeglik onder die soeklig geplaas moet word.

Radslede skrik dikwels wanneer in verslae verspreiverliese as 8% of 10% aangegee word. Die skrywer wys daarop dat dit dikwels meer ekonomies is om die oorvragkapasiteit van toerusting tydelik te benut as om hoër kapitale uitgawes aan te gaan vernaamlik waar die eenheidsprys van elektrisiteit laag is. Verliese word natuurlik verhoog maar effek op die verkoopsprys van elektrisiteit is minimaal in verhouding met die koste om swaarder toerusting te installeer en die kapitale las vir 12 maande per jaar en vir baie jare te dra.

Dit alles verg deeglike beplanning en 'n nugtere oorweging van die finansiële implikasies deur die ingenieur.

Munisipale elektrisiteitsondernemings verteenwoordig 'n ontsaglike kapitaalbelegging en dit is in belang van die verbruikers en belastingbetalers dat daardie bates op die aller beste en ekonomiese wyse aangewend moet word.

Die skrywer sê tereg „In distribution planning, the frugal employment of capital requires not only technical proficiency but also personal courage and presumption" en bewys verder die geringe invloed wat salarisuitgawes het op die verkoopsprys van elektrisiteit.

Daardie tegniese bekwaamheid en moed waarvan die skrywer praat en wat die belastingbetalers van Pretoria R2,000,000 gespaar het kom met jare van ondervinding en 'n intieme kennis van die onderneming en die omgewing.

Maar dit is die verantwoordelikheid van die Raadslede as verteenwoordigers van die verbruikers en belastingbetalers om te verseker dat die bekwaamste ingenieurs sal staan aan die spits van daardie ondernemings waarin soveel kapitaal belê is.

En dit is vir 'n Stadsraad die moeite werd om sulke ingenieurs te trek en te hou en nie somaar vir 'n pot lensiesop aan die nywerhede af te staan nie.

In die sterk kompeterende klimaat waarin ons vandag lewe en met die nypende te kort aan ingenieurs en tegnici in die Republiek sal Raadslede hierdie probleem met moed en 'n oog op die toekoms moet aanpak.

Ons is mnr. de Jager baie dank verskuldig vir die lewering van hierdie referaat waarin hy met moed en bekwaamheid die tekortkominge sowel as die suksesse van die beplanning in die Pretoria onderneming uitwys. Die belastingbetalers van daardie stad is bevoorreg om sulke ingenieurs in beheer van die elektrisiteitsonderneming te kan hê maar dit is ook hulle verantwoordelikheid om die ingenieurs te hou.

Die referaat roep vir ons as elektrotegniese ingenieurs tot nadenke en versigtigheid en wys op die belangrikheid om die balans tussen kapitale uitgawes en tegniese volmaaktheid te hou.

Meneer die President, dit gee my groot genoeë om nou namens ons almal 'n mosie van dank aan die skrywer voor te stel.

THE PRESIDENT: Thank you, Mr. Theron. I will now call on Mr. Frantz, Cape Town to second the vote of thanks.

Mr. A. C. T. FRANTZ (Cape Town): Mr. President, gentlemen, a seconder always finds himself in a difficult position. The proposer usually has stolen all his thunder, and has said all the the nice things there are to be said about the paper, and the seconder has either to repeat what the proposer has said, or say as little as possible and then sit down.

Mr. President, I would like to endorse all that Mr. Theron has said about Mr. de Jager's very interesting paper, and I would like to thank Mr. de Jager for once again drawing the attention of members of this Association to the important role which economics plays in electricity supply undertakings.

We have had quite a number of papers on this subject, and on different aspects of the subject within recent years, but I think it does no harm to draw the attention of the members to the importance that economics plays.

Mr. de Jager has rightly pointed out that the largest single item of cost is capital charges, and he has suggested ways and means of reducing these.

One of these is a degree of self-financing, which in effect means that the present generation is required to pay for benefits which accrue to future generations.

Some of us may think this not a very good idea, but when we come to consider things, I think we cannot deny that this is going on all the time. We are enjoying today things which were paid for by previous generations, things which we ourselves could never hope to pay for.

In this connection you may know that in the Cape Province the Administration has recently introduced a system of self financing called the Revolving Fund, to which Councils have to contribute to the extent of 0.1 cents per R of the municipal valuation. This cost ratepayers about R700,000 in 1962, and is intended to provide a source of interest-free capital which has to be repaid over various periods depending upon the use to which it is put.

Regarding the frugal planning of distribution systems suggested by Mr. de Jager, I would hesitate to be too frugal in this respect except with the full approval of the Council. The reliability of electrical equipment should be very good, but even with the best statistical information on transformer reliability, I think it would be taking a great risk not to provide stand-by or alternative means such as ring mains, for supplying consumers.

Some consumers can be very critical, but as Mr. de Jager suggests it might be possible to treat the domestic consumer more severely, and give preference to the commercial or industrial consumers, this might not be so easy to arrange, however, as we found in Cape Town in 1951 and 1952 when we had to introduce some planned power cuts. It was very difficult to cut off the domestic consumers without at the same time cutting off commercial and industrial consumers, or, what is even worse, hospitals and the like.

As regards Mr. de Jager's comparisons between the overhead and underground distribution systems, I think his figures for the relative cost of underground systems are rather pessimistic.

For instance, in the Cape, Escom found that a fully underground system in a newly developed township cost them only 10% more than an overhead system, and my municipality is at present developing a distribution system for a township near Bergvliet in the southern suburbs, where it is estimated that an underground system would cost only about 12½% more than the normal boundary line type of overhead construction which we adopt in all these sort of townships.

Nevertheless, Mr. de Jager has put up some very good suggestions and ideas, and it is the duty of all of us in charge of electricity undertakings to bear in mind that there are other

ways of doing things. We must examine the present methods critically, and we should not hesitate to abandon "old Spanish customs" if we can prove that the new ideas are sound.

Mnr. die Voorsitter, dit is met groot genoeë dat ek nou Mnr. Theron se mosie van dank vir Mnr. de Jager ondersteun. (Applous.)

THE PRESIDENT: Ladies and gentlemen, the paper is now open for discussion.

Mr. R. W. KANE (Johannesburg): Mr. de Jager has presented a very interesting paper, and I would like to congratulate both Mr. de Jager and Mr. Gilmour, of yesterday, for their entertaining and nicely abridged presentations.

I would like to comment on three aspects of Mr. de Jager's paper, and these comments will centre on the two tables provided.

(Incidentally the first two comments are a little bit of a smokescreen to lead up to the third one.)

Firstly, in Table No. 1, Mr. de Jager illustrates the comparative trend in total salaries and wages over 20 years, and the total, 20 years ago, was some 21% of all expenditure followed by 19.4% and 14.6.

I am however wondering whether the basic year of 1940/41 was a wise choice. I appreciate that this probably arose from the choice of the latest figures most likely available, being 1960/61, and then he merely went back two decades.

But 1940/41 was a war year, and I suspect that Pretoria, in common with many other towns, made some indirect contribution to the salaries of those who were on active service.

I do not know whether such contributions were debited to a central fund, or charged to the department, but I do suspect that 1940/41 figures do not reflect a normal year.

In Johannesburg we had 30% of the staff on active service in 1941, which rose to 40% in 1941/42.

The point is (as an aside) you will probably find that what you are trying to improve will be further improved if you had taken, say 1939 figures, and so on.

Interestingly enough, although he shows a percentage decrease in salaries over the years, there is also an actual decrease in the salary costs, which is not always the case, especially when total operating costs are compared with capital.

With a vast increase in capital costs, when you compare the other operating costs as a percentage, the percentage drops but the actual costs are going up.

Another interesting aspect is the actual capital outlay per units sold. I have juggled with the figures. They are not really quoted except the globular figures, and I wish to emphasise this, that it is the capital outlay and not the annual capital costs, I am using.

These approximately are .03 Rand for 1940/41 followed by 043 and 047. To further illustrate my ultimate point the comparable figures for Johannesburg are 045, 033 and 072 Rand.

There are certain aspects of the Pretoria pattern that are not common to all towns. Firstly, the load factor is relatively high, mainly through supplies to Iscor and at one stage the Railways, and latterly to that consumer of theirs, Escom.

The comparison with Johannesburg is interesting in the distinct drop to .033 in 1950/51. If one shows other years, in Johannesburg, say in 1953/55, the Johannesburg figures dropped to .02 Rand, only because of the unexpected relatively high supply of units to Escom and its effect on the load factor.

Both my points are, in fact, a further illustration that without full facts being appreciated some very misleading conclusions can be made.

Finally, I am interested in Table No. 2, and perhaps I have not got my facts clear, insofar as I am not too sure whether road only, or all accidents are solely Pretoria.

Ignoring road accidents, the total of other accidents is 114, of which 4 are overhead mains, including service connections.

Rumours of the country-wide blitz on the re-conditioning of overhead service connections, by the Labour Department, if true, are therefore somewhat puzzling.

Admittedly the figures quoted are for fatal accidents. Is there another story or reason behind this service connections blitz? It seems to me at least the figures of fatalities do not appear to justify such action.

Perhaps Mr. Groenewald can help as to whether the more recent ability to record and compile details of accidents in categories has been in use long enough to justify action being taken at this stage. Thank you.

Mr. D. MURRAY-NOBBS (Port Elizabeth): Mr. President, the paper presented by Mr. de Jager I feel is very bold in its conception, and quite revolutionary in design.

The author points out that the major component of expenditure in an electricity undertaking is capital expenditure, and goes on to offer suggestions whereby this component can be reduced.

On the generation side, we are tied down by the size of generating set and the steam conditions. For example a power station with 30 megawatt machines, and fairly low steam conditions will cost around £70 per kilowatt of installed capacity.

Whereas a station with 550 megawatt sets, as pointed out by Dr. Straszacker, during his address, will cost about £32 to £34 per KW.

This represents a vast saving in capital expenditure, which is naturally out of reach of municipal electricity undertakings.

The requirements of the generating plant are therefore directly influenced by the system demand, and any capital savings in this respect can only be marginal.

On the distribution side the picture is somewhat different, because there is much more scope for frugality in capital expenditure.

I agree that the design of the distribution system should not be excessively liberal. However, I cannot agree with the author in some of the suggestions he puts forward particularly where reliability of the service, and continuity of supply may be jeopardised.

He refers to increasing the loading of oil pressure cables beyond a designed conductor temperature of 85 degrees Centigrade to a figure as high as 135°C for the sake of saving capital expenditure on further cables, subject, of course, to due regard being taken to soil conditions.

It is my opinion, Mr. President, that it is not wise to depend on thermal resistivity of the soil as closely as all that for the purpose of overloading th cable system and delaying capital charges, because it is well known that the G figures along a cable route can vary quite considerably due to moisture migration from the surrounding soil on the one hand, and moisture penetration from the surface due to rainfall or other causes.

It can be a variable quantity and to overload a cable to the extent and under the circumstances mentioned is taking a risk

which cannot be justified on the score of reducing capital expenditure.

Mr. President, I would like to hear some of our cable manufacturing friends, on this particular point.

It is all very well to suggest thinning down and thinning down until the distribution system is fully loaded, but this, in my opinion, is not the way to run an electricity supply system reliably.

I feel, Mr. President, that the first requirement of the City or Town Electrical Engineer is to produce the power required by consumers and to produce that power reliably.

After all, electricity is the life blood of the modern city, and industrial life, and therefore domestic life, depends on it, and it is our duty as municipal electrical engineers to ensure that electricity supply is continuous.

I would therefore submit, Mr. President, that apart from capital costs, or any other factors, electricity supply must go on.

It is all very well for consumers to say we don't mind being inconvenienced now and again due to lack of electricity supply, but in this regard, we only have to consider what happened in the south of England some 18 months ago when the circuit breaker supplying a certain transmission line tripped on fault. Cascading took place to such an extent that many parts of southern England were without power for some considerable period.

At the time major power stations were shut down, and due to inter-connected grid planning these power stations—which I understand had no house sets and therefore had great difficulty in getting back on to the system.

Apparently, had a certain 275 KV line been in service as planned, then this electricity catastrophe would not have occurred.

Arising out of that failure of supply, the Central Electricity Generating Board was very severely censured by the public, by the press, by industry, and by the government. Surely, this is a lesson to us to plan well ahead, and plan adequately.

It may be as a result of that unfortunate failure that the Central Electricity Generating Board has placed orders for a very large number of gas turbo alternators to be installed at strategic points throughout the system, to assist in meeting peak loads, but at the same time to ensure adequate supplies to power station auxiliaries, in the event of complete failure of supply.

I submit if that capital had been expended earlier, it is possible the interruption would not have been nearly so great.

It is all very well, Mr. President, to suggest economising on capital expenditure, but I am convinced in my own mind that this must not be done at the expense of the reliability of supply. When our consumers close the switch, the supply must be there, regardless of cost, and if the supply is not there, then we, as municipal engineers are failing in our duty.

It is a tendency nowadays to follow a fairly prevalent pattern overseas of reducing factors of safety, and this seems to be reflecting itself in engineering practice in various parts of the world, but I feel that we members of this Convention should not be prepared to compromise in this respect, but should place first and foremost, continuity of electricity supply. That is our function, and should always be our constant aim. I therefore, Mr. President, cannot subscribe to the suggestions made by Mr. de Jager to reduce the component of capital expenditure to a degree where it might interfere with the hard earned confidence of our consumers. (Applause.)

THE PRESIDENT: Gentlemen, we will discuss this paper later, but we must now adjourn for tea.

CONVENTION ADJOURNED FOR TEA.

*On resuming after tea.*

THE PRESIDENT: Ladies and gentlemen, we will now continue with our deliberations.

(Mr. R. Sibson was called to the platform.)

Mr. Sibson, in appreciation for the work you have done for this Association, I have much pleasure in informing you that the Association have made you an Honorary Member, and I would ask you to accept this token as a mark of appreciation and thanks from the members for the work you have done for this Association. (Applause.)

Mr. R. SIBSON (Bulawayo): Mr. President and gentlemen: it is difficult for me to express the gratitude that I feel to yourself, sir, your executive, and the members of this Association for making me an honorary member.

My contact with the Association goes back, I think, to 1935 when I attended my first conference in Pietermaritzburg. It is a fairly long time, and a good deal of my professional life since then has been bound up with the aims, objects, and experiences of this Association. Perhaps you will forgive a little reminder of the rather grim post-war years when things were difficult, and when we had sub-committees worrying about coal supplies, and other sub-committees worrying about export and import controls, but during a portion of that time I was actually acting as your President, and coming from Rhodesia it gave me quite a "kick" to preside at some of the meetings where we interviewed very important people associated with the South African government. While, of course, the majority of the Executive were South Africans, and adopted attitudes which were understandable in relation to representatives of their own Government, I as President had no compunction at pulling their hair with the greatest of pleasure!

Perhaps sometimes it can be an advantage to have, in one of your officials, a person who is completely unbiased and divorced from your more domestic affairs.

However, I realise that you have a large agenda Mr. President, and I am rather anxious to have the opportunity a little later, if the time permits, to comment on the paper that we heard this morning, so I won't delay you now, but must once again express my very deep appreciation to all of you for making this presentation to me this morning.

THE PRESIDENT: Ladies and gentlemen, as you know at this session, we have been pleased to confer honorary mmbership on Mr. Chris Downie, for long and loyal service to this Association. I will now ask Mr. Frantz if he will kindly accept this token, and present it to Mr. Chris Downie when he gets back to Cape Town — of our appreciation and good will to Mr. Chris Downie for all the work he has done for this Association. (Applause.)

Mr. A. C. T. FRANTZ (Cape Town): Mr. President, gentlemen, on behalf of Mr. Downie who unfortunately could not be here today, I wish to thank the Association and I will convey to Mr. Downie your expressions of gratitude and hand over to him this very fine token of your appreciation and this certificate.

THE PRESIDENT: We will now continue, gentlemen. Mr. A. P. van Schalkwyk will now present his paper on "Some Practical Aspects of 11 kV Overhead Reticulation."

# Some Practical Aspects of 11kV Overhead Reticulation

By A. P. VAN SCHALKWYK,
Bloemfontein Electricity Dept.

## INTRODUCTION.

In presenting a paper on this subject the author is aware of the fact that there are many designs of 11kV line construction employed by the various supply authorities throughout the country, and that the originators of these designs will be able to submit very good reasons for their particular configuration especially with regard to crossarm arrangements and conductor spacings.

It is not claimed that the practical aspects of construction as submitted in this paper are any better than those employed on your particular network, but they do represent the outcome of various designs and practices evolved by the Bloemfontein Electricity Undertaking during the past 17 years.

If this paper, therefore, should provoke an active discussion on the pros and cons of the various methods of 11kV overhead reticulation, and in so doing should help supply authorities who are about to embark on such projects to avoid some of our failures, it would justifiably have served its purpose.

The Bloemfontein 11kV network serves a rural community of 1,375 consumers distributed in an area practically surrounding the city to a radius up to 12 miles. A total length of 157 miles of single phase and three phase overhead line is involved in this project which, as a matter of interest, feeds into one of the few if not the only single phase 3 wire 220/440 volt L.T. reticulations in the country. This latter remark is deemed necessary to explain the configuration of L.T. conductors indicated on some of the drawings used to illustrate the text.

The subject matter of this paper is presented under the following main headings with subdivisions where necessary.

1.0 Choice of voltage for primary reticulation.
2.0 Choice of conductor materials.
3.0 Types of poles.
4.0 Earthing and Lightning Protection.
5.0 Crossarm arrangements, Tee-offs and isolation, arrester mountings and cradling.
6.0 Protection and system operation with reference to operational difficulties.
7.0 Fault Localization.
8.0 Operational Hazards.
9.0 Suggested avenues of exploration for future improvement.
10.0 Conclusion.

## 1.0 CHOICE OF VOLTAGE FOR PRIMARY RETICULATION.

In selecting a transmission voltage from the group of standard voltages ranging from 3.3kV to 33kV, it is an axiom that the highest voltage within practical limits should be selected.

It is this practical aspect which has probably determined that where a primary network intended to feed into a L.T. reticulation is involved, the choice is limited to a maximum of 11kV.

This fact has been very forcibly established in the case of 11kV cable networks where, as a result of worldwide probing of the causes of frequent 11kV cable failures, it has been tentatively admitted that the margin of safety in applying lower voltage techniques to 11kV cables, is too small.

Unless there is sufficient reason to select a higher voltage such as 33kV for transmission of block loads, or in areas where load tap-off points are so widely separated that L.T. reticulation is ruled out, it would appear that 11kV transmission is well justified.

This was the case in Bloemfontein where an 11kV cable network had already been established when expansion into the rural areas, consisting mostly of 5 morgen plots, was considered.

## 2.0 CHOICE OF CONDUCTOR MATERIALS.

For the type of line under consideration in this paper the choice of conductor material is limited to copper aluminium and steel, the first two being selected purely on a basis of comparative costs with due consideration of some of their physical properties. The use of steel is justified purely on the score of extreme economy combined with tensile strength as current carrying medium where loads are too small to make voltage drop a limiting factor.

### 2.1 COPPER CONDUCTORS.

Copper is too well known as a conductor material to require any further comment. The fact that it has been superseded by all-aluminium and steel-cored aluminium conductors is based purely on grounds of economy and not on account of any superior qualities of aluminium.

### 2.2 ALUMINIUM CONDUCTORS.

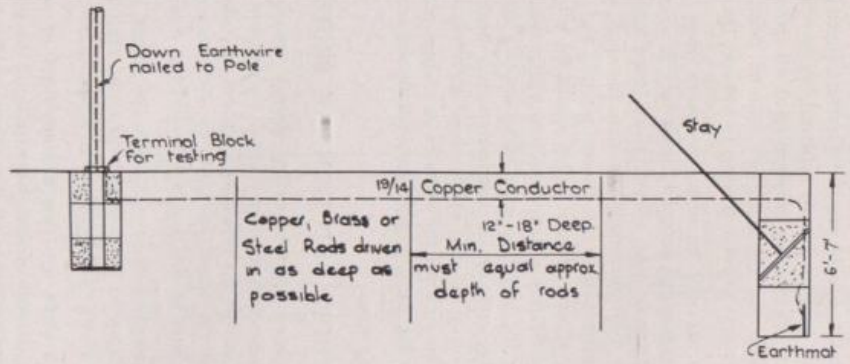
Following on the above remarks, the claim for increased economy where aluminium is used could be illustrated for a typical size of conductor say 0.1 square inch copper on a basis of R0.276 per lb. for copper and R0.219 per lb. for aluminium of equivalent copper cross section.

For identical loads and voltage drops the size of copper equivalent aluminium conductor is 7/.073 at 1,029 lb. per mile compared with 2,086 per mile for copper.

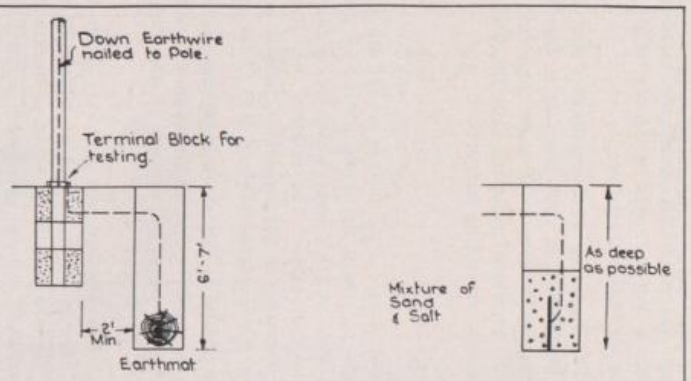
Per mile of conductor run therefore copper would cost
2,086 x 0.276 = R575.7, and aluminium would cost
1,029 x .219 = R225.35, which is a saving of 61% on conductor costs.

This cost advantage is, however, not the only factor to be taken into consideration. There are for instance factors which could mitigate against the use of aluminium such as:—

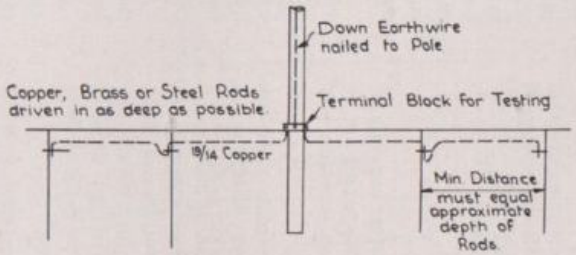
(a) *Increase conductor diameter and therefore increased windage.* This diameter of a 7/.173 aluminium conductor is .519 inch and 0.1 copper conductor .408 inch, i.e. an increase



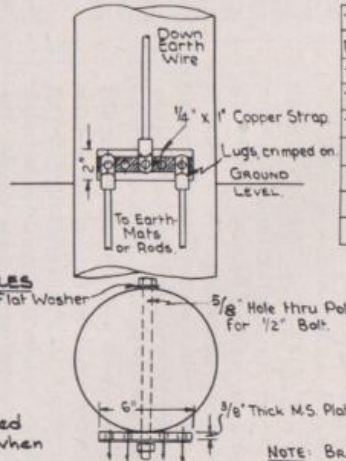

NORMAL EARTHING ARRANGEMENT AT SHACKLE POLES




EARTHING ARRANGEMENT WHERE EARTH RODS CANNOT BE USED DUE TO HARD OR ROCKY SOIL




NORMAL EARTHING ARRANGEMENT AT INTERMEDIATE POLES




TERMINAL BLOCK.

NOTE: Sufficient No. of Rods or Mats must be installed until earth resistance is less than 2 ohms when down. earth wire is uncoupled.

NOTE: BRASS WASHERS TO BE INSERTED UNDER BOLTHEADS SECURING LUGS TO STRIP.

DOWN EARTHWIRE SIZES.

| TYPE OF O.H. LINE | MAIN EARTH | INTERM EARTH |
|---|---|---|
| RURAL DISTRIBUTION LINES | 7/110 Aluminium | — |
| TYPE A FEEDER | 7/110 Aluminium | — |
| TYPE B FEEDER | 19/16 COPPER | 7/110 Aluminium |
| TYPE C FEEDER | 19/16 COPPER | 7/110 Aluminium |
| | | |
| | | |
| | | |
| | | |

CITY OF BLOEMFONTEIN
ELECTRICITY DEPARTMENT.

EARTH CONNECTIONS FOR 11 KV O.H. LINES.

| DRAWN: | DATE: 27-1-55 | DRG NO. |
|---|---|---|
| TRACED: | | |
| CHECKED: | | 1 - 4 |
| APPROVED: | | |

CITY ELECTRICAL ENGINEER.

of 27%. This increased diameter will naturally be of greater importance where iceloading has to be taken into consideration but fortunately in South Africa we need only take account of the 27% increase in windage which could force the designer into using a heavier type of pole, and wider spacings.

The comparative equivalent wts. per ft. run including windage are .678 lb./ft. aluminium and .632 lb./ft. for copper conductor respectively, which means an increase for aluminium of 7.3%. This is still a tolerable figure when total sag along the resultant pull is considered, but when we come to the angle of swing, the aluminium conductor swing will be 73° from the vertical and compared with 51° for copper. When employing steel cored aluminium, however, as is mostly the case for H.T. lines, the higher ultimate strength permits smaller pull-up sags which counterbalance the effect of windage and increased sags due to the higher co-efficient of expansion of aluminium.

(b) *Corrosion*. It is a known fact that brightly polished aluminium when exposed to the atmosphere soon dulls due to the formation of a film of oxide. This oxide is non-conductive and if permitted to continue to a sufficient thickness can cause high resistance joints. The remedy to this problem when joining aluminium to aluminium surfaces by mechanical clamping is to coat the surface with an anti-corrosive paste.

There is also corrosion set up when two desimilar metals such as aluminium and copper for instance form a galvanic couple. The remedy is to avoid contact between such metals but when one deals with aluminium conductors at some or other point in the circuit say a switch or transformer terminal, there is bound to be contact and some care has to be taken. Contact is avoided by clamps having mechanical separation between aluminium and copper leads with the former generally encased in a copper tube when the clamp is of copper or brass and vice versa when the clamp is of aluminium. Galvanic action will, however, only be serious if a suitable electrolyte such as atmospheric polluted water or dampness should exist. The remedy in this case is also to apply anti-corrosive paste copiously to the parts before clamping together.

The South African inland climate is, however, so dry that fear of ineffective joints resulting from the above two causes has not yet been experienced in Bloemfontein, though admittedly it could be troublesome at the coast.

## 2.3 STEEL CONDUCTORS.

As mentioned in paragraph 2.0 steel conductors can only be considered in cases where the currents to be carried are so small that the consequently high voltage drop is within permissable limits.

In a rural layout consisting of 5 morgen plots there are numberous branch lines carrying at the most 50 K.V.A. in single phase 11kV load, i.e. a current of 4.55 amps.

Using a No. 8 Galvanized steel conductor with a loop resistance 42 ohms. per mile and 50 c.p.s. reactance of 17.14 ohm. per mile of circuit run, a 50 K.V.A. load evenly distributed along this length will impose a voltage drop of 100 volts at Cos $\phi = .8$, which is .91% and tolerable as these branch lines are seldom more than a mile long.

The cost of a No. 8 Galvanized steel conductor is R18.5 per mile compared with approximately R33.28 per mile for the smallest size of ACSR conductor marketed or R111.15 per mile for a No. 8 copper conductor which is the smallest permissable on H.T. reticulation.

The saving in using steel conductors for branch lines is therefore worthwhile in first cost. It is true that $I^2R$ losses are considerably in favour of aluminium but from a maintenance and operational point of view the mechanical strength of the steel is an overriding factor.

## 3.0 POLES.

Ruling out lattice type towers which are used on higher voltage lines or where the configuration of the route makes it essential also on 11kV lines, we have the choice of wooden, concrete or steel poles. The relative cost for poles of say 30′ length operating at permissable factors of safety are R5.12 for wooden R26 for concrete and R33.77 for steel poles.

Where economy is the most important factor the wooden pole is the only answer, but where absolute reliability of service is required the expense of concrete or steel poles will have to be tolerated.

The life of a wooden pole can vary from 10 to 25 years depending on the type of soil in which it is planted, the climate of the area and the presence of insects attacking wood. The first creasoted wooden poles were planted in Bloemfontein 17 years ago, and certainly less than 1% of them have had to be replaced. Realizing, however, that wooden poles can never have the life of steel or concrete poles and that sooner or later they will have to be replaced, we have recently decided on a policy of planting steel poles at all strain points, which will facilitate the replacing of wooden poles if this should prove necessary without having to rebuild the line.

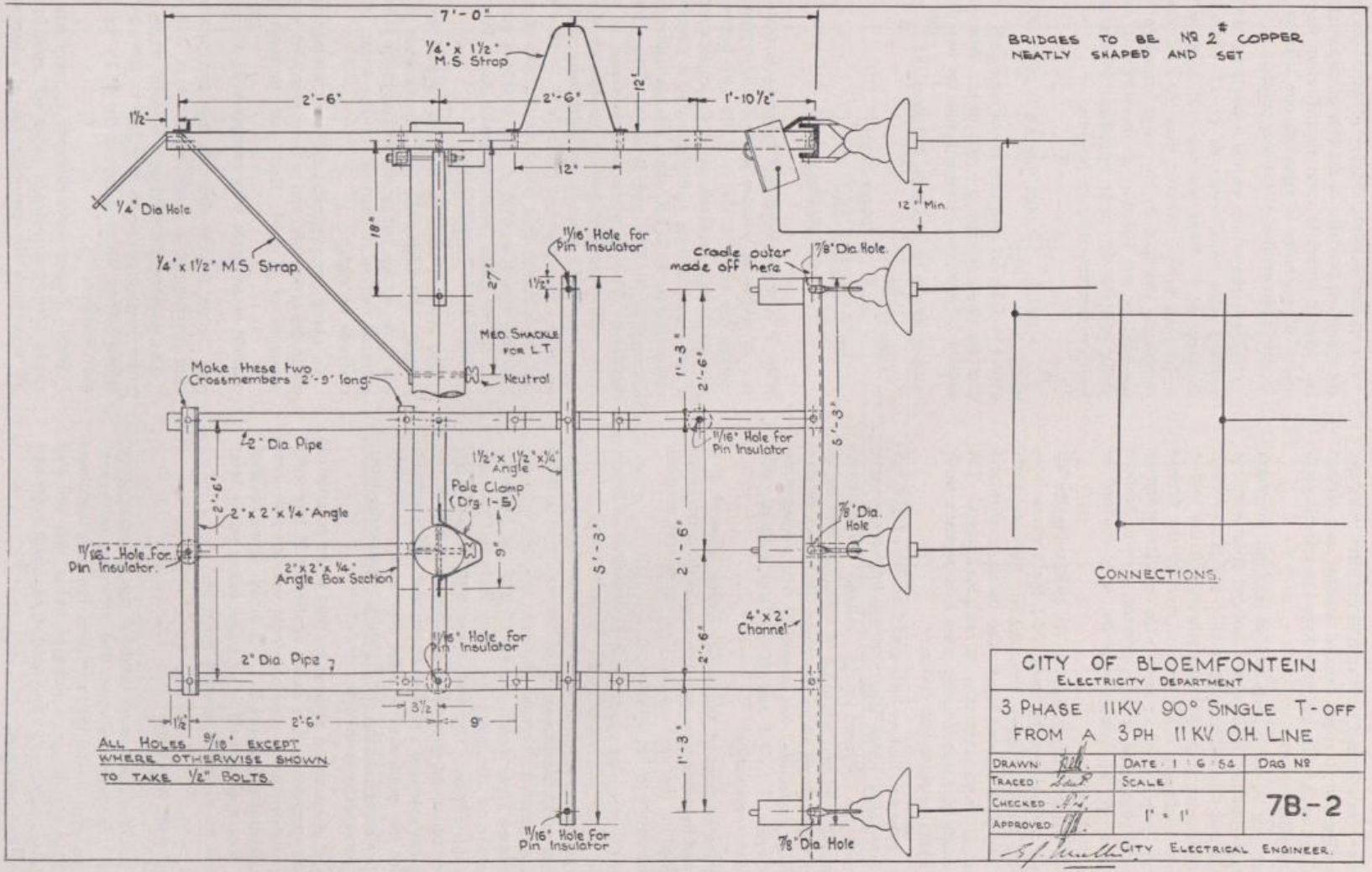
Concrete, as will be seen, compares very favourably with steel. To customers situated closer to the source of manufacture of such poles, the advantage of lower railage costs which must be a fair percentage in this instance, should be even more prominent than at Bloemfontein. For lines of major importance where wooden poles would be ruled out, concrete poles are definitely a proposition worth considering especially if facilities for handling such bulky articles already exist. For normal rural reticulation however, where both H.T. and L.T. circuits are run on the same poles with vertical spacing for the latter, the mutiplicity of holes or clamps required rules out concrete poles for the positions where we now employ steel poles.

## 4.0 EARTHING AND LIGHTING PROTECTION.

In a country where possibly only a small portion of the southern and south western coastal regions can be regarded as lightning free for all practical purposes, it follows that protection against the effect of lightning disturbances plays a very prominent part in the design of overhead lines.

Bloemfontein being the City with the second highest thunderstorm incidence in the country, it will be realized that we have had a fair share of headaches in trying to solve this problem.

Generally there are two distinct lines of reasoning which dictate the pattern of line construction, the one being the all earthed construction and the other which could be termed the all insulated construction.


7'-0"
1/4" x 1 1/2" M.S. Strap
2'-6"
2'-6"
1'-10 1/2"
12"
1 1/2"
1/4" Dia Hole
1/4" x 1 1/2" M.S. Strap
18"
27"
12" Min.
11/16" Hole for Pin Insulator
1 1/2"
Cradle outer made off here
7/8" Dia. Hole
M&D Shackle for L.T. Neutral
Make these two Crossmembers 2'-9" long
2" Dia Pipe
1 1/2" x 1 1/2" x 1/4" Angle
Pole Clamp (Drg 1-5)
2" x 2" x 1/4" Angle
11/16" Hole For Pin Insulator.
2" x 2" x 1/4" Angle Box Section
9"
5'-3"
2'-6"
1'-3"
11/16" Hole for Pin Insulator
4" x 2" Channel
2" Dia Pipe
3 1/2"
9"
1 1/2"
2'-6"
ALL HOLES 9/18" EXCEPT WHERE OTHERWISE SHOWN TO TAKE 1/2" BOLTS
11/16" Hole For Pin Insulator
7/8" Dia Hole
BRIDGES TO BE Nº 2 # COPPER NEATLY SHAPED AND SET
CONNECTIONS.
CITY OF BLOEMFONTEIN
ELECTRICITY DEPARTMENT
3 PHASE 11KV 90° SINGLE T-OFF FROM A 3PH 11 KV O.H. LINE
DRAWN:
DATE: 1 : 6 : 54
DRG Nº
TRACED:
SCALE:
CHECKED:
1" = 1'
7B.-2
APPROVED:
CITY ELECTRICAL ENGINEER.

In the former type all metal parts such as insulator ironwork, crossarms, cradles and stays are bonded together and earthed to a longitudinal earth whire which is tapped to suitable earth electrodes at regular intervals.

In the latter type all metal parts such as insulator ironwork, crossarms stays (but not cradles) are isolated from earth, it being reasoned that this additional insulation will prevent flash overs from conductor to earth if the potential of the former is raised under lightning conditions or even in the reverse direction if the potential of an earth wire or metal structure should be raised above that of the conductor. As will be clear from elaboration of this system later on, it is confined to wooden pole construction.

We initiated 11kV rural reticulation in 1946 using the all earthed system as indicated in figure 7B-5 for 3 phase lines and figure 7C-5 for single phase construction. All metal parts on the pole top were bonded together to the earth wire and tapped down to earth electrodes at suitable points. The longitudinal earth wire was intended more as a common earth bond than a lightning protection device.

It was also reasoned that as little could be done for direct strokes, the proximity rather than the position of the earth wire governed the induced surge voltage. Operational difficulties soon proved that screening of the conductors by an earth wire or wires placed above the phase conductors to give a 45° umbrella protection, was essential. The construction indicated in figure 9–1, 9–2 and 7C–5A was evolved, still with all earthed construction.

The operation of lines of the earlier design, situated in a particularly bad lightning area, was very considerably improved when converted to the new construction, so it was adopted for further extensions to the network.

Even with the screening earth wires as indicated in figure 9–1 and 7C–5A we still experienced outages during storms in areas which appeared to be more prone to lightning disturbances, and as an experiment reconstructed about 2 miles of line which suffered repeated damage, by using wooden crossarm members (iron wood) instead of steel but following the same pattern as for figure 9–1 there being no cradling involved on this section. The earth wires were tapped down to earth at every second pole where a single spike was driven in. These spikes averaged about 10 ohms. each. This appears to have solved the problem as we have experienced no further damage on this section during two lightning seasons, the latter one being a particularly severe one.

This type of construction appears to hold some promise of more reliable operation and is easily applied to H type construction on wooden poles, also on single wooden pole construction as illustrated in figure 9–1, but breaks down on steel or concrete pole lines as well as at strain points where steel poles are used on a normal wooden pole line.

## 4.1 EARTH ELECTRODES.

Whether the all earthed or all insulated type of construction is employed, experience indicates that screening earth conductors are essential for reliable operation, but their usefulness as an anti-lightning device is nullified unless they are tied to earth at points sufficiently close together via earth electrodes of sufficiently low resistance.

The closest possible spacing of earth electrodes is one at every pole, as practised in the case of major transmission lines, but when it comes to rural electrification where the absolute degree of economy is essential, one tries to get away with the minimum number of earthing points.

On single phase lines we use a single No. 8 Galvanised steel earthing wire with resistance of 21 ohms. per mile and reactance of 8.9 ohms. per mile with earth as return. During a lightning stroke, however, these 50 c.p.s. characteristics are completely swamped by the surge impedance of the channel followed by the lightning stroke which is estimated at 400 ohms. and the self surge impedance of the earth conductor, which is determined by the formula

$\sqrt{\frac{L}{C}} = 60 \log_e \frac{2L}{r}$ ohms where h = height of conductor above earth r = radius of conductor in the same units. In our particular case the surge impedance is 500 ohms. When lightning strikes midway between two earthing points the impedance to earth is made up of two parallel paths 400 ohms and $\frac{500}{2}$ ohms or

$$\frac{400 \times \frac{500}{2}}{400 + 250} = \frac{100{,}000}{650}$$
$$= 154 \text{ ohms.}$$

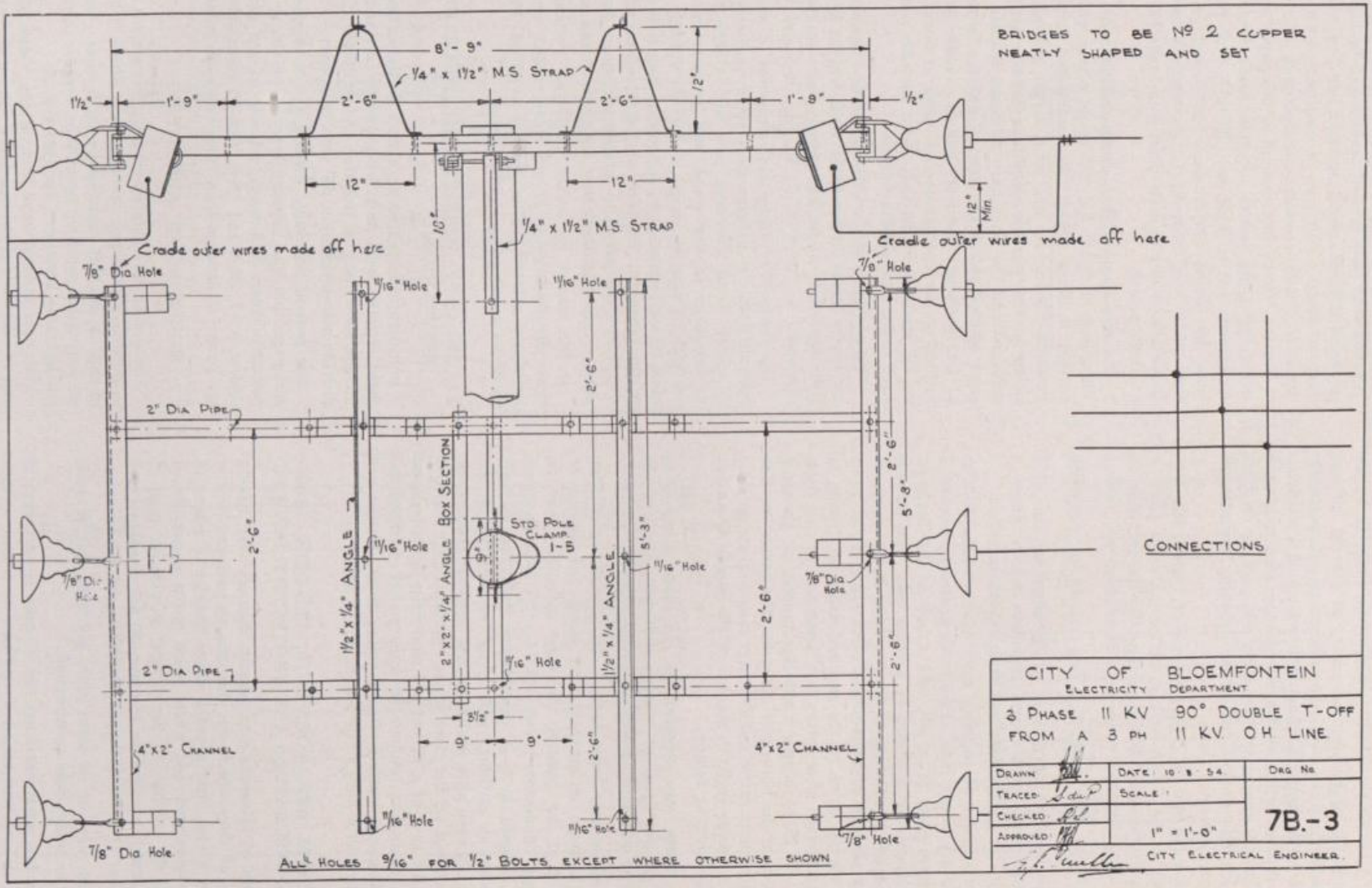
When it is remembered that lightning currents of 50 K.Amps can be expected, such a stroke will impose an immediate voltage rise of 50 x 154 = 7,700 kV. Fortunately this high potential which oscillates along the earth conductor for only a few micro seconds settles down to a potential above earth determined by E = I R where I is the lightning stroke current assumed as 50 K.A. and R is the earth wire and electrode resistance. This is where the resistance of earth wire and earth lead becomes important for instance if it should be of the order of 15 ohms. from earth wire mid point to earth electrode. This potential could be E = 50 x 15 = 750 K.V. and the insulator pins which in the case of all earthed construction would be tied to this potential are liable to flash over to the phase conductor which has a low resistance path to earth via the system neutral.

The inherent time lag to flash over of an insulator often succeeds in bridging the few microseconds of high potential due to the stroke, but cannot withstand the lower but sustained potential which is retained in the event of a high earth electrode resistance.

To quote our particular case, the average spacing of earth electrodes is 400 yds., and at these points we aim at a minimum resistance of 2 ohms. Each path to earth from mid point consists of an earth wire resistance 21 x $\frac{200}{1760}$ = 2.38 ohm. plus 2 ohm. for the electrode thus two parallel paths of 4.38 ohm reverting to a single resistance of 2.19 ohm.

The possible potential at mid point where a pole is likely to be situated can reach 50 x 2.19 = 109.5 kV for a 50 K.A. stroke current which is beyond the 45 kV wet flashover of the pin insulator.

With a 2 ohm earth electrode at every pole and a 50 K.A. stroke current at midspan which will split into two halves of 25 K.A. each the potential rise at adjacent poles will be


BRIDGES TO BE Nº 2 COPPER NEATLY SHAPED AND SET
8'-9"
1/4" x 1 1/2" M.S. STRAP
1 1/2"
1'-9"
2'-6"
2'-6"
1'-9"
1/2"
12"
12"
12"
12" Min
12"
1/4" x 1 1/2" M.S. STRAP
Cradle outer wires made off here
Cradle outer wires made off here
7/8" Dia Hole
11/16" Hole
11/16" Hole
7/8" Hole
2" Dia Pipe
2" Dia Pipe
2'-6"
2'-6"
2'-6"
5'-3"
5'-3"
2'-6"
2'-6"
2'-6"
2'-6"
1 1/2" x 1/4" ANGLE
2" x 2" x 1/4" ANGLE BOX SECTION
1 1/2" x 1/4" ANGLE
STD. POLE CLAMP 1-5
9"
11/16" Hole
11/16" Hole
7/8" Dia Hole
7/8" Dia Hole
11/16" Hole
3 1/2"
9"
9"
4" x 2" CHANNEL
4" x 2" CHANNEL
11/16" Hole
11/16" Hole
7/8" Dia Hole
7/8" Hole
ALL HOLES 9/16" FOR 1/2" BOLTS EXCEPT WHERE OTHERWISE SHOWN
CONNECTIONS
CITY OF BLOEMFONTEIN
ELECTRICITY DEPARTMENT
3 PHASE 11 KV 90° DOUBLE T-OFF
FROM A 3 PH 11 KV O.H. LINE
DRAWN
DATE: 10 · 8 · 54
DRG No.
TRACED:
SCALE:
CHECKED:
APPROVED:
1" = 1'-0"
7B.-3
CITY ELECTRICAL ENGINEER.

E = 25 x 2 = 50 kV which is within the range of 11 kV pin insulators. It is, however, expensive to provide earthing of this standard and we have compromised on one particular section with earth electrodes of approximately 8 ohm resistance every second pole, which, combined with other such resistances and the normal 2 ohm resistances every 400 yads. to establish a line which has proved free from lightning disturbances during two seasons.

It will be noted that an earth electrode of 2 ohms has been quoted. This is the figure we aim at for the earth point at all transformer positions and is dictated by the fact that an earth fault on a 220 volt consumer's installation will raise a fault current of $\frac{220}{R}$ amps. For this current to positively operate the main circuit breaker of 80 amps we aim at a 2 ohm transformer earth point resistance which leaves a small margin for supply lead and fault resistance values.

We make a point of planting earth plates whenever it is necessary to dig a stay hole. This earth electrode consists of a 1/16" copper plate 24" x 24" with a hole in the centre to which a terminal lug is bolted by a brass bolt. The plate is placed on edge in the bottom of the stay hole. If the resistance of one earth plate or combination of earth plates is not down to 2 ohms we get down to the required value by driving in 5 ft. long galvanized steel spikes 5 ft. apart and joining them to a 19/16 or 19/14 copper conductor tapped off an earth terminal block at the bottom of the pole. The reason for this comparatively short earth spike is that it is seldom possible to drive in a deeper spike in the soil of the supply area. See figure 1–4 for earthing details.

Earthing values vary considerably. In some places it is possible to get out figure of 2 ohms with only one mat. In other cases two mats plus up to 6 additional spikes are required.

In cases where stay holes have to be blasted out of rock there is little point in burying earth plates and driving of spikes is out of the question. In these cases we resort to burying copper conductors (mostly 19/14 or 19/16 scrap joined to required length) in a 2' deep trench radiating in both directions from an earthing point along the direction of the line. Apparently even after backfiling and tamping down of the trench there is not yet the close contact between electrode and earth as in the case of a driven rod, and these buried earths only render satisfactory results after some period of consolidation or on thorough wetting when tamping down. Values per 100 ft. of conductor vary from 5 ohm. to 35 ohm.

## 5.0 CROSSARM ARRANGEMENTS, TEE-OFFS, IRONWORK, INSULATORS AND PROTECTIVE DEVICES.

The pattern of crossarm arrangement depends very largely on the type of duty which the line has to perform. For a major feeder across open country where transfer of power in block is contemplated, and where there is the possibility of stepping up the voltage in the future, suspension type of insulators should be used as the use of pin insulators for voltages higher than 11kV is not well favoured.

When using steel or concrete poles the high cost of such poles point to single pole construction.

When wooden poles are used the H pole construction is comparative in cost and makes an increase to higher voltage possible with only ground clearance to be taken into account provided sufficient phase clearance had been allowed for in the original design. This type of construction also makes the all-insulated wooden crossarm construction a practical proposition.

For the type of line covered in this paper and serving rural consumers along narrow servitude roads, however, the H type of construction is ruled out. There is little prospect of these lines ever being converted to operation at a voltage higher than 11 kV so economical considerations have dictated pin insulators on intermediate poles with single 10" disc insulators at strain points.

The very simplest and cheaptest conductor arrangement is illustrated in figure 8–1 for single phase with possible conversion to three phase. We anticipated some trouble with insulator flash-overs due to a larger wetted creepage path under adverse weather conditions but this has fortunately not occurred and the lines have rendered reliable service on the score of flashovers. The vertical distance between phases had to be increased, however, due to trouble with large birds settling on the conductors and rising in flocks. Although we tie all ironwork to the O.H. earth wire the construction lends itself to the all-insulated pattern.

The evolution of the single phase and three phase line with earth wire below the conductor level, and the later modification with earth wire above the phase conductors has already been illustrated in figure 7C–5, 7C–5A, 7B–5 and 9–1.

The methods of fixing steel crossarms to wooden poles has been dictated by our experience which indicates that any form of clamp round a wooden pole will in time come loose due to shrinkage of the wood, and at least one bolt through the pole to take the weight and avoid slipping down the pole must be supplemented by supporting diagonals to avoid tilting of the crossarm. Supports of No. 8 galvanized wire (usually scrap) lend themselves to infinite adjustment for acurate trimming — and alignment later on if this should prove necessary.

In this respect the bolted VEE type 3 phase crossarm has some disadvantage as it will "concertina" and pull out of horizontal plumb. This can be avoided by welding the members together in a rigid structure.

### 5.1 TEE-OFF'S AND CIRCUIT ISOLATION AND PROTECTION.

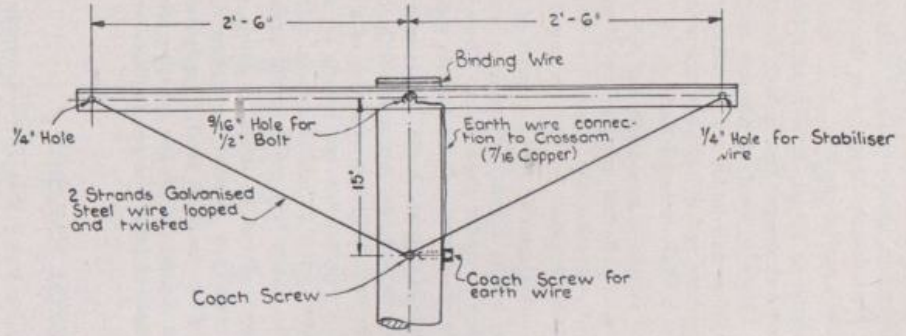
In a network serving a rural area it follows that tee-offs from main arterial feeds must be provided for, and as these also include some form of isolation and protection the design must provide accommodation for such equipment.

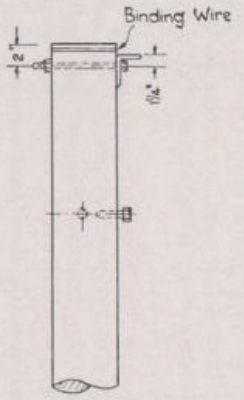
The general protective scheme will be discussed in a later paragraph but the normal branch line must at least have protective fuses and some patterns in use are indicated in figures 7C–3, 7B–2 and 7B–3. Tee-off from intermediate poles are easier to arrange than from make-off poles.

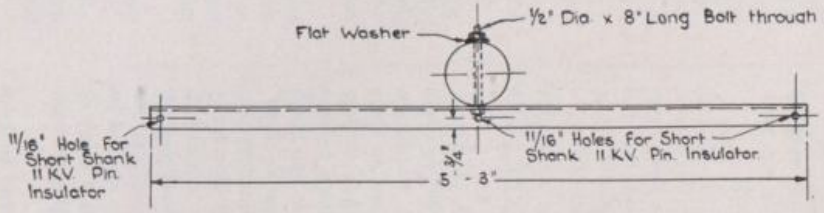
### 5.2 MOUNTING OF ARRESTERS.

The prevailing lightning makes it imperative to fit arrestors to prevent overvoltage on equipment which is bound to occur in spite of the best screening by earth wires. Any overvoltages set up during switching operations must be dissipated to earth via lightning arresters. See figure 9–7.

Arresters selected have been of the Value of Thyrite type, and in determining the operating voltage we have been guided




NOTE: 8" x 1/2" Bolt to be threaded 3".

NOTE: 1) Holes in Centre of Crossarm must be offset as shown.
2) Top of pole to be clamped with steel binding wire to avoid splitting.

2" x 2" x 1/4" ANGLE IRON CROSSARM.

| CITY OF BLOEMFONTEIN. ELECTRICITY DEPARTMENT. | | |
|---|---|---|
| INTERMEDIATE POLE ON 3-PHASE 11 KV O.H. DISTRIBUTION FEEDER. | | |
| DRAWN: | DATE: 3·6·54 | DRG. Nº |
| TRACED: | SCALE: | 7B.-5 |
| CHECKED: | 1" = 1'-0" | |
| APPROVED: | | |
| CITY ELECTRICAL ENGINEER. | | |

by American practice in deciding on 9,000 volts as the phase to neutral voltage rating.

Arresters are located at every transformer point, at every terminal point and wherever a cable terminates on an O.H. line. In the case of long lines where there are insufficient transformer points, additional arresters are provided to have a set about every mile.

### 5.3 CRADLING.

With long runs of L.T. mains mounted below the 11 kV mains, protection of the former in the event of a H.T. conductor breakage is essential.

Our cradles consist basically of three longitudinal No. 8 Galvanized steel wires of which in the earlier pattern of construction the centre one was also the common earth conductor of the 11 kV reticulation. In the later design of 3 phase line with earth wires on top (figure 9 – 1) the centre wire was retained as a cradle wire.

We found this middle wire essential as a stabilizer and point for anchoring the two outers which are otherwise inclined to cave in towards mid span due to the weight of the cross stringers. The cross members are spaced about 15 ft. apart.

At intermediate poles the outer longitudinals are carried on steel outrigger strips and at make-off points on crossarms of suitable length. Figures 7B–8 and 7C–8 give a general indication of the layout.

## 6.0 PROTECTION AND SYSTEM OPERATION.

The main arterial feeds to the rural areas of our network scatter in so many radial directions that it has not been economically possible to convert them into ring feeds.

The general arrangement is therefore to have one back-up circuit breaker controlling a particular radial feed, this circuit breaker being situated in a ring feed substation. In some cases this circuit breaker is arranged for automatic reclosing but where no such provision is available, a pole mounted 3 phase recloser is placed on the first pole away from the substation.

All branch lines teeing off from such a main artery are protected by porcelain housed H.R.C. fused cutouts of the indicating drop-out type.

Initially we used to split up long arterial feeds by similar cutouts as used on branch lines but as the loads grew we could no longer risk breaking and making loads of such magnitude. It was also difficult to obtain proper discrimination on these fuses, so lately they have been replaced by automatic sectionalizers. An actuating current coil records every fault impulse through the sectionalizer by pulling up an armature one notch for every impulse but only breaks circuit during a "dead" period of the controlling recloser, after a predetermined number of notches have been reached. The first notch will give faulty branch circuits beyond the sectionalizer a chance to clear. If the fault should be on the main feed beyond the sectionalizer the second impulse will bring it to the tripping position and the faulty section beyond the sectionalizer will be cleared on the second trip of the recloser. If there should be a delay of 1 minute between fault impulses the recloser notching arrangement resets automatically.

The co-ordination of fuse-sectionalizer-recloser and back-up circuit breaker is rather delicate especially if the maximum permissable tripping time of the back-up circuit breaker is restricted to for instance one second by setting on the main supply ring.

## 7.0 FAULT LOCALIZATION.

When an intermittent fault which in 90% of the cases is cleared by the protective devices, breaks down to a permanent fault it means that some consumers are without supply, and localisation and repair must be effected in the shortest possible time.

Generally these faults occur under adverse weather conditions and have to be located in poaring rain under lightning conditions which sometimes rule out tests involving contact with O.H. lines which cannot be earthed as it would nullify the test.

Our first step is therefore always a patrol which will reveal any obvious faults such as broken conductors, tree branches on line, wires across lines etc. If this should not reveal any obvious fault, there are many possible checks to follow, of which some are ruled out for practical reasons and others are used on account of the extreme urgency of restoration of supply.

(a) If the section is confined to $\pm$ 1 mile a more intense patrol will be carried out with stoppage at every pole for more close examination usually without erection of a ladder at these poles. This usually happens on the return run after the first quick patrol proved negative.

(b) If the section is longer, it is usually broken near the midpoint with a quick megger test in both directions to reveal the faulty half. Here a word of warning is necessary as a perfectly healthy line will under wet conditions give readings as low as 2 megohms and unless an instrument covering this range is used one is likely to be mislead.

(c) The faulty section is now ready for pole to pole inspection, or loop test or reflected impulse test of which the latter two will generally involve too much lost time, being lab instruments usually handled by test personnel.

(d) A device often resorted to when parts of the faulty line are inaccessable, or the urgency of repair is great, is to stage a deliberate switch on under observation. There will invariably be some tell-tale flash to reveal the trouble spot.

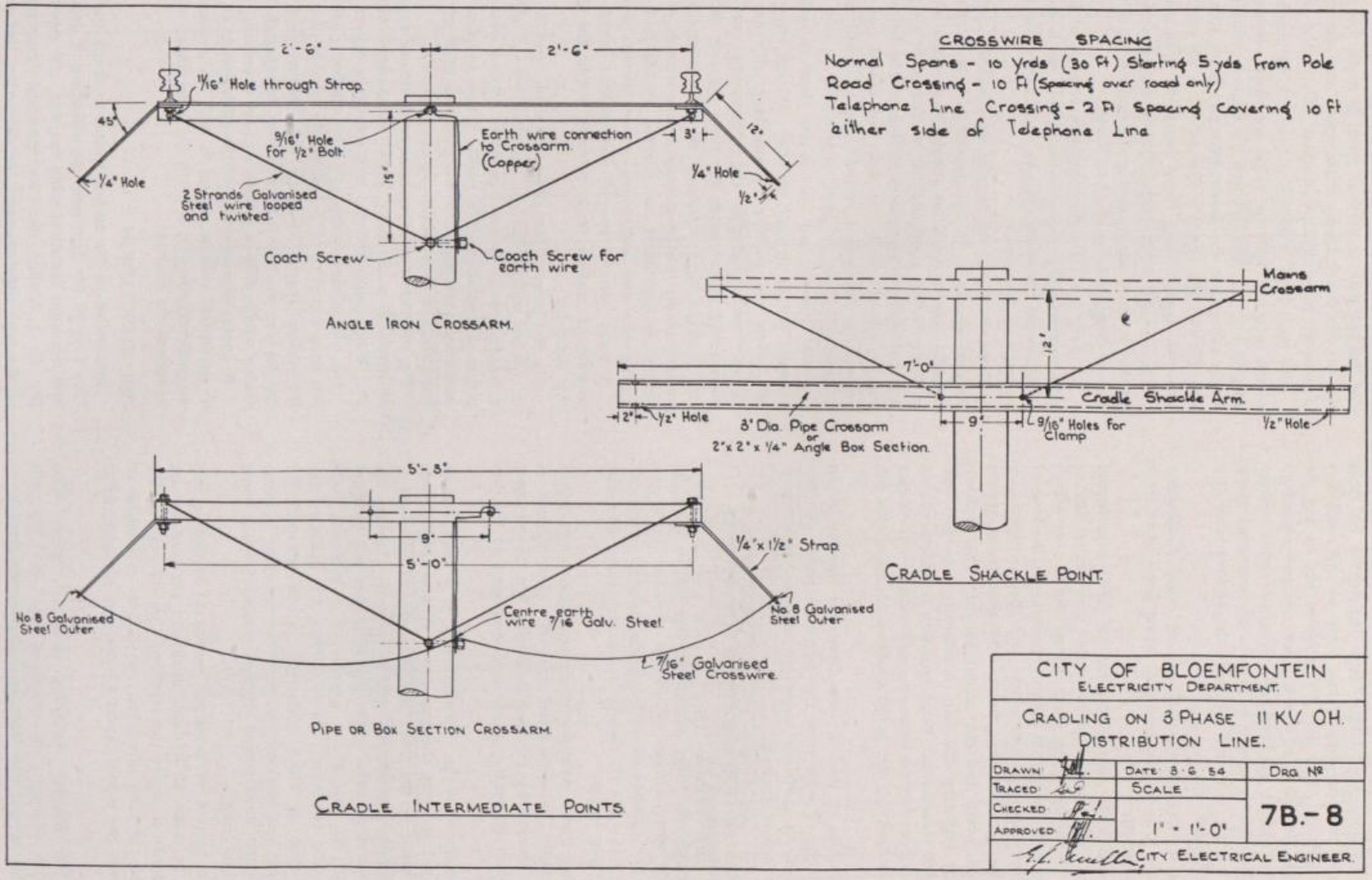
An aid in pinning down faults but one which we have not yet used due to apparent non availability in this country appears to be the fault indicator consisting of a magnetic yoke clamped round any conductor and having an indicating flap which drops down as a telltale whenever current of a predetermined value passes this point in the network.

These indicators placed at strategic points which can be easily reached under any weather conditions should ensure a more rapid pinning down of faults. In fairness it must be pointed out that regular patrols for resetting after intermittent faults will be required otherwise one is likely to be completely mislead.

## 8.0 OPERATIONAL HAZARDS.

It can safely be stated that 75% of supply interruptions, intermittent and permanent, on our 11kV O.H. network has been caused by trees.

The rural areas surrounding Bloemfontein were well established communities when it was decided to reticulate. The


CROSSWIRE SPACING
Normal Spans - 10 Yrds (30 Ft) Starting 5 yds From Pole
Road Crossing - 10 Ft (Spacing over road only)
Telephone Line Crossing - 2 Ft Spacing Covering 10 ft either side of Telephone Line
2'-6"
2'-6"
1 1/16" Hole through Strap
45°
9/16" Hole for 1/2" Bolt
Earth wire connection to Crossarm. (Copper)
3"
12"
1/4" Hole
1/4" Hole
2 Strands Galvanised Steel wire looped and twisted.
15"
Coach Screw
Coach Screw for earth wire
ANGLE IRON CROSSARM.
Mains Crossarm
12"
7'-0"
Cradle Shackle Arm.
2"
1/2" Hole
3" Dia. Pipe Crossarm or 2"x 2"x 1/4" Angle Box Section.
9"
9/16" Holes for Clamp
1/2" Hole
CRADLE SHACKLE POINT.
5'-3"
9"
5'-0"
1/4"x 1 1/2" Strap.
No 8 Galvanised Steel Outer
Centre earth wire 7/16 Galv. Steel.
No 8 Galvanised Steel Outer
7/16" Galvanised Steel Crosswire.
PIPE OR BOX SECTION CROSSARM.
CRADLE INTERMEDIATE POINTS.
CITY OF BLOEMFONTEIN
ELECTRICITY DEPARTMENT.
CRADLING ON 3 PHASE 11 K.V. OH. DISTRIBUTION LINE.
DRAWN
DATE 3-6-54
DRG Nº
TRACED
SCALE
CHECKED
APPROVED
1" = 1'-0"
7B.-8
CITY ELECTRICAL ENGINEER.

result was that plot boundaries were demarcated by trees planted close to the boundary fences, some 40 and more feet high. With servitude roads only 50′ wide we had to hug the fence lines and fell foul of trees which owners refused to have cut down to our requirements. Whereas lower voltage lines will still remain in service in spite of an occasional touch from a tree branch, an 11kV line will almost invariably trip out or blow a tee-off fuse.

Our advice to any party contemplating rural distribution of this nature is to be insistent on the cutting down of all trees along a power route.

As mentioned under paragraph 4.0 we have experienced some trouble with birds. One particular case being due to large flocks of Egrets rising from lucern lands over which an 11kV line with horizontal spacing passed. At the end of a day's feeding they rise and masse and their wings easily bridge the distance between phases with disasterous results to the particular bird and our supply record. The problem was solved by replacing the bare conductors with 660 volt P.V.C. insulated conductors. More generally trouble is caused by birds or owls settling on crossarms and coming into contact with phase conductors, this being confined to lines with pin insulators.

The temptation to see a free fireworks display when throwing a piece of wire over the overhead mains has the same attraction as probably anywhere else in the country, and needs no further comment.

## 9.0 AVENUES OF EXPLORATION FOR FUTURE IMPROVEMENTS.

(a) *Pin Insulators*: Our experience has shown that the standard 11kV pin insulator of 70 kV dry and 45kV wet flashover is not capable of withstanding weather conditions as experienced at 4,000 ft. altitude in Bloemfontein. We now specify 80 kV and 50 kV.

We have had many instances of pin insulator failure which inevitably results in conductor burn-off. The failure is generally not caused by external flashover, but by puncture of the porcelain between pin top and conductor in the top groove.

It would appear that the "Achilles heel" of a pin insulator is the unglazed spot on the top where it presumably rests while being baked in the kiln. If the quality of porcelain is doubtful, moisture penetrates and eventually lowers the puncture value to a point where the high potential gradient set up during the first micro seconds of a lightning flash breaks down the insulation. In paragraph 4.1, mention was made of the time lag which exists while a creepage path for flashover round the external surface of an insulator is being formed. It is the short period of high potential which some insulators fail to resist.

To prevent ingress of moisture we have devised a cap which could be made of any soft metal (in our case we use scrap cable lead) to cover the insulator top. We cannot log any experience of their effect but apart from prevention of moisture ingrees one would expect a more even electrical stress distribution.

(b) *Porcelain housed indicating drop-out fuses*: Our experience with this type of equipment rated at 7,500 volts with grounded neutral has been one of constant trouble, as the leakage path to earthed metal is much too short to stand up to the overvoltages experienced on our system. These points are generally the weakest link in the chain.

The open type of drop-out fuse link mounted on insulators of the required flashover value are much more reliable in this respect but are more subject to contact trouble, these parts being exposed to the atmosphere and liable to stick when the fuse blows. The result is that an arc is set up inside the fuse tube which eventually burns away the tube material.

The remedy would appear to be the open type fuse links of very robust construction and strong spring action to ensure a clear drop-out when the fuse blows.

(c) *Sectionalizers*: Sectionalizers cost about R60 per single pole unit as compared with about R11 for a drop-out cutout. They would therefore only be used where the circuit load is beyond say 10 amps.

Their distinguishing feature of breaking circuit when the back-up supply is off, has proved to be a disadvantage in this respect. If a sectionalizer should have locked out, the section of line which it controls must be cleared of all possible faults and preferably meggered or voltage tested before a switch-on can be risked. With the drop out cutout one could take a chance but not with a sectionalizer as it will most likely fail to destruction as we have experienced to our cost.

Under system fault conditions there is seldom time to pressure test or megger, so after clearing any obvious faults we follow the practice of switching off, the main backup circuit breaker, closing the sectionalizer on the repaired section and again closing the main breaker. With radio contact between men stationed at the sectionalizer and main breaker points this takes only a few seconds of supply interruption to consumers not affected by the fault, but involves having two men out which is not always possible.

A more robust type of sectionalizer which will also be capable of making fault currents would therefore eliminate this difficulty.

(d) *Reclosers*: The chain weighted type is relatively low in cost but suffers from the fact that it is not self-resetting, and a regular patrol to reset must be carried out after any suspicion of operation. The earlier makes supplied had very low rupturing capacities and we paid the price of complete disintegration on severe faults in some instances.

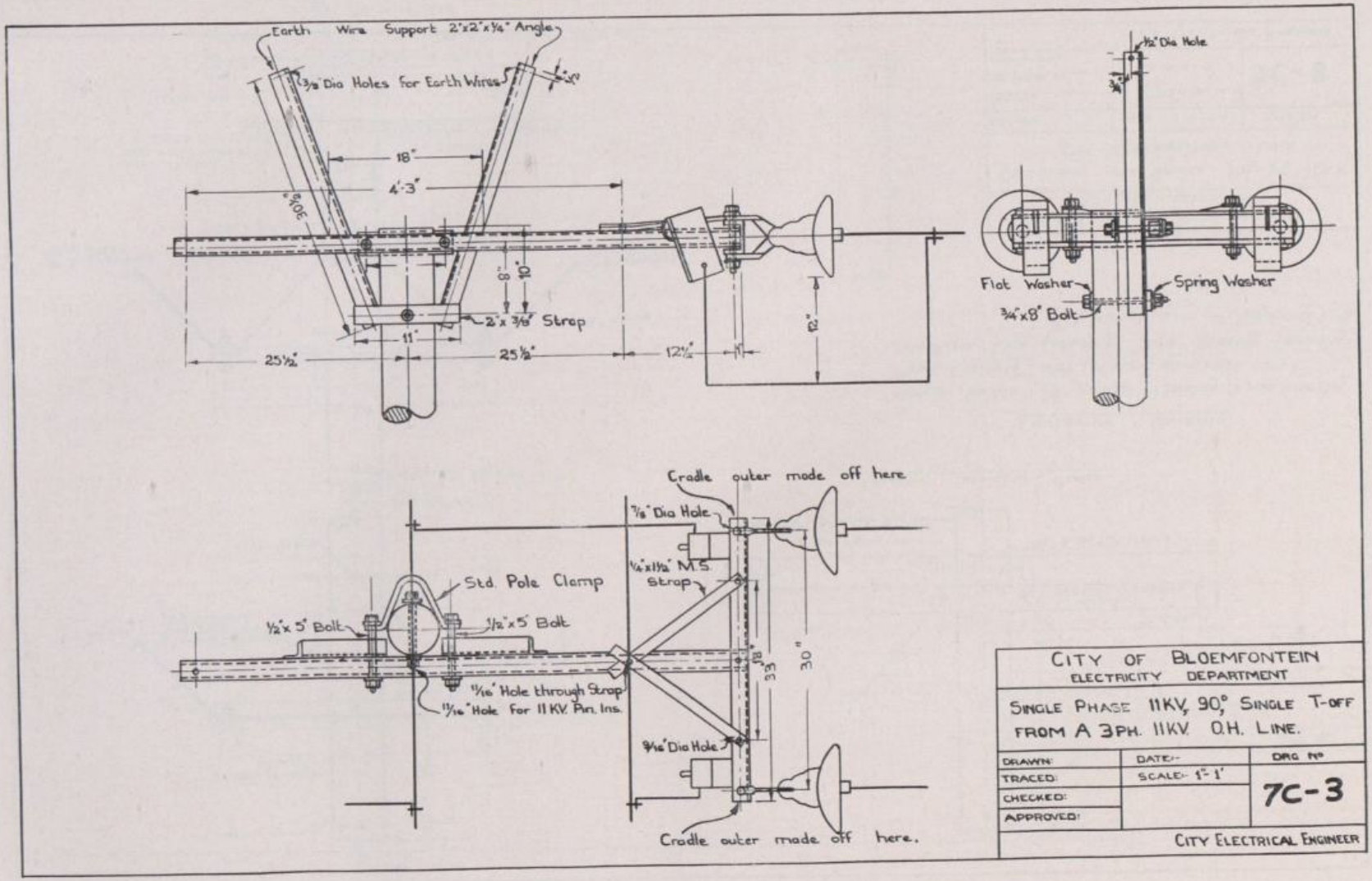
The self resetting types now available are expensive, costing as much as a complete 11kV switchpanel with instruments etc., but is most reliable and robust in operation.

(e) *Lightning Arresters*: The modern lightning arrester has been found to be a reasonably reliable item of equipment but unless special counting arrangements are installed one has no idea whether it functions or not, though there are some makes which drop a telltale cap on operation.

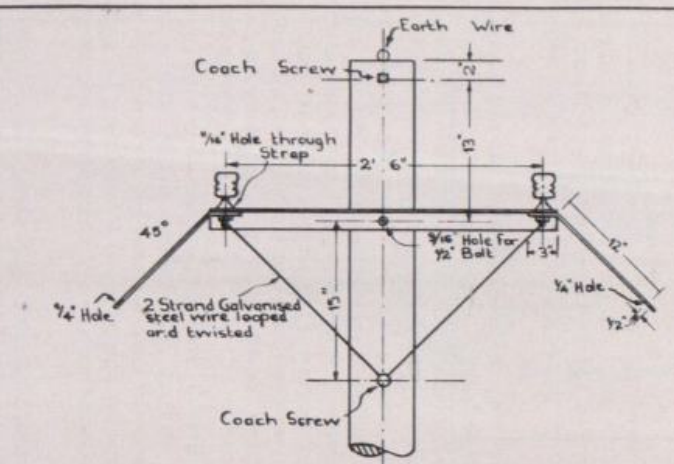
To make an assessment of the effectiveness of arresters with a particular voltage rating it will be necessary to install magnetic counters in a particular area under observation and to record the findings.

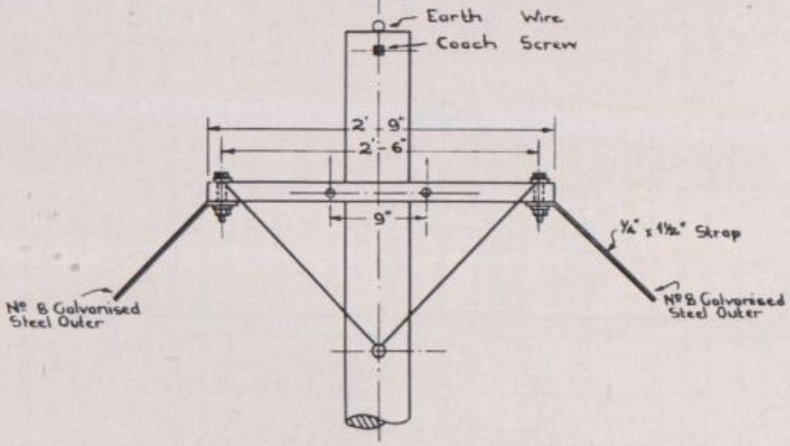
## 10.0 CONCLUSION.

In conclusion the author wishes to thank the Bloemfontein City Council for permission to make use of departmental data and drawings for illustrating the text, and especially to thank Mr. G. J. Muller, the City Electrical Engineer for fatherly advice and encouragement in delivering this paper.

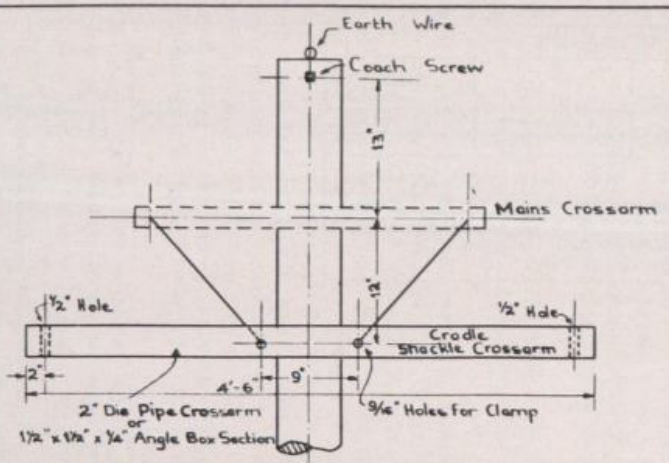



| CITY OF BLOEMFONTEIN<br>ELECTRICITY DEPARTMENT | | |
|---|---|---|
| SINGLE PHASE 11KV, 90° SINGLE T-OFF FROM A 3PH. 11KV O.H. LINE. | | |
| DRAWN: | DATE:- | DRG No |
| TRACED: | SCALE:- 1"= 1' | 7C-3 |
| CHECKED: | | |
| APPROVED: | | |
| CITY ELECTRICAL ENGINEER | | |




CRADLE INTERMEDIATE POINTS

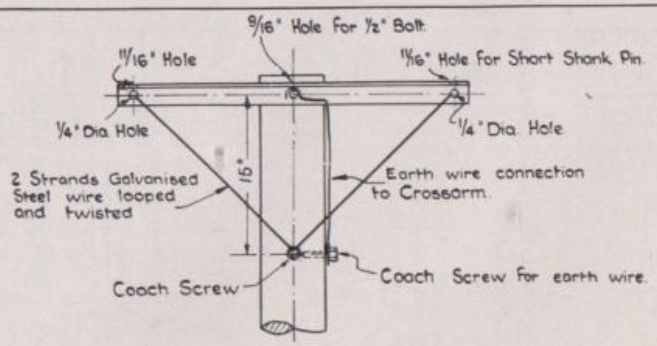


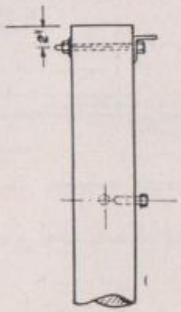

CRADLE SHACKLE POINT

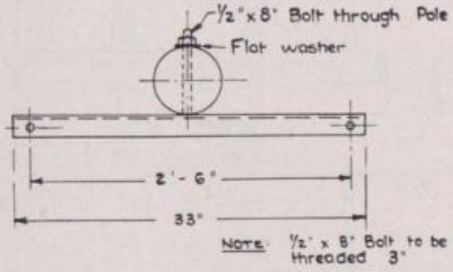
CROSSWIRE SPACING

Normal Spans - 10 yds (30ft) Starting 5 yds from Pole
Road Crossing - 18ft (Spacing over road only)
Telephone Line Crossing - 2 Ft Spacing Covering 10 ft either side of Telephone Line

| CITY OF BLOEMFONTEIN ELECTRICITY DEPARTMENT | | |
|---|---|---|
| CRADLING ON SINGLE PHASE 11 KV. OH DISTRIBUTION LINE. | | |
| DRAWN: | DATE: 3-6-54 | DRG NR |
| TRACED | SCALE | 7C-8 |
| CHECKED | 1" - 1'-0" | |
| APPROVED | | |
| CITY ELECTRICAL ENGINEER. | | |

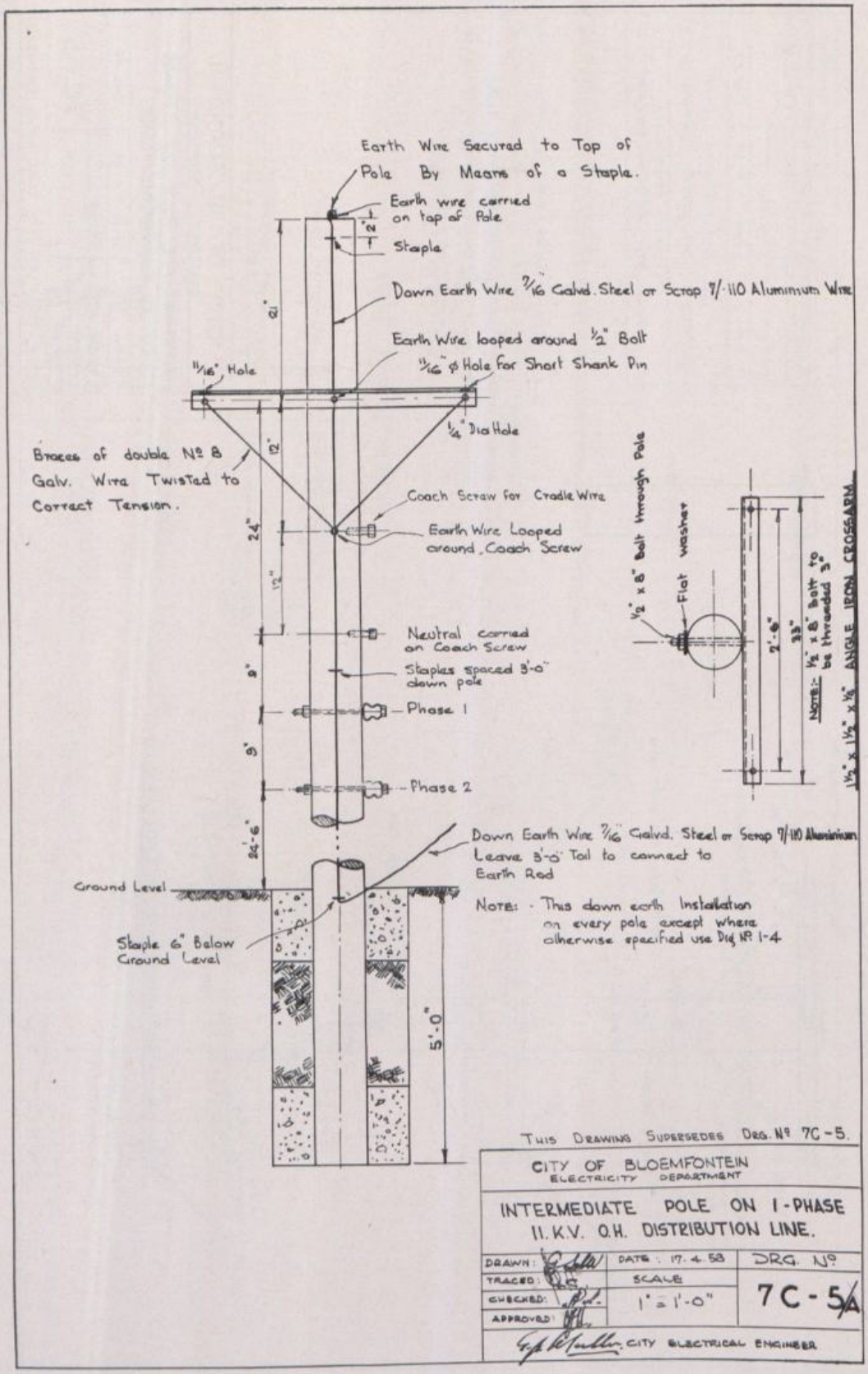


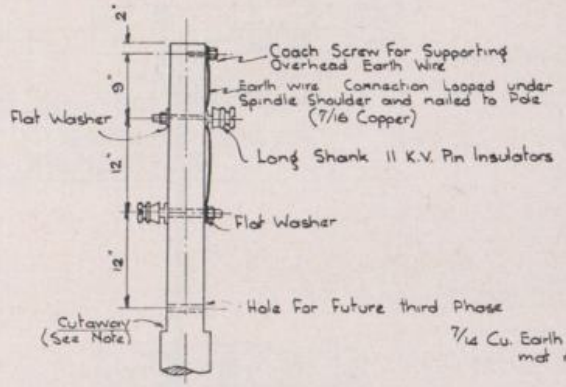





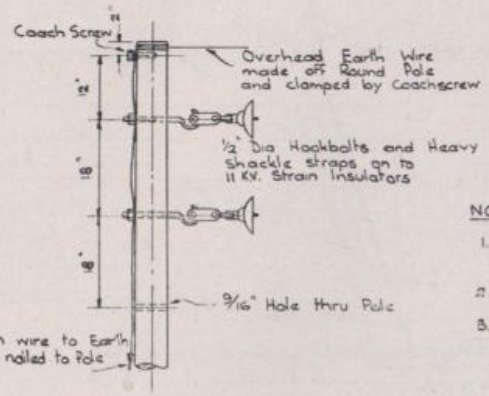

1½" x 1½" x ¼" ANGLE IRON CROSSARM

| CITY OF BLOEMFONTEIN<br>ELECTRICITY DEPARTMENT. | | |
|---|---|---|
| INTERMEDIATE POLE ON 2-PHASE 11 KV OH DISTRIBUTION LINE. | | |
| DRAWN: | DATE: 2·6·54. | DRG NO |
| TRACED: | SCALE: | 7C.-5 |
| CHECKED: | 1" = 1'-0" | |
| APPROVED: | | |
| CITY ELECTRICAL ENGINEER. | | |

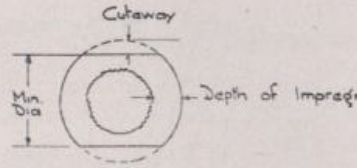

Earth Wire Secured to Top of Pole By Means of a Staple.
Earth wire carried on top of Pole
Staple
Down Earth Wire 7/16 Galvd. Steel or Scrap 7/.110 Aluminium Wire
Earth Wire looped around ½" Bolt
11/16" Hole
11/16" ø Hole for Short Shank Pin
¼" Dia Hole
Braces of double Nº 8 Galv. Wire Twisted to Correct Tension.
Coach Screw for Cradle Wire
Earth Wire Looped around Coach Screw
Neutral carried on Coach Screw
Staples spaced 3'-0" down pole
Phase 1
Phase 2
Down Earth Wire 7/16" Galvd. Steel or Scrap 7/.110 Aluminium
Leave 3'-0" Tail to connect to Earth Rod
Ground Level
Staple 6" Below Ground Level
5'-0"
NOTE:- This down earth installation on every pole except where otherwise specified use Drg Nº 1-4
½" x 8" Bolt through Pole
Flat washer
2'-6"
33"
NOTE:- ½" x 8" Bolt to be threaded 3"
1½" x 1½" x ⅛" ANGLE IRON CROSSARM
THIS DRAWING SUPERSEDES DRG. Nº 7C-5.
CITY OF BLOEMFONTEIN
ELECTRICITY DEPARTMENT
INTERMEDIATE POLE ON 1-PHASE 11.K.V. O.H. DISTRIBUTION LINE.
DRAWN:
TRACED:
CHECKED:
APPROVED:
DATE: 17.4.58
SCALE
1" = 1'-0"
DRG. Nº
7C-5/A
CITY ELECTRICAL ENGINEER




INTERMEDIATE POLE

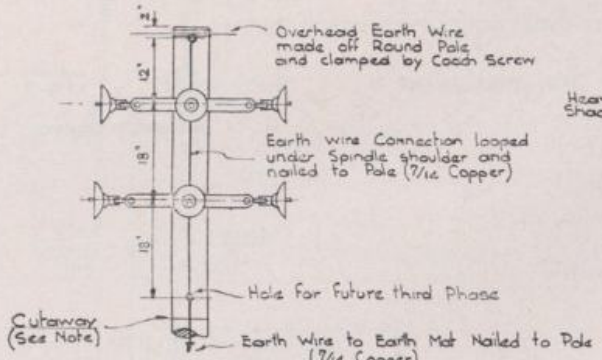


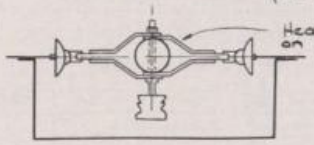

TERMINAL POLE



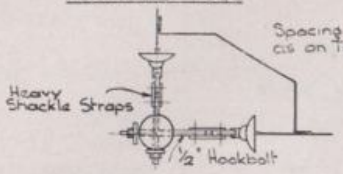

NOTE ON A CUTAWAY (IF REQUIRED DUE TO POLETOP DIAMETER IRREGULARITY)

1. MAXIMUM CUTAWAY NOT TO EXCEED 50% OF DEPTH OF IMPREGNATION
2. Min. DIA TO BE NOT LESS THAN 6"
3. NO CUTAWAY ALLOWED ON TERMINAL POLES OR SHACKLED BEND POLES

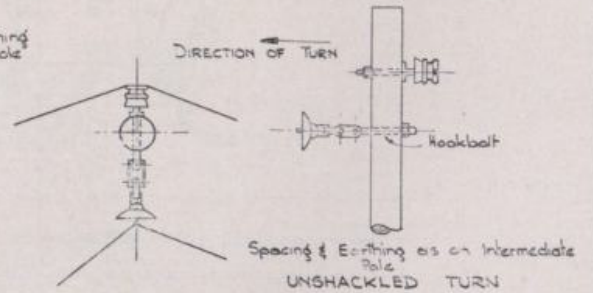


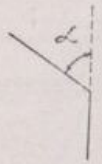

INTERMEDIATE SHACKLE POLE & BRIDGING




SHACKLED TURN




UNSHACKLED TURN



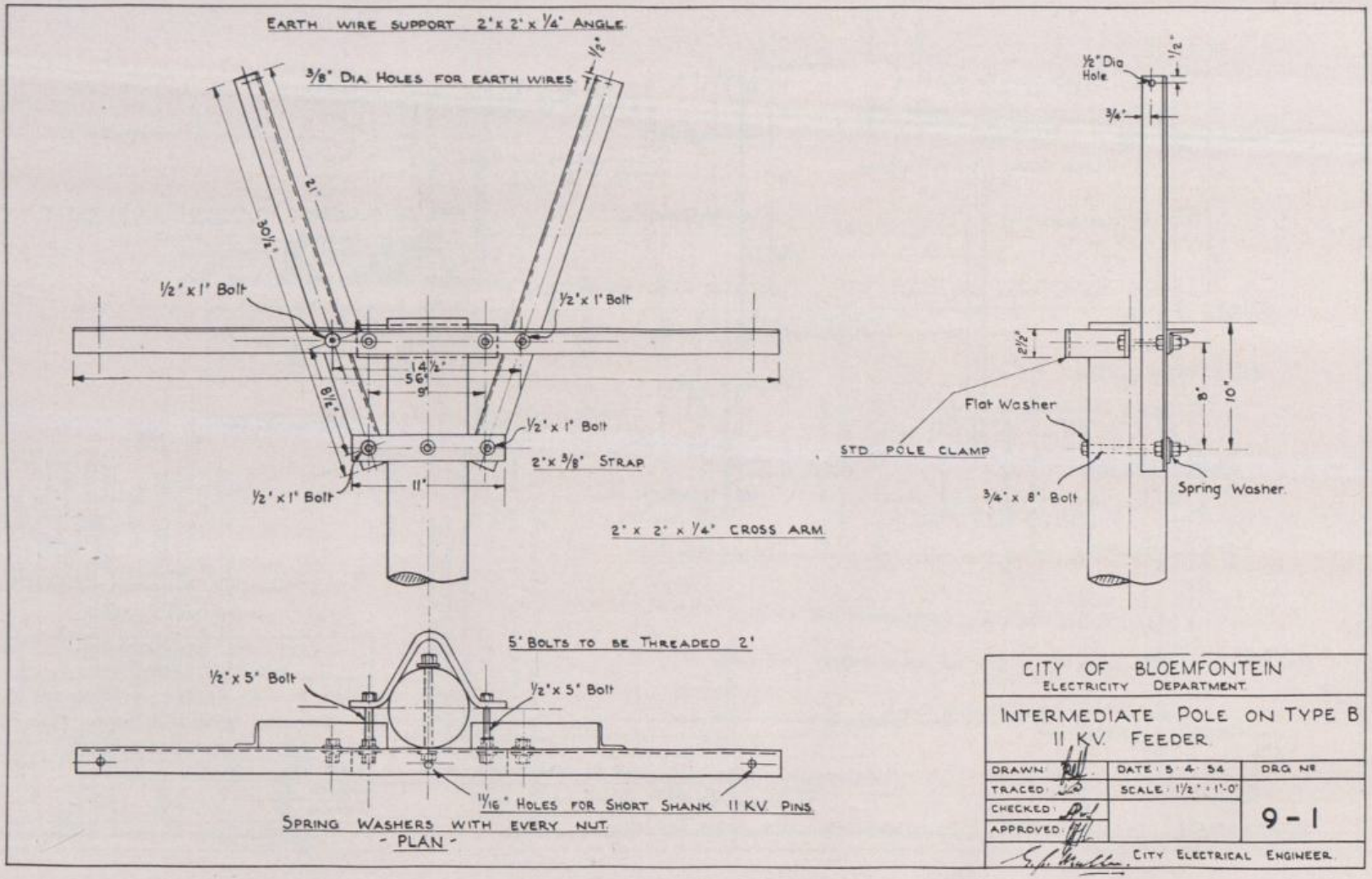

| α | CONSTRUCTION OF TURNING POLE |
|---|---|
| 1 - 15° | NORMAL INTERMEDIATE POLE |
| 16 - 60° | UNSHACKLED TURN |
| 61 - 90° | SHACKLED TURN |

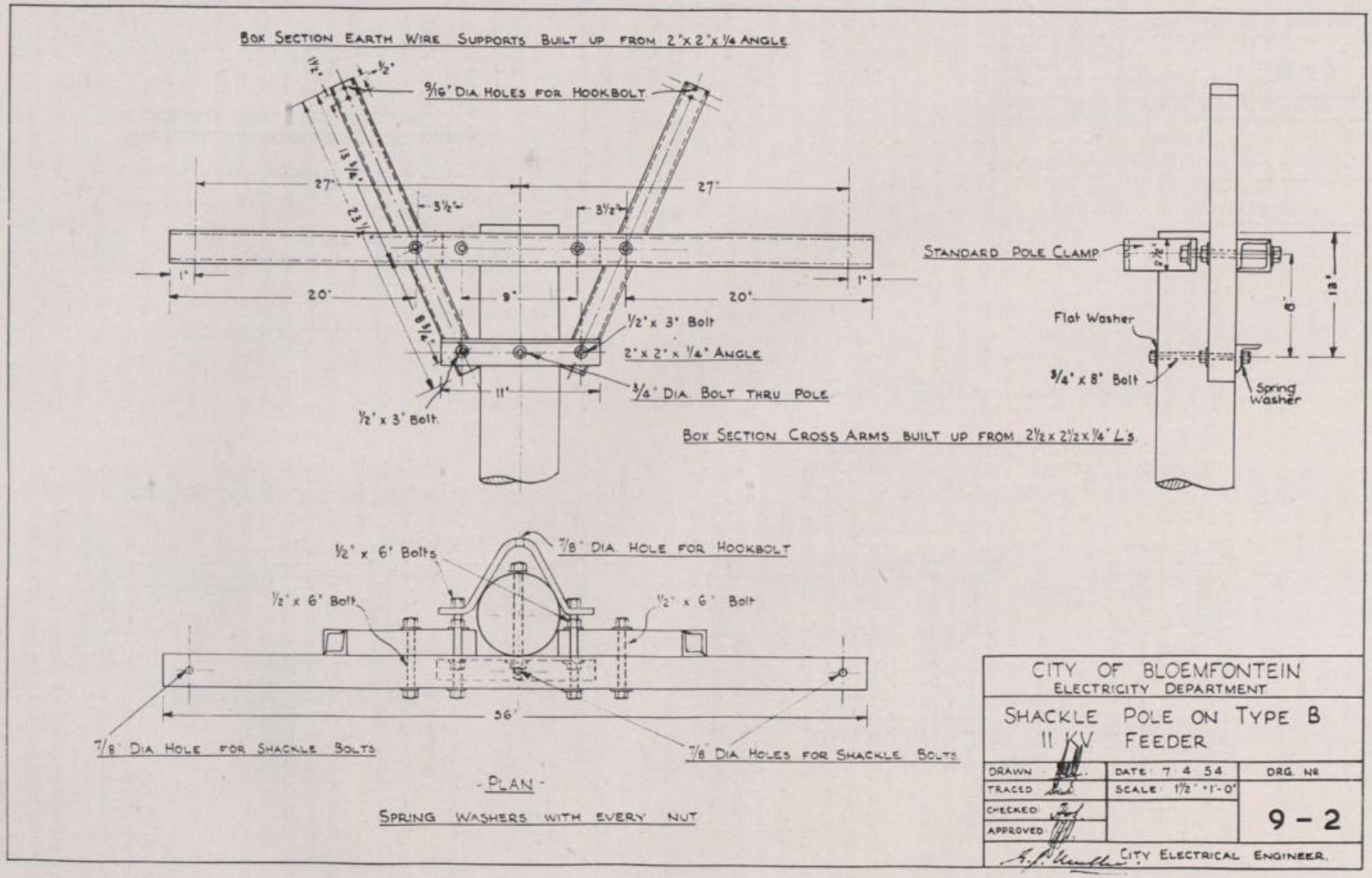
CITY OF BLOEMFONTEIN
ELECTRICITY DEPARTMENT

TYPE A 11 K.V. FEEDER : INTERMEDIATE SHACKLE , TERMINAL & TURNING POINT

| DRAWN: | DATE: 9.6.54 | DRG NO |
|---|---|---|
| TRACED | SCALE: | 8-1 |
| CHECKED: | ½" = 1'-0" | |
| APPROVED: | | |

CITY ELECTRICAL ENGINEER


EARTH WIRE SUPPORT 2" x 2" x 1/4" ANGLE
3/8" DIA HOLES FOR EARTH WIRES
1/2"
2"
30 1/2"
1/2" x 1" Bolt
1/2" x 1" Bolt
14 1/2"
5 1/2"
8 1/8"
1/2" x 1" Bolt
2" x 3/8" STRAP
1/2" x 1" Bolt
11"
2" x 2" x 1/4" CROSS ARM
5" BOLTS TO BE THREADED 2"
1/2" x 5" Bolt
1/2" x 5" Bolt
11/16" HOLES FOR SHORT SHANK 11 K.V. PINS
SPRING WASHERS WITH EVERY NUT
- PLAN -
1/2" Dia Hole
1/2"
3/4"
2 1/2"
8"
10"
Flat Washer
STD POLE CLAMP
3/4" x 8" Bolt
Spring Washer
CITY OF BLOEMFONTEIN
ELECTRICITY DEPARTMENT
INTERMEDIATE POLE ON TYPE B
11 K.V. FEEDER
DRAWN:
DATE: 5-4-54
DRG Nº
TRACED:
SCALE: 1 1/2" = 1'-0"
CHECKED:
APPROVED:
9-1
CITY ELECTRICAL ENGINEER.

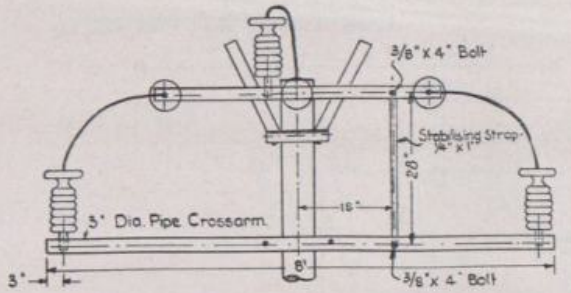



CITY OF BLOEMFONTEIN
ELECTRICITY DEPARTMENT

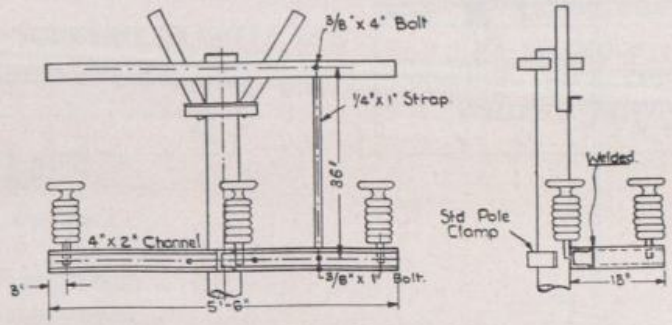
SHACKLE POLE ON TYPE B
11 KV FEEDER

| | | |
|---|---|---|
| DRAWN | DATE: 7 4 54 | DRG. NR |
| TRACED | SCALE: 1½" = 1'-0" | |
| CHECKED | | 9 – 2 |
| APPROVED | | |

CITY ELECTRICAL ENGINEER.

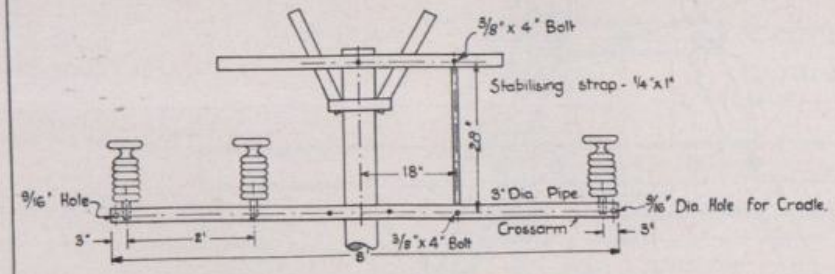



MOUNTING ARRESTORS ON TERMINAL POLE




MOUNTING ARRESTORS ON INTERMEDIATE SHACKLE WITHOUT CRADLING.

NOTE: Method of clamping arrestors determined by type available.




MOUNTING ARRESTORS ON INTERMEDIATE SHACKLE POLE WITH CRADLING

| CITY OF BLOEMFONTEIN<br>ELECTRICITY DEPARTMENT. | | |
|---|---|---|
| MOUNTING ARRESTORS ON TYPE B<br>11 KV FEEDER. | | |
| DRAWN: | DATE: 15-4-54 | DRG. NR |
| TRACED: | SCALE: ½" = 1'-0" | 9-7 |
| CHECKED: | | |
| APPROVED: | | |
| CITY ELECTRICAL ENGINEER. | | |

THE PRESIDENT: Thank you Mr. van Schalkwyk. I'll now call on Mr. Wilson to propose a vote of thanks.

Mr. J. WILSON (Pretoria): Mr. President, gentlemen, at the outset I would like to congratulate the author, Mr. van Schalkwyk, on his approach to this subject, and also for the presentation he has given us here this morning.

Obviously Bloemfontein have put considerable time and thought into the design and planning of this system, and that, of course, is a pre-requisite of any economical supply, particularly in rural areas where you are faced with such a low consumer density. The chief merit of his paper lies in the fact that he has not only provided us with considerable detail of how Bloemfontein have set about this problem, but has also given us the answers as to why they have adopted certain practices.

Mr. van Schalkwyk at the outset made it quite clear of course that each supply authority would have to design its system to meet its own needs and conditions, and that therefore one could expect quite a difference of opinion on what should be done, and I don't therefore, propose to take him to task on anything that Bloemfontein has done. I think they have set about their problem in an excellent way, and since I know that my seconder has something to say on this, and I don't want to be accused of stealing his thunder.

I think my own contribution can possibly be of most value if I remark on certain of the features in his paper and indicate where we have found it expedient in Pretoria to depart from the practices adopted by Bloemfontein.

These departures have been mainly due to three factors, firstly the mixed type of loads we have in our rural areas, secondly the size of some of these loads, and thirdly that old bugbear, high earthing resistance.

As regards the loads, in our rural areas we not only have to cater for the normal loads of farms and small-holdings, and possibly those of an isolated township, but also quite a lot of industrial load. This takes the form of brick yards, quarries, there is a vanadium mine and quite a large number of factories, and some of the individual loads of these consumers are as high as a thousand KVA, so that over the years we have had to reconsider the economies or merits of the reliability of supply question and where we initially started out with a radial system of feeders, today we have no radial feeders of any consequence in the rural areas, the system now being essentially one of ring mains.

The necessity of being able to feed the loads from either ends of the mains, and the fact therefore that we use a standard size of conductor throughout the length of the main lines, has precluded the use of any series graded form of protection. We thus have no circuit breakers in the lines themselves or any automatic sectionalising devices.

Our method has been to use an auto reclose breaker at each end of the ring, and at suitable intervals, in the length of the line to install load break, fault make ganged sectioning switches. 3 phase spur lines are connected solidly to the main lines, while single phase spur lines are connected through open, drop out, expulsion type fuses. We use these too, for connecting the smaller transformers. Any transformer of 100 KVA or higher rating is controlled by a circuit breaker.

Due to the high earthing resistances and the high cost of getting these down to a sufficiently low value where earthing is necessary we use a high sensitivity back up type of earth leakage rely on the auto reclosers, so that in the event of an earth fault, such as a conductor falling, we can ensure the isolation of the line.

Inicidentally, in connection with the fusing, we have low rupturing capacities on the rural system and therefore, that, combined with the fact that there has been quite a lot of improvement in the normal rewirable type of fuse, has made it unnecessary for us to employ high rupturing capacity fuses.

Our spur lines which are constructed mainly with galvanised steel conductor, are very seldom longer than one mile in length, and where found inadequate it has been due mainly to carrying capacity and not voltage drop.

Because the voltage rise on the lines is roughly proportional to the earthing resistance, for any discharge to earth through an earthing lead, we do get somewhat higher voltage rises on our lines in the Pretoria area than we would normally contemplate, and this condition we have tried to meet in the following ways.

Where we have our main lines on concrete poles, we have screening earth wires, and we insulate by means of two disc insulators per phase, each of BSS rating of 35. On the spur lines which are all constructed with wooden pole lines, we provide no earth wires at all, and the only earths provided are those necessary at points such as transformer connections, where we use a pin insulator of BSS rating of 50 but of course, with a wood pole naturally we have got quite a high insulation level due to the pole itself.

Our experience over the years has been that our only failures of pin insulators have been at the earthing point and elsewhere we haven't had them at all. Even where we have had a direct strike on the line, the insulators have been found intact although the pole has been shattered.

Roughly, that is the method we have employed on the Pretoria Rural system, and we can say that we do provide a reasonable security of supply as far as our consumers are concerned.

A lot has been said on the economics of this, and I don't propose to say any more this morning.

There are other factors, though, that we have been using in recent years, and perhaps these might be of interest to the members.

In the first place, as far as transformers are concerned, today we use a hermetically sealed unit, with a fixed voltage ratio, and of simple mechanical design. It is really just a plain tank with the insulators brought out. These are designed for a high withstand impulse level, a low impedence and to be mechanically strong.

On our rural system, that is the pure rural system, not taking townships into account, we use practically no L.T. reticulation whatsoever; there are of course the odd occasional short lines that have to be constructed below H.T. lines, but there we use PVC insulated conductors and so avoid the cost of expensive cradling.

Wood poles of course we have been using for almost the last 35 years now, and we have had quite good experience with

these. The modern treated pole has an estimated life of some 20 to 35 years, and our experience certainly supports this.

A point of interest there may be that the Forestry Department advise now that they have definitely established that planting a wooden pole in concrete has no deleterious effect as far as the pole is concerned. We ourselves have never found this necessary. In the few places where we go through turfy soil our method has been to use a foreign soil in re-filling the hole, and we have found that quite satisfactory.

The other thing we are thinking about is this, that where we are faced with conductors being fairly heavily loaded now, we are contemplating loading these conductors to their thermal limit and where necessary using voltage regulators in order to look after the regulation. We haven't actually done so yet, but that is the line along which we are thinking at the moment, in order to avoid the high cost of re-conductoring.

Mr. President, with those few words I will conclude, and I would like, on behalf of our members here, to propose a very hearty vote of thanks to Mr. van Schalkwyk for this paper which he has presented this morning — one which I think should provoke quite a lot of discussion and should enhance the value of the proceedings of this association.

THE PRESIDENT: Thank you Mr. Wilson. I will now ask Mr. Mathews to second the vote of thanks.

Mr. J. A. MATHEWS (Kimberley): Mr. President, I am very grateful to you for asking me to second this vote of thanks to Mr. van Schalkwyk for his interesting paper.

I am also grateful to Mr. Wilson for not stealing my thunder completely.

Mr. van Schalkwyk has forestalled the obvious first criticism which can be levelled at his written paper by claiming that the methods employed by Bloemfontein are the results of 17 years of evolution, and that the optimum construction type has still to be found.

His second paper this morning is also of interest, and for which thanks must be recorded.

This Association was originally brought about to further the interests of municipal electricity undertakings by the readings of papers and the discussions on subjects appertaining to municipal electricity undertakings.

I believe that in Mr. van Schalkwyk's paper, like the paper given by Mr. R. S. Dunstan in 1955 at Pretoria, we have a paper which can be used as a reference for a very long period.

Its value will be in the use the small town engineer can make of it. He can, with a minimum of time and in a manner easily understood find the results of 17 years of experience; for the larger towns and cities this paper is, perhaps, over-simplified, because of the fact that the undertaking is well able to employ sufficient engineers to permit of one being assigned to overhead work on a more full time basis.

As with all things, it is important that overhead mains should be designed and erected economically. With the ever increasing costs, it is essential that materials and labour be conserved as far as practical, and it is a corollary that the practice of standardisation be followed as much as possible.

Despite the desire of the aesthetic, it is not possible to hide completely the routes of overhead mains, thus it is essential that due regard be paid at all times to the appearance of overhead mains.

It is thus imperative that constructional work be good, as many a pleasing design is spoilt by bad erection.

Nothing is more unsightly than an overhead scheme with poles leaning at all angles, and having a generally sad and soggy appearance. In fact the whole appearance of a line resembling a "donkey's breakfast" rather than a project worthy of an engineer is to be found in many towns in the Republic.

It is therefore of major importance that the engineer responsible for overhead construction be fully alive to his duty to ensure by careful checking of design and by the control of erection, that the breakfast so frequently seen is not to be found in his area of jurisdiction.

This paper, unfortunately, does not offer advice and record the experience and the erection and stringing procedures adopted in Bloemfontein. One presumes that this had been an oversight on the part of the author.

It is to be noted that the author does not suggest any type of pole which would be of advantage for any particular situation. He does, however, suggest that steel poles have advantages at strain points. With this one must agree, but with the life of a wood pole estimate at 17 to 25 years, it seems reasonable to me that one interruption to supply to change a rotted strain pole once in that period has an economic value which should not be overlooked, particularly when the price ratio of 1 to 6 is considered.

The author should, in his reply, discuss the merits of Group A and Group B wooden poles as well as give an indication of the best type of pole he has found to be most suitable for his centre, perhaps a colleague from the coastal belt would fill in the picture with his recommendations for the pole to be used on the coastal belt.

The treatment of poles with preservatives in accordance with the SABS specification does not end with the delivery of the poles. The author is recommended to consider ways of continued treatment by way of long storage periods, stacking and in situ preservation. In all the figures given the cross arms are shown to be without any joggle, this to fit more snugly round the pole. My belief is that a joggled cross arm does, despite its enhanced price, ensure a more satisfactory job, thereby obviating the need to use twisted steel stabilising members for the cross arms, in a manner reminiscent of a farmer's fence.

The author omits any reference to corrosion protection. This of course is of vital importance to a user particularly those who are in the coastal regions. I suggest perhaps that the hot dip galvanising process, despite its costs, is the best form of anti-corrosion protection.

The author does not refer to the very important aspect of staying. This is of great importance. Perhaps he would care to amplify the paper with his views on this aspect. In figure 1—4 the position shown by the stay, at less than 6 ft. deep, suggests soils in the Bloemfontein area having very good bearing pressures. Would it not be better to insist on the earthing being fixed in a separate position rather than in with the stay plate.

One of the most important and yet most vulnerable links on a transmission and distribution practice is the humble insulator. Not only are its electrical characteristics important, but due regard must be given to its mechanical abilities to withstand the loads imposed upon it . I note that the author does not stress this sufficiently. It would also be of value if he enlarged on the reasons for the decisions taken in Bloemfontein in adopting values of 80 KV and 50 KV SOV values.

Would the author be prepared to suggest a "puncture" value.

The weather conditions in Kimberley are not greatly dissimilar to Bloemfontein. Of the lines erected in Kimberley I can report not a single insulator failure in the past eight years, because of generously chosen insulator levels; nor have we experienced transformer failures from steep fronted wave forms.

In 20 years of 33 KV experience we can claim a similar record. The increase in cost by selecting a generously proportioned insulator, has, I believe, paid good dividends in freedom of failures.

The Kimberley area is fortunate in that fouling of insulators is of relatively little consequence, and thus special spray washing and other cleaning and maintenance measures are not generally necessary.

The author has not suggested any methods for the "binding in of the lines". This I consider to be of very great importance, as even with badly damaged insulators, it is sometimes possible to continue supply for a short period due to the binding holding the cracked insulator together.

From the choice and selection of insulators, it is but a short step to the consideration of impuse levels for overhead lines. Can the author give any statistical information on the number of outages for earthed and unearthed lines, and also for any lines which his municipality has erected without the use of steel cross arms.

Clause 4-3-1. of the Code of Practice for Overhead Lines does not suggest insulation levels, but it does stress that all items of insulation, comprising a system should be properly co-ordinated.

It is with regret that little reference is made to the respective advantages of using one metal or another for conductors, other than that of the price factor. I believe that the engineer from the smaller undertaking would appreciate some guidance in this regard. He is often required by council policy to accept the lowest tender offered, irrespective of any other factor which may suggest that another tender could be more advantageous. Having the support of the experience of a larger Council, he could perhaps influence his Council's decision to accept the best tender offered.

Again insufficient stress has been given to conductor jointing, and other connections. The paper appears to suggest that provided dissimilar metals are kept apart, and anti-oxidising paste is applied all will be well with the joint. Apart from these factors it is essential that the mechanical strength be so achieved that it is at least esqual to that of the conductor.

The author relates the earthing of lines with the lightning problem. With this I am in full agreement. In the Northern Cape earthing conditions are not good. Despite this apparent disadvantage it has been found that by running a special steel wire from every pole top, to a coil of wire buried under the pole butt, and running a continuous earth wire from pole to pole, reasonable reliability can be achieved. This, I admit, is expensive, but as reliability is desired it must be paid for.

I have not been able to reconcile that the overhead lines with which the author is associated comply in all respects with the Code of Practice. Perhaps the author may like to comment upon this.

Mr. President, I realise that it is not I who was asked to give the paper, but that I should second Mr. Wilson's vote of thanks.

Realising this belatedly, that I have this duty to perform, I have now much pleasure in seconding the vote of thanks, and would like to assure Mr. van Schalkwyk that the measure of discussion, which I am sure will result, will give him immense satisfaction that his paper, and the ensuing discussion is to be of value to his colleagues in the industry. (Applause.)

THE PRESIDENT: Thank you. The paper is now open for discussion, gentlemen.

Mr. L. J. HOOLEY (Visitor) (Salisbury): Five brief quick points, Mr. President — time is pressing. Golf is imminent, I believe!

Perhaps I am out of order, but I would like to take the opportunity of being first from the floor to congratulate Mr. Sibson on a very well deserved "election to the Peerage".

Secondly, which is on a point of order. When I arrived in Margate a few days ago, I was a plain chartered Electrical Enginer from the Ministry of Power in Salisbury. I now find from remarks directed from your bench that I am suddenly elected to Councillor. I'll be very disappointed if I get here tomorrow and find that I am not the Mayor of Umtentweni.

Coming back to the papers, Mr. President, I would like to thank both the authors for very excellent papers. I am sorry I cannot reply to Mr. de Jager's paper in his own language, except perhaps to use the brief "Dankie", but I have studied the English translation of the paper and found it of great interest.

I do, however, agree with Mr. Kane of Johannesburg who put this point better than I can, that one has to be careful with the use of tables and statistics in papers. It is pointless, in my opinion, going to three or four places of decimals in the preparation of statistics if one has used a wrong basis of assumption or incorrect or abnormal assumptions in the formation of those statistics.

Which takes me to the next point. Electrical accidents are referred to in both papers, Mr. President.

I don't agree when it was said that we should be a little naive in talking about electrical accidents, and that we should talk about electrical safety instead. I know all the arguments for and against that aspect of safety propaganda for the public, but I am not going to be mealy-mouthed here at this Convention and pretend that electrical accidents do not occur.

It happens to be my job to consider reports of electrical accidents in the Federation and to hold inquiries into them where necessary. As I said yesterday, there are about 24 deaths every year due to electrocution. The near-fatalities are probably four to five times that number.

The bulk of fatalities occur either on overhead lines, or from the use of portable appliances.

Coming back to the papers again, Mr. President, the statistics show in connection with road deaths a terrible figure indeed, but we should not be too smug and complacent about the apparent low rate of deaths from electrocution in comparison. I think that it is a mistake to try and smooth over the electrical accident records.

The fact that Pretoria has had a very low incidence of deaths in connection with overhead lines does not necessarily show the general trend. In fact and conversely, I would say to any Supply Engineer who has been unlucky enough to have a solitary death on his sytem, not thereafter to form his opinion and design his future works based on that one solitary accident. I do commend to each of you that you should study all the accidents which have occurred in all areas, when you will find there is a trend.

That, then takes me to the next point which is on the design of distribtion systems, and I can only make a very small point here, and that is this:

From experience of a great number of deaths associated with overhead lines which have been caused by contact with stay-wires which have become alive, I would suggest to any of you responsible for overhead line systems that if you have protective multiple earthing, you can make every stay-wire safe by bonding it to the neutral conductor. If you do not have protective multiple earthing, then you should either run a separate earth-wire from each stay-wire back to the sub-station earth point or put an insulator in the stay-wire. The stay wire's own contact with the ground cannot be relied upon to provide an effective path for fault current.

The last point is in connection with load-factor. These days we talk about load-factor as some kind of magic password to all sorts of things. Now it is all very well when we are talking about generation and bulk transmission to take load-factor into very serious account indeed, and we might with judicious planning and load factor improvements, delay certain capital expenditure When we come to ordinary distribution systems it is a different kettle of fish altogether. In addition to load factor, there is one other factor which is equally important in distribution, and that is diversity factor. Very briefly, if you consider a block of flats of say 100 families (and when I quote statistics here, Mr. President, I am not making false assumptions, these are based on figures we have taken out in the past), you will find, notwithstanding that each consumer might have an individual load of say 10 kilowatts (cooker, water heater, and one or two other things), the over-all maximum demand of the 100 flats is likely to be less than 3 kilowatts—it might even be 2 kilowatts—per consumer.

Now if you are going to experiment with that very low coincidental demand, which is the result of a high diversity factor, by encouraging people to increase the use of their own individual loads a little further (whilst I am not saying it is a bad thing—it obviously increases sales of units), it might overload your distribution system. In fact, you could find yourself in a worse position economically than when you started. If you cannot take advantage of diversity factor, then distribution systems are going to be twice or three times the size and cost they are now.

I do suggest it again to you, not to rush into this magic formula of load factor improvement on a distribution system without considering this other equally important aspect of diversity factor too.

Thank you very much.

THE PRESIDENT: Are there any contributors to Mr. van Schalkwyk's paper?

Mr. J. L. VAN DER WALT (Vereeniging): This is one of the beauties of local government, and that is that the layman and the technician can consult and co-operate together and discuss papers like these. I represent the layman today!

In connection with Mr. de Jager's paper, I would like to comment as follows:

With such a high ratio of interest to capital it should pay Pretoria to give serious consideration to saving interest payments. From the figures given, it is seen that from 1941 to 1961 the interest rates on municipal stock rose by not less than 3% which is therefore the main cause of tremendous increase in capital charges during 1941 and 51.

The author states that such capital charges are irreversible and that the effects must be borne by the undertaking for the full life of the loan.

This is true in respect of what is known as earmarked loans, and the effect of large fluctuations in the interest charges can thus become a heavy burden.

One wonders, therefore, why Pretoria has not availed itself of the Consolidated Loan Fund method of financing their schemes, whereby these fluctuations in interest charges are completely ironed out in that all departments share the common rate of interest on advances from this fund.

If a Consolidated Loans Fund had been in operation then the power undertaking would have benefited from the average rate in financing its high capital cost power extensions.

The author goes on to discuss the investment of depreciation funds. He says that if depreciation fund accruals were immediately ploughed back into the electricity undertakings, there would be a saving in capital. In a Consolidated Loans Fund this procedure would be automatic and all the departments of the Council would benefit from the ploughing back in place of the method of external investment of various depreciation and renewals funds.

From a financial management point of view, an engineer who demands that his undertaking reserves be ploughed back may find himself in difficulties when he receives a large sum of money from these sources, and finds that he can spend it only over a period. The loss of interest in such a case could be quite considerable.

No indication is given as to the method of calculating depreciation in the power undertaking. If this calculation is based upon the life of assets in such a way that the annual appropriation from revenue account is calculated so as to replace assets which become worn out or obsolete before (but not long before), the relevant loan has been repaid, then we would have no quarrel with the system.

More often than not, however, it is found that contributions to depreciation and renewals funds are based on empirical

calculations, and in fact the revenue account of an undertaking is very often called upon to bear a double charge in respect of capital redemption and replacements.

To put it another way, it frequently happens that where a power station has been paid for in full, there is a large amount accumulated in depreciation funds and no objections are raised to extensions or even new power units being erected and financed from this surplus.

Whether this has been done in Pretoria I do not know, but it certainly has occurred in other undertakings. This means that the consumer has not only been paying his own share for electricity, but he has contributed towards a reduced unit cost for posterity. That reminds one of the young scholar who had to write an essay on the Capital Indebtedness of his Country. He wrote, "It is a pity that the future generation is not present to see the wonderful schemes we are executing with their money."

In any event, re-investment of depreciation funds with the object of relieving the undertaking of capital charges will not normally be effected, because by law the depreciation funds must be funded and loans from depreciation funds must be repaid plus interest. One cannot conceive that the city treasurer would agree to the reinvestment of depreciation funds in the electricity undertaking at interest rates which are substantially lower than those which he could earn by external investment.

Another factor which has contributed very substantially to the increase in capital charges in a modern electricity undertaking, is the inflated cost of capital equipment over the past 20 years.

It is common knowledge that this equipment has increased out of all proportion to the increase in the cost of other capital equipment or the cost of wages.

The second method of reducing capital charges by means of a more frugal allocation of capital to extensions, impress one . . . under the financial heading, "Every engineer is a perfectionist, and none of them likes to be caught on the wrong foot when it comes to meeting the public demand for more and more electricity, or for some other service, especially where there is intensive and rapid industrial development".

One must anticipate the demand for electricity and other essential services. In other words, it amounts to an investment gamble.

I am in full agreement with the writer when he says, "When in doubt — delay", especially if he is armed with the reserve of equipment and material, and the necessary borrowing powers to effect extensions at a short time.

But how often is that the case?

We must further ask "Is this a wise policy?" Is this a reply to industrial areas as well? The author has only referred to domestic consumers — or I presumed he did — but I do not think that his industrial consumers would take up such a placid attitude. More so if they are aware that he took that investment gamble with open eyes. Continuity of supply is of the utmost importance to the industrial consumer.

Then we come to self-financing. Revenue producing accounts pay interest (or they should) in your self-financing schemes. It is normal that where you establish the Revolving Fund or the Capital Development Fund, as we have in the Transvaal, that Revenue producing accounts do pay, but non-revenue producing accounts don't. They benefit from that.

The electrical undertaking like Pretoria would require very large appropriations from revenue to investments in such a fund. One is inevitably led to the conclusion that in local government it is extremely difficult to divorce one department from the whole organisation. The electrical department belongs to the ratepayer, and it must be conducted in their interest.

The ratepayers guarantee the indebtedness which is usually stated in a figure of so many rand per capita, which reminds me of the following story.

An American father asked to see his new-born son. He was shown a row of babies all crying, and he asked the nurse, "Why are they crying?" and she said, "Well, if you were just born a few hours ago, you have no clothes to wear, you are out of work, and the government tells you you owe them 1,700 dollars, you'd be bawling too, wouldn't you?"

Mr. President, I take this opportunity of thanking Mr. de Jager for giving us his very interesting paper on economics.

Thank you very much.

THE PRESIDENT: Thank you Mr. van der Walt. We will now adjourn gentlemen, but before you go there are a few announcements.

(THE SECRETARY made the Convention Announcements.)

CONVENTION ADJOURNED FOR LUNCHEON.

## CONTRIBUTION TO MR. VAN SCHALKWYK'S PAPER by E. B. MARTIN.

Under Section 2.3., the author compares steel, aluminium and copper conductors for short spur lines. He reaches the conclusion that galvanised steel is the lowest in first cost.

This is perfectly correct, but I would like to point out that standard 6-aluminium over 1-steel A.C.S.R. has been used in this comparison. One of the lesser known advantages of using a composite conductor such as A.C.S.R. is that the proportions of steel and aluminium can be varied, giving conductors of similar size but of varying mechanical and electrical characteristics. Thus, on a short spur line, where the load is small, mechanical strength is more important than electrical conductivity, and unusual strandings of A.C.S.R. are commonly used for such lines. These conductors have a central wire of steel but instead of having six aluminium wires in the outer layer, as with conventional conductors, each alternate aluminium wire is replaced with steel. The stranding thus becomes 3-aluminium plus 4-steel. These conductors have very high mechanical strength as 90-ton quality steel is still used and they also have adequate electrical conductivity to allow for possible future increases in load.

In the table below I have compared aluminium and copper conductors in four groups, each having approximately the same resistance per mile and in the last two groups I have also included galvanised steel wire.

The following comments relate to each group:—

*Group A*:

These conductors are of approximately .02 sq. inch copper equivalent and both are of the conventional stranding. The high strength and low cost of A.C.S.R. is well illustrated.

*Group B*:

This is a comparison with No. 8 solid copper which is the smallest size of copper permitted for overhead line construction. The 6/1 stranding A.C.S.R. is of comparable strength and although the resistance is somewhat greater than of copper, this is not important as the comparison is being made primarily on strength. The cost of this A.C.S.R. is less than half that of the minimum strength of copper conductor.

*Group C*:

Here the comparison is made with a fairly large size of stranded steel conductor such as is used for farm lines. It will be seen that by making use of a ¼ stranding A.C.S.R. having high tensile steel strands and high conductivity aluminium strands, it is possible to obtain an A.C.S.R. having almost the same strength as the steel conductor but costing only fractionally more and yet having about one quarter of the resistance. While it may be argued that low resistance is not necessary for the load envisaged, it should be remembered that this can be obtained at an almost negligible increase in cost.

*Group D*:

The comparison is based on a small, solid steel conductor as mentioned by the author. While it is not possible to obtain an A.C.S.R. of comparitive cost, even by using ¼ stranding, it should be pointed out that the difference is only about R10.00 per mile and that there is a five-fold reduction in resistance which in turn could mean a five-fold increase in load without modifying the line at some future date.

During the discussion on the paper, Mr. Lombard remarked that, while there was an appreciable saving in using aluminium in the larger sizes, this disappeared with small conductors. This, I feel, is only partly correct. It will be seen from my table that the cost difference between A.C.S.R. and copper is reduced as the conductors become smaller until, in the case of Group D, there is in effect no difference at all. However, it must be remembered that the copper conductors shown in Group D as well as in Group C have low breaking loads and are not permitted for overhead line construction, while the breaking loads of the equivalent A.C.S.R. are well above the minimum figure.

## WRITTEN CONTRIBUTION TO MR. A. P. VAN SCHALKWYK'S PAPER by Mr. R. J. G. STANTON

With regard to the paper presented by Mr. A. P. van Schalkwyk of Bloemfontein on the aspects of 11 kV overhead reticulation, I would like to congratulate Mr. van Schalkwyk on the presentation of his paper which is most interesting, and should be of great value to towns contemplating rural electrification.

The paper is particularly interesting to me personally, as I was associated with the erection of the first rural schemes in Bloemfontein in 1946, and naturally it is very heartening to know that the system has worked successfully for 17 years and the design appears to be very sound.

During the past five years a fair amount of rural electrification has taken place in and around Ndola, and several types of construction have been tried, as the area is subject to severe lightning storms during the rainy season, and the best type of line is naturally the one which gives the least amount of trouble under these conditions. One fairly long line of approximately 9 miles was erected using suspension insulators on steel poles and having an earth wire above the line for lightning protection, but it has been found that during lightning storms this line was very prone to lightning surges, and has, in fact, given more trouble than any of the other lines which have since been erected using an all insulated construction.

Our standard voltage of supply to the rural areas has been fixed at 11 kV which has proved to be the most economical voltage, as our furthest consumers are approximately 10 miles from the Power Station.

Although we are adjacent to the Copper Mines where one would normally think that all conductors would be made of Copper, we have found that considerable saving can be effected by the use of aluminium conductors, and consequently we have now standardised on this type of material. There is a tremendous amount of theft of copper wire in this part of the country, and the use of aluminium has overcome most of these troubles.

| Group | Stranding Conductor | Resistance ohms/mile | Breaking Load lbs. | Weight lbs./mile | Approx. Cost per mile |
|---|---|---|---|---|---|
| A | 6/1 x .083 ACSR | 2.19 | 1695 | 300 | R 66 |
| | 7 x .064 Copper | 1.98 | 1372 | 462 | R123 |
| B | 6/1 x .0661 ACSR | 3.46 | 1165 | 190 | R 42.8 |
| | No. 8 solid copper | 2.16 | 1237 | 409 | R111.5 |
| C | ¼ x .0661 ACSR | 6.92 | 2620 | 311 | R 35.4 |
| | No. 12 solid copper | 5.10 | 550* | 173 | R 47.1 |
| | 7 x 14 Swg stranded steel | 24.00 | 2450 | 644 | R 33.0 |
| D | ¼ x .059 ACSR | 8.70 | 2100 | 247 | R 28.0 |
| | No. 14 solid copper | 8.62 | 330 | 102 | R 28.6 |
| | No. 8 solid steel | 42.00 | 1800 | 365 | R 18.5 |

* Not permitted for overhead line construction due to low breaking load.

Initially we went to a lot of trouble and expense in trying to avoid aluminium corrosion problems, particularly where dissimilar metal connections are necessary, and we have found that during the past five years no sign of corrosion has taken place at any of these connections. Consequently we have now modified our methods of connections to save as much money as possible by avoiding the use of expensive line taps. Where it is possible we have used the Noral crimping line tap which is applied by hand, using a modified type of bolt cropper, and these joints have given no trouble whatsoever. With regard to mid-span connectors, we are using the automatic type with spring loaded cones and do not use twisted joints at all.

Due to the very high cost of transporting materials to Northern Rhodesia, we have found that it is virtually impossible to erect cheap rural lines using steel or concrete poles, and consequently have standardised on the use of pre-impregnated wooden poles to S.A.B.S. 339/1951. We have had no trouble whatsoever with poles of this type and feel sure that a minimum of 25 years life can be expected although the area is heavily infested with termites.

One of the biggest problems to be faced in using wooden poles is the fire hazard, as the bush is always burnt during the dry season and it is essential to clear a path along the entire route of the overhead line long before the grass is dry. Generally speaking, the overhead lines are constructed similar to B.S. 1320-1946 except that wooden cross arms are not used due to the fact that we have not been successful in obtaining timber which does not warp and twist after it has been erected.

Pin insulated lines are favoured using higher flash-overs than those in Bloemfontein, and the minimum of 85 kV dry has been laid down, and has proved most successful during the past four stormy seasons. We have not experienced any punctured insulators at all during the past 5 years.

In all cases where the earth is of sufficient low conductivity to allow earth leakages equipment to operate we have dispensed with a continuous earth wire, and these lines have given the least amount of trouble during the stormy seasons.

A considerable amount of combined construction has been erected throughout the various African Housing Areas, and here we use the method of a split neutral which forms part of the cradle and erected immediately below the 11 kV lines and protects the low tension conductors below. The split neutral is earthed at each third or fourth pole by means of an 8 gauge galvanised wire stapled to the pole and wound around have been erected, 8 ft. extensible ground rods have been the butt, and underneath the pole forming a spiral. The earth wire is securely bonded to the split neutrals.

At positions where Transformers and Lightning Arrestors have been erected, 8 ft. extensible ground rods have been driven into the earth which have proved more successful than the burying of plates or fabricated "baskets".

The rural overhead lines are all controlled by the use of auto reclosers and have incorporated a separate sensitive earth leakage relay, which, after all, is the most important part of the protection of the system. But for all other tee-offs and transformer positions drop-out fuses are used and graded according to the load required.

One of the major problems in Northern Rhodesia of erecting any rural lines is the fact that a lot of money has to be spent on clearing anthills to maintain the required ground clearances, and the heavy bush has to be cleared on either side of the line to avoid trees from falling on to the conductors during storms. We find that this preparatory work can cost up to 40% of the cost of erecting the line.

In conclusion I must again mention the fact that the Drawings submitted by Mr. van Schalkwyk will undoubtedly prove very useful to any Engineers who anticipate rural electrification, and probably one day a standard set of standard conditions similar to B.S.1320 could be produced and published in Southern Africa incorporating all the useful data which has been gained in practical experience, and would be invaluable to the Electrical Engineers.

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# MEMBERS FORUM

*Quizmaster*: Mr. R. W. BARTON (Welkom).

*Question* 1: It appears that some local authorities in the Republic are experiencing difficulty in obtaining competent staff for the running of their power stations. Guidance is requested from the Forum on this subject.

Mr. K. ADAMS (Johannesburg) felt that the solution to this problem was to raise the salary of the Town Clerk sufficiently to allow adequate prospects of a financially satisfactory career to all employees in the service of the municipality.

*Question* 15: In the United States of America the National Economic Committee investigated the relative efficiency of large, medium-sized and small business. One conclusion reached from the large sample investigated was that a business having a capital on the average of 500,000 dollars showed lower costs of production and higher dividends to shareholders than those having a capital of 5,000,000 dollars and infinitely better results than those of 50,000,000 dollars capital. Is there any lesson to be learnt from this sub-division of the organisational structure of the electricity supply industry in South Africa?

Mr. H. PRINS (Johannesburg) was of the opinion that considerably more information would have to be given about these relatively small so-called efficient businesses before any conclusions could be drawn from such a brief statement. There were the questions of stability in times of depression, growth in relation to population growth, provision to cover wasting assets and depreciation, social security for employees, long term after-sales service, contribution to research, etc., all of which were probably lacking to some degree in smaller firms. If the statements in the question were true, he wondered why so many notable firms in the engineering industry were amalgamating.

Mr. K. ADAMS (Johannesburg) supported the idea that smaller business firms were more efficient and cited the case of British Railways which were being drastically pruned in the interests of efficiency.

Mr. W. H. MILTON (Escom) pointed out the danger in applying a conclusion reached along a specific line of investigation to a completely different problem. The reports mentioned in the question excluded monopolies such as the electricity supply industry and the results could therefore not be applied to this industry.

Mr. J. MITCHELL (Kitwe) told a story which amusingly illustrated the flexibility of economic theory and its disconcerting tendency to produce a different answer every time the question was put.

*Question* 9: At one time is was usual to apply different tariffs for various uses in order to encourage cooking, heating, and power loads as distinct from lighting.

This has now fallen away but why should it still be considered correct to charge higher rates for business premises than for domestic supplies?

Is it not time now to charge for electricity according to how it is used rather than who it is that uses it?

Mr. G. J. MULLER (Bloemfontein) was positive that domestic consumers were charged less than business consumers because there were more voters in the domestic field.

Mr. KALIL (Bloemfontein) was deeply appreciative of Mr. Muller's remark.

Mnr. E. E. DE VILLIERS (Carletonville) was van mening dat besigheide 'n hoër gehalte van toevoer verlang en daarom moet meer betaal.

Mr. R. SIBSON (Bulawayo) (Hon. Member) said that the practice of charging higher tariffs for business premises was based on the good old railways principle of charging what the traffic will bear. He felt that it was justified since it resulted in an increase of gross sales, which benefited all consumers.

Mr. F. STEVENS (Ladysmith) stated that although this practice was not justified technically, in a commercial sense it was justified, since business concerns virtually re-sold the electricity and reaped a profit on it.

Mr. W. H. MILTON (Escom) pointed out that Escom did not follow the policy of charging what the traffic will bear. He felt that it would be very difficult to justify such differentiation unless one had a directive from some authority outside the monopolistic electricity supply industry, since the latter is not controlled by normal economic pressures.

*Question* 13: What reaction has there been to the paper given by Mr. W. Barnard on the development of single phase H.T. Reticulation for Municipal Townships?

Mr. E. E. DE VILLIERS (Carletonville) claimed that the saving in capital in using this system, compared with the conventional, was considerable, some 20 to 25% with single phase and 35 to 40% with three phase. Carletonville had adopted the system for new townships.

QUIZMASTER said that Welkom had also copied this idea from Johannesburg and had achieved a saving of 29 to 30% over the conventional all-underground system.

Mr. R. W. KANE (Johannesburg) pointed out that when comparing costs one had to take into account who pays for service connections, streetlighting and transformers. In Johannesburg the installation described by Mr. Barnard had cost £162 per stand, compared with the estimated cost of £214 for an equivalent overhead installation.

Mr. R. M. O. SIMPSON (Durban) mentioned that in Durban underground systems had also proved cheaper than overhead when applied to Native or Indian townships with narrow street frontages, the service cables being looped from cottage to cottage along the back boundary.

QUIZMASTER felt that Mr. Simpson's remarks would be useful to those having difficulty in persuading the Department of Bantu Administration and Development to agree to underground installations.

Mr. E. E. DE VILLIERS (Carletonville) said that he had found with this system that three-phase service connections were considerably cheaper than single phase.

Mr. J. MITCHELL (Kitwe) pointed out that in making comparisons, density (number of stands per acre) must be taken into account, and cited a native township near Salisbury where a conventional three phase underground installation cost R140 per house.

Mr. A. P. VAN SCHALKWYK (Bloemfontein) wanted to know what were the limitations of the single-phase system, for instance, in business centres where consumers might want three phase supplies.

Mr. E. E. DE VILLIERS (Carletonville) offered to enlighten Mr. van Schalkwyk privately.

*Question* 12: Have any attempts been made to introduce plastic insulated H.T. Power Cables in the Republic? It is understood that this type of cable is at present being used on the Continent and the U.S.A. up to 15 kV, and in the United Kingdom up to 11kV.

Mr. V. H. WOODS (Vereeniging) said that there was no technical or manufacturing reason to hold back the use of 3.3 kV and 6.6 kV P.V.C. insulated cables, except possibly the lack of a S.A.B.S. Specification. Also, very few cable users had asked for them. With regard to polythene, extrusion presented problems. In view of the extremely high capital cost of the equipment and of the small demand, some years would elapse before high voltage polythene insulated cables could be produced locally.

He mentioned that other synthetic materials were being considered, including 'butav' PCP and 'butav' hypolon. Butyl insulated 11 kV cables were being made locally and interested users would be well advised to consult the cable manufacturers.

Mr. R. M. O. SIMPSON (Durban) agreed that PVC insulated cables were very good, but felt that present methods of jointing and terminating were generally not satisfactory.

Mr. A. C. T. FRANTZ (Cape Town) supported Mr. Simpson's remarks and said that having tried and discarded epoxy resin joints, his Department was still searching for a more satisfactory method than the bitumen joint at present in use. He had recently installed same imported 11kV

polythene insulated aerial cable in a thickly wooded area. The cost was very high.

Cr. V. F. CHECKETTS (Pretoria) said that PVC insulated cables up to 6.6 kV were being made in this country and such cables up to 11kV were possible. Jointing presented no problems, but the technique was entirely different to that used with paper-insulated cables. PVC tapes of special grades were used. Any of the cable manufacturers would be glad to supply detailed information.

QUIZMASTER wanted to know whether there was any satisfactory way of jointing PVC insulated low tension service connection cables to paper-insulated main cables.

Mr. V. F. CHECKETTS (Pretoria) acknowledged that this was a difficult question but claimed that it could be done with tapes or with epoxy resins. It was, however, not a usual procedure, and certainly not possible with high voltage cables.

Mr. J. MITCHELL (Hon. Member) claimed that in his area hundreds of epoxy resin (polyester) joints had been made and had so far given no trouble.

Mr. McNEILL (Stanger) was very surprised to learn of the high cost of the 11kV plastic-insulated cable purchased by Mr. Frantz, as he had himself obtained a length of .0225 sq. ins. cross-section for R1.50 per foot.

*Question* 8: What is the normally recognised demand in kilowatts for a house when an electricity network has to be planned?

Mr. F. STEVENS (Ladysmith) submitted actual figures obtained in Ladysmith of after diversity maximum demand. They varied from 2.8 to 4 kW in winter, and from 2.1 to 2.76 kW in summer. Load control was exercised on water heaters.

Mr. DE JAGER (Pretoria) quoted test results for all-electric houses in winter from Pretoria, which ranged from 2kW for small houses to 6 kW for large houses. Day-to-day variation was approximately 20%.

Mr. A. Q. HARVEY (Warmbaths) regarded three Kilowatts as an average figure.

Mr. VAN SCHALKWYK (Bloemfontein) listed the following after diversity maximum demand figures obtained in Bloemfontein for various classes of domestic consumers:-

| | |
|---|---|
| Sub-economic scheme | 1.96 kW |
| Housing scheme for elderly persons | 2.1 kW |
| Railway housing scheme | 2.96 kW |
| National Housing economic scheme | 3.22 kW |
| Private, middle-class housing | 3.48 kW |
| Private, upper-class housing | 5.70 kW |

QUIZMASTER mentioned that a certain residential township being established in the U.S.A. had been designed for an after-diversity maximum demand of 25 kW per stand.

Mnr. E. E. DE VILLIERS (Carletonville) het gevra tot watter mate die oorvrag kapasiteit van toerusting in ag geneem is, deur die gebruik van gemiddelde syfers in plek van die maksimum. Hy het gevoel dat dit belangrik is om gebruik te maak van die hoër kapasiteit van transformators in wintertye, en sodoende kapital koste te sny.

Mr. J. L. VAN DER WALT (Vereeniging) pointed out that statistics could be misleading unless all factors were taken into account.

Mr. W. H. MILTON (Escom) said that it was essential to plan for future requirements. Escom were experiencing after-diversity maximum demand figures which varied from 2 to 6 kW but were planning for at least 8 kW per consumer. He pointed out that geographic considerations affect the issue, e.g. consumers in areas where coal was expensive would tend to have higher maximum demands.

Mr. R. M. O. SIMPSON (Durban) said that air-conditioning was a factor which would have to be considered in domestic loading in the future. Its impact in commercial fields had been dramatic.

Mr. R. W. KANE (Johannesburg) agreed that planning for the future was essential, even if it only extended to transformer sites.

*Question* 2: Is the Wiremen's and Contractors' Act necessary, and does it serve any purpose?

Mr. W. H. MILTON (ESCOM) said that the agitation for the Act dated back to the days of the late George Swingler who had found a very real need for it.

Mr. J. L. VAN DER WALT (Vereeniging) felt that the Act was very necessary and quoted the case of a house in Krugersdorp where all fittings had been installed and the contractor had been paid, after which it was found that not a scrap of wire had been drawn into the tubes.

Mr. R. W. KANE (Johannesburg) personally thought that the mere registration of contractors and wiremen was unnecessary, but that other parts of the Act, which empowered the supplier to control unsafe wiring were vitally necessary.

Mr. J. McGIBBON (Carletonville) as the result of his experience in Ndola, felt strongly that control should be exercised over electrical wiremen.

*Question* 14: The short circuit ratings of paper insulated power cables is generally determined by the temperature rise of the cable conductor. The figure which has so far been accepted as a safe maximum temperature is 120 degrees centigrade which was originally recommended by S. W. Melson of the C.M.A. in his discussion on the I.E.E. paper "Safeguards Against Interruption of Supply" (Journal I.E.E.—1938, 82, P 479).

Considerable savings are possible if this temperature barrier can be increased. Distribution Engineers in Britain are in favour of the barrier being increased to 160 degrees Centigrade especially now that the results of the extensive tests carried out by Gosland and Parr under the instructions of the E.R.A. have become known (E.R.A.—Report, reference F/T 195: 1960).

What are the comments, especially from the point of view of the cable manufacturers?

Mr. WOODS (Vereniging) warned that it would be extremely dangerous to accept such an up-rating based on conductor temperature alone. Many other factors, such as electro-magnetic forces tending to cause disruption, and melting of the lead sheath due to passage of fault current had to be considered. Insufficient reliable information about these factors was available at the present time. The safety margin inherent in the 120 degrees Centigrade limit had hitherto taken care of these factors.

*Question* 10: What experience have members of successfully dealing with the problem of fierce dogs in association with nervous meter-readers?

Mr. J. I. INGLIS (Pietersburg) remarked that persons who kept dangerous dogs could be compelled to place their meters in a position of safe accessibility.

*Question* 3: Doubts have been expressed about the economics of installing high-frequency-responsive, remotely-operated relays for the switching off and on of load as a means of reducing system load peaks and for the control of other loads including streetlighting. Is not this system being over-rated and is it really worth the investment? Would it not be better to install low-cost, peak-load generating plant to deal with system peaks?

Mr. J. MITCHELL (Kitwe) claimed that the cost of ripple control plant per kilowatt shed was only half that of generating plant and therefore would normally be an economic proposition. However, if the electricity supply was derived from a nation-wide grid system, planning was necessary at national level to ensure that the installation of the ripple plant did in fact result in a reduction in generating plant.

Mr. C. J. MULLER (Bloemfontein) pointed out that the reduction in maximum demand achieved by the installation of ripple control benefited the distribution system as well as the generating plant.

Mr. YODAIKEN (Que Que) confirmed Mr. Mitchell's statement regarding costs and resultant savings, particularly when restoring supply after a breakdown. He felt strongly that the benefit of the savings should be given to the consumers whose apparatus had been used to that effect.

## ANNUAL REPORT OF THE SECRETARIES

To the President and Members of the Association.

Mr. President, Gentlemen,

It gives me great pleasure to submit to you the Annual Report of your Association together with the Revenue and Expenditure Account and Balance Sheet for the financial year ended 28th February, 1963.

OBITUARY:

We have received no intimation of the passing of any members of the Association during the year under review but notification has been received of the death of Mr. P. Atkins who passed away on the 20th October, 1960. Mr. Atkins was Secretary/Treasurer of the Association from 1927 to 1929.

THIRTY-SIXTH CONVENTION:

The 36th Convention of the Association was held in East London from Tuesday, 8th May to Friday, 11th May, 1962. Delegates were welcomed to East London by his worship the Mayor, Councillor H. C. K. Roberts and the Convention proceedings were officially opened by Prof. A. F. P. J. Heydorn of the Electricity Control Board. The total attendance of members, delegates, representatives, officials, visitors and ladies numbered 408.

On behalf of the President, members of the Association and all others who attended the Convention, it gives me great pleasure to record our appreciation to His Worship the Mayor and City Councillors of East London for the hospitality extended by them. I also wish to extend sincere thanks to the City Council and to the various officials thereof for their willing and valued assistance in the organisation of the Convention. To the President it gives me great pleasure to place on record the appreciation of all concerned for the dignified and efficient discharge of his duties. Grateful thanks are also extended to Mrs. Giles for her support and assistance.

The first paper presented to the Convention was "Some Aspects of Electricity Supply Economics" by Prof. Hugh H. Smith, M.Comm., Ph.D., of Rhodes University. This paper dealt in many respects with economic aspects of electricity undertakings which had been discussed to a degree at earlier Conventions, but had not been subjected to full analysis. The paper provided a great deal of thought-provoking information for Electrical Engineers, Councillors, Town and City Treasurers and indeed all others concerned with the provision of Electricity Supplies.

The next paper presented was "The Effect of Standardisation on the Economy of Electricity Supply" by Mr. A. A. Middlecote, B.Sc.(Eng.), M.(S.A.), I.E.E. This sincerely written paper brought forward lively discussion on an ideal where sacrifice is perhaps sometimes called for on the part of an individual for the common good.

The paper "Electricity Costs and Tariffs" by John H. West, M.B.E., B.A.(Com), M.Econ., F.I.S., Under-Secretary, Ministry of Finance, Federation of Rhodesia and Nyasaland, as a further valuable contribution to the consideration of economic factors in electricity supply.

The Fourth paper "The Development of a Power Station for an Isolated Community" by Y. E. O. Barratt, Electrical Engineer, Queenstown, was a valuable history of an electricity undertaking of a medium size South African town remote from major industrial development.

## JAARVERSLAG VAN DIE SEKRETARISSE

Aan die Voorsitter en Lede van die Vereniging.

Mnr. die Voorsitter en Here,

Dis met groot genoeë dat ek die Jaarverslag van u Vereniging tesame met die Inkomste en Uitgawerekening en Balansstaat vir die boekjaar geëindig 28 Februarie 1963 aan u voorlê.

STERFKENNIS:

Ons het gedurende die jaar onder oorsig geen kennis ontvang van die heengaan van enige lede van die Vereniging nie, dog kennis is wel ontvang van die afsterwe van Mnr. P. Atkins wie op 20 Oktober 1960 oorlede is. Mnr. Atkins was Sekretaris/Tesourier van die Vereniging vanaf 1927 tot 1929.

SES-EN-DERTIGSTE KONVENSIE:

Die 36ste Konvensie van die Vereniging is gehou in Oos-Londen vanaf Dinsdag 8 Mei tot Vrydag 11 Mei 1962. Afgevaardigdes is in Oos-Londen verwelkom deur Sy Edele die Burgemeester Raadslid H. C. K. Roberts en die verrigtinge van die Konvensie is amptelik geopen deur Professor A. F. P. J. Heydorn van die Elektrisiteitsbeheerraad. Die Konvensie is bygewoon deur 408 lede, afgevaardigdes, verteenwoordigers, amptenare, besoekers en dames.

Namens die Voorsitter, lede van die Vereniging en al diegene wie die Konvensie bygewoon het wens ek met genoeë ons waardering uitspreek teenoor Sy Edele die Burgemeester en Stadsraadslede van Oos-Londen vir die gasvryheid aan ons betoon. Ook wil ek ons innige dank uitspreek teenoor die Stadsraad en sy verskeie ampsdraers vir hulle gewillige en gewaardeerde hulp by organisasie van die Konvensie. Namens almal teenwoordig wil ek teenoor die Voorsitter die waardering van alle betrokkenes uitspreek vir die waardige en doeltreffende wyse waarop hy hom van sy taak gekwyt het. Ons hartlike dank gaan ook an Mev. Giles vir haar hulp en bystand.

Die eerste lesing by die Konvensie aangebied was „Some Aspects of Electricity Supply Economics" deur Prof. Hugh H. Smith, M.Comm., Ph.D. van Rhodes Universiteit. Hierdie bydrae het in baie opsigte gegaan oor ekonomiese aspekte van elektrisiteitsondernemings wat tot 'n mate reeds by vroeëre Konvensies bespreek is dog nooit volledig ontleed is nie. Die referaat het 'n groot hoeveelheid inligting tot nadenke verskaf aan Elektriese Ingenieurs, Raadslede, Stadstesouriers en andere wie met die verskaffing van elektrisiteitsvoorrade gemoeid is.

Die volgende onderwerp, „The Effect of Standardisation on the Economy of Electricity Supply" is behandel deur Mnr. A. A. Middlecote, B.Sc.(Ing.), M.(S.A.), I.E.E. Hierdie ernstige verhandeling het lewendige bespreking uitgelok oor 'n ideaal waar dikwels opoffering van 'n enkeling ter bevordering van die gemeenskaplike voordeel geverg word.

Die referaat „Electricity Costs and Tariffs" deur John H. West, M.B.E., B.A.(Com), M.Econ., F.I.S., Ondersekretaris van die Ministerie van Finansies van die Federasie van Rhodesië en Njassaland was 'n verdere waardevolle bydrae tot die oorweging van ekonomiese faktore by elektrisiteitsverskaffing.

Die vierde verhandeling „The Development of a Power Station for an Isolated Community" deur Y. E. O. Barratt, Elektriese Ingenieur van Queenstown was 'n waardevolle geskiedkundige oorsig van die elektrisiteitsonderneming van 'n middelmatige Suid Afrikaanse dorp wat ver van grotere nywerheidsontwikkeling geleë is.

The final paper presented was "Load Factor and Consumer Maximum Demand" by M. P. P. Clarke, B.Sc.(Eng.), Town Electrical Engineer, Somerset East. This paper was well received and, dealing as it did with an ever present problem, evoked interesting discussion.

On this occasion Members' Forum was conducted by Mr. R. W. Barton and many matters of practical interest were discussed. Our thanks are extended to Mr. Barton for undertaking this task.

It was unanimously agreed to accept the invitation received from Margate to hold the 37th Convention in that town.

MEMBERSHIP:

The following new members were elected during the year ended 28th February, 1963.

*Councillor Members*:

Municipal Council of Broken Hill, Northern Rhodesia.
Borough of Dundee.
Municipality of Adelaide.

*Engineer Members*:

H. E. Summers (Bulawayo).
A. D. Kinsman (Durban).
J. D. van Niekerk (Alberton).
T. H. Baillie (Broken Hill).
E. E. Steele (Ndola).
R. J. G. Stanton (Ndola).
E. H. Surtees (Dundee).
M. H. L. Boshoff (Graaff-Reinet).
G. T. Honiball (Windhoek).
D. L. Rishworth (Odendaalsrus).

*Associate Members*:

G. E. H. Jones (Formally Town Electrical Engineer, Mafeking).
A. Rossler (Formally Town Electrical Engineer, Cradock).
S. J. Liebenberg (Department of Bantu Administration and Development).

*Associate*:

G. A. Huysamen (Postmasburg).
F. de Witt (Adelaide).
E. J. Te Brugge (Mafeking).

*Affiliates*:

Rhodesian Congo Border Power Corporation Ltd.
A. Jackson — Consulting Engineer.
African Wire Ropes Limited.
Harold E. Bell (Pty.) Ltd.

The following resignations took place:—

*Councillor Members*:

Rouxville Municipality.

*Affiliates*:

Mouchel and Partners.
General Motors South Africa (Pty.) Limited.
Dr. J. K. Marais.

Comparative membership figures are as follows:—

| | 1961/62 | 1962/63 |
|---|---|---|
| Councillor Members | 125 | 127 |
| Engineer Members | 122 | 121 |
| Honorary Members | 13 | 13 |
| Associate Members | 29 | 33 |
| Associates | 10 | 12 |
| Affiliates | 85 | 87 |

Die laaste referaat was „Load Factor and Consumer Maximum Demand" deur M. P. P. Clarke, B.Sc.(Ing.), Dorps Elektriese Ingenieur van Somerset-Oos. Die verhandeling het 'n goeie ontvangs geniet; aangesien dit gegaan het oor 'n probleem wat altyd op die voorgrond is het dit interessante besprekings uitgelok.

By hierdie geleentheid is die Ledeforum waargeneem deur Mnr. R. W. Barton en baie aangeleenthede van praktiese belang is bespreek. Ons dank gaan aan Mnr. Barton vir hierdie taak wat hy onderneem het.

Eenparig is besluit om Margate se uitnodiging te aanvaar om die 37ste Konvensie aldaar te hou.

LIDMAATSKAP:

Die volgende nuwe lede is verkies gedurende die jaar geëindig 28 Februarie 1963.

*Raad Lede*:

Munisipale Raad van Broken Hill, Noord Rhodesië.
Die Stad Dundee.
Munisipaliteit van Adelaide.

*Ingenieur Lede*:

H. E. Summers (Bulawayo).
A. D. Kinsman (Durban).
J. D. van Niekerk (Alberton).
T. H. Baillie (Broken Hill).
E. E. Steele (Ndola).
R. J. G. Stanton (Ndola).
E. H. Surtees (Dundee).
M. H. L. Boshoff (Graaff-Reinet).
G. T. Honiball (Windhoek).
D. L. Rishworth (Odendaalsrus).

*Verbonde Lede*:

G. E. H. Jones, voorheen Dorps Elektriese Ingenieur, Mafeking.
A. Rossler (Cradock).
S. J. Liebenberg (Departement van Bantoe Administrasie en Ontwikkeling).

*Deelgenote*:

G. A. Huysamen (Postmasburg).
F. de Witt (Adelaide).
E. J. te Brugge (Mafeking).

*Geaffilieerdes*:

Rhodesian Congo Border Power Corporation Ltd.,
A. Jackson, Raadgewende Ingenieur.
African Wire Ropes Limited.
Harold E. Bell (Eins.) Bpk.

Die volgende Bedankings is ontvang:

*Raad Lede*:

Rouxville Munisipaliteit.

*Geaffilieerdes*:

Mouchel en Vennote.
General Motors S.A. (Eins.) Beperk.
Dr. J. K. Marais.

Die vergelykende ledetalsyfer is as volg:

| | 1961/62 | 1962/63 |
|---|---|---|
| Raad Lede | 125 | 127 |
| Ingenieur Lede | 122 | 121 |
| Erelede | 13 | 13 |
| Verbonde Lede | 29 | 33 |
| Deelgenote | 10 | 12 |
| Geaffilieerdes | 85 | 87 |

FINANCE:

Once again I wish to convey sincere thanks to Mr. R. W. Kane as convenor of the Finance Committee of the Association and to Mr. Downey as the second member thereof.

It is also my pleasure to thank the advertisers in the proceedings for their support. It is, however, regretted that the number of advertisers has this year shown a marked decrease, with the result that the cost of publication of the Proceedings to the Association has increased. Should the Affiliates have any suggestions to make in this regard, I can assure them that they would receive very serious consideration.

The Income and Expenditure Account for the year under review and the Balance Sheet as at 28th February, 1963, which are submitted to you reflect an excess of expenditure over income for the year of R1890 (£945). The accumulated funds of the Association now stand at R7487 (£3743). The 1962 Convention was more costly than has been the pattern over recent years, but it is not considered that the position calls for any undue concern.

REGIONAL BRANCHES:

The Regional Branches in the Eastern Cape and Natal continued to function satisfactorily during the year under review.

At the Mid-Year Executive Meeting it was the pleasant task of the Council to welcome to the Association the newly established Highveld Branch. This Branch has taken over the work of the Rand Association of Municipal Electrical Engineers. The latter organisation, whose activities extended over 140 meetings, has been of great assistance to its wide-spread membership, comprising undertakings throughout the Southern Transvaal and Northern Orange Free State as well as even further afield. To those responsible for this work in the past it is desired to record the appreciation of all concerned.

MID-YEAR EXECUTIVE MEETING:

Springs acted as host for the Mid-Year Executive Meeting in 1962. On behalf of the President and Executive Council thanks are conveyed to His Worship the Mayor and Councillors of Springs for the hospitality extended on the occasion of the meeting.

SUB-COMMITTEES AND REPRESENTATIVES:

Once again it is my pleasure to convey the appreciation of the Association to members of the various Sub-Committees and Organisations, for their assistance given unstintingly behind the scenes. Their work is vital not only to member undertakings of the Association but to the community as a whole.

To you, Mr. President, and all members of the Executive Council I express sincere thanks for your assistance and courtesy during the past year.

To the Association and all its Members we extend best wishes for 1963/64.

R. G. EWING,

for Davidson & Ewing (Pty.) Ltd.,
Secretaries.

15th March, 1963.

FINANSIES:

Weereens wil ek my hartlike dank betuig aan Mnr. R. W. Kane, byeenroeper van die Finansiële Komittee van die Vereniging en Mnr. Downey die tweede lid van die komitee. Ek wens ook adverteerders in die verrigtinge vir hulle ondersteuning te bedank. Met spyt word egter opgemerk dat die aantal adverteerders hierdie jaar 'n merkbare afname getoon het met die gevolg dat die publikasiekoste van die verrigtinge vir die Vereniging vermeerder het. Indien geaffilieerdes in hierdie verband enige voorstelle wil doen kan ek hulle verseker dat hulle ons ernstige oorweging sal geniet.

Die Inkoste- en Uitgawerekening vir die jaar in oënskou en die Balansstaat soos op 28 Februarie 1963 wat aan u voorgelê word toon 'n surplus van uitgawes oor inkomste van R1890 (£945) vir die jaar. Die opgehoopte fondse van die Vereniging staan nou op R7487 (£3743). Die 1962 Konvensie het meer gekos as wat gedurende afgelope jare die geval was dog die posisie hoef geen kommer te wek nie.

STREEKSTAKKE:

Die Streekstakke in Oos-Kaapland en Natal het gedurende die jaar in oënskou voortgegaan en op bevredigende wyse gefunksioneer.

Op die Halfjaarlikse Vergadering van die Uitvoerende Komitee het die Raad die nuutgestigte Hoëveld Tak by die Vereniging verwelkom. Hierdie Tak het die werksaamhede van die Randse Vereniging van Elektriese Ingenieurs oorgeneem. Laasgenoemde organisasie se werksaamhede het gestrek oor 140 vergaderings en dit was van groot hulp vir sy wydverspreide lede wat ondernemings dwarsdeur Suid Transvaal, die Oranje Vrystaat en verder ingesluit het. Aan diegene wie vir hierdie werk in die verlede verantwoordelik is wil ons die waardering van almal oordra.

HALFJAARLIKSE UITVOERENDE VERGADERING:

Springs het as gasheer vir die 1962 Halfjaarlikse Uitvoerende Vergaderings opgetree en namens die Voorsitter en die Uitvoerende Raad word ons dank betuig teenoor Sy Edele die Burgemeester en Raadslede van Springs vir hulle gasvryheid by geleentheid van die vergadering.

ONDERKOMITEES EN VERTEENWOORDIGERS:

Weereens is dit my voorreg om die waardering van die Vereniging oor te dra aan die lede van die verskeie Onderkomitees en Organisasies vir die milde hulp wat hulle agter die skerms verleen het. Hulle werk is lewensnoodsaaklik nie slegs vir ondernemings wat lede is van die Vereniging nie maar vir die gemeenskap as 'n geheel.

Aan u, mnr. die Voorsitter en alle lede van die Uitvoerende Raad wens ek my hartlike dank te betuig vir u hulp en hoflikheid gedurende die afgelope jaar.

Aan die Vereniging en al sy Lede word vir 1963/4 die beste toegewens.

R. G. EWING,

Namens Davidson & Ewing (Eins.) Bpk.
Sekretarisse.

15 Maart 1963.

# Association of Municipal Electricity Undertakings of Southern Africa

## BALANCE SHEET — 28th February, 1963.

| 1962 | | £ | | R | |
|---|---|---|---|---|---|
| R9,377 | ACCUMULATED FUNDS | | 3,743 | | 7,487 |
| 8,920 | Balance at 28th February, 1962 | 4,688 | | 9,377 | |
| *457* | *Less*: Excess of Expenditure over Income for the year | 945 | | 1,890 | |
| | PROVISIONS | | 148 | | 297 |
| 167 | Agent's Commission | 58 | | 117 | |
| 164 | Sales Commission | 90 | | 180 | |
| 117 | SUNDRY CREDITORS | | 802 | | 1,603 |
| — | SUBSCRIPTIONS IN ADVANCE | | 6 | | 12 |
| — | GRANT RECEIVED IN ADVANCE FOR MARGATE CONFERENCE | | 250 | | 500 |
| R9,825 | | | £4,949 | | R 9,899 |

| 1962 | | £ | | R | |
|---|---|---|---|---|---|
| 2 | PRESIDENTIAL BADGE Nominal Value | | 1 | | 2 |
| 89 | FURNITURE AND FITTINGS — at cost less depreciation | | 40 | | 80 |
| 7,138 | INVESTMENTS | | 3,726 | | 7,453 |
| 2,000 | 200 6% Permanent Paid Up Class "B" Shares of R10 each, fully paid | 1,000 | | 2,000 | |
| 4,212 | Fixed Deposit | 2,232 | | 4,464 | |
| 926 | Savings Account | 494 | | 989 | |
| 2,345 | DEBTORS | | 1,057 | | 2,114 |
| 140 | PAYMENTS IN ADVANCE | | 96 | | 192 |
| 20 | DEPOSIT Davidson & Ewing (Proprietary) Limited | | 10 | | 20 |
| 91 | CASH AT BANK | | 19 | | 38 |
| R9,825 | | | £4,949 | | R9,899 |

Davidson and Ewing (Proprietary) Limited
per R. G. EWING
Secretaries.

P. A. GILES, President.

Report of the Auditors to the Members of the Association of Municipal Electricity Undertakings of Southern Africa.

We report that we have examined the books, accounts and vouchers of the Association for the year ended 28th February, 1963; we have satisfied ourselves of the existence of the securities and have received all the information and explanations we required. In our opinion the above Balance Sheet is properly drawn up so as to exhibit a true and fair view of the state of the affairs of the Association as at 28th February, 1963, according to the best of our information and the explanations given to us and as shown by the books of the Association.

SAVORY, BRINK, CREMER & CO.,
Chartered Accountants (S.A.), Auditors.

Johannesburg, 29th March, 1963.

## Association of Municipal Electricity Undertakings of Southern Africa

## INCOME and EXPENDITURE ACCOUNT for the year ended 28th February, 1963.

| 1962 | | £ | R |
|---|---|---|---|
| 70 | Audit Fee | 35 | 70 |
| 160 | Bad Debts — Advertising in Proceeding | — | — |
| 37 | Bank Charges | 17 | 34 |
| 2,632 | Convention Expenses | 2,243 | 4,488 |
| 10 | Depreciation — Furniture and Fittings | 5 | 9 |
| 443 | Executive Council Expenses | 435 | 870 |
| 10 | Insurance | 10 | 20 |
| — | Legal Fees | 41 | 82 |
| — | Loss on Sale of Proceedings | 159 | 317 |
| 132 | Postages and Telegrams (General) | 117 | 234 |
| 322 | Printing an dStationery (General) | 173 | 346 |
| 1,800 | Secretarial Fees | 900 | 1,800 |
| 30 | Subscriptions | 15 | 30 |
| 219 | Sundry Expenses | — | — |
| 105 | Sundry Expenses | 45 | 90 |
| — | Flowers | 7 | 15 |
| 457 | Excess of Income over Expenditure transferred to Accumulated Funds | — | — |
| R6,427 | | £4,202 | R8,405 |

| 1962 | | £ | R |
|---|---|---|---|
| 412 | Income from Investments | 223 | 446 |
| 169 | Profit on Sale of Proceedings | — | — |
| 2,278 | Subscriptions and Attendance Fees — Affiliates | 1,210 | 2,421 |
| 3,559 | Subscriptions — Council and Other | 1,819 | 3,637 |
| 9 | Sundry Revenue | — | — |
| — | Bad Debts Recovered | 5 | 11 |
| — | Excess of Expenditure over Income Transferred to Accumulated Funds | 945 | 1,890 |
| R6,427 | | £4,202 | R8,405 |

SCHEDULE 1

| | | | |
|---|---|---|---|
| PROCEEDINGS | | | |
| Advertising (gross) | | 1,173–00 | |
| Sales | | 392–00 | 1,565–00 |
| *Less*: | | | |
| Cost of Printing | | 1,636–31 | |
| Provision for Sales Commission | | 117–30 | |
| Provision for Agents Commission | 180–00 | | |
| *Less*: | | | |
| Overprovided 1962 | 51–70 | | |
| | | 128–30 | |
| | | | 1,881–91 |
| NET LOSS ON SALE OF PROCEEDINGS | | | R316–91 |

# THIRD DAY

*On resuming at* 9.30 *a.m.*

THE PRESIDENT: Good morning, ladies and gentlemen. The first item on the agenda this morning is the Annual Report of the Secretaries. This report is contained in your Agenda. Will Clr. Klopper please speak to this item?

Clr. A. M. L. KLOPPER (Germiston): Mnr. die President, dames en here: Ek dink u sal met my saamstem dat die jaarverslag van ons Sekretarisse 'n baie volledige een is, en ek wil hulle graag namens u bedank vir die nougesette en bekwame wyse waarmee hulle hul pligte gedurende die afgelope jaar uitgevoer het.

Ek twyfel of die meeste van ons besef hoeveel werk daar agter die skerms deur mnr. Ewing en sy personeel uitgevoer moet word, nie net om 'n kongres soos hierdie een te reël nie, maar om die sake en belange van die Vereniging gedurende die jaar te behartig.

Mr. President, in glancing through this report and those of previous years, I noticed that the Municipal Electrical Undertakings' membership of this Association has remained more or less static during the past few years.

There are still many municipal electrical undertakings who have not yet become members of this Association, and I would urge member undertakings (and by this I mean their councillor and engineer representatives), to assist this Association with the recruitment of additional members.

Referring to the Income and Expenditure account, Mr. Ewing has very properly drawn our attention to the fact that there has been an excess of expenditure over income for the year of R1,890. I have no doubt that the Finance Committee and the Executive Council will take suitable steps to ensure that there will not be a further deterioration of our financial position.

Mention was also made in the Annual Report of the decrease in revenue from advertising in the Proceedings, which was partly responsible for the year's deficit, and I sincerely hope that our affiliates will respond to Mr. Ewing's appeal for constructive suggestions in this regard, and support.

Mr. President I now have much pleasure in moving the adoption of the Annual Report of our Secretaries, and the Financial Statement, and I would like to propose a hearty vote of thanks to Mr. Ewing and his staff for the good work that they have done during the past year on behalf of this Association. (Applause.)

Mr. H. T. TURNER (Umtali): Mr. President, if you look at Schedule 1 of the Balance Sheet for the year, you will notice that there is a loss on the sale of the proceedings of R316. Now it does appear that members generally aren't obtaining, and purchasing as many copies of our proceedings as they possibly should do.

As you know, they form a wonderful library of our discussions over the years, and it was felt at the executive meeting

yesterday that members should obtain more of these proceedilngs for distribution to members of their technical staff who would find them of considerable value. If more of our proceedings were sold, it would tend to make up the loss in our advertising, which, as you see, has been referred to in the report.

Other than that, Mr. President, although we had a loss of £945 last year, which might have been due to the rather poor support which members gave to the dinner-dance social functions which were held at East London last year, very possibly with the new arrangements now being tried this year it may be rectified. Nevertheless, the financial position does require some attention, but I would like to thank the Secretaries, and particularly Mr. Kane as Chairman of the Finance Committee for a very excellent report, and I have great pleasure in seconding the proposal for the adoption of this Balance Sheet and Accounts.

THE PRESIDENT: Thank you, Mr. Turner; are there any comments, gentlemen?

Mr. J. E. MITCHELL (Hon. Member): Statements have been made in regard to the financial situation which has arisen during this last year, and I certainly am perturbed at what is happening in regard to the Convention expenses.

In 1954, when it was decided that affiliates should pay fees, we had various ideas of how the Convention should be run. The first time it was run on similar lines to what it is now was at Pretoria in 1955, where the Convention expenses, if I am correct, were about £550 to £600.

The next place was in Salisbury, and the Convention expenses were round about £700. We got perturbed when we found it was £900 in Cape Town in 1958, but unfortunately I haven't the figures with me since then, but I see at Livingstone it was £1316 and it went up another £928 at East London, which seems to me that, as previous speakers have said, something has got to be done in regard to the organisation of these Conventions, to keep these expenses down.

We also had other ideas as to how the Convention should be operated, and I am going to ask the executive to give consideration to something which we have had in mind since 1955, and that is that we should be able to select our own venue irrespective of who the president is. The first time we ever did that was, in fact, in Margate in 1957, but except for Livingstone this year little has been done.

What I would like to suggest is this, that the Executive give consideration to selecting one, or possibly two venues, for the Convention. My own idea would be Durban every year.

There is a reason behind this — it seems to me that it has sufficient hotels to cater for every class, and it has the facilities for the Convention. Not only that, it would mean the Secretaries could contract every year with people who are going to put on the functions required for the Convention.

At one time municipalities contributed larger amounts. I know for instance, in Salisbury it cost something like £2,500 out of the Council's pockets for the Convention.

These contributions from the municipalities where the Conventions have been held are becoming less and less, and there is reason for this because funds and finances are becoming more and more difficult to come by.

But if we had a Convention at one single place we could organise it so that we knew each year exactly what it was going to cost.

It would make it very simple for the secretaries, because the same arrangements could be made year after year, and not only that, it could be the same week every year, and all councillors would know exactly where they were going — councillors could arrange their holidays at the same time as the Conventions, so could engineers.

By doing this they would know, within a few pounds, exactly what the Convention was going to cost each year, and I would like them to give consideration to that.

I would finally say, of course, that I would like to add my congratulations to Dick (everybody knows him as Dick), he started at my Convention in 1956 and he has gone from strength to strength, and he knows this job backwards. He in fact, would welcome an arrangement such as I have suggested.

Not only Mr. Ewing, but you know Mr. Ewing is a farmer as well today — he has a lady called Miss Brewin, (you have seen her name on a lot of papers which have gone out), and I can tell you that she does a good 25 to 30% or even more of the work for this Convention but stays in the background, and stays behind and has to carry on the work in Johannesburg, while Dick is having a good time here. . . .

But he does a wonderful job of work for us, and I hope he will never leave us, even if his dairy farming is making a fortune. Thank you.

Mr. G. J. MULLER (Bloemfontein): Mr. President, I think there is a lot in what Mr. Mitchell has said from the economic point of view, convenience, and so on, but I think quite a number of members I have spoken to are rather strongly in favour of seeing the country while they can, and without spending over-much of their own cash.

This is a point that the executive will have to remember.

The over expenditure arises mainly, I think, from two causes, the lack of advertising, or the falling off in our advertising, and what I consider rather excessive expenditure on our social side.

For a Convention consisting of councillors and engineers, I must admit it is really poor budgeting. We know what we are going to get in the way of revenue roughly, and if we can't make ends meet, then we shouldn't blame the councils for having deficits occasionally.

Mr. President, I think we must really cut our coat according to our cloth, and I think the executive are giving thought to that.

Something that has occurred to me this morning on the advertising side, the proceedings appear once a year, it is circulated amongst councillors and engineers and affiliates, it hasn't got an excessively wide circulation, and adverts there are perhaps very difficult to get from a business angle, because most advertising today is in the hands of advertising agents.

It has occurred to me, Mr. President, that our Agenda might be used for advertising too. That at least gets studied for a whole week, and I think from the advertising angle, although the circulation is admittedly smaller still, but at least it will be seen and studied far more intensively than the proceedings.

Mr. R. L. DE LANGE (East London): Mr. President, I have listened with interest to Mr. Mitchell when he suggested that you should have one centre for your Convention.

I presume that Mr. Mitchell and Mr. Simpson have something very much in common, and who knows, they are thinking of leading the river down to Durban?

Mr. President, may I say that being a member of other municipal organisations, I am a little bit disturbed to see the expense of your organisation; and to be very blunt about the whole matter, Mr. President, don't you think sometimes that too much attention is being paid to the social side?

I feel if the shoe is a bit tight, then we should be prepared to cut down a bit.

I am very happy to see, mind you, as a city councillor where we are usually open to criticism regarding budgeting, that some other organisation is also coming in for a bit of criticism.

The suggestion put forward by Mr. Muller, I think is a very good one. You have many associate members and I think probably the Agenda could be used for a bit of advertising. But regarding the one centre, I think it would be a very big mistake if your executive council does decide to go to one centre.

You have the various larger cities, and I would like to say that we regard East London as the one and only city in South Africa; if it wasn't for East London South Africa couldn't exist.

So Mr. President, although we, in East London, are not very greedy, we wouldn't begrudge that little town of Cape Town or Johannesburg or another one, the opportunity of having a Convention. But I do feel that your executive is quite capable of dealing with this matter, and I suggest a little bit of blunt and frank talk at your executive, to make a few sacrifices, most probably you could cut down on your expenditure.

Thank you.

Mr. R. W. KANE (Johannesburg): I happen to have, very roughly, the costs of running the Annual Conventions and the figures I am going to quote are the total costs borne by the Association in running the Convention in the various towns.

In practically every instance that figure is higher than we get in affiliate fees. This is understandable too, because the actual expenses which the affiliate fees were supposed to meet was, I think, the Thursday night party, to put it very bluntly.

In Pretoria we had £753 in affiliate fees, but the Convention cost us £888. Salisbury we had £958, and the Convention cost the Association £1,175, and so the figure goes, until the last three years. On every occasion the Convention expenses were slightly more, but the last three years they have been considerably more than the main income.

I think there are two answers: one is the level of the entertainment. We have tried to do it this year in a slightly different way — we have tried to reduce that expense. But there is another thought concerning the proceedings.

The sales consist of something in the region of 180 documents. Every member gets two free issues so that 180 or 190 odd that were sold obviously have gone to certain affiliates or municipalities and I am wondering if it wouldn't be wise to perhaps charge every member for at least one copy.

Mr. A. W. LINEKER (Johannesburg): Mr. President, I am a visitor and I have no business to be on my feet in this connection at all, except that I would like to take this opportunity of thanking the A.M.E.U. for inviting me consistently for a considerable number of years now to attend the Convention.

May I suggest that if you are looking for a few pounds, you institute a personal registration fee? It needn't be very much —something of the order of two or three rand.

This is done in operating most other Conventions, and seeing that you get something of the order of 4 to 600 people attending, it should ease your financial position a little, without imposing too much of a strain on those individuals who have the honour of attending your Convention.

THE PRESIDENT: Any further discussion, gentlemen?

Mr. P. J. BOTES (Roodepoort): Mr. President, I am not going to discuss the financial implications, as I think the executive can deal with that. They are quite capable, and there have been some good thoughts expressed here.

I just want to know why the proceedings of the last Convention were so late. I don't know whether that is the usual practice, to get them out a year after the Convention.

THE PRESIDENT: The reason why the proceedings were sent out so late, Mr. Botes, is that these typographical chaps make a lot of mistakes, and after the Agenda had been printed last year, in their very great enthusiasm (they sometimes don't think), they destroyed all the type, and when it came to the printing they had to do it all over again.

Yesterday you suffered another quirk from this typographical error as they call it. I call it a "typographical mistake" Yesterday some people tried to take me to task for taking a vote to continue the proceedings an extra fifteen minutes. If you had read your agenda in both official languages you'd have seen that the Afrikaans version said 12.30 and the English version said 12.00. To split the difference we made it 12.15.

Is there any further discussion on this report?

Then may I take it this report is adopted?

(THE REPORT WAS ADOPTED.)

Thank you. We will make a note of the comments that were made for the next executive meeting. Thank you ladies and gentlemen.

The next item is the appointment of the auditors. I would like to move from the Chair that Messrs. Savory, Brink, Cremer & Co. be appointed. Is there any objection to that? (This was Agreed.)

Well, gentlemen, can we proceed with the reports?

The Annual Report of the Recommendations Committee for New Electrical Commodities.

Does Mr. Lombard want to say anything to this report?

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

This Committee is constituted as follows:—

(1) A.M.E.U. Mr. C. Lombard, Mr. R. W. Barton.
(2) Mr. R. W. Kane.
(3) South African Bureau of Standards: Mr. A. A. Middlecote, Mr. D. I. Jones.
(4) S.A.I.E.E. Wiring Regulations Committee: Mr. J. C. Fraser, Mr. J. T. Williams.
(5) Electricity Supply Commission: Mr. J. W. Barnard, Mr. W. Steen-Stenerson.
(6) Electrical Engineering and Allied Industries Association: Mr. J. Morrison.
(7) Electrical Contractors Association of South Africa: Mr. F. B. Gibson, Mr. J. M. Fraser.
(8) Secretaries: Messrs. Davidson and Ewing (Pty.) Ltd.

The Committee continued with its work and two meetings were held during the year. All recommendations were made known to members through the medium of the news bulletins which, I must remind members, are private and confidential and should be treated as such.

Various applications are still under consideration by the Committee and will be finalised as soon as the applicants have made arrangements to submit samples of the commodities concerned to the S.A. Bureau of Standards for testing purposes and the test reports are available.

In view of the interest taken by members in earth leakage protection, it is worth mentioning that the Committee has recommended two types of single phase core balance earth leakage protection units as suitable for use. No applications for 3 phase earth leakage protection units of the core balance type have so far been submitted to the Committee for consideration.

The Committee does not consider applications in respect of commodities for which a standard specification exists. One application under this category was received during the past year.

It would virtually be impossible for the Committee to carry out its functions without the co-operation of the S.A. Bureau of Standards who carries out tests on commodities where necessary, and it is desired to record our thanks to the Bureau for the assistance and services rendered to the Committee during the past year.

Our thanks are also due to the representatives of the various organisations and bodies who served on the Committee for their kind and valuable assistance.

C. LOMBARD, Convener.

## ANNUAL REPORT: RIGHTS OF SUPPLY SUB-COMMITTEE

The Committee did not meet during the past year.

Several queries in connection with this subject received from other bodies such as the Transvaal Municipal Association and the United Municipal Executive were, however, dealt with by correspondence.

A representative of this Committee also attended a meeting of the United Municipal Executive in Pretoria where this subject was discussed.

C. LOMBARD, Convener.

## JAARVERSLAG VAN DIE KOMITEE BELAS MET AANBEVELINGS OOR NUWE ELEKTRIESE WARE.

Hierdie Komitee is soos volg saamgestel:—

(1) V.M.E.O.: Mr. C. Lombard, Mnr. R. W. Barton.
(2) Mnr. R. W. Kane.
(3) Suid-Afrikaanse Buro vir Standaarde: Mnr. A. A. Middlecote, Mnr. D. I. Jones.
(4) S.A.I.E.I. Bedradingsregulasies-komitee: Mnr. J. C. Fraser, Mnr. J. T. Williams.
(5) Elektrisiteitsvoorsieningskommissie: Mnr. J. W. Barnard, Mnr. W. Steen-Stenerson.
(6) Elektriese Ingenieurswese en Geallieerde Industrië Vereniging: Mnr. J. Morrison.
(7) Elektrotegniese Aannemers Vereniging van Suid-Afrika: Mnr. F. B. Gibson, Mnr. J. M. Fraser.
(8) Sekretarisse: Mnre. Davidson & Ewing (Edms.) Bpk.

Die Komitee het met sy werksaamhede voortgegaan en twee vergaderings is gedurende die jaar gehou. Alle aanbevelings is deur middel van nuusbriewe aan lede bekend gemaak, en ek moet lede weer daarop attend maak dat die nuusbriewe privaat en vertroulik is en moet as sulks behandel word.

Verskeie aansoeke word nog deur die Komitee oorweeg en sal afgehandel word sodra die applikante reëlings getref het om monsters van die betrokke ware aan die Suid-Afrikaanse Buro vir Standaarde vir toetsdoeleindes beskikbaar te stel en sodra die toetsresultate bekend is.

Met die oog op die belangstelling van lede in aardlekbeveiliging mag dit gemeld word dat die Komitee twee tipes enkelfasige kernbalans aardlekbeveiligings-eenhede as geskik vir gebruik aanbeveel het. Dusver is geen aansoeke ten opsigte van 3-fasige aardlekbeveiligings-eenhede van die kernbalans tipe aan die Komitee vir oorweging voorgelê nie.

Die Komitee oorweeg nie aansoeke ten opsigte van ware waarvoor daar reeds 'n standaard spesifikasie neergelê is nie. Een aansoek onder hierdie kategorie is gedurende die afgelope jaar ontvang.

Dit sal vir die Komitee feitlik onmoontlik wees om sy opdragte uit te voer sonder die samewerking van die S.A. Buro vir Standaarde wat, waar nodig, artikels aan toetse onderwerp en ons wil graag ons dank aan die Buro betuig vir die hulp en diens aan die Komitee verleen gedurende die afgelope jaar.

Ons is ook dank verskuldig aan die verteenwoordigers van die verskillende instansies en liggame wat in die Komitee gedien het vir hul vriendelike en gewaardeerde bystand.

C. LOMBARD, Saamroeper.

## JAARVERSLAG: „REG VAN VOORSIENING" ONDERKOMITEE.

Die Komitee het nie gedurende die afgelope jaar vergader nie.

Verskeie navrae in verband met hierdie onderwerp van ander liggame, onder andere die Transvaalse Munisipale Vereniging en die Verenigde Munisipale Bestuur ontvang, is deur middel van korrespondensie afgehandel.

'n Verteenwoordiger van hierdie Komitee het ook 'n vergadering van die Verenigde Munisipale Bestuur in Pretoria bygewoon, waar hierdie onderwerp bespreek is.

C. LOMBARD, Saamroeper.

## ANNUAL REPORT: S.A.I.E.E. COMMITTEE TO REVISE THE CODE OF PRACTICE FOR OVERHEAD LINES FOR CONDITIONS PREVAILING IN SOUTH AFRICA.

As the A.M.E.U. representative on this Committee, I have to report that since the meeting held on the 24th October, 1960, when a Drafting Sub-Committee was appointed, there have been no further developments.

It is understood, however, that a meeting of the Drafting Sub-Committee is to be arranged in the near future.

C. LOMBARD, Representative.

## ANNUAL REPORT: S.A.I.E.E. COMMITTEE: CODE OF PRACTICE FOR SUBSTATIONS.

This Committee is really an Exploratory Committee established for the purpose of ascertaining whether a Code of Practice for Electrical Substations on similar lines to the Institute's Standard Wiring Regulations for the Wiring of Premises and the Code of Practice for Overhead Lines would be welcomed.

As the A.M.E.U. representative on this Committee I have to report that since the first meeting which was held some years ago when a Sub-Committee was appointed to explore the scope of a possible Safety Code relating to substations, there have been no further developments.

The Sub-Committee has not yet reported back to the main Committee, and is unlikely to do so in the near future.

C. LOMBARD, Representative.

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

I have pleasure in presenting the report on the activities of the S.A. Bureau of Standards during the past year:

ELECTRIC ARC WELDING SETS.

The first meeting of the committee was scheduled for March 12, 1963.

ISOLATING TRANSFORMERS.

This specification was finalized at a meeting held on January 29, 1963, and is now being prepared for submission to the Council of the South African Bureau of Standards.

DISTRIBUTION TRANSFORMERS.

The second draft for the main committee is in preparation.

SABS 156, MOULDED-CASE CIRCUIT-BREAKERS.

Several objections to various clauses in the draft specification were received from committee members since the last meeting which was held on November, 26, 1961. These were settled after a lengthy correspondence and the specification is now being submitted to Council for its approval.

SABS 177, PORCELAIN AND TOUGHENED GLASS INSULATORS FOR OVERHEAD POWER LINES.

After the final meeting of the committee held on November 7, 1961, it was considered necessary to revise the range of standard test voltages and the way of conducting high voltage tests. A sub-committee meeting was held on October 12, 1962, and subsequently the final meeting of the committee on

## JAARVERSLAG: S.A.I.E.I.-KOMITEE BELAS MET DIE HERSIENING VAN DIE GEBRUIKSKODE VIR BOGRONDSE GELEIDINGS VIR TOESTANDE SOOS IN SUID-AFRIKA AANGETREF.

In my hoedanigheid as verteenwoordiger op hierdie Komitee moet ek rapporteer dat sedert die vergadering van 24 Oktober 1960 toe 'n Onderkomitee saamgestel is om 'n konsepkode op te stel, daar geen verdere verwikkelings was nie.

Blykbaar sal 'n vergadering van die Onderkomitee binnekort gereël word.

C. LOMBARD, Verteenwoordiger.

## JAARVERSLAG: S.A.I.E.I.-KOMITEE: GEBRUIKSKODE VIR SUBSTASIES.

Eintlik is hierdie Komitee 'n Ondersoekkomitee wat in die lewe geroep is met die doel om vas te stel of 'n Gebruikskode vir Elektriese Substasies soortgelyk aan die Instituut se Standaard Bedradingsregulasies vir die Bedrading van Persele en die Gebruikskode vir Bogrondse Geleidings byval sal vind.

In my hoedanigheid as verteenwoordiger van die V.M.E.O. op hierdie Komitee moet ek rapporteer dat daar sedert die eerste vergadering wat enige jare gelede gehou is, toe 'n Onderkomitee benoem is om 'n moontlike Veiligheidskode met betrekking tot substasies te ondersoek, daar nog geen verdere verwikkelings was nie.

Die Onderkomitee het nog nie aan die Hoofkomitee verslag gedoen nie, en dit is onwaarskynlik dat 'n verslag in die naby toekoms uitgebring sal word.

C. LOMBARD, Verteenwoordiger.

## VERSLAG OOR DIE WERKSAAMHEDE VAN DIE ELEKTROTEGNIESE INGENIEURSONDERAFDELING VAN DIE S.A. BURO VIR STANDAARDE.

Dis vir my aangenaam om die verslag oor die werksaamhede van die S.A. Buro vir Standaarde gedurende die afgelope jaar voor te lê:

ELEKTRIESE VLAMBOOGSWEISTOESTELLE.

Die eerste vergadering van die komitee is belê vir 12 Maart 1963.

ISOLEERTRANSFORMATORS.

Hierdie spesifikasie is tydens 'n vergadering gehou op 29 Januarie 1963 afgerond, en word nou in gereedheid gebring vir voorlegging aan die Raad van die Suid-Afrikaanse Buro vir Standaarde.

DISTRIBUSIETRANSFORMATORS.

Die tweede konsep vir die Hoof-komitee word tans voorberei.

SABS 156, MINIATUURSTROOMVERBREKERS.

Verskeie besware teen verskillende klousules in die konsepspesifikasie is sedert die jongste vergadering wat op 26 November 1961 gehou is van Komitee-lede ontvang. Die besware is na 'n lang briefwisseling uitgestryk en die spesifikasie gaan nou aan die Raad vir goedkeuring voorgelê word.

SABS 177, ISOLATORS VAN PORSELEIN EN VERSTERKTE GLAS VIR BOGRONDSE KRAGLYNE.

Na die finale vergadering van die komitee gehou op 7 November 1961, was dit nodig geag om die omvang van standaardtoetsspannings en die metode om hoogspanningstoetse uit te voer te hersien. 'n Onderkomitee vergadering is op 12 Oktober 1962 gehou en daarna die finale vergadering van die

February 28, 1963. The document was approved and will be prepared for submission to the Council of the South African Bureau of Standards.

SABS 178, STANDARD INSULATORS FOR OVERHEAD POWER LINES.

A sub-committee meeting was held on August 21, 1962, to discuss a standard for clevis and tongue couplings for string insulators. Proposed standard gauges were discussed at the meeting held on February 28, 1963.

SABS 187, HIGH AND LOW VOLTAGE BUSHINGS AND SABS 188, STANDARD BUSHING INSULATORS.

The fourth meeting of the committee was held on December 13, 1962, and the documents are being prepared for overseas comments.

CODE OF PRACTICE FOR THE LIGHTING OF STREETS AND HIGHWAYS.

At the second meeting of the Technical Committee it was decided that a Working Group should prepare a draft code to be submitted to the Main Committee. Using the Dutch Code as a basis for discussion, the Working Group has made considerable progress. The Working Group held its eighth meeting on January 18, 1963.

SAFETY SPECIFICATIONS.

As a result of comments received subsequent to the publishing of the notice in the Government Gazette of December 15, 1961, a meeting of the Main Co-ordinating Committee was held on May 1, 1962, followed by a meeting of the combined cables committe on May 29, 1962. As a result of decisions taken at the above two meetings the ten specifications concerned were amended and have now been re-submitted to the Honourable the Minister of Economic Affairs for promulgation.

EARTH-LEAKAGE PROTECTIVE DEVICES.

The first meeting of the committee was scheduled for March 5, 1963.

COPPER WIRE AND BAR FOR ELECTRICAL CONDUCTORS.

The specification was finalized at a meeting on February 19, 1963, and is now being prepared for submission to the Council of the South African Bureau of Standards.

DOMESTIC ELECTRIC REFRIGERATORS.

On August 28, 1962 the Bureau held an exploratory meeting with manufacturers, users, and other interested bodies to discuss a proposal to prepare a specification for domestic electric refrigerators. The committee decided that such a specification could not be drawn up at present due to the fact that local manufacturers were all manufacturing under licence to overseas principals in different countries whose requirements differed. However, the committee recommended that a code of practice detailing various methods of test, as for instance a standard method for determining cubic capacity, be prepared.

LOW VOLTAGE ISOLATING TRANSFORMERS.

The final meeting of the committee for the above specification was held on January 29, 1963. The document is now being prepared for the Council of the South African Bureau of Standards.

komitee op 28 Februarie 1963. Die dokument is goedgekeur en sal in gereedheid gebring word vir voorlegging aan die Raad van die Suid-Afrikaanse Buro vir Standaarde.

SABS 178, STANDAARD ISOLATORS VIR BOGRONDSE KRAGLYNE.

'n Onderkomiteevergadering is op 21 Augustus 1962 gehou om 'n standaard vir vurk-en-tangkoppelings vir kettingisolators te bespreek. Voorgestelde standaardmate is tydens die vergadering van 28 Februarie 1963 bespreek.

SABS 187, HOOG- EN LAAGSPANNINGSDEURVOERE EN SABS 188, STANDAARD DEURVOERISOLATORS.

Die vierde vergadering van die komitee is op 13 Desember 1962 gehou en die stukke word voorberei vir oorsese kommentaar.

GEBRUIKSKODE VIR DIE BELIGTING VAN STATE EN HOOFWEË.

Tydens die tweede vergadering van die Tegniese Komitee is besluit dat 'n werkgroep 'n konsepkode moet opstel vir voorlegging aan die Hoofkomitee. Met die Hollandse Kode as basis by die besprekings, het die werkgroep reeds aansienlike vordering gemaak. Die werkgroep het hul agste vergadering op 18 Januarie 1963 gehou.

VEILIGHEIDSPESIFIKASIES.

As gevolg van kommentaar wat na die verskyning van die kennisgewing in die Staatskoerant van 15 Desember 1961 ontvang is, is 'n vergadering van die Hoofkoördinansie-komitee op 1 Mei 1962 gehou en daarna 'n vergadering van die gekombineerde kabelskomitee op 29 Mei 1962. Ten gevolge van die besluite by die bovermelde twee vergaderings geneem, is die tien betrokke spesifiaksies gewysig en is dit nou weer by Sy Edele die Minister van Ekonomiese Sake ingedien vir promulgering.

AARDLEKBESKERMINGSAPPARATE.

Die eerste vergadering van die komitee is gereël vir 5 Maart 1963.

KOPERDRAAD EN -STAAF VIR ELEKTRIESE GELEIERS.

Die spesifikasie is op 'n vergadering op 19 Februarie 1963 afgehandel en word nou gereedgemaak vir indiening by die Raad van die Suid-Afrikaanse Buro vir Standaarde.

HUISHOUDELIKE ELEKTRIESE YSKASTE.

Die Buro het op 28 Augustus 1962 'n ondersoekingsvergadering saam met vervaardigers, gebruikers, en ander belanghebbende instansies gehou om 'n voorstel dat 'n spesifikasie vir huishoudelike elektriese yskaste opgestel word te bespreek. Die komitee het besluit dat so 'n spesifikasie nie nou opgestel kan word nie aangesien plaaslike vervaardigers onder lisensie vir oorsese moedermaatskappye in verskillende lande fabriseer, waar die vereistes verskil. Die komitee het egter aanbeveel dat 'n gebruikskode opgestel word wat verskeie toetsmetodes uiteensit, soos byvoorbeeld 'n standaardmetode vir die bepaling van kubieke inhoud.

LAAGSPANNINGS ISOLEERINGSTRANSFORMATORS.

Die finale vergadering van die komitee vir bovermelde spesifikasie is op 29 Januarie 1963 gehou. Die dokument word tans voorberei vir die Raad van die Suid-Afrikaanse Buro vir Standaarde.

SABS 168, MEDIUM VOLTAGE VULCANIZED RUBBER INSULATED CABLES AND FLEXIBLE CORDS FOR POWER AND LIGHTING.

Document embodying the proposals of the Bureau for the revision was sent out during the beginning of December, 1962. Members of the committee were asked to comment in writing. These comments are now being collated preparatory to a meeting being held.

MOTOR VEHICLE CABLES AND WELDING CABLES.

The Council approved the above projects and draft documents have been prepared. These will be sent to members of the committee at a later date.

ELECTROTECHNICAL NOMENCLATURE.

Ten meetings were held during the year, seven on Group 07, Electronics, and three on Group 10, Machines and Transformers. The final meeting of Group 07 was scheduled for April 4, 1963.

In conclusion I would like to thank the officials of the Bureau for their kind assistance during the year and also the engineer members who are serving as representatives of the A.M.E.U. on the various S.A.B.S. technical committees.

C. LOMBARD,
A.M.E.U. Representative
S.A.B.S. Committees.

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SABS 168, MEDIUMSPANNING GEVULKANISEERDE RUBBERGEÏSOLEERDE KABELS EN BUIGBARE KOORDE VIR KRAG EN BELIGTING.

Stukke wat die voorstelle van die Buro vir hersiening behels is gedurende die begin van Desember 1962 uitgestuur. Komitee-lede is om skriftelike kommentaar gevra. Hierdie kommentaar word nou vergelyk in voorbereiding van die hou van 'n vergadering.

MOTORVOERTUIGKABELS EN SWEISKABELS.

Die Raad het die bovermelde projekte goedgekeur en konsepdokumente is opgestel. Dit sal later aan komitee-lede gestuur word.

ELEKTROTEGNIESE NOMENKLATUUR.

Tien vergaderings is gedurende die jaar gehou, sewe oor Groep 07, Elektrotegniek, en drie oor Groep 10, Masjiene en Transformators. Die finale vergadering vir Groep 07 is beplan vir April 1963.

Ten slotte wil ek graag al die amptenare van die Buro bedank vir hul vriendelike hulp gedurende die jaar asook die ingenieurslede wat as verteenwoordigers van die V.M.E.O. op die verskillende SABS tegniese komitees gedien het.

C. LOMBARD,
V.M.E.O. Verteenwoordiger,
S.A.B.S.-Komitees.

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Mr. C. LOMBARD (Germiston): Mr. President, ladies and gentlemen, the report is in front of you, and I have nothing to add.

THE PRESIDENT: Are there any questions? (There were none). I take it this report is accepted, ladies and gentlemen. (The Report was Approved.)

Mr. Lombard can we have the next one, The Annual Report of the Rights of Supply Sub-Committee. (Approved.)

Annual Report of the S.A.I.E.E. Committee to revise the Code of Practice for Overhead Lines for Conditions prevailing in South Africa.

Mr. C. LOMBARD (Germiston): Mr. President, ladies and gentlemen, as you see from the report I couldn't report much progress at the time but I may inform you that we have now had a meeting of the Working Sub-Committee and I think that from now on you'll find that progress will be made.

THE PRESIDENT: Thank you Mr. Lombard. Are there any comments? (The report was approved.)

Annual Report S.A.I.E.E. Committee, Code of Practice for substations.

Mr. C. LOMBARD (Germiston): As you can see from the report there has been no progress in this matter, and I doubt whether there will be any progress in the future. I personally think you can write off this particular committee.

THE PRESIDENT: Thank you Mr. Lombard. Any comments, discussion, questions? (Report Approved.)

Report on the Activities of the Electrical Engineering Division of the S.A. Bureau of Standards.

Mr. C. LOMBARD (Germiston): Mr. President, ladies and gentlemen: I have nothing to add to my report, but perhaps Mr. Middlecote or Mr. Prins will have something to say about it.

THE PRESIDENT: Thank you Mr. Lombard. Ladies and gentlemen, I am not correcting Mr. Lombard in his report on the Code of Practice for the Lighting of Streets and Highways. Mr. Lombard's report was quite correct when it went to print, but since it has gone to print a new recommendation for the Code of Practice for Streets and Highways, by the International Committee of experts of the C.I.E. has been received by the drafting code committee; the drafting code committee has now accepted this report of the Committee of experts from the international body as a basis for considering the South African Code of Practice for the Lighting of Streets and Highways.

Mr. A. A. MIDDLECOTE (S.A.B.S., Pretoria): Mr. President, I would just like to thank the members of the A.M.E.U. for the help they have given the Bureau in the past year in preparing specifications and codes of practice.

However I do feel a bit guilty and so had better cover the hardy annual that comes round half way down page 49 of the report viz. "Safety specifications". Usually I get rather roasted about this, and this year everyone has been kind—they haven't said a word.

I would just like to say that in principle they will definitely be published. The trouble at the moment is that there is a bit of legal argument, with which most of you are familiar. It would appear that we might have to print out in full in the Government Gazette every darn'd word of each specification for it to have any legal standing. We have asked the government law advisers to find out whether we can do it in a shorter way, because as you will realise, once we have it

printed in full, every one of the slightest amendments which we may have in the future, will demand a complete printing of the specification.

Whatever the decision, I feel very confident that within the next two months or so the specification should be declared compulsory, and a period of approximately one year given to people to fall into line.

That is all I have to say, Mr. President. Thank you very much.

THE PRESIDENT: Thank you Mr. Middlecote.

Electrical Wiremen's Registration Board, Annual Report, 1962. Mr. Kane is the representative.

(Mr. Kane had nothing to report, and there were no questions.)

## ELECTRICAL WIREMEN'S REGISTRATION BOARD. ANNUAL REPORT 1962.

The membership of the Board for 1962 was as follows:—

Chairman: Mr. J. J. Groenewald.

Members: Mr. T. D. Bowness
Mr. A. Elisio
Mr. J. M. Fraser
Mr. R. W. Kane
Mr. A. S. Treurnicht.

The Board held 11 meetings and the Examination Sub-Committee met on 3 occasions during the year. 467 applications were considered, 446 were accepted for examination, 2 exempted and 19 deferred or refused. The certificates issued during 1962 were 224 bringing the total since 1940 to 8,066.

There were 4 written examinations with a total of 517 candidates of which 195 were successful in proceeding to the practical test. There were also 10 practical examinations with 367 candidates tested of which 225 were successful.

Certain amendments to the Act proposed by the Board were adopted by the Labour Department and resulted in the passing of the Electrical Wiremen and Contractors Amendment Act No. 48 of 1962 which was fully discused at the 1962 Convention in East London.

During the year no new areas were determined in terms of Section 18 of the Act but a number of applications for such determinations were received. The Board passed a resolution recommending that Section 19 and 20 be applied on a national basis and this will receive attention during 1963.

I am indebted to the Board for the information provided in this report and for permission to submit it to Convention.

R. W. KANE,
Representative.

Mr. C. LOMBARD (Germiston): I wonder if I could raise a point which I think would be of interest to many local authorities.

With the promulgation of Act No. 48 of 1962 (i.e. the Electrical Wiremen's and Contractors Amendment Act), local authorities are now compelled to employ licenced wiremen for carrying out wiring on their own premises, whereas this was previously not necessary if they were supply authorities.

Some local authorities have employed Bantu who have received training at Platplaats in wiring work, the intention being to make it possible for them to gain the necessary experience to become eligible to sit for the examination for the Wiremen's Certificate of Registration.

The question now is whether these Bantu can still be permitted to do wiring work under the supervision of a licensed wireman as trainees.

I seem to remember that trainees were at some time or another permitted to do wiring work on this basis, but I have been unable to find any provision for this in the original Act, or in the Amendment.

The Bantu I am referring to would more or less fall into the same category as the Cott trainees.

Mr. R. W. KANE (Johannesburg): The Act was originally promulgated as No. 20 of 1939 and it was further amended by Act 69 of 1955, Act 35 of 1957 and then finally 48 of 1962.

In 1955 both the definition of an improver was altered, and section 20, which referred to trainees, and also persons receiving training under the Native Building Act 27 of 1951.

There is provision in the complete up-to-date Act with all the amendments, covering Mr. Lombard's query. The only thing I think one must be fairly careful about (and I am speaking from personal experience in this respect), is that the employment of these trainees has the approval of the Labour Department, as regards wages and conditions.

THE PRESIDENT: Thank you, Mr. Kane. Does anybody else wish to speak?

Mr. H. J. GRIPPER (Knysna): Mr. President, just before starting this short comment on the Wiremen's Act, I would like to urge that future Conventions be held somewhere where we can spread our papers out and read them. I know I have got quite a lot of notes here, in the bag under the seat on the floor, but I am not feeling particularly bright at the moment, so I am not going to take up your time by discussing all those notes now, bar this one.

This clause is the one we discussed last year, whereby government buildings, and provincial buildings, were not necessarily to be inspected by the local supply authority.

It wasn't long after we left that Convention that in Knysna we received a letter from the Cape Provincial Administration —indirectly. It was sent to the local school board in the first place, and they passed it on to the Council, asking the Council please to inspect all installations carried out on school buildings in that neighbourhood.

The Council naturally asked my opinion on the matter, because I had reported to them that there was no necessity now to do such inspection, and I got the Council to accept the duty of that inspection, during the pleasure of the Council, and subject to all forms, and formalities being completed and fees, and what-not being paid.

The reason for asking the Council just to accept this duty during their pleasure was that I felt that at this Convention we might get a little more clarity on the subject.

THE PRESIDENT: Thank you Mr. Gripper. Are there any other contributors to this discussion?

Mr. R. W. KANE (Johannesburg): I am trying to look up our bulletin — No. 64, as I think the particular point that Mr. Gripper has raised is covered in that bulletin.

Later on today in his paper Mr. Burger refers to cutting instead of unravelling a knot — Mr. Burger also, in his paper, refers to the fact that he had always been of the opinion that the Act really did apply to Government buildings.

Unfortunately, the law advisers had a totally different opinion, and we were all being faced with the ridiculous situation that when we caught the government bodies in their misdeeds they promptly told us that it had nothing to do with us.

It is mentioned here, "It is emphasised in all such cases the installation whether performed by a contractor or employees of the public service, is not subject to inspection or approval by the supply authority, with one important exception, namely the requirements of Regulation 76 (2) of the Factories Act.

It will be appreciated that where such installations are in fact under the control of a person appointed in terms of para. (a), (b), (c), or (d) of regulation 31 of the Factories Act the production of a certificate will suffice, but in all other cases an inspection and test will be necessary for the requirements of Regulation 76(2) . . . (that is the earthing) . . . of the roofs.

It is believed that Regulation 72(2) itself will be amended to relieve the supply authority of the necessity of checking the earthing on any premises registered as a factory. This is the responsibility falling on the registered user. It will however, be appreciated that all the government and other such departments will be required to notify the supply authority of increased or varied electricity requirements. In practice this may automatically follow for tariff or metering alterations."

It depends on the local conditions — the very people who objected to us interfering in their installations, were the first people to come along and say, "Well, we hope you are going to continue to test."

But in a smaller town — and I think there was a case quoted of a country school — something going wrong with it — what is the local engineer going to do?

I am afraid he has to use his common sense. He might get special permission, as Knysna has got to do certain things, and it is up to his own good judgment.

After all, one doesn't want to see the place shut down for two or three months, until the P.W.D. get down to the place.

On the whole, the Act does not ask you to take that responsibility, and it is what the government departments told us we did not have in any case . . .

THE PRESIDENT: Thank you Mr. Kane. Any other questions, ladies and gentlemen?

Mr. R. L. DE LANGE (East London): Mr. President, I don't know if you noticed in yesterday's press that the whole question of job reservation was now being discussed, and I believe that the wiremen also fall within that category.

As a layman I think this is one of the most important matters on your Agenda. The question of electricity, as we know it, to the layman is naturally very dangerous; and I say with respect to Bantu wiremen, it doesn't just mean that a man can walk in and do the installation; and whilst appreciating the fact that these people will have the training I think that there will be difficulties.

I don't want to go into the question of what is happening locally, in view of the fact of certain discussions going on, as to who is going to do the reticulation or installation of wiring.

We had a question down at East London where there is a native township of approximately 10,000 houses which are going to be built. Now we are going to do the job. Whether the municipality is going to do it, or whether our worthy friends Escom are going to do it is still a matter to be decided upon.

But I think your organisation should take very strong steps to preserve that right — that the wiring is done by first class men.

We know, Mr. President — and I say this with respect — that where you have a very large scheme, such as the one I have just mentioned, it means that a very careful watch will have to be kept on the work being carried out, and therefore I would suggest, in view of this question of job reservation (I don't want to delve into that side this morning), I do feel that your organisation should keep a very close eye on this matter. Thank you.

THE PRESIDENT: Thank you Mr. de Lange.

Mr. R. W. KANE (Johannesburg): I think we are all having the same problem. A very large installation, of course, normally will not be done by the staff of a municipality, unless there is something unusual taking place. It is normally put out to public tender.

But I just want to assure Clr. de Lange that the fact that we were talking about trainees — should be viewed in terms of the equivalent of an apprenticeship.

From the point of job reservation, the Bantu will only be allowed to work in Bantu areas, but to work by himself, he still has to have a Wireman's licence, and take the same test as the European, and until that stage comes he will be working as a trainee under the control of licenced wiremen.

THE PRESIDENT: Thank you Mr. Kane.

Mr. W. H. MILTON (Escom): I just wanted to advise you that from Escom's view we have agreed that we will inspect government installations when called upon to do so, and all our managers have been advised to act accordingly.

We do not undertake wiring work in households, unless it is impossible to obtain a contractor for the job. Those occasions are extremely rare.

All wiring work is done by contractors . Thank you.

THE PRESIDENT: Thank you Mr. Milton.

Mr. J. J. GROENEWALD (Dept. of Labour, Pretoria): Mr. President, I would like, before we go on to the next item, to avail myself of this opportunity of thanking Mr. Kane for his very able representation on the board. I can assure you that your delegate really does justice to your Association.

We have on the board been faced during this past year with implications resulting from the amendments to the Act, and I think that it is largely because of the co-operation that we have had from your Association, through Mr. Kane, that most of these small problems have been settled successfully by the Board.

I would like to endorse what Mr. Kane has said in relation to the standard that is being maintained by the Board in relation to the registration of Bantu electricians.

This point that Mr. de Lange has raised is an important point, but the Board is definitely ensuring that the same standards are being maintained in relation to the native as would apply to the European, i.e. as regards the examination and the practical test.

Mr. F. STEVENS (Ladysmith): Mr. President, I would like to learn if there are other engineers besides myself who are faced with there being too few registered wiremen in their town to cope with the work to be done.

We are continually badgering our contractors to get registered wiremen. They are making a concerted effort to do so but without any success. Consequently we are having to allow men without even provisional registration to operate in our area.

Thank you.

THE PRESIDENT: I think that shortage is not only confined to Ladysmith, Mr. Stevens. The question of supply and demand exists, and if you want more wiremen you must pay them a little more; you'll soon attract them from the larger centres!

Any further discussion on this Report, ladies and gentlemen? (Report Approved.)

At this point I'd like to express my appreciation to both Mr. Lombard and to Mr. Kane for the work they have done for the A.M.E.U. during the past year. You will note also that we are loading Mr. Lombard a little too heavily and I think it will be the executive's duty to try and find some assistance for him in the future.

I would like you to show your appreciation for the work these two gentlemen have done during the past year in the usual way. (Applause.)

I have not been wrong in leaving the last report last, because it appears under the wrong name, ladies and gentlemen.

That report should be under my name i.e. the Report of the S.A. I.E.E. Wiring Regulations Committee. As Chairman, we have a chairman of that committee here, and perhaps he would like to speak to it.

## SOUTH AFRICAN INSTITUTE OF ELECTRICAL ENGINEERS.

## WIRING REGULATIONS COMMITTEE.

During the period under review the Wiring Regulations Committee of the South African Institute of Electrical Engineers have met on three occasions whilst the sub-committees at Natal and Cape Western met once and three times respectively. Apart from an investigation that is proceeding into estimated load and cable ratings the principle business conducted concerned certain revisions that were published in pamphlet form early this year. Since in addition it was necessary to reprint the Afrikaans version the opportunity was taken in the reprint to correct certain errors existing in the 1960 version.

The amended regulations cover briefly, current ratings for armoured p.v.c. cables, mineral insulated metal sheathed cables, underwater lighting, autotransformers, mixed loading on circuits, the use of combined bush and lock nuts and a few other minor amendments mainly for clarification.

J. C. DOWNEY, Representative.

Mr. R. W. KANE (Johannesburg) Thank you Mr. President. I have very little to say about this report. The 1963 amendment to the regulations is available; this has been advertised throughout the country, in the main centres, and it is up to you good people to get a copy and bring the position up to date.

We would like to take the opportunity of asking the Association as a whole — I was rather interested last night listening to all the comments on load tests that have taken place in various centres. I have here, a questionnaire—and I have got the permission of the executive to ask you good people who are interested to take a copy home, and if you can answer these questions I'd like you to do so and send these copies back to me.

It really concerns estimated loading in domestic premises, mainly large blocks of flats.

It isn't everybody throughout the years who have really systematically taken load tests in blocks of flats. Even last night people were talking about maximum demand, ammeters, and these, if used, do not always give anything more than an indication of loading per phase. It is most important that we have the actual true load taken and the conditions in the block of flats.

This afternoon these documents will be available in the foyer for those who want to collect them. Thank you.

THE PRESIDENT: Thank you Mr. Kane. Any discussion, ladies and gentlemen? (Report Approved.) I think there is one other item that Mr. Kane wants to refer to and that is cable specifications.

Mr. R. W. KANE (Johannesburg): Members will remember that last year one or two of us got rather heated about tender conditions, and cable specifications. I know I did, and we will be issuing a bulletin giving all I am going to say, in perhaps better detail and probably clearer, but we have, as an Association, a great deal of variation in the type of tender documents that go out.

Many years ago Mr. Muller (I think in 1959), produced a sample set of tender documents for cable requirements, and the Cable Association have had one or two queries about our methods. I just want to emphasise that first of all, in any complete document of this nature, there is a general set of conditions, then there is a special set of conditions, and further there is the technical set of conditions of the specifications which deals with the size of cable, the type you want, and all the rest of it.

In as far as the general conditions are concerned, some people have their own general conditions, others follow the standard that is laid down by the Institute of Treasurers.

The Treasurer's document is still available. It was our Mr. Eastman who first drafted it, about 1949. It was accepted by the Institute of Treasurers in 1952, and it is still available at 50 cents a copy in Johannesburg, and your bulletin will give you their address.

The second set of conditions is the special conditions, that refer to the basic figures that are quoted for the price of copper, lead, and things like that, and also the date in which the order should be placed, for the final adjustment of the metal variations.

We are suggesting that, first of all, everybody should use this standard set of general conditions issued by the Treasurers,

and secondly, as far as the special conditions are concerned, that everybody in calling for tenders will use a reasonable and sensible basic figure for lead and copper so that all tenderers will quote on the same basis and you have a common basis to work on.

Finally the question of placing the order. Some people use three days after the Council has accepted; some use four days, some use 10 days, some say, "We will tell you that you are going to get the order, but don't place the order for material until we phone you"; in other words they are playing the market as much as they can to their ability, and you even get people saying, "Not the seller's price, but the mean between the buyer and the seller's price on such and such a day following the Council's acceptance of the order," and we are suggesting that you really ask our friends the cable manufacturers to place the order on the selling day following the receipt of the order.

We are going to recommend that there should be standard conditions for their and our sakes, and that will all be in black and white in the bulletin.

THE PRESIDENT: Thank you ladies and gentlemen.

CONVENTION ANNOUNCEMENTS FOLLOWED.

CONVENTION ADJOURNED FOR TEA.

*On resuming after tea.*

THE PRESIDENT: Gentlemen, we will now continue with our delibertaions, and I'll call on Clr. Warman to speak to an item discussed by the Executive.

Clr. T. WARMAN (Durban): Mr. Chairman, I heard this morning Mr. de Lange from East London making some idle boasts about the tourist industry. I believe he represents a little dorp somewhere in the Eastern Cape. Of course, the best that he could do as far as tourism is concerned is to run second to Durban, but jealousy will get him nowhere.

Another field in which Natal is leading the field is dealing as you know with a problem that has exercised the minds of your Executive on a number of occasions, and that is the personal liability of an electrical engineer in charge of an undertaking.

You know, Mr. Chairman, that your Executive referred this to the United Municipal Executive and they took a course which your executive believes to be the right one, and that is they referred us to the legislation as promoted under local government ordinance of Natal, which covers the position admirably.

I would like to comment briefly on what the clauses are appertaining to in the local government ordinance as mentioned above.

First of all it records that by a certain section of the ordinance that officers and servants of the Council or the undertaking, whichever authority it is, are indemnified against any personal action, liability, claim or demand in consequence of any matter or thing undertaken by them under the direction of the city council or the local authority, and most importantly things that are done in good faith.

The main provisions of that Ordinance are given in this Extract from Notice No. 233 published in Natal Provincial Gazette No. 3100/28.6.62, City of Pietermaritzburg.

REGULATION RELATING TO THE INDEMNIFICATION AND LEGAL DEFENCE OF AN OFFICER OR SERVANT OF THE CITY COUNCIL

1. (a) It is recorded that by Section 79 of Ordinance No. 21 of 1942 officers and servants of the Council are indemnified against any personal action, liability, claim or demand in consequence of any matter or thing done by them under the direction of the Council, in good faith, for the purpose of Ordinance No. 21 of 1942 or any by-law in force within the city.

(b) Whenever --

(i) any law imposes upon any officer or servant of the Council, acting in his official capacity, a statutory duty of a personal nature, in the performance of which he is independent of the control of the Council; and

(ii) such officer or servant becomes involved in legal proceedings whether civil or criminal arising out of any matter or thing done or omitted by him in the performance of such statutory duty; and

(iii) such officer or servant has forthwith reported to the head of his department, or, in the case of a head of department to the Town Clerk, in writing, the fact that such legal proceedings have been commenced against him and has furnished such particulars thereof as have been required; and

(iv) the Council has resolved or, in any case of urgency, the Mayor and the chairman of the staff committee have agreed in writing, that, in its or their opinion, the officer or servant concerned acted in good faith and without negligence or foolishness in the performing of the statutory duty in question;

the Council shall be deemed (subject to sub-section (c) thereof) to have indemnified the officer or servant concerned against to have indemnified the officer or servant concerned against any claim or liability which may devolve upon him as a result of such legal proceedings and shall undertake his defence or pay his legal costs therein.

(c) If any officer or servant, in respect of whom the indemnity provided by sub-section (b) is in operation, fails to obey any lawful direction given to him on behalf of the Council in regard to the legal proceedings in which he is involved, such indemnity shall thereupon cease and determine, and the officer or servant concerned shall, on demand, reimburse to the Council the amount of any expenses or other liabilities it may have incurred on his behalf."

So you can see Mr. Chairman that the Ordinance which has been promoted and is embodied in the Local Government Ordinance of Natal, covers fully all the problems that from time to time have arisen and been reported to your Executive.

I think it would be right at this stage to present to the conference the recommendation that the electrical engineers and councillor members go back to their various Councils in an endeavour to promote a similar type of legislation.

THE PRESIDENT: Thank you, Clr. Warman. You will please take note of what Clr. Warman has said, gentlemen.

We will now continue with our proceedings, and it gives me great pleasure to call on Mr. L. J. J. Hutton to present his paper on Meter Reading Methods in Salisbury.

# Meter Reading Methods in Salisbury

by L. J. J. HUTTON
City Treasurer's Department, Salisbury.

## 1. INTRODUCTION

1–1: This paper is a history of meter reading activities in Salisbury since the end of the last war.

It seeks to set out the changes in methods of meter reading which have taken place during the post-war years, giving the reasons for such changes, the adoption of the joint meter reading principle, and outlines the three separate reading methods in use at the present time.

Some aspects of handling meter readings and consumptions to the billing stage are explained, with emphasis on the importance that is attached to strict control of reading programmes when a cyclic billing process is employed.

Reference is also made to the manifold duties so closely akin to meter reading itself which have become the responsibility of the Joint Meter Reading Branch throughout the years.

1–2: The City Council is responsible for the metered supply of electricity within the Municipal Area and to a Licensed Area of Supply covering approximately 600 square miles outside the City Limits. It is also responsible for the supply of water to individual consumers in the Municipal Area and in bulk to seven Town Management Boards, in addition to several private townships which are situated in peri-urban areas not yet under the jurisdiction of a local authority.

1–3: In most instances where meter reading activities are discussed in this paper the meters concerned can be water and/or electricity, but wherever figures are quoted they refer, in all instances, to electricity only.

## 2. IMMEDIATE POST-WAR YEARS

2–1: At the end of 1945 Salisbury had 5,618 electricity consumers; of these 4,253 were inside the Municipal Area and the remaining 1,365 were situated in the Licensed Area of Supply.

2–2: An arrangement of convenience then existed whereby the City Engineer's Department was responsible for the reading of all water and electricity meters in the Municipal Area, with the exception of the then few maximum demand electricity meters which were read by the Electricity Department, whilst all electricity meters in the Licensed Area of Supply were read by the latter department.

2–3: Meter readings taken by the two departments were submitted to the Treasury which prepared the relevant accounts. Instructions from consumers for special meter readings on the disconnection and reconnection of supply were also received by the Treasury and transmitted to the Department responsible for meter reading in that particular area.

2–4: Consumers' complaints regarding misreadings were handled similarly by the Treasury, which initiated instructions for disconnection of supply on non-payment of accounts.

2–5: The whole area of supply was divided into six geographical zones which formed the main basis for accounting control. These zones were divided, in turn, into meter reading routes. Separate meter books, in which was recorded the basic data of each consumer, were maintained for each meter reading route.

2–6: Meter Readers were required to enter the current reading and deduct the previous reading to ascertain consumption. The same details were entered on a record card retained at the premises so that the consumer could, if he wished, verify the consumption charged. These entries also furnished proof that premises had been visited, instead of meters being "read" in the comfort of a local bar or the house of some "fair lady" consumer, as was found to be the practice on more than one occasion.

2–7: On completion of each meter reading route the meter book was passed to the Treasury for checking and processing. This involved a somewhat laborious process of transcribing consumptions to large schedules, which had been prepared previously from the meter books. The units consumed were then analysed into the appropriate tariff rates, and the extensions calculated by comptometer operators. Account cards, mechanically addressed in the same order as the meter books, were completed manually, and after being balanced to the schedules, were used as a posting medium to the manual ledgers. All accounts were despatched at the end of each month, and were due and payable by the 15th of the following month. Except for the account addressing process, which was also used to head meter book folios and consumer's record cards, the accounting system was manual.

2–8: Despite the wide distribution of responsibility the arrangement worked quite well on the meter reading side; the organisation was flexible and any delays in meter reading were easily absorbed and caused little disruption. However, many difficulties were encountered regularly in the field of supplier-consumer relations, as all enquiries, complaints and instructions from the public had first to be directed to the Treasury and then transmitted to the Department concerned for action and return. There was no other suitable arrangement practicable as, in the majority of cases, representations by a consumer related to his account, and it would have imposed unnecessary inconvenience to direct him to another Department.

2–9: Whilst this system could be maintained reasonably well with the then existing number of consumers, statistics of immigration and the gradual step-up of building operations foreshadowed a considerable rate of growth, and it was obvious that a different form of control would soon have to be introduced.

## 3. THE FIRST IMPACT OF GROWTH

3–1: By the end of 1949 the number of consumers totalled 8,774, a gain of more than 3,000 in little less than four years.

Peri-Urban development had risen considerably and the number of consumers in the Licensed Area of Supply had nearly doubled from 1,365 in 1945 to 2,657 in 1949.

3–2: By June 1950, the total number of consumers exceeded 10,000 of which 6,683 were in the City and 3,552 in the Licensed Area of Supply.

3–3: This rapid rate of growth quickly exposed defects in the tripartite control of meter reading, particularly in the field of public relations It was not always possible to satisfy immediately a consumer's enquiry or complaint, although he considered his enquiry or complaint to be of such importance, that it required urgent and special attention.

3–4: In addition, there had been little opportunity to arrange meter reading routes in advance, so that new connections would fall into their correct positions in the meter books. This period was still prior to the days of large building projects in planned townships and, in consequence, development, particularly in the Licensed Area of Supply had, as yet, no fixed pattern. Government policy only allowed sub-division to small building lots when a piped water supply was available, this development was not orderly and caused a sporadic demand for electricity connections over a wide area.

To those who have not been closely concerned with the organisation of meter reading, it might be difficult to appreciate fully the complex problems which were being encountered at this stage. Efforts to regularise meter reading routes, the very foundation of meter reading, were frustrated regularly by the installation of new electricity connections, causing thereby wastage of transport, and labour. By this time delays in the reading programme were seriously affecting the accounting procedure, but, most important of all, there was a deterioration in public relations which was caused by the Department concerned directly with the public in the matter of their accounts being unable to produce prompt and satisfactory answers to enquiries and complaints.

3–6: Unfortunately, as so often happens, an ever increasing work-flow brought pressure and unusual demands to bear on organisations and staff alike, so that departmental staff relations became severely strained, thereby inhibiting effective control over what had become a cumbersome, inefficient and uneconomical system.

## 4. PROGRESSIVE ACCOUNT BILLING ON THE INTRODUCTION OF PUNCH CARD ACCOUNTING

4–1: In the early part of 1950, a survey of the possibilities of introducing a Punched Card Accounting System in the Treasury was completed, which had a considerable bearing on future developments in the organisation of meter reading.

4–2: Treasury functions had not reached the stage where large machines could be employed economically, and it was decided that a Junior Tabulator using 38 column cards would be sufficient. This prevented the full mechanisation of electricity accounting, as only the actual billing process could be carried out with 38 column cards; consumptions still had to be processed manually to the stage of calculating charges, after which the machines printed the accounts.

4–3: Inherent in the mechanisation programme was the necessity for a cyclic billing process which, naturally, had a considerable effect in the meter reading field.

4–4: The nature of the Punched Card System required all information to be coded, and a means of identifying each particular consumer's account had to be devised. Stand numbers were disregarded as they were duplicated in various parts of the City and Suburbs, and the complicated description of progressive sub-divisions prevente simple property coding.

4–5: It was eventually decided that the controlling factor must be a code reference per consumer, made up as follows:—

| Reading Zone | / | Meter Book No. | / | Page No. |
|---|---|---|---|---|
| 2 digits | | 3 digits | | 3 digits |

4–6: This code number was attached to the consumer in a particular property, and not to the consumer himself. The accounts and all other punched card productions held this number.

4–7: The addressograph stencils already kept in meter book order included the same reference number, besides the consumer's name and postal address. Thus the statements produced by the Accounts Section were addressed in the same sequence.

4–8: Such arrangements ruled out any haphazard movement of meter book folios from one position to another, and reading routes had to be very carefully arranged, with adequate provision for new consumers.

4–9: To bring these particular arrangements into effect required a general tightening up of meter reading procedures, and it was accepted that it was unlikely that this could be brought about and efficiently maintained under the existing form of control.

## 5. FORMATION OF JOINT METER READING BRANCH

5–1: The foremost factor which influenced ultimate decisions was the question of service to the public, for as mentioned previously, the system in use had its weaknesses.

5–2: A further important point that had to be acknowledged was the attitude of the average citizen, which had undergone a marked change with the increased tempo of the times, and it was absolutely essential to provide an adequate and efficient service so as to satisfy the demand that these changes had brought about.

5–3: Of particular concern was the unpalatable act of non-payment disconnection; as the number of consumers increased so would there have to be a more extensive use of this weapon to enforce payment of an account. This process demanded special attention and could not be administered efficiently when the Department responsible for accounting became a bystander after instructions to disconnect had been issued.

5–4: By virtue of the planning of new residential and industrial areas, the re-zoning of the older residential areas with flat rights in the city and the development of private townships in the peri-urban areas, it became apparent that there would be an unprecedented increase in all classes of electricity consumers, particularly in the Licensed Area of Supply.

5–5: Residential accommodation was in very short supply, due to the ever increasing flow of immigrants, whilst many were awaiting the opportunity to acquire land for building purposes.

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*REMARKS*

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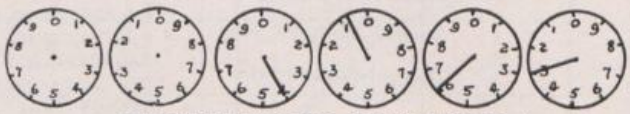


DISREGARD THE RED DIALS MARKED 10 & 100

READING DATE 11 OCT. READING 4063.

## CITY OF SALISBURY

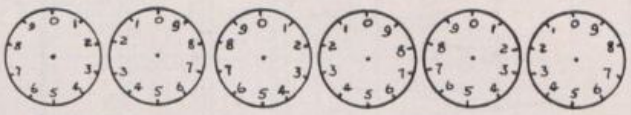
CONSUMER'S METER READING CARD

*PLEASE ASSIST BY CARRYING OUT THE FOLLOWING INSTRUCTIONS.*

1. INDICATE THE POSITION OF THE POINTERS ON THE DIALS OF YOUR METER THUS:—  DISREGARD THE RED DIALS
2. READING MUST BE TAKEN ON OR ABOUT THE DATE INDICATED.
3. DETACH CARD AT PERFORATION AND POST IMMEDIATELY. COMPLETE REVERSE FOR YOUR RECORDS.
   *Should a completed card fail to arrive within Seven days of the reading date, it will be necessary to charge an average consumption.*

*PERIODIC CHECKS WILL BE MADE TO PROTECT YOUR INTERESTS.*

CONSUMER'S RECORD



READING DATE _____ READING _____

PREVIOUS READING _____

CONSUMPTION _____

*RETAIN THIS PORTION FOR YOUR RECORDS.*

5–6: It was accepted that the problem could best be solved by the formation of a meter reading section which would be entirely responsible for all meter reading activities, without impinging on the technical authority of the Supply Departments.

It was considered that the establishment of this section would enable close examination of the whole meter reading procedure to be undertaken so as to develop, over a period of time, an organisation that would be expert in all meter reading matters and well able to cope with the problems resulting from the influx of new consumers.

5–7: Apart from the technical aspects of supply it was recognised that all enquiries relating to accounts and requests for the connection or disconnection of supply were made to the Treasury, and in order that most consumer matters would receive attention at one group of centrally situated offices it was decided to attach the Joint Meter Reading to the Electricity and Water Accounts Section of the Treasury.

5–8: This decision was not reached without some misgivings on the part of the supplier Departments, as understandably they were loath to leave the destiny of their consumers in the hands of strangers. It was suspected, however, that this was tinged with a certain amount of relief at the thought of being able to pass responsibility for many of the thousand and one enquiries and complaints which are so much a part of municipal life over to the Treasury.

## 6. INITIAL ORGANISATION

6–1: The first major tasks undertaken by the new branch were the integration of the three separate units previously engaged in meter reading activities, and a complete survey and re-organisation of meter reading zones and routes. The latter was essential so as to ensure an even flow of work could be obtained to support the progressive billing process that was about to be introduced.

6–2: At this time, in December 1951, the number of consumers had increased to 12,191, of which 7,524 were in the Municipal Area and 4,667 in the Licensed Area of Supply. The percentage increase in peri-urban areas was far in excess of that in the City (Table I) and this created many problems, particularly in the process of re-arranging reading routes. The aim was to equate the reading time for all routes, irrespective of the area involved in order to ensure an even flow to the accounting stage. Owing to the increasing number of new consumers it was necessary to conduct regular examinations of meter reading routes and zones, making sub-divisions of such routes and zones, where necessary, so that the standard reading time for all routes remained constant.

6–3: Meter book folios were redesigned to contain not only meter readings and consumptions, but also the breakdown of units under various rates and the actual charge for each month's consumption. (Fig. 1). Although this was not directly connected with meter reading, it assisted considerably in administration, particularly when attending to consumers' enquiries, as it gave a complete picture of debits raised. It also resulted in savings of material and labour as it was no longer necessary to transcribe consumptions to the large schedules previously used. The effect was also felt in the first stage of the billing procedure, as the combined meter reading account folio provided a compact set of records in ideal

**City of Salisbury** METER READING AND ACCOUNT CARD

Form No. 33
Comm. 600.459

Stand No. 332.
Street 4 SHADY LANE
District WILLOWVALE

MR. ALBERT T. WILLIAMS,
P.O. BOX 8094,
CAUSEWAY, S.R.
STD. 332 /DEP. A.C./ 16/23/44.
WILLOWVALE.

Section 16
Book 23
Folio 44

BEWARE OF DOG.

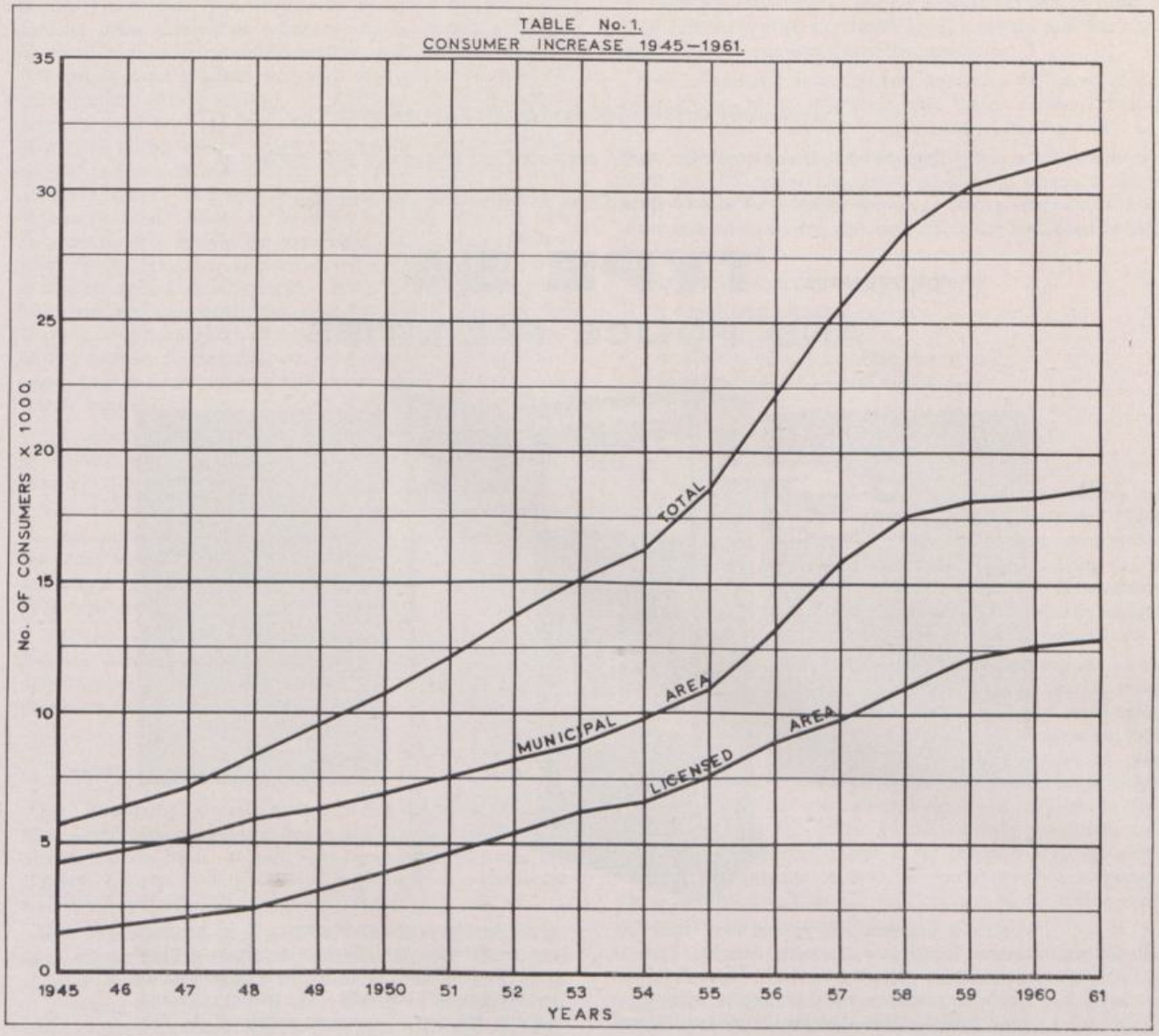
**ELECTRICITY**

ROOM QUOTA CHANGED
MEMO. C.E.E. 24/F/Gi. 12.11.57

31825 D.E. 3492 18.4.58
METER No. ~~21349~~

No. OF ROOMS 3. 4 QUOTA UNITS 48 64.
SCALE E11 SURCHARGE 18% MIN. CHARGE £2.10.0

| Date | | Reading | Consumption | | Total Cons. to Date | 8d .625 | | Code | Surcharge | £ | s. | d. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JUNE | | | | | | | | | | | | |
| MAY | | | | | | | | | | | | |
| APRIL | | | | | | | | | | | | |
| MAR. | | | | | | | | | | | | |
| FEB. | | | | | | | | | | | | |
| JAN. 195 | | | | | | | | | | | | |
| DEC. | | | | | | | | | | | | |
| NOV. | | | | | | | | | | | | |
| OCT. | 11 | 4063 | 418 | | 4063 | 64 354 | | | | 3 | 12 | 1. |
| SEPT. | 10 | 3645 | 652 | | 3645 | 64 588 | | | | 4 | 6 | 6 |
| AUG. | 11 | 2993 | 886 | | 2993 | 64 822 | | | | 5 | " | 10 |
| JULY | 12 | 2107 | 943 | | 2107 | 64 879 | | | | 5 | 4 | 4 |
| JUNE | 12 | 1164 | 770 | | 1164 | 64 706 | | | | 4 | 13 | 9. |
| MAY | 10 | 394 | 583 | | 394 | 64 519 | | | | 4 | 2 | 3. |
| APRIL | 9 | 18590 | 634 | | 18590 | 64 570 | Rem. D.E. 5873 18.4.58 | | | 4 | 5 | 5 |
| MAR. | 10 | 17956 | 618 | | 17956 | 64 554 | Rdg. 18719. | | | 4 | 4 | 5 |
| FEB. | 10 | 17338 | 663 | | 17338 | 64 599 | | | | 4 | 7 | 2 |
| JAN. 195 | 12 | 16675 | 554 | | 16675 | 64 490 | | | | 4 | " | 6 |
| DEC. | 11 | 16121 | 493 | | 16121 | 64 429 | QUOTA CHANGED. | | | 3 | 16 | 9. |
| NOV. | 11 | 15628 | 618 | Av. | 15628 | 48 570 | | 2. | | 3 | 12 | 9. |
| OCT. | 12 | 15010 | 510 | | 15010 | 48 462 | | | | 3 | 6 | 2. |
| SEPT. | 10 | 14500 | 582 | | 14500 | 48 534 | | | | 3 | 10 | 7. |
| AUG. | 10 | 13918 | 763 | | 13918 | 48 715 | | | | 4 | 1 | 8 |
| JULY | 10 | 13155 | 986 | | 13155 | 48 938 | | | | 4 | 15 | 5 |
| JUNE | 11 | 12169 | 1094 | | 12169 | 48 1046 | C/R. 12235 15.6.54 | | | 5 | 2 | 1 |
| MAY | 10 | 11075 | 608 | | 11075 | 48 560 | Normy readings. | | | 3 | 12 | 2 |
| APRIL | 9 | 10467 | 592 | | 10467 | 48 544 | | | | 3 | 11 | 2 |
| MAR. | 9 | 9875 | 557 | | 9875 | 48 509 | | | | 3 | 9 | 1 |
| FEB. | 9 | 9318 | 574 | | 9318 | 48 546. | | | | 3 | 10 | " |
| JAN. 195 | 10. | 8744 | 663 | | 8744 | 48 615 | | | | 3 | 15 | 7. |
| DEC. | 12 | 8081 | 524 | | 8081 | 48 476. | | | | 3 | 7 | 7. |
| NOV. | 11 | 7557 | 550 | | 7557 | 48 502 | | | | 3 | 8 | 7. |
| OCT. | 9 | 7007 | 590 | | 7007 | 48 542 | | | | 3 | 11 | 1 |
| SEPT. | 10 | 6417 | 628 | | 6417 | 48 580. | | | | 3 | 13 | 5. |
| AUG. | 10 | 5789 | 748 | | 5789 | 48 700 | | | | 4 | " | 9 |
| JULY | 11 | 5041 | 893 | | 5041 | 48 845 | | | | 4 | 9 | 8 |
| JUNE | 12 | 4148 | 934 | | 4148 | 48 886 | | | | 4 | 12 | 3 |
| MAY | 10 | 3214 | 676 | | 3214 | 48 628 | | | | 3 | 16 | 4 |
| APRIL | 10 | 2538 | 603 | | 2538 | 48 555 | | | | 3 | 11 | 10 |
| MAR. | 9 | 1935 | 524 | | 1935 | 48 476 | | | | 3 | 7 | " |
| FEB. | 12 | 1411 | 582 | | 1411 | 48 534 | | | | 3 | 10 | 7. |
| JAN. 1956 | 12 | 829 | 576 | | 829 | 48 528. | | | | 3 | 10 | 3. |
| DEC. | 10 | 253 | 253 | | 253 | 24 229 | e 5/10 QUOTA. | | | 1 | 12 | 11 |
| NOV. | | 0 | | | | | | | | | | |
| OCT. | | | D.E. 2247 22.11.55 | | | | | | | | | |
| SEPT. | | | | | | | | | | | | |
| AUG. | | T/O F.46133 A.T. WILLIAMS | | | | 25.11.55 | | | | | | |
| JULY | | | | | | | | | | | | |
| B/FWD. | | | | | | | | | | | | |




sequence for the punch operators, who were required to translate consumptions and charges on to pre-punched cards.

6–4: When planning the order in which readings were to be carried out in the geographical zones (now numbering ten), attention had to be paid to the amount of transport available. This consisted of an assortment of four-wheeled motor vehicles and bicycles, besides the oldest form of transport, "walking" Care had to be taken to avoid any form of transport being idle, and the meter reading programmes were arranged to ensure that walking, bicycle and motor routes were being covered at the same time. In most parts of the Licensed Area of Supply four wheeled motor transport was essential, as there were few tarred roads, and in some parts the distance between properties was considerable. The cheaper forms of transport were used wherever possible and the opportunity was taken to transport meter readers by vehicles to the more densely populated parts in outlying districts and from the unloading point they caried on their duties on bicycles or on foot. Meanwhile, the vehicles proceed further afield on meter reading duties and on their returned picked up the meter readers, together with their bicycles, and transported them back to base.

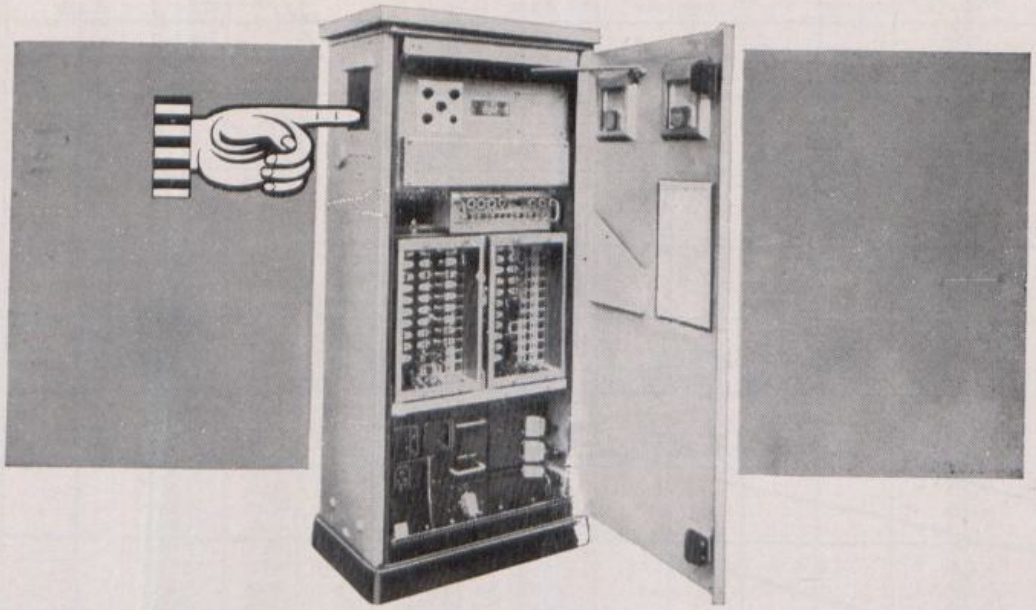
## 7. FURTHER EFFECTS OF RATE OF GROWTH

7–1: During the first four years' operation of the Joint Meter Reading Branch, Council's Electricity Undertaking gained a further 6337 consumers, making a total in December, 1955, of 18,528 consumers.

7–2: Although domestic accommodation was still in short supply, there was a considerable movement of consumers each

*Exceptionally versatile and flexible, the "Electro-matic" Type 54 vehicle actuated road traffic controller provides a very wide variety of facilities to deal with the difficult problems of modern traffic.*

# FOR EXAMPLE... TYPE 54
## AND POLICE FACILITIES



For those junctions and intersections where the "human touch" is occasionally desirable. Type 54 has a special police access door. Through this an officer may select:—Fully automatic working — Fixed-time working — Manual operation. On controllers with three or more phases the right-of-way can be manually switched by push-button from phase to phase in any sequence. It is, however, not possible for the officer to terminate a phase until the minimum green period has expired, or to shorten or eliminate any pre-set clearance periods. He may, if required, switch off the light signals without interfering with the operation of the controller.

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month. The number of instructions to disconnect and reconnect supplies upon changes of residence and temporary absences on leave had been increasing steadily, and between 800 and 900 special meter readings were now required to be obtained each month. Where changes of consumer in a particular property coincided, one visit sufficient, but the peak period of operations in this sphere occurred during the first and last few days of each month, and sufficient staff and transport had to be available to carry out these duties. Although the Regulations require 48 hours' notice to be given for disconnections and re-connections of supply, the strict application of this requirement is not favoured, as unnecessary hardship could ensue if a property was without supply. Many incoming consumers who had not completed the necessary formalities for the opening of an account found that supply had been disconnected at the request of the outgoing consumer, and the resultant appeals for the restoration of the service could not be ignored merely because they had not complied with the Regulations.

7–3: It was felt that disconnections and reconnections should be effected within two or three hours of the request being made, in order to improve supplier-consumer relations.

7–4: To ease the effect of these increasing additional duties on the monthly reading programme, the meter month was shortened generally to allow the maximum number of staff and amount of transport to be available during the peak period of special readings.

7–5: By making various adjustments, the Joint Meter Reading Branch, although hard pressed at times, had been able to absorb the increased volume of consumers without disrupting the monthly reading timetable and its allied duties.

## 8. STAFF

8–1: The staff of the reading branch had originally consisted of a Chief Meter Reader (fixed establishment) and 9 meter readers (hourly paid). It had been necessary to increase the number of meter readers as more consumers were connected and at the end of 1954, the meter reading staff was 19.

8–2: Whilst it had been possible, from time to time, to fill some vacant clerical positions from reading staff, the avenue of advancement was limited and difficulties were encountered in obtaining the services of a suitable class of employee. The rate of turnover in staff was exceptionally high and this presented a very serious problem. The work of meter reading was rightly considered important, being the initial stage in the cycle of operations leading to the rendition of accounts, and the staff employed were the Council's main front to the consumer. In fact, a Meter Reader was often the only employee of the Council with whom a consumer had any direct contact.

8–3: There was no lack of employment for the unskilled worker, and one of the biggest obstacles to recruitment of meter readers was that future prospects were very limited for the person seeking a horizon beyond that offered by his present employment. To make the prospects more attractive, fixed establishment posts of Senior Meter Reader were created, and the maximum rate of pay for hourly paid employees was increased. The higher hourly rate of pay was paid to those employees engaged on the more responsible duties. There was no fixed minimum rate of pay on engagement and, in cases of employees with prior experience or of a certain capability, the starting rate of pay was above the minimum.

8–4: In addition, it was general practice to fill vacant junior clerical posts in the Electricity and Water Accounts Branch with any suitable employees on the meter reading staff.

8–5: The consequence of this grading was to retain a higher number of the more satisfactory employees, although not as many as had been hoped, owing to strong competition from commerce and industry, and staff difficulties continued to exist for some time.

The staff position at the end of 1955 was—

1 Chief Meter Reader.
4 Senior Meter Readers.
6 Meter Readers (maximum rate of pay).
8 Meter Readers (general rate of pay).

## 9. INTRODUCTION OF RADIO-TELEPHONE EQUIPMENT

9–1: The mileage covered by meter reading vehicles had gradually increased, and by December, 1954, exceeded 15,000 miles per month . The greater part of this mileage was travelled in the course of obtaining monthly meter readings in the Licensed Area of Supply and the remainder in disconnecting and re-connecting supply on instructions of consumers, obtaining check readings and effecting non-payment disconnections.

9–2: When disconnecting and reconnecting supply on the instructions of consumers and carrying out other special duties, every effort was made to ensure that the most economical routes were followed, but duplication of routes were unavoidable because it was politic to accept instructions at short notice. Frequently, however, requests for connection of supply were received whilst the meter readers were en route to effect disconnection at the behest of the outgoing consumer; consequently, the properties had to be revisited after the meter readers had returned to base. It was impossible to prevent these additional calls as the requirements of the public could not be anticipated or controlled.

9–3: Disconnection of supply for non-payment resulted invariably in rapid action by the consumer, but reconnection had to be delayed until the meter reading staff concerned had returned to base and received instructions to reconnect. Whilst it was accepted that the consumer was at fault in these cases, many house-holders were inconvenienced to a greater extent than was really necessary by the relatively long periods that supply was unavailable, particularly as, in many instances, borehole water supplies were dependent on electricity. To reduce hardship to a minimum it was recognised practice to restore supply on the same day as payment was made, notwithstanding the amount of overtime that had to be paid to the staff, but urgent appeals for early reconnection often could not be ignored, particularly when they were accompanied by cries of a baby in the background who, it was stated, was hungry and could not be fed until electricity was available.

9–4: The use of radio telephone systems had been developed in the departments of the City Electrical Engineer and the City Engineer, and during the early part of 1955 an examination of the possible advantages of installing radio control in certain

vehicles used in meter reading was made with the assistance of those Departments.

9–5: It was considered that if details of instructions received at short notice could be relayed to staff already in the field there would be a considerable saving in mileage alone; the same principle would apply if details of payments could be given at regular intervals to staff engaged on the non-payment disconnection process. As the cost of setting up a complete system of radio control would have been high, it was not considered that the benefits to be gained at that stage justified the expense, and for an experimental period it was arranged that any radio equipment obtained would operate on the City Engineer's main station and frequencies.

9–6: In June, 1955, three 5 Watt Mobile units and one 5 Watt fixed station were obtained. The mobile sets were operated from Landrovers, which had recently been introduced into the Transport Pool for permanent allocation to meter reading, whilst the fixed station was installed in the Chief Meter Reader's office.

9–7: This arrangement was allowed to continue for approximately one year, during which time all operations in which radio was used were noted and the effects analysed regularly. The results of this detailed study proved the benefits that could be obtained by the use of radio control in meter reading activities. In one particular month a saving of some 315 miles was recorded, due solely to the transmission of instructions which would otherwise have awaited the return of meter readers to base. Although the advantages which accrued in the sphere of direct service to the public could not be so easily measured, there was ample evidence that consumers enjoyed the benefit of a quick and efficient service when the need was greatest, for in numerous cases it had been possible to execute instructions, and respond to appeals for restoration of supply, within minutes of their receipt.

9–8: As the City Engineer's Department wished to expand its own service and utilise all the existing facilities it was necessary for the Meter Reading Branch to obtain separate frequencies, and install a main station if it wished to continue using radio communication. With the co-operation of the Department of Posts and Telegraphs, the necessary frequencies were allocated and a 15 Watt Fixed Repeater Station installed. This gave the Meter Reading Branch its own radio network which could be readily expanded by adding further mobile units and fixed stations.

9–9: Three further 5 Watt mobile units were purchased and installed in Landrovers during July, 1957, and a 5 Watt fixed station was installed, in the accounts office for direct communication with vehicles engaged on non-payment disconnections.

## 10. TRANSPORT

10–1: Despite efforts to keep motor vehicle mileage at a minimum, the increasing rate of growth, which in 1956, exceeded an average of 300 new consumers per month, caused the monthly mileage to rise. The motor vehicles on permanent allocation from the Transport Pool during 1956 were 10 Landrovers and 5 other trucks, which had to be augmented during peak periods of special meter readings, and at times when weather conditions prohibited the use of bicycles or of meter readers on foot.

10–2: The use of motor cycles as meter reader's transport had been considered from time to time, but the condition of most roads in peri-urban areas had ruled against this form of transport. There had, however, been a gradual improvement of road conditions in some areas, particularly those under the control of Town Management Boards, and the possible use of motorcycle transport was again considered.

10–3: It was found that in addition to ordinary motor cycles, a make of motor scooter was available. These machines, which cost approximately £150 each, had only appeared in Salisbury during the early part of 1956, and although first-hand reports on their capabilities were not available it appeared that this type of machine might prove more suitable than the orthodox motor cycle.

This machine was powered with a 150 c.c. two stroke engine, and it was claimed that fuel consumption was approximately 100 miles per gallon. The small wheels and other features of design were reported to give a greater degree of manoeuvreability and safety. The maximum speed was restricted to approximately 45 miles per hour, a factor which found favour, as the comparative high speed of motor cycles and the manner in which they were so often ridden, had given rise to certain opposition when a change to this form of transport was first mooted.

10–4: Because of the complete lack of experience of this new mode of transport a single machine only was purchased in September, 1956, for a trial period of six months. During this period, the machine was used on outlying parts of the City and per-urban areas where road conditions were suitable. It was employed on 143 days and travelled 4,468 miles, an average of over 31 miles per day, with 66 miles as the longest mileage covered in any one day. Fuel consumption averaged 90 miles per gallon, and the running costs worked out at a fraction under 1d. per mile. The machine was only off the road for servicing and short periods during heavy rainstorms. There had been some doubt as to the machine's usefulness during rainy weather, and it was found that even the lightest rain seriously inconvenienced the rider, but the addition of a windshield enabled it to be used in all but the heaviest storms. Although the motor scooter was used principally in the outskirts of the City and the nearer parts of the Licensed Area of Supply, it was taken further afield for testing purposes. It proved to be safe and comfortable on all hard surfaces, and on roads with loose surfaces its performance was good, but under these conditions it had to be ridden at very low speeds as passing traffic was a particular hazard because of dust and stones.

10–5: The conclusions drawn from this experiment were that this mode of transport could be extended immediately, and used in all areas where road conditions permitted. With anticipated further improvements in road surfaces, it was decided that additional machines could be introduced and that this type of vehicle would eventually be the main form of transport used in meter reading. A further four machines were purchased in October, 1957, and meter reading motor transport then comprised — 10 Landrovers, 3 other petrol trucks and 5 motor scooters.

10–6: It had only proved possible, at this stage, to release two of the heavier transport units as an increased demand for transport had been occasioned by additional staff (the strength was now 30), which was required for meter reading duties. At the end of 1957 the total number of consumers had reached 25,757 of which 15,899 were in the Municipal Area and 9,858 in the Licensed Area of Supply. (Fig. 1).

10–7: The total mileage per month had risen to approximately 19,000 miles, and for December, 1957, the actual mileage for the two forms of transport used on the various meter reading duties were —

| TOTAL | FOUR WHEELED VEHICLES | | SCOOTERS | |
|---|---|---|---|---|
| 19,441 | 16,131 miles | | 3,310 miles | |
| Meter Reading | Non Payment | Other Duties | Meter Reading | Other Duties |
| 8,086 miles | 2,675 miles | 5,370 miles | 887 miles | 2,423 miles |

10–8: Mileage travelled in the performance of duties other than the monthly meter reading programme had risen sharply, due mainly to requests for special meter readings in respect of changes of residence, which exceeded 1,500 per month. In addition, there had been a natural growth in —

(a) The number of check readings required.

(b) Investigations of consumers' complaints, and

(c) Increased activity in the field of non-payment disconnection.

10–9: As additional consumers were connected in outlying areas, beyond established reading routes, the process of meter reading itself was proving costly. At one stage because of a spate of new connections in one particular area, it was necessary to travel nearly 100 miles to obtain only 78 readings. Although this position tended to improve as more consumers were connected, it was realised a considerable time would elapse before it became really economical to make monthly visits to consumers situated on the outer fringe of the Licensed Area of Supply.

10–10: Whilst plans for the gradual introduction of motor scooters would reduce transport costs considerably, some means had to be found to obtain a reduction in mileage itself.

## 11. SELF METER READING

11–1: Prior to the transfer of a number of consumers situated outside the Licensed Area of Supply to the Southern Rhodesia Electricity Supply Commission, a system of self-meter reading had been operated by the Electricity Department. Very few consumers had been involved, and it was not considered that the system had been really successful. By this

TABLE NO. 2.

**VEHICLE MILEAGE**

DECEMBER, 1957 — JUNE, 1962.

| | TOTAL | FOUR WHEELED VEHICLES | SCOOTERS |
|---|---|---|---|
| December, 1957 | 19,441 miles | 16,131 miles | 3,310 miles |
| June, 1958 | 17,832 ,, | 15,601 ,, | 2,231 ,, |
| December, 1958 | 16,296 ,, | 8,809 ,, | 7,487 ,, |
| June, 1959 | 18,888 ,, | 10,929 ,, | 7,959 ,, |
| December, 1959 | 19,260 ,, | 11,525 ,, | 7,735 ,, |
| June, 1960 | 17,328 ,, | 9,634 ,, | 7,694 ,, |
| December, 1960 | 17,113 ,, | 8,228 ,, | 8,885 ,, |
| June, 1961 | 17,801 ,, | 6,913 ,, | 10,888 ,, |
| Decmeber, 1961 | 16,903 ,, | 6,618 ,, | 10,285 ,, |
| June, 1962 | 17,364 ,, | 7,170 ,, | 10,194 ,, |

| | FOUR WHEELED VEHICLES | | | SCOOTERS | | |
|---|---|---|---|---|---|---|
| | METER READING | NON PAYMENT | OTHER DUTIES | METER READING | NON PAYMENT | OTHER DUTIES |
| December, 1957 | 8,086 miles | 2,675 miles | 5,370 miles | 887 miles | — miles | 2,423 miles |
| June, 1958 | 7,192 ,, | 1,830 ,, | 6,579 ,, | 546 ,, | — ,, | 1,685 ,, |
| December, 1958 | 1,650 ,, | 650 ,, | 6,509 ,, | 5,491 ,, | — ,, | 1,996 ,, |
| June, 1959 | 1,737 ,, | 3,600 ,, | 5,592 ,, | 5,305 ,, | — ,, | 2,654 ,, |
| December, 1959 | 2,396 ,, | 3,710 ,, | 5,419 ,, | 5,771 ,, | 190 ,, | 1,774 ,, |
| June, 1960 | 1,161 ,, | 2,558 ,, | 5,915 ,, | 3,559 ,, | 1,867 ,, | 2,268 ,, |
| December, 1960 | 1,155 ,, | 1,442 ,, | 5,631 ,, | 4,484 ,, | 1,860 ,, | 2,541 ,, |
| June, 1961 | 1,321 ,, | 146 ,, | 5,446 ,, | 3,610 ,, | 4,403 ,, | 2,875 ,, |
| December, 1961 | 1,425 ,, | — ,, | 5,193 ,, | 3,314 ,, | 4,386 ,, | 2,585 ,, |
| June, 1962 | 1,497 ,, | 47 ,, | 5,626 ,, | 3,521 ,, | 3,976 ,, | 2,697 ,, |

method the consumer was provided each month with a form bearing the facsimile of a meter dial on which he was required to mark the indicator positions. This portion of the form was then detached and returned through the post. The properties were visited every third month when an official meter reading was obtained. Although the requirements were simple, research revealed that only a small percentage of the forms were returned, many of which had been incorrectly marked or arrived too late for entry in the reading record.

11–2: A similar scheme had been operated by the Southern Rhodesia Electricity Supply Commission for some years, and copies of reports on this subject with schedules of returns were kindly made available by the Commission for study. Whilst the system effected considerable savings of transport and labour, only a limited measure of success had been obtained in the return of meter readings. The reports indicated that the overall percentage of return was 66%, and the highest in any particular area 70.5% with some areas below 40%. Considerable difficulties were experienced with mis-readings and failure to return cards, and it was found necessary to nurse new consumers in the initial stages and seek co-operation through personal visits and explanatory letters.

11–3: There could be no doubt that a successful self meter reading scheme would result in very considerable savings, but the success would depend mainly on first obtaining and then retaining the co-operation of consumers. In April, 1957, a report on this subject was considered by the Council, and authority was obtained to experiment with a system of self meter reading, which was to be retained as a permanent feature, if successful. As a general increase in electricity charges was about to be made, it was considered politic to await implementation of the new Tariff before introducing a self-meter reading scheme, and the first consumers were not approached until January, 1958.

11–4: Some 800 consumers domiciled in the outer fringes of the Licensed Area of Supply were selected for the first phase of the scheme, and in January, 1958, a letter was sent to each of these consumers explaining the proposed scheme and the reasons for its introduction. It also advised that self-reading cards would be sent from that month; however, for January and February the returns were not to be used for account compilation but to be checked against readings taken in the normal way. Senior members of the Meter Reading Branch visited any consumer who required advice or when it was obvious that incorrect readings had been recorded by the consumer. Numerous visits to consumers after normal working hours were necessitated, but it was considered that no effort should be spared to obtain the fullest possible co-operation from all consumers in order to ensure success of the venture. To assist consumers calling at the office with enquiries, dial units of the various types of meters in use were obtained so that accurate demonstrations could be given.

11–5: The self reading system used was the simplest that could be devised and it operated in the following manner.

(a) Approximately one week before meter reading date a stamped addressed card (Fig. 2) bearing printed numbered dials was despatched in an envelope to each consumer.

(b) On return of the card the reading was interpreted and entered in the meter reading record.

(c) If a card was not returned or the entry on a card was considered inaccurate, an average consumption based on the three previous months' consumption was charged. The consumer was advised by post-card that an average consumption would be charged and the reason for this action.

(d) Check readings were taken by Council's meter reading staff every fourth month, and such readings were used for computing the account for that particular month.

11–6: Very few real difficulties were encountered during the initial period and the response was most encouraging; the average rate of return being 76.3%. Not one consumer had voiced any objection to the scheme, and after the first few months, applications were actually being received from consumers in other areas suggesting that they be allowed to read their own meters. These were mainly consumers whose meters were inside premises and were usually found locked on meter readers' visits.

It was realised that only a small number of consumers were covered by the system, and they could be considered a special type, in that they were in the main, farmers and large landowners who elected to live some considerable distance from the City centre. They were persons who could be expected to appreciate the high cost involved in meter readers travelling some 15–25 miles each month to obtain readings at properties often many miles apart. Nevertheless, it was decided after the first six months of operation that the system could be used permanently and applied to other areas.

11–7: The experience gained during the initial period indicated that the system as originally introduced only needed to be modified in one respect, and that was the use of periodic check readings for computation of a particular month's account. It had become apparent that the consumers concerned were taking a greater interest in their meter readings and consumptions, and retaining the consumer's record portion of reading cards. As the time of their reading varied from that of the meter reader, there was a difference between the consumption according to their reading and that actually charged. This had led to a number of queries, and although the amounts involved could never be large, it was felt that the goodwill which prevailed was in some instances threatened. Accordingly, it was decided to accept the consumer's figures each month, provided they proved similar to those obtained by Council's staff during the "check" month. This minor alteration in no way reduced the value of the official reading, as it was vital that regular checks were made to obviate the possibility of any major undercharge or overcharge.

11–8: Over a period of several months the self reading system was extended by approaching consumers in the same manner as before, but in addition, advising them of the success that had been obtained during the first phase of the scheme. Eventually some 3,700 consumers were included in the scheme, which position was maintained until early in 1960.

11–9: As was to be expected, not all consumers then involved gave their fullest co-operation, but it was found that many of those who did not return cards were content to allow averages to be charged in the knowledge that the periodic visits of reading staff would result in automatic adjustment to their account.

11–10: The scheme now embraced many classes of consumer and types of properties, and it was not always possible to

request a consumer to read his own meter. In addition to the occasional domestic meter awkwardly situated, there were many others serving flats, shops and offices, and installed in locked meter rooms or in another part of a building to which the consumer could not gain easy access, or had no right of entry. Special arrangements were made for these meters to be read monthly by Council's reading staff, and the consumers involved were not included in the Self Reading Scheme.

11–11: The actual savings that could be attributed directly to the Self Meter Reading System could not be accurately established for several reasons, the most important of which were —

(a) An increase in consumers since the scheme was first introduced; and

(b) The continuous introduction of motor scooters to replace heavier vehicles.

But there had been no need to engage further reading staff since the introduction of the scheme, and the joint effect of self meter reading and new transport methods resulted in a welcome reduction in the transport costs, which for the financial year ended 30th June, 1959, totalled £8,640 against £11,434 for the previous financial year.

11–12: The final step in extending the Self Meter Reading System commenced in January, 1960, when arrangements were made to apply the system to all consumers resident in the Licensed Area of Supply. At that time the consumers in the Licensed Area numbered 12,222, and of these 3,994 were already covered by the self meter reading scheme.

11–13: By the end of April, 1960, the transfer had been completed, and the self reading system embraced 11,656 consumers; there were approximately 700 meters which still had to be read each month by Council's staff because they were not easily accessible to the consumers.

11–14: It would be wrong to say that this final phase had an easy passage as the consumers concerned were from all walks of life, and in many instances it proved extremely difficult to make the simple requirements of marking a reading card understood. Some consumers, for reasons best known to themselves, at first rejected the idea of self meter reading and refused to co-operate. Fortunately, the number was small, and with tactful handling most agreed eventually to lend their assistance.

11–15: Self meter reading is now accepted as a permanent feature and some 12,300 reading cards are despatched to consumers in the Licensed Area of Supply each month; the number of meters read regularly by meter readers is still approximately 700.

The average rate of returned cards is 74.3% but this does not mean that more than a quarter of the consumers do not co-operate, since absence on leave and changes of residence must be taken into account, plus the fact that there is a fairly large group who willingly accept an average consumption in the knowledge that the account will be adjusted automatically every fourth month when an official check reading is taken.

11–16: Although duties outside the monthly reading programme increased enormously, the introduction of the large-scale self-reading system enable the labour force of the Meter Reading Branch to be stabilised, but the greatest economy occurred in the mileage travelled monthly by motor vehicles. Before the system was introduced in January, 1958, approximately 9,000 miles per month were travelled by vehicles to obtain monthly meter readings, but in spite of an increase of nearly 3,000 consumers, the average monthly mileage was reduced to approximately 6,000 miles. (Table No. 2.). This figure fluctuates from month to month because of adverse weather conditions, affecting the use of scooters and periodic checking of self reading areas. The reduction would have been even greater, but for the fact that bicycles were dispensed with, and only near and densely populated areas are read by meter readers on foot.

11–17: All meters inside the Municipal Area are still read each month by Council's staff and although the question of extending self reading to these meters has been conssidered, the obstacles preventing the introduction of a successful sytem are varied and numerous. The first and major difficulty is presented by water meters which are read presently at the same time as electricity meters. Because of the position of many water meters it would be a physical imposition to ask consumers to read their water meters too. There is also the insurmountable problem of electricity meters which are not easily accessible to the consumer. It is estimated that approximately one third of the consumers in the Municipal Area would have to be excluded from any self meter reading scheme because of inability or difficulty in gaining access to meters.

11–18: The self reading system helped to solve the problem of locked premises in the Licensed Area of Supply, but the incidence of failure on the part of meter readers to obtain readings because of locked premises was high in the Municipal Area. It was often difficult to obtain access to meters in many instances except after normal working hours, and the continuous charging of average consumptions, besides being undesirable, often resulted in an overcharge or undercharge.

To help overcome this difficulty a card similar to that used in the self meter reading system was designed for completion by the consumer, when access to the meter could not be obtained by the meter reader. This card was left at the premises concerned and carried the usual instructions for completion, together with a request that it be forwarded immediately so that it reached the Meter Reading offices within 48 hours. The response was excellent, and resulted in the number of averages in the case of locked premises being reduced by more than half.

11–19: Self Meter Reading is not a system entirely without faults or complications, particularly as its success is so dependent on the good-will and co-operation of the consumer. One of the first essentials is to ensure that each consumer receives regularly a card immediately before meter reading date. If it arrives too early it is most likely forgotten. This can be easy to arrange in areas where the postal service is reliable, but where the service is indifferent care has to be exercised. No effort must be spared to obtain the maximum co-operation from consumers, for no legislation could ever result in correctly entered cards being returned promptly. Of equal importance is the periodic check readings on the occasion of visits to self reading areas. Such checks and inspections have to be thorough as a meter may have been purposely mis-read or there may have been a change of consumer without application for supply having been made.

11–20: Of course most of the problems encountered are also evident in any meter reading system. As mentioned earlier, self meter reading assists considerably in overcoming the difficulty of locked premises, but on occasions there have been cases where cards are not completed and returned and upon inspection the premises housing the meter have been found locked. A simple and effective "cure", when all requests for co-operation prove abortive is to charge a normal average consumption for three months and then increase the charge considerably in the fourth month. This device has yet to fail in its purpose of claiming a consumer's attention.

## 12. COMPLETION OF TRANSPORT REPLACEMENTS AND EXTENSION OF RADIO CONTROL

12–1: The process of introducing scooters had proceeded as planned and in September, 1958, a further seven machines were purchased making the total number employed twelve. This resulted immediately in a considerable reduction in heavy vehicle mileage (Table No. 2.) and permitted the release of five pool transport vehicles.

12–2: Radio-telephone control had become an accepted feature in most activities outside of the monthly reading programme but motor scooters could only be used for special meter reading duties and non-payment disconnections to a limited extent. Towards the end of 1959, advice was received that the manufacturerers of the radio-telephone equipment already in use were marketing a mobile radio unit designed for installation upon motor scooters.

This model was a 5 Watt transistorised set operated from a 6 volt battery that could be charged from the scooter's electrical circuit. It was waterproof and dustproof and in general performance was similar to the sets already installed in Landrovers.

12–3: The possibility of installing radio telephones on motor scooters had not been anticipated, but as it would allow further reductions in the use of heavy vehicles whilst retaining radio control three sets were ordered for installation on new scooters being delivered (Plate No. 1). When these were commissioned, three heavy vehicles were released to the pool for other duties.

12–4: There had been further increases in duties outside normal meter reading on which radio control was an advantage; the "moving population" had grown, and, at the end of 1959 instructions for special readings on the occasion of change of residence and leave exceeded 2,000 per month. This rate of movement created special problems, particularly from the accounting viewpoint. Close attention also had to be given to the maintenance of a strict and regular non-payment disconnection procedure, in which the use of radio controlled vehicles became an important aid.

12–5: The operating life of a motor scooter employed on meter reading was proved to be between four and five years, but the economic life had been fixed at three years.

By keeping a close scrutiny on maintenance costs it was possible to decide when machines were no longer economic to operate, and in January, 1962, five scooters which had been purchased in 1956/57 were replaced.

12–6: Meter reading transport now comprises — 4 Landrovers all with radio telephone control, and 15 motor scooters, of which three are fitted with radio telephones.

This transport is entirely adequate for present day requirements and it is not anticipated that any additional vehicles will be required for some time to come.

## 13. ADVANCES IN ACCOUNT MECHANISATION

13–1: Progress in mechanised accounting must necessarily be related to the machinery employed, and whilst the 38 Column Tabulator was used, little advance could be made. The main procedure, introduced in 1951, remained unchanged and in electricity and water accounting the machinery was used only as a billing medium until new machines were installed in 1958.

13–2: The advantages of punched card accounting in various Treasury procedures had been well proved, but machinery with a higher capacity and giving wider fields of application than could be provided by the 38 column class was required in furtherance of the mechanisation programme. With the installation of an 80 Column Senior Tabulator and a 550 Electronic Calculator it became possible to fully mechanise the electricity and water accounting procedure.

13–3: Current meter readings were punched into cards already carrying static consumer data, tariff scale details and the previous month's meter readings. These cards then passed through the calculator which ascertained consumptions and computed charges, punching these calculations at the same time into the cards. On completion of this operation the cards were passed to the tabulator, which printed the accounts and produced the ledgers.

13–4: No manual operations were necessary and the period between meter reading and account rendition was reduced from an average of fourteen days to seven days. The elimination of manual calculations resulted in the disappearance of monthly charges from the meter reading record (Fig. 1). Meter book folios were re-designed so that meter readings and consumptions only were shown.

13–5: It is said that the use of extensive mechanised accounting leads to the tail wagging the dog, and this can be so. The experience gained with mechanisation of electricity and water accounting, however, only served to illustrate that this was in fact an ideal situation. In order to keep the tail wagging with pleasure and obviate frustration or friction between sections, it was essential for the dog to behave in an orderly maner i.e. by ensuring that there was uninterrupted rhythm in the whole cycle of operations.

13–6: The new procedure with speedier rendition of accounts was an added spur to better organisation and efficiency, as it required an even stricter control of meter reading time tables. It was now even more essential that an even flow of work to the machines was maintained so that the billing process could be completed in the machine time allocated.

13–7: To ensure an even flow, geographical meter reading zones were subdivided so that there were thirty-three separate groups. By this method the effect of any delay encountered in the completion of a particular reading route was minimised, and sections of accounts as related to zones could be completed more frequently. The machinery aided the control of monthly reading programmes as the detailed statistics produced enabled a more accurate and closer examination of reading routes.

13–8: Consumers' meter reading record cards were still in use as there had been no alternative method of recording meter readings for the benefit of the consumer. The primary purpose of the record card was to provide the consumer with means to check consumptions charged without reference to the accounts office, and also furnish proof that premises had been visited by meter reading staff. These cards were of little use in self reading areas where premises were visited every fourth month, and of doubtful value in premises where a consumer did not have ready access to his meter. In addition, many premises with meters inside, were found locked when a meter reader called, thus preventing readings from being obtained and entries made on the record cards. It was difficult to establish the extent to which consumers used their record cards, but it was considered that any check was usually carried out after receipt of an account.

13–9: The introduction of a 906 Tabulator made it possible to incorporate past and present meter readings on accounts, which arrangement immediately benefitted consumers in the self meter reading areas as they could check their figures with consumptions charged. It was also more accurate than manual entries on record cards, besides saving the cost of the cards and the time spent in making entries. It was estimated that on average approximately one-third of the time spent by a meter reader at any premises was taken up by entering readings and consumptions on the consumer's meter reading record card.

13–10: A system of quoting past and present meter readings on accounts was introduced in October, 1962, when consumer's reading record cards were withdrawn. There was little opposition by consumers to this move, but the extent of the resultant economies have yet to be established.

## 14. RADIO METER READING

14–1: The system of regular meter reading with the aid of radio telephones was first brought to notice in 1959 through a newspaper article. This indicated that the Municipality of Roodepoort-Maraisburg was considering a report by its Organisation and Methods Officer, recommending that such a system be introduced. It claimed that direct readings from metering points radioed back to base eliminated many hours of checking by Meter Readers and other staff before accounts were sent out to consumers, and that fewer meter readers were required for actual reading. The article also stated that only two other towns in the world were known to be using the system; they were Fayetteville and Munro both in North Carolina, United States of America.

14–2: This report aroused considerable interest, as it was thought that such a system might help to eliminate some of the meter reading problems, particularly those concerning the control of Meter Readers in the field, the constant necessity to check readings, and the speedy passage of meter readings to the Accounting Branch. Further information on the subject was sought, and the authorities concerned were most helpful. Unfortunately, the nearest, Roodepoort-Maraisburg had no practical experience, and whilst the City of Munro had used the system successfuly for some two years, the total number of meters involved was only 8,000, and including water, and natural gas besides electricity meters.

14–3: The City of Fayetteville advised that a system of radio meter reading had been in operation for some time, and all meters were read by that method. Full details of the procedure were given, the difficulties which had been encountered and the manner in which they had been overcome were explained. The meter reading problems were similar to those in Salisbury, and the size of Fayetteville and the number of meters read made it an ideal place with which to make comparisons. This City was responsible for the monthly reading of some 23,000 electricity meters and 13,000 water meters mostly situated in heavily populated areas, which could be compared with the situation inside the Salisbury Municipal Area.

14–4: One of the most important points to emerge was that they employed only four meter readers and two radio receiving clerks, which was little more than one half of the number used to read approximately the same number of meters in Salisbury. It was stated that previously six meter readers had been employed with six helpers. Further information was sought on this particular subject, but it was confirmed that the meter reading was undertaken wholly by four meter readers working forty hour weeks, five days at eight hours each. The mode of transport was walking and motor vehicles.

14–5: The basic principles of the system employed were relatively simple. Each meter reader was equipped with a portable radio telephone set and transmitted readings as they were obtained to a receiving clerk who made the necessary


PLATE NO. 1.
MOTOR SCOOTER EQUIPPED WITH RADIO TELEPHONE.

entries in the meter reading record. It was usual for a receiving clerk to be responsible for calls from two meter readers, but this varied with the areas being read, and a receiving clerk could comfortably receive calls from three meter readers.

14–6: The only record carried by the meter reader was a route book which detailed each consumer's name and residential address plus any other useful information such as the whereabouts of an unusually positioned meter, or the presence of a vicious dog. No opportunity was provided for the undesirable practice of obtaining reading with the aid of previous readings and consumptions.

PLATE No. 2.
RADIO METER READING. TRANSMITTING A METER READING TO BASE.

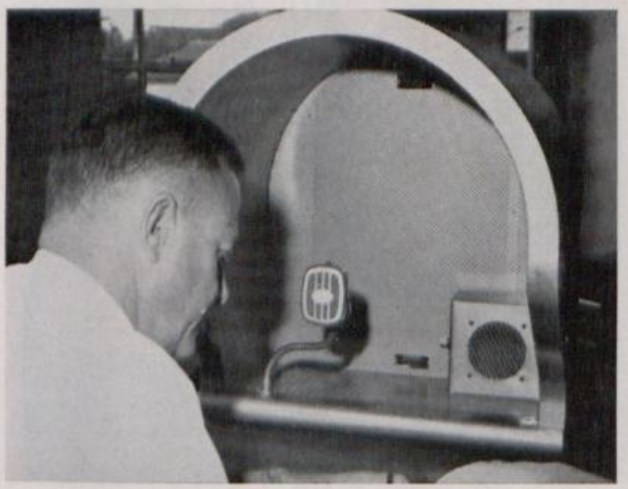

PLATE No. 3.
RADIO METER READING. MONITOR RECEIVING METER READINGS.

14–7: The foremost advantages of the system were stated to be:—

(a) A complete control of meter readers in the field.
(b) Meter readings could be checked as received.
(c) Every meter point was visited.
(d) The meter reading record was always available at the office.
(e) An even flow to the billing section was assured.
(f) Reading programmes were not seriously upset by adverse weather conditions.

14–8: Details of experience gained in Fayetteville proved particularly interesting, as it gave the opportunity for comparison, and indicated how a scheme of radio meter reading might be employed and fitted in with existing reading systems. There was no reason why the same advantages should not accrue with the introduction of this scheme and, as radio telephone equipment was already in use, the cost would not be high.

14–9: The availability of suitable portable radio telephone sets was investigated but it was found that none could be obtained locally; in fact, it appeared that there were few actually being produced. Those on the market were either too low in output, giving very limited range, or could not be adapted for use with the existing equipment. Advice was eventually received of a new type of portable set being produced in England, and the local distributors arranged that one would be obtained and loaned for experimental purposes. Unfortunately, there was considerable delay before a set was available for export and it was not received until the latter part of 1961.

14–10: This set was transistorised, and operated by 12 volt rechargeable batteries which gave an approximate working life of eight hours. It was fully waterproofed, which was an important requirement. The weight including battery was 24 lbs. and this was more than actually desired, but as the Meter Reader would be using a scooter, it was not considered that this would cause any hardship. On test, the range and performance proved equal to that of the mobile units and fixed stations already used.

14–11: For the first experiment an area was chosen where reading routes had recently been re-arranged; it contained a fairly even proportion of light industrial, business and domestic consumers, and although it was quite a high density area, it had always been a problem for meter reading. This was due to variations in the type of electricity meters, the position of water meters, plus the fact that many premises had several electricity meters at different points; additional meters having been installed after the original connection. The whole meter reading programme in this zone was completed within two-thirds of the usual time taken. Further experiments were carried out in the other "mixed" areas, and also in wholly residential areas where reading routes had not been re-arranged. The results were similar and it was found that on average the time for reading was reduced by approximately one-third.

14–12: The savings in time and labour were not confined to work in the field, for, as all readings were checked as received, the meter reading records had been passed to the Accounting Branch as each route was completed. Whilst these experiments proved the possibilities of radio meter reading, its real value could not be fully assessed as only one portable radio telephone set was used in the experiment whereas the monitor could have received readings from two other meter readers.

14–13: It was accepted that radio meter reading could not replace self-meter reading, but would improve efficiency if it were to be used inside the Municipal Area for all meters beyond a reasonable walking distance from base.

Until the system was employed for a period in a limited way, it would not be possible to establish exactly what equipment would be required to read the meters mentioned, and for the initial stage it was arranged that three portable radio sets should be purchased, being the number that could be accommodated on the existing network.

14–14: The cost of the sets, with six batteries and the necessary extension to a fixed station amounted to £798 which it is estimated will be recovered by savings within the first year of operation.

14–15: As the system was only introduced in early December, 1962, it is not possible to give further facts or figures in this paper, but it is in regular use (Plates 2 and 3) and the initial results have confirmed that radio meter reading will result in the advantages expected.

## CONCLUSION

The object of this paper is not to boost the principle of joint meter reading control, although in Salisbury it is believed to be the most efficient and economical system when a local authority is responsible for more than one metered service, nor is it the intention to dogmatize on the subject of responsibility for meter reading.

The real aim is to illustrate the value of close co-operation in meter reading and kindred activities which directly or indirectly effect that very important person, the consumer and his account. Unless there is the closest liaison in all phases of account preparation, from meter reading to rendition of the account itself the consumer is not properly served, no matter how efficient individual groups employed in this operation might be. The main duty is to provide an efficient economic service, which ensures early presentation of accurate accounts.

Salisbury's boom period created conditions rarely experienced, and if changes in meter reading procedures had not been made, cost would undoubtedly have risen considerably. It was, however, not only possible to cope with the increase in consumers that these conditions brought about, but efficiency was increased whilst costs were substantially reduced. (Table 3).

Self Meter Reading is a system which must recommend itself, as it is the most economical method that can be

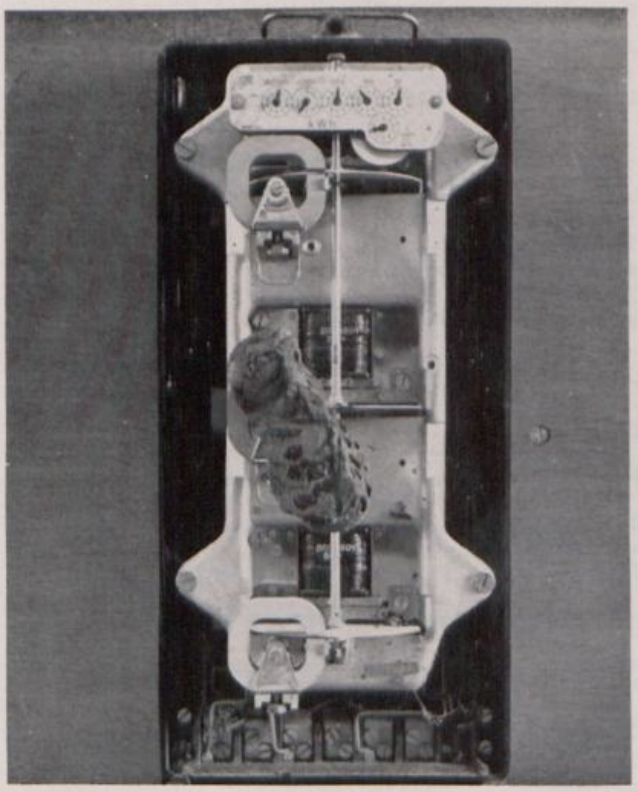

PLATE No. 4.
METER READING HAZARDS. HORNET'S NEST INSIDE A METER.

PLATE No. 5.
METER READING HAZARDS. THE METER READER'S FRIEND?

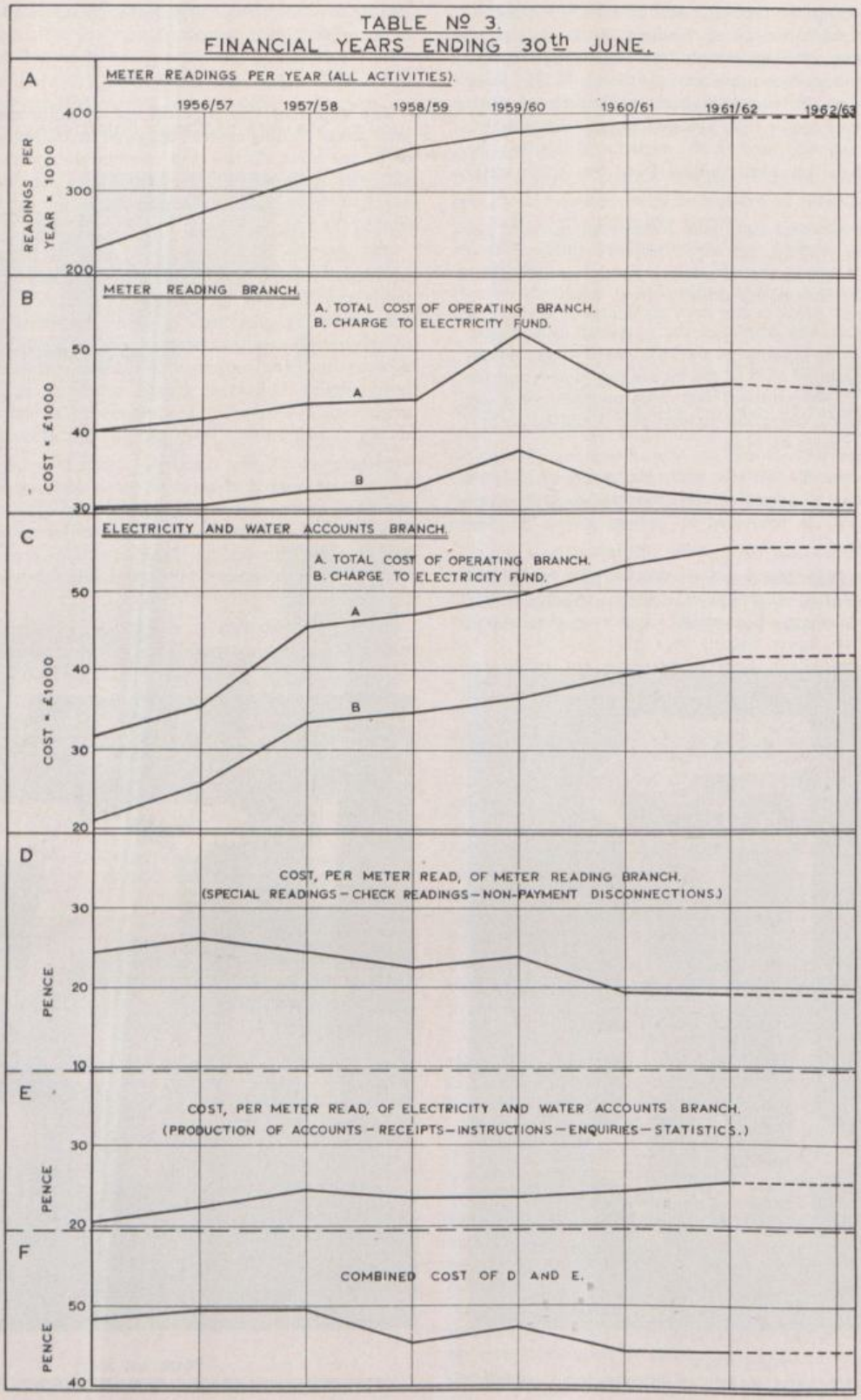
TABLE Nº 3.
FINANCIAL YEARS ENDING 30th JUNE.
A
METER READINGS PER YEAR (ALL ACTIVITIES).
1956/57
1957/58
1958/59
1959/60
1960/61
1961/62
1962/63
READINGS PER YEAR × 1000
400
300
200
B
METER READING BRANCH.
A. TOTAL COST OF OPERATING BRANCH.
B. CHARGE TO ELECTRICITY FUND.
COST × £1000
50
40
30
A
B
C
ELECTRICITY AND WATER ACCOUNTS BRANCH.
A. TOTAL COST OF OPERATING BRANCH.
B. CHARGE TO ELECTRICITY FUND.
COST × £1000
50
40
30
20
A
B
D
COST, PER METER READ, OF METER READING BRANCH.
(SPECIAL READINGS – CHECK READINGS – NON-PAYMENT DISCONNECTIONS.)
PENCE
30
20
10
E
COST, PER METER READ, OF ELECTRICITY AND WATER ACCOUNTS BRANCH.
(PRODUCTION OF ACCOUNTS – RECEIPTS – INSTRUCTIONS – ENQUIRIES – STATISTICS.)
PENCE
30
20
F
COMBINED COST OF D AND E.
PENCE
50
40

employed. However, as its efficiency depends so much on the consumer and the administrating officials, it requires careful handling and that personal touch which is so often lacking in larger organisations.

Being such a new idea, Radio Meter Reading could be looked upon as unnecessarily involved and expensive to set up, but it does provide that all important control over the movements of field workers, and with surprising results. At the same time, it greatly reduces the incidence of mis-readings whilst speeding the flow of work.

Salisbury's Meter Reading Branch is proud of its achievements, but the battle for further efficiency with lower costs is not considered over, for any new techniques that come to notice will be explored and adopted, if proved suitable.

ACKNOWLEDGEMENTS

In conclusion, I wish to thank the Salisbury City Council for enabling me to prepare and present this paper, and also to express my appreciation for the encouragement and advice of the City Electrical Engineer, Mr. E. C. Lynch, the City Treasurer, Mr. H. R. Martin, and Treasury Assistant, Mr. I. A. B. Galletly.

I also wish to acknowledge the assistance given by my colleagues in the Treasury and the Electricity Departments.

THE PRESIDENT: I now have much pleasure in asking Mr. Simpson to propose a vote of thanks.

Mr. R. M. O. SIMPSON (Durban): Mr. President, Mr. Hutton, ladies and gentlemen, I think it is well known that nearly all meter reading business of Municipal Supply Undertakings has been taken over by the respective Treasury Departments throughout South Africa. It is therefore with particular pleasure that as an Engineer, it has fallen to me to thank the Author for such an interesting address.

Meter reading, generally throughout South Africa, and apparently in Rhodesia has been taken over by the Treasurers in the endeavour to reduce costs of reading by including any other metered services in the rounds of a Meter Reader.

It has undoubtedly caused some difficulties, but these have generally been overcome by close co-operation between the Engineer and Treasurer.

The failure to co-operate can have most serious consequences which I need not enumerate here. In Durban we have agreed to combine Disconnection and Reconnections with our normal faults organisation which is radio controlled, to avoid overlapping visits. This arrangement works reasonably, at times we do get into some difficulty due to the number of disconnections required.

Mr. Hutton has given us his experiences in a number of aspects of Meter Reading which have been spoken about but not tried out as yet and I am quite certain that other members of the Association and my own Treasury Department, would like to hear more about them, and which will now be available to them in the proceedings.

The rapid rate of rise in the number of consumers in Salisbury gave the impetus to investigate alternate meter reading methods.

At one particular time they were increasing unit sales at the rate of over 25% per annum, which is an exceptionally high rate.

One of the most interesting developments that appealed to me, has been his experience with the introduction of a system of self-reading.

In Durban this particular problem has come to the fore several times; a while ago it went as far as the initiation of a careful investigation by the Treasury Department, but was held over, pending the introduction of an electronic computer, to see what effect this unit had on billing and rendition of accounts.

I am informed that the position now is that the Computor is working satisfactorily, the whole question of self reading, or quarterly reading of meters, will be fully investigated.

I personally have been interested in this particular aspect for some time, as it has appealed to me as being a reasonable method of reducing meter reading costs.

From preliminary investigation in Durban, if we introduced the reading of meters either on a quarterly or self reading basis there would be a probable saving of some 40 to 50,000 rand per annum in meter reading costs alone. A very satisfactory saving in expenditure.

There are many difficulties that can be foreseen and I think Mr. Hutton, from his experience in Salisbury has been able to give us some help. The one fear that one has, in the introduction of self reading, or quarterly reading of accounts, is the change of population, change of consumer change of address.

From the information given in the paper this morning, Salisbury has experienced a fairly rapid change of consumer, and I would be pleased if Mr. Hutton would enlarge on that particular aspect in relation to self reading or quarterly reading, because one can see the difficulties in keeping track of a consumer if you have to rely on his reporting changes etc.

There is also the problem of change of Tenancy not just necessarily moving to a new address, but leaving the town and going to another City and the difficulties in getting timely notice of this move.

In that case, have the Treasury Department found it necessary to increase the amount of deposit normally called for.

Further points of particular interest in the paper Mr. Hutton states that in 1957 they had 30 meter readers employed with a total number of consumers of about 25,000. From the information I have, in 1963, with about 85,000 consumers in Durban, we employ 33 meter readers. Maybe, there is some particular problem that has made these two rather dis-similar, but I would like Mr. Hutton to express an opinion here.

Dealing with the question of radio, I was very interested in this aspect, but there are certain points that require further comment.

One can see some decided advantages in being able to keep a careful check of the movements of a meter reader. You can track him right throughout the course of his day with radio control, but how do you fare when you get into some of these difficult areas that present blind patches on the spectrum of VHF? And there are quite a number of them. Mind you, Salisbury is a little flatter than Durban, but there are quite a number of positions in Durban that are quite blind to the reception of VHF?

The other point is wrong readings and the placing of responsibility due to lack of clarity of speech, does Mr. Hutton have to have a trial radio broadcaster's test to check up that these men have got good broadcast voices.

The use of scooters — one can see there that there is quite a lot to be gained in the reduction of costs, but I would like to know if Mr. Hutton has come up against difficulties presented by the men themselves refusing to drive scooters.

I should imagine the accident hazard to a person in driving around a busy town in a motor car as compared to a scooter is quite different, and I feel that there may be some exception taken to the use of scooters from the point of view of the increased danger on the one hand, and also to health on the other, because as we know they can effect the kidneys, and other internal organs. Objection may also be taken to the use of scooters in wet weather conditions.

In view of the above difficulties I am assuming that the use of radio in Salisbury is mainly restricted to areas where there are no large blocks of flats, because here also I can see

difficulties in the use of radio in getting your signals to the central station.

The other point, too, is the cost of maintaining radio. How has maintenance costs affected the scheme over a period of time? I presume that with the introduction of transistorised sets that your battery drain is relatively low, so that battery and radio set maintenance is not unduly heavy. I would like a little more information regarding this particular aspect.

Mr. Hutton, spoke about the necessity for co-operation, that undoubtedly, is the key to a lot of the troubles that can arise when two separate departments are responsible for meters and meter reading.

It is all very well to take an untrained man off the streets and teach him how to read a meter, but if he is to be reliable, he has got to be taught more than that, if we are going to reduce possible troubles that can arise from lack of knowledge of what a meter is and how it works.

I would like to know whether Salisbury have means of training in the electricity department of new entry meter readers.

This is essential, particularly where you have such things as meter constants to contend with which can lead to difficulties.

We have had occasions, due to factors beyond our control, where the marking of a constant on a meter has been obliterated, and due to inexperience on the part of a meter reader, this has not been noticed and a wrong account has been sent out monthly until it is discovered some months later which can be disastrous and disconcerting to both the supply authority and to the consumer, here adequate training should almost eliminate such troubles.

With regard to the general aspects of meter reading I notice that in Salisbury the Treasury can carry out disconnections and reconnections themselves, which might to some extent account for the discrepancy between the staffing of the Salisbury and Durban meter reading sections.

There is one other aspect I would like to ask in respect of meter reading: what is the position in Salisbury with regard to the reading of meters of large industrial and commercial consumers? Where two part metering, or kVA demand metering has been installed?

I would like to know because that is one aspect of meter reading that is still carried out by my department. It is rather a strange situation in this respect that the meter reader is deemed to be a more intelligent being than an electrician, and in Durban is paid more money, but when it comes to complicated meter reading, as for instance kVA demand meters this is done by the electricians.

The one obvious reason is of course is that meter reading can also be linked up with the necessity for a careful and frequent maintenance and checking of the meter reading equipment to see that no faults have developed.

Mr. President, there are other interesting points I would like to raise but I feel there are others who would also like to speak on this paper, so with these comments, I would again like to thank Mr. Hutton very much indeed for a most interesting paper, and have very great pleasure in proposing a hearty vote of thanks. (Applause.)

Mr. D. MURRAY-NOBBS (Port Elizabeth): Mr. President, I think Mr. Simpson has covered the subject of Mr. Hutton's paper very comprehensively. I am placed, therefore, in a very awkward position.

However, I hope you will bear with me and forgive me if I tend to encroach on some of the points he has already made.

Mr. President, we have listened with great interest to a very informative paper by Mr. Hutton on a subject which is of great importance to engineers in charge of electricity undertakings.

Firstly, because it refers to the means by which the revenue of the undertaking is measured, and secondly it is a service which is paid for from the revenue.

In the case of Salisbury, Mr. Hutton has shown that a high standard has been achieved in the matter of organised meter reading, and he has effectively illustrated how, despite the phenomenal growth of that city, the electricity section of the Treasury has been able, not only to keep pace with developments, but to introduce new accounting systems, revised transport requirements, and up-to-date methods of communication. However, the system described represents basically the most common form of meter reading employed at the present time, and for that reason should give ample food for thought and constructive momment.

In this connection, Mr. President, there are one or two observations which I would like to make. From an examination of the figures of vehicle mileage, it is noted that although the figures for meter reading reduced considerably after the advent of self-meter reading, the figures of mileage carried out on other duties remained fairly constant, and in some cases actually increased.

Mr. Hutton has defined other duties to include,

(a) the number of check readings required;

(b) investigation of consumer's complaints;

(c) increased activity in the field of nonpayment disconnection.

In the absence of mileages related to special readings, one might assume that the number of check readings and investigations remain at a consistently high level. If this is, in fact, true, then there must be sound reasons for the mileage stated under these headings.

Now the function of the meter reader is to take a reading: make a subtraction, and arrive at the figure of electricity consumed during the month in question. If this operation is carried out correctly, and the metering system is sound, then no doubt concerning the accuracy of the figures should arise, and consequently no additional transport costs need be incurred on that account.

If, on the other hand, the meter reader makes a mistake in the figures, then the reader is inefficient, and if, say, the consumption of electricity for a particular month is higher than usual the reader should be in a position, after brief consultation with the consumer, to give some possible, and perhaps simple reason.

The point I am trying to make is that the meter reader should have sufficient technical training to enable him to

approach his job in an intelligent fashion. I am not inferring that the job of meter reading should be the job of the technical branch, but I do imply that it is not sufficient to employ meter readers, show them how to read a meter, and then let them loose among the consumers.

In undertakings where meter reading is the function of the treasury, provisions should be made for the electricity department to provide a simple course of training on the possible likely causes of varying consumption of electricity from month to month, so that they would then be in a position to satisfy the queries of consumers who may be affected. This may add slightly to the time necessary for meter reading, but I do know that the extra effort entailed in this respect will result in much better consumer relationship, eliminate a lot of unnecessary correspondence, and reduce considerably the transport and time necessary for attending to check readings and complaints.

As far back as 1932 the Port Elizabeth Treasury took over the task of meter reading from the electricity department, as far as domestic and commercial consumers were concerned, much to the chagrin of the engineers at that time, and probably many since.

But with the present co-operation that exists between the two departments, the job of meter reading functions satisfactorily. In regard to the industrial or bulk consumers, who account for close on 56% of our revenue, their meters are read by technical officials of the electricity department for the reason that any error in reading or interpretation could be embarrassing to the Council and annoying to major consumers; and also for the reason that many of these meters are situated in chambers which contain "live" equipment, and in terms of our regulations, only authorised employees are allowed access.

In the case of the meters read by the technical officials, there have been only three complaints of suspected faulty meter readings over a period of 5 years and in each case, the meter, when tested, was found to be within the tolerances permitted.

During the same period, three faulty KVA meters were discovered, and these were corrected without even coming to the notice of the consumers.

This bears out my point, Mr. President, that some technical knowledge could be of great advantage in increasing the efficiency of meter reading.

Incidentally, I may mention that the same category of personnel is used in Port Elizabeth for disconnecting and reconnecting consumer supplies.

I mention these points to illustrate that no meter reading system should be subjected to undue speed simply to satisfy the voracious appetite of mechanical accounting machines. Rather take a little more time initially and thereby save a lot of time and recriminations ultimately.

Perhaps in the course of discussion Mr. Hutton could let us know what system of training is provided for meter readers in Salisbury, what steps are taken there to endeavour to reduce the transport mileage necessary in attending to check readings and investigations of consumers' complaints, and if unskilled meter readers are used for the purpose of disconnecting and reconnecting consumer supplies, how are the technical requirements of this task overcome?

From what I have just said, I would not like the impression to be created that I have no time for accounting machines; this would be foolish in the extreme. But in the case of meter reading, at one end is the consumer, at the other end the meter reader, and in the middle the machine. Therefore if the machine is properly fed, it will do what is expected of it.

I submit it is not sufficient for the meter reader to read accurately and quickly, interpretation of the consumption is every bit as desirable, and when the meter reader becomes an efficient interpreter, then time will be saved and consumer relationships improved.

I feel, Mr. President, I have spent a long time on this aspect of the paper, but I do think the point I have endeavoured to make is important. Although this aspect of the problem is really beyond the scope of Mr. Hutton's paper, it could be mentioned that the extent of meter reading necessary can vary considerably with the design of tariffs employed in the electricity undertaking. Again I can quote Port Elizabeth where, a number of years ago electricity was sold under a multiplicity of tariffs. Since that time, the tariff structure has been re-designed and simplified, and in consequence we have been able to withdraw to date some 6,000 meters from consumers' premises. With an average output per meter reader per working day of 146 meters, this represents a saving of 41 meter reading days.

On the aspect of self-meter reading Mr. Hutton assures us that, despite its success in the Salisbury licenced area of supply, it is not without its faults and complications. This is interesting to note, because again, in Port Elizabeth, this system has been applied in a modest degree, particularly in cases where the meter reader could not obtain access to premises, but the general results were found to be inaccurate, and this, coupled with the problem of a comparatively high floating population, has prevented any extension of the system.

As an afterthought, Mr. President, and referring to this particular self meter reading system, I might refer to the further complications that could arise in that system, in the event of say, a go-slow strike on the part of postal workers, as happened in England a short time ago.

The author, Mr. President, is to be congratulated, for producing a most informative and thought provoking paper, on a subject which is of great interest to all undertakings represented at this Convention.

The historical record of the growth of consumer population in the Salisbury area, and the lively attention which has been paid to its special problems are deserving of our acknowledgement and credit. I therefore have much pleasure Mr. President, in associating myself with Mr. Simpson's remarks, and seconding the vote of thanks to Mr. Hutton. (Applause.)

THE PRESIDENT: In throwing this paper open for discussion, your executive has been at times criticised for having technical papers. I think this is one paper where councillors can quite readily and easily join in the discussion.

I hope the engineers will hold back a little and allow the councillors in the discussion first!

Clr. R. L. DE LANGE (East London): Thank you Mr. President. I am one of those unfortunate city councillors who express the opinion that as a city councillor there was too much of this high faluting technical stuff for us ordinary city councillors, and most probably if there was a paper in which we could take part, we would be much happier.

Mr. Preident, as an ordinary layman, once again, I'd like to express my appreciation to Mr. Hutton for the very clear, and concise way in which this paper has been put out.

As a city councillor, we face the question of finance. I find here that the treasurers are taking over the job of the electrical engineers in this sphere. Well, we'll have city electrical engineers becoming councillors, and what not, Mr. President, and even worthy town clerks, and we are exceptionally proud of this, and I think you are not doing too badly at all.

If I may give you the position as far as we are concerned, may I say that the question of the card system I find very interesting.

It has been raised whether it is going to be successful with the individual who flies by night. Mr. President, I would like Mr. Hutton to tell us: does the card system fit in with the house owner as well as the tenant? I feel that is a system where you have the owner who stays in his own property, and that would be a proposition, but it would be rather difficult most probably with the ordinary tenant.

The question of the radio system is very interesting indeed. We in East London are more or less a compact city. I don't know if, at this stage, it would fit in with the system, but most probably for a city that was spread out it would be very useful.

I want to point out that we in East London now have a system that the readings of both the electricity and the water meter readings are done by one man. Previous to this system we had 7 meter readers on the water side, and 5 on the electrical side, plus each one having a Bantu with him.

That has now been cut down to 6, and we now have 6 meter readers for approximately 15,000 installations.

Our disconnections are all done by radio telephone, that is they are done by the Electricity Department. Special disconnections are also done by members of the Electricity Dept. and they amount to approximately 30 per month.

The question of transport we are very fortunate in that respect. Our meter readers, combining both water and electricity (we are not as fortunate as Port Elizabeth who do 146 a day; I don't know if that covers both water and electricity), do approximately 90 readings per day.

Mr. President, our system at the moment is that we do quarterly readings. Our readings are done every three months. We send out accounts monthly, and are based on the average of a two months' charge, and I will say that we have found that a very successful system thus far.

Insofar as the industrial side is concerned, there we have special meters, and this also is not done by the meter readers of the Treasury, but by the Eelectricity Dept.

I know Mr. Murray-Nobbs has said that the consumer comes between the meter reader and the treasury (correct me if I am wrong), but I think the one who really comes in between is the city councillor. Whenever there is any trouble with our meter reader or with his account the easiest method of approach, if you want to get back in the next municipal election, is to tackle your city councillor, and I am sure that sometimes they even agree to pay the account for the disgruntled tenant.

I would like to recommend this to some of the potential councillors or electrical engineers who intend to become city councillors at the city elections.

Mr. President may I once again say as a councillor I appreciate the paper put forward, and I would like to tell you that we, on behalf of all the other city councillors, accept the position that we can take part in this highly technical paper of yours.

THE PRESIDENT: Thank you Mr. de Lange. It is nice to know that some councillors are prepared to talk to a paper. I would remind Mr. de Lange, a sandwich wouldn't be any good without any meat in it.

Do further councillors wish to discuss this paper.

Mr. J. A. BARNETT (Johannesburg, Affiliate): Mr. President, gentlemen, this subject has been very dear to me for a long time. As a student many years ago I did prepare a small paper on this particular aspect.

I believe today that we have reached the stage were electricity has become an integral part of our life; without it it is doubtful whether or not we could survive.

It is in my humble opinion that the day of meters, meter readings, and all associated with it, are antiquated and should be dispensed with completely.

In this respect of course, I associate my remarks with the President, when he says that we should plan for the future.

Is there any reason whatsoever why we cannot dispense with domestic metering, and allow consumers to have electricity on tap. Bulk metering per suburb, or portion of a suburb, could then be taken by the supply authority, and a yearly average calculated for any particular suburb, because it is appreciated that some suburbs in towns use more electricity than others.

There would be a considerable saving of all these meters, meter testing, and such like, and there would be no question of reconnection fees or anything like that, because the average supply of units per suburb would then be added on to the general assessment rate.

I don't think it is very difficult, because it has been tried as far as water is concerned, and there is no reason why this should not apply to electricity.

I would be particularly interested to hear from members why this method cannot be considered, and would like to see at one of these Conventions a paper on this particular subject, giving the facts and figures for a large, small, and medium sized town.

This suggestion of course, is purely for domestic consumers, and does not include industrial or other large users, but in any case these people are already metered at the source, usually on H.T. supplies.

The question of a general rate for electricity you can imagine will dispense with quite a lot of the problems that have been

associated, and papers that have been read at these Conventions for many years, on meters, meter reading, meter testing, and all the other allied subjects. (Applause.)

CONVENTION ADJOURNED FOR LUNCHEON.

## WRITTEN CONTRIBUTION ON MR. HUTTON'S PAPER. by MR. R. GILMOUR (Cape Town)

Mr. Hutton has presented a paper which is undoubtedly of interest and value to all municipalities who are responsible for the reticulation of electricity. Having been concerned with the accuracy of metering and associated disputes for the best part of my life, I naturally have derived great benefit from this paper. I have, therefore, a few questions to put to Mr. Hutton.

I would like to know what proportion of domestic service rate meters are housed in common meter positions to which consumers have no access; also do many of these consumers request to see their meters at any time?

As regards the use of radio for the reading of meters, I think this is a novel and somewhat interesting application of radio. However, I would be glad if Mr. Hutton could supply the following information:

(1) Is the use of radio for this purpose in Salisbury an extension of an existing radio communication system?

(2) What frequency is used and is amplitude or frequency modulation employed?

(3) Who maintains the equipment? If it is done by the municipality which department is responsible and are specially trained staff employed?

As the reading of meters is the responsibility of the Treasurer's Department in Salisbury, how are the meter readers trained? Are they required to have any basic technical knowledge of a meter e.g. the meaning of creep, minimum starting or running current etc., which would enable them to decide whether to recommend examining or changing the meter or not?

## WRITTEN CONTRIBUTION ON MR. HUTTON'S PAPER by MR. L. J. HOOLEY (Visitor, Salisbury)

The meter reading department of an electricity undertaking is often the unloved and unwanted Cinderella of the organisation, but surely this is unfair if the department functions efficiently and makes full use of its privileged position for promoting consumer goodwill.

It was indeed a pleasure to read Mr. Hutton's excellent paper and to hear him speak on it, perhaps more so because I happen to be a Salisbury consumer and therefore find it reassuring to know that the consumers' interests in Salisbury are so carefully tended.

It also happens that I was at one time Consumers Engineer and Meter Superintendent for a very large London Borough of some 50,000 consumers, and afterwards Commercial Engineer for four similar boroughs forming a sub-area of the London Electricity Board, and I speak with some knowledge of the trials and tribulations of the Meter Reading and Accounting Departments.

There are three aspects of the subject I should like to put to Mr. Hutton, concerning, respectively, payment in advance, disconnexion for non-payment, and the dog problem.

*Payment in Advance for Electricity.*

In a "cash only" business transaction the goods and money change hands at the same time and the cash customer is free to go to any shop he fancies.

At a cash-cum-credit shop the customer either pays cash at the time of sale (if he has the inclination and the cash) or, if his credit is good, the sale is "entered" for payment to be made a month (or, who knows, several months) later.

Electricity, however, is not a commodity to be parcelled up and sold over the counter, nor has the customer any choice of supplier, nor, in most instances, even the option to pay cash. Nor, on the other hand, has the electricity undertaking much of an option to refuse a prospective consumer who can make satisfactory arrangements for payment, usually in the form of a cash deposit representing perhaps one or two months' expected consumption.

In many areas of Britain, the use of prepayment meters for the "pay-as-you-go" consumer is widespread and that class of consumer is willing to pay more by way of increased meter rentals or standing charges for the convenience of a slot-meter as compared with the credit meter and presentation of bills.

However, I do not suggest that prepayment meters would be generally suitable in Salisbury remembering that in addition to much higher costs (compared with ordinary credit meters) of purchasing, testing, calibrating, maintenance of such meters including the repairing of coin-mechanisms damaged by abuse and the use of spurious coins, washers and a miscellany of other objects, a prepayment meter must be fixed in a secure position and under the direct control and observance of the consumer. Also, the prepayment meter collector can only empty the coin-box in the presence of the consumer or of some responsible person to whom rebates, if any, can be paid, or from whom deficiencies in cash, due to the use of incorrect coins, can be collected or to whom any suspected interference with the meter can be pointed out; also, the collector has to make the necessary on-the-spot calculations in relation to units consumed and standing-charges due for each consumer and to issue receipts, and to return to a banking point at least twice a day to cash up for security reasons and because of the weight of coins, and therefore can only deal with perhaps twenty consumers in a day.

It will be appreciated then that the difficulties explained by Mr. Hutton in obtaining ordinary meter readings in Salisbury would be increased enormously in the circumstances related above. The presence of a responsible person at the time of collection would be impossible to obtain in very many instances during normal working hours because of the high incidence of working wives, and the collection and carrying of large sums in coins during the hours of darkness would be a grave security risk, especially to the collectors themselves.

My suggestion for "payment of electricity charges in advance" for Mr. Hutton's consideration is not, however, based on the use of prepayment meters but on the application of a much simpler system.

The City of Salisbury Electricity Undertaking follows the common practice of requiring a deposit from each new con-

sumer before initially connecting a supply, and at the present time I believe the amount of the deposit is based approximately on the cost of two months' consumption.

Once the deposit has been paid over the counter, however, it remains dormant (in theory) and inviolate except for accumulating interest, until the supply is finally disconnected for that particular consumer. The deposit, of course, provides a measure of security to the undertaking against any default in payment, but notwithstanding that the deposit is held, consumers can still be disconnected from the supply if, for some reason or other, the account is not paid by the due date.

In the Meter Reading and Accounting Department of any normal electricity undertaking, domestic consumers comprise the largest single classified group for tariff, meter reading and billing purposes, and the expected monthly consumption of a domestic consumer can be very easily determined.

Therefore, instead of requiring the prospective consumer to make a deposit of say £10.0.0. on which interest has to be paid during the continuation of the contract over an unpredictable number of years, the same amount could be required as an initial payment in advance against a pro-forma account. Each subsequent account would be rendered after normal meter reading on the due date, and would show the amount to be debited for the preceding month against the actual amount held, and the estimated amount required in advance for the succeeding month.

The marginal sum left in the "kitty" could, in fact, provide the necessary security for any interim consumption between meter reading date and date of payment.

If a proper agreement is made between undertaking and consumer for payment in advance on this basis the agreement could be terminated and supply disconnected in the event of any default or refusal to pay.

As an additional service to the consumer, particularly where he receives a weekly wage or salary, advance payments might be accepted weekly and credited towards the next monthly account.

I do think that for domestic consumers, especially for groups now in the transitional stage from special unmetered but restricted supplies (where electricity costs are often subsidised and paid for as part of the rental for the premises) to unrestricted but metered supplies in terms of the standard tariffs, that payments in advance will be of immense mutual benefit to the undertaking and to consumers.

It is possible, too, that further evolution in the methods of charging for supplies will lead to a greater use of load-limiting circuit-breakers for all groups of domestic consumers of say 30 to 40 amperes capacity as an alternative to the traditional use of kWh. meters; and in which event the predetermined fixed charge with no running charge to be provided for, will be ideally suited for collection in advance.

*Disconnexion for non-payment.*

As I am designated Chief Electrical Inspector for the purpose of administering the Electricity Supply and Electricity Wiring Regulations made in terms of the Federal Electricity Act, I am aware, of course, of all the situations in which an electricity undertaking may, or shall, with or without notice, depending on circumstance, disconnect a consumer's electrical installation from the supply.

The electricity undertaking is permitted to disconnect where the consumer has failed to pay charges lawfully due, and the City of Salisbury Electricity Department, in common with other undertakings, considers that the presentation of the ordinary monthly account which contains a specified date for payment is sufficient in itself as a final notice, and any default in payment after the date can lead to disconnexion.

Whilst the undertakings' right to do this is beyond question, especially as they are custodians of public money and must ensure that irrecoverable debts are kept to the absolute minimum, I do think that some modification of this approach might be tried.

The supply of electricity is (rightly so and for very good reasons) a protected monopoly. A consumer has no choice of supplier and if disconnected for non-payment has no alternative but to pay up before supply is restored.

Retailers in ordinary commerce and industry are not so privileged and even a refusal to supply further goods does not prevent the customer "going to the firm next door" for his requirements.

Notwithstanding this, it is common practice for a retailer to send at least one final demand before taking drastic action.

In the case of electricity accounts, there must be instances in which the account has not been received by the consumer, or has been genuinely forgotten, or attendance at the one and only office for payment cannot be conveniently arranged by the due date, and I would have thought that "final notices" would be more suited to such circumstances than the drastic cutting off, especially where the undertaking does in fact hold a substantial security deposit against the incurrence of an irrecoverable debt.

I have arrived at this conclusion, not merely from the consumer goodwill aspect but from an examination of the City of Salisbury's own figures at page 58 in the Printed Agenda, where Mr. Hutton in his table No. 2, shows some phenomenal vehicle mileages for the purpose of disconnexions for non-payment.

In fact, it can be seen that on more than one occasion the "non-payment" mileages (if the statistics are acceptable without some undisclosed qualification) very closely approach the total meter-reading mileages.

Some of the costs of this very high mileage are probably recovered from the recalcitrant consumers by way of reconnexion fees, but in fairness to the majority of regular payers, some alternative method seems to be indicated, although I am quite sure that the City of Salisbury have already given much thought to the problem.

However, speaking as a Salisbury consumer who meets his commitments, I should like to see by way of experiment the use of final notices as reminders instituted for say, twelve months, and a study made of the effect on the non-payment mileage and all the incidental work, at the end of the trial period.

I am aware that many consumers who would otherwise pay their accounts on due date would await a final notice, but

if some incentive is given to pay by due date by the application of a surcharge on late payments, this should not be a substantial argument against sending final notices.

If such an experiment shows that consumers do not generally respond to prodding by final notices and that "disconnexion for non-payment" mileage and all the undisclosed work associated therewith are not diminished, I would suggest the introduction of a payment-in-advance scheme which I outlined above.

*"Beware of the Dog".*

The solution to the dog problem was given to us at the excellent "Gay Nineties" production so very kindly put on for the delegates.

The meter reader, faced with an approaching dog which is barking "bow-wow" continuously, should take the dog firmly behind the neck with one hand. He should thrust his other hand down the dog's throat, grab its tail and then turn the dog inside out. The dog will then run away backwards barking "wow-bow"!

*On resuming at* 2.30 *p.m.*

THE PRESIDENT: We will resume now, gentlemen, and with your permission I should like to postpone Mr. Burger's paper until after the tea session, for a number of reasons. First of all Mr. de Jager has to get back to Pretoria, and as one or two contributors wish to contribute to the discussion, it will be essential for us to finalise the discussion on that paper immediatly, and if you are agreeable, I'll ask Mr. de Jager to come up to the rostrum, and we'll continue the discussion on his paper.

This is also a paper where councillors can voice their opinions and feelings on the matter. There is a lot of meat in it, so you haven't got a sandwich without any meat!

Mr. T.S. KALIL (Bloemfontein): Mr. President, I am very pleased that we are being given an opportunity of talking on this paper again, but unfortunately I was'nt prepared for it this afternoon, but I do want to say this, that the impression I gained was that Mr. de Jager was concentrating virtually the powers of the whole Council in the Electricity Department.

On the third page his speech here, "The fact that the City Treasurer allocates interest in respect of these funds at his disposal does not necessarily mean that the funds are being invested to the best advantage . . ."

I realise, and I think that the policy throughout the country has been that profits must be cut down by any municipality as far as possible, but we, I think, as councillors, also appreciate the fact that we have a number of utility departments, parks, sports fields, and so on, which cater for the health of our citizens, and unless some, or one or other branch, of a municipal undertaking can assist, over and above the rates that are obtained, then I am afraid that most of our cities would not go forward, but would be retarded.

There were a number of aspects in this paper that I felt would give councillors particularly an opportunity of getting their teeth into something.

Another aspect I gained, too, was the impression that the price of the commodity sold — in this case electricity — should be spread over a period by means of building up these reserve funds. As I worked out the percentages, there is an apparently increasing cost, that is the overall cost percentage of about 4% so that spread over a period, if the tariffs were arranged so that one could place, say 5% of your income in a reserve fund, one would level out prices and I think one could then cover the eventual increase in costs from the higher cost of production and so on, as they seem to go along and these things increase.

I don't know, Mr. de Jager can perhaps correct me there; he might have arguments against that.

I think it is in this paper as well that the suggestion is made that the power station plant that is available must be such that it can meet a peak demand, but then in purchasing the plant, or laying out the capital, you must so economise that you will not have any over-capitalisation of that plant. That is fine if you can anticipate exactly what your peak periods are going to be; or you can satisfy yourself that there is not going to be a break down.

I think in this paper Mr. de Jager has made it abundantly clear that the reliability of supply is very very important, and in conclusion I would like to congratulate him, and the speakers subsequent to him who contributed so much towards this subject.

Mr. R. M. O. SIMPSON (Durban): I would like to join the previous speakers in thanking Mr. de Jager for a most interesting address. Papers on the subject of Economics of Distribution are always of very great interest, particularly where information is given in connection with schemes and costs that one can compare with ones own installation enabling comparisons to be made and resulting questions asked. There are one or two points that I would like to raise in this regard.

(a) Mr. de Jager mentioned a proposal for operating cables at higher temperatures with a corresponding increase in capacity, in this connection I was interested some time ago during a visit to Sweden to find that in Stockholm, due to the type of cable that had been used for some years at 5 kV. being suitable for uprating that they were operating sections of this system at 10 kV., with a considerable saving. This makes me think of the policy that has been followed on many systems throughout South Africa and other countries of buying cables to specification that leave no possible chance of increasing operating voltage. It does of course, still allow investigation into raising of the normal maximum operating temperature.

(b) The other point that interested me, was the method adopted in Pretoria for the operation of their Major Substations. I note that one of the 20 MVA. transformers is normally kept on load and that the other one purely for Standby, I presume that the full load is carried by one transformer only; if this is so, using the Pretoria method in our major substations in Durban where we operate with 2 — 15 MVA units, I find that it would cost us practically R1,000 a year more per substation than under the present conditions where transformers are parallelled and the load shared.

With regard to the provision of standby plant, it is very difficult to separate Residential from Industrial Consumers unless you wish to complicate your system with corresponding

increase in costs. It is economic to have a certain amount of mixed load on the higher voltage system as it assists generally in improving the diversity with a corresponding reduction in costs, etc. Any system that fails to provide adequate standby to Consumers suffers from a very great potential disadvantage and can also cause considerable losses to Industry. If we consider, consumers such as Oil Refineries, similar to the one in Durban, we find that a ten minute shutdown is likely to cost in the region of R50,000 and thereafter a standing loss of over R1,000 per hour. We have investigated several smaller consumers and find that quite a number averaged from between R1,000 to R2,000 loss in the event of the shutdown of supply. These losses are very heavy and I consider it unreasonable to expect Industrial Consumers to operate under such dis-advantages. In fact I am quite sure that a number of Industrial Consumers would willingly pay extra for this standby facility.

The economics of distribution can also be considerably improved by application of suitable tariffs. Some years ago in Durban we introduced a Three Part Tariff which allowed for two separate demand charges which encouraged Industrial Consumers to adjust their hours of operation to avoid the normal system peak load periods and I estimate that this has contributed considerably to a rise in our system load factor of over 7% during the last 10 years.

It is apreciated that tariffs of this type can become increasingly difficult to operate with changing system characteristics but so far they have not got beyond our control. With these few comments I would like again to thank the speaker for a most interesting address.

Mr. J. J. GROENEWALD (Dept. of Labour, Pretoria): Mr. President, Mr. Kane referred to me personally in some respect yesterday, and perhaps I should reply to that.

I had thought that this paper of Mr. de Jager's was a paper that had no implications as far as the Factories Act was concerned and therefore I thought I would be able to just sit back and enjoy it. And I would like to say how much I did actually enjoy it, that is reading the paper.

En, mnr. die President, ek wil graag vir mnr. de Jager bedank en geluk wens op die interressante wyse waarop hy sy verhandeling voorgedra het.

Mr. President, Mr. Kane has shown us the adaptability of statistics. In going to the very bottom of a column in the second table of Mr. de Jager's paper, he came across a figure of four electrocutions in connection with overhead service mains.

I did not think that that really had any reference to this particular paper which dealt with economics, but nevertheless the matter has been raised.

I think there is a tendency to speak about accidents in rather a global fashion.

We are electrical engineers, and we do not control road accidents, and therefore this inevitable reference to road accidents, I think, should be avoided. Let us rather view the matter of accidents in our own industrial field and endeavour to reduce these accidents as far as is practically possible.

Four electrocutions in six years in Pretoria, may not appear very many, but I do think that every single accident is a major human consideration, and should be treated as such, and in the field of the engineer. I think it is the personal responsibility of the engineer to try and eliminate every accident if at all possible.

Now when we come to the question of overhead service mains, we have a particular application in the use of electricity. We have controlled conditions. Overhead service mains are required to be installed under the control and supervision of responsible engineers, by competent electricians; all conductors themselves are subject to approval, the method of connection at the terminals is clearly specified, therefore there should be no obvious reason why one should have accidents in this connection.

It is therefore rather distressing that we find we are having approximately four accidents per year directly due to defective overhead service mains; there have been approximately 16 electrocutions over the past four years.

I do think that it requires the earnest attention of every electrical engineer. When it was referred to the "blitz" in referring to the humble effort of the Department of Labour, I think Mr. Kane had in mind a recent press report. It is not a blitz at all. It is merely an organised approach in trying to get electrical suppliers to comply with the provisions of the Act that have been incumbent upon them for over 20 years now.

I think it is a responsibility which they must face. Thank you, sir.

Mr. P. J. BOTES (Roodepoort): Mnr. die President, eerstens wil ek mnr. de Jager gelukwens met die lewering van die uiters interessante referaat.

Mnr. de Jager en ook mnr. Theron wat gepraat het, van Vanderbijlpark, raak net-net aan die kwessie van salarisse van elektrotegniese ingenieurs. Oor hierdie aspek, en alhoewel my bydra 'n indirekte bydrae is en effens van die onderwerp afgaan, voel ek dat dit van uiters belang is en dat ek 'n waarskuwing aan my kolegas wil rig.

Wat ek gaan sê mnr. die President, is nie 'n aanval op die Transvaalse Plaaslike bestuurs ordinansie nie, ook nie op stadsklerke nie. Ek sien hier is 'n paar op die Konvensie, en ek hoop net dat my bydrae nie vir hulle idees sal gee nie.

Die Transvaalse plaaslike bestuurs ordinansie bepaal dat die salaris van die stadsklerk 10% hoër kan wees as die hoogste betaalde amptenaar van die Raad. Gestel nou daar is 'n stadsklerk wat sy eie salaris nie opstoot — en wie wil nie sy eie salaris opgestoot sien nie — dat sal hy eerstens vasstel dat daar onder al die hoofde van departemente, die stadsingenieur, die persoon is wie se salaris die maklikste is om op te stoot.

Om die stadsingenieur se salaris op te stoot word soveel van die ander departemente soos parke, verkeer, brandweer, en bus diens, onder hom geplaas, en dit word afgerond deur die elektrisiteits-afdeling ook onder hom te plaas.

Nou, mnr. die President, word 'n werkswaardering deur buite konsultante gedoen. Die gevolg is dat die stadsingenieurs se salaris fantasties hoog styg, terwyl die ander hoofde se salaris o.a. die elektrotegniese ingenieur, baie min indien glad nie styg nie.

Die stadsklerk egter kry 10% hoër salaris as die van die stadsingenieur.

Ek wil dit net nogeens duidelik stel dat dit in Roodepoort toevallig so gebeur het, en nie moedswillig beplan is nie.

Mnr. die President, ek wil net oordra aan die Konvensie die gevaar wat dit inhou vir die elektrotegniese ingenieur.
Dankie.

Mnr. VAN DER SPUY (W.N.H.R.): Mnr. die President, dames en here, ek wil ook graag mnr. de Jager gelukwens met die hoogstaande referaat wat hy vir ons voorgedra het. Al die werk wat deur ingenieurs gedoen word, is tog op een of ander manier baie onafhanklik van die koste, en die ekonomie van die stelsel is van die eerste belang.

As mentioned by Mr. de Jager, one of the methods of reducing the capital charges is by the more efficient planning of the distribution network.

It is felt that the average engineer could make more use of the latest techniques and information available when designing new networks and installations. The advent of the modern high speed electronic computer has made available a new tool to the design engineer.

The computer at the C.S.I.R. has already been used for design problems in heavy current engineering and has proved most effective.

Programmes for this machine are available, and we can take advantage of world experience when solving such problems as systems stability, economic cable or overhead line loadings, minimum cost, — loadings of power transformers, etc.

Incidentally for those engineers who have no ready access to computer facilities, we would be only too willing to assist with any of their problems. After all, Mr. President, when a systems design based on certain parameters has been completed after weeks of hard work, and there are 30 or 40 variations possible, and each new set of variables requires a complete new set of re-calculations, even the most enthusiastic design engineer accepts certain suppositions after a month or so.

A computer able to do 5,000 multiplications or divisions per second, and 30,000 additions or subtractions per second, allows a fantastic rate of calculations to be done within minutes.

A close study of the economic cost loadings of transformers alone, could make a substantial contribution to the saving of capital outlay in a distribution system. For example in calculating the economic loading on a transformer, changes in costs, labour prices, value of money over the years, service ageing (or life) etc. will change the economic loading point of that transformer.

A study by Klopfenstein showed that depreciation increases at an exponential rate with respect to load, while savings in fixed costs decreases linearly.

Collecting and analysing more data from tests, log books, ammeter charts and weather charts, would improve the knowledge of service ageing of transformers. Field experience with modern transformers is just beginning and the variations from the average life predicted in the laboratory are just beginning to be found.

According to Klopfenstein the rapid growth of demand makes 50% of transformer capacity less than 10 years old. Only about 15% is older than 30 years.

The small group containing the very old equipment should be observed in an attempt to collect load and ambient data to establish experience tested ageing guides.

The gathering of statistics by one central body and planned analysis thereof would make design information available to all.

Systems can then be designed based on realistic performance figures, and standby capacity reduced to a lower level with consequent saving in capital outlay.

Mr. K. ADAMS (Johannesburg): Mr. de Jager has found that Parkinson's law of growth of personnel is occurring in practice. This is a very interesting phenomenon and I have looked very carefully for an explanation of it in the light of my work in emolumetrics.

The tendency for a group to grow, appears to be a function of the income gradient in a group. When the income gradient is low — that is, when incomes in the group are very nearly the same — the group will grow numerically, particularly at the lowest levels. If the income gradient is high, then the rate of numerical growth is curbed.

It appears that the explanation of this phenomenon involves the concept of progress. A human being must progress while he is alive. If vertical progress is barred then the group will progress horizontally, i.e. numerically and become fat and obese. This puts costs up.

I hope this brief note will shed some light on the mechanism of the operation of Parkinson's law.

Mr. G. HERRMANN (Salisbury): Mr. President, gentlemen, in his stimulating and thought-provoking paper, Mr. de Jager has touched on one of the basic problems of the engineer. Although the engineer may well strive for perfection the practice of engineering is almost invariably a matter of compromise. It may be a compromise as between conflicting technical requirements, or it may be a compromise between technical and economic considerations.

As an illustration, I would like to quote as an example the almost every day problem of selecting the size of a cable, or, for that matter, even the determination of the insulation thickness of a cable.

The engineer's task therefore is to make the maximum beneficial use of the limited resources available, not only to his Council but to our whole social and economic structure.

We cannot, under such a precept, attain perfection without placing an excessive burden on Society. This, I feel, is a fundamental problem raised in this paper.

Of course, every engineer, in his tendency towards perfectionism, prefers for instance the use of cable to overhead lines, but against this preference must be weighed the economic considerations; where a developed and relatively dense group of consumers has an established demand, and established consumption, it may well be that an undeground system may cost little more than an overhead system. But aesthetic, safety, and continuity considerations must be adequate to offset the additional cost.

It is often possible, as Mr. Simpson pointed out in the case of an industrialist, to place a real value on continuity, so that such a consumer may be willing to spend thousands of pounds on a duplicate supply and standby plant, and he again will be evaluating this cost in terms of the cost to him of an interruption.

The value to be placed on the continuity of supply to a domestic consumer is not so readily ascertained (except perhaps in terms of votes), and when it comes to safety or aesthetics, it becomes most difficult to evaluate these in terms of pounds shillings and pence, or rands and cents. Here the judgment and experience of the engineer and his colleagues, and the requirements of his Council will be decisive.

There is, after all, a point at which we must draw the line on our insistance on continuity of supply and consumer service, otherwise we would end up with 100% standby capacity (and a little extra for a factor of safety), duplicate cable feeds throughout, duplicate switchgear and plant — and even duplicate Municipal Electrical Engineers.

As an indication of the cost variation that can occur, the Southern Rhodesian Government has recently reticulated portions of some of its African townships. Although these are not absolutely identical, the housing density is comparable. In one township the cost for an all overhead reticulation — this included a connection fee to the Municipality that was supplying the Government — together with street lighting and overhead service connection, was £23.10.0 per house. In another, where we have an all underground reticulation, the cost was £98. per house.

Allowing 10% per annum for depreciation and interest, the monthly amounts to be recovered from the consumer are 3/11 and 16/4 respectively an increase of more than 12/- per consumer per month, which represents a very substantial proportion of the total income of this class of consumer.

In view of the limitation of funds available, the more elaborate scheme also deprives many other potential consumers of the enjoyment of electrical services.

At the same time, as we feel that we are still uncertain about the trend of electrical consumption among African consumers, the overhead system also has the advantage of allowing us as greater degree of flexibility for meeting future load growths.

Thank you Mr. President.

Mnr. E. DE C. PRETORIUS (Potchefstroom): Mnr. die Voorsitter, ek dink ek is die persoon wat mnr. de Jager seker die langste ken van al die mense wat hier teenwoordig is; ek ken hom al sedert 1944, en my persoonlike ondervinding is dat u moet nie te veel waarde heg aan wat hy sê nie! Op Universiteit het hy al die standpunt ingeneem dat as 'n ding wit is sal hy sê dit is swart, en hy sal sy standpunt met alle krag verdedig, alhoewel hy in sy binneste weet dit is wit. Dit net terloops.

Ek wil eerstens, mnr. die President, mnr. de Jager van harte gelukwens, en dit kom uit die diepte van my hart, dat hy die eer te beurt geval het om die eerste persoon te wees na my wete wat by 'n Konvensie van hierdie vereniging 'n referaat volkome in Afrikaans gelewer het. Ek dink dis werklik iets uitstaande, en dis 'n geskiedkundige gebeurtenis.

Om tot by sy referaat te kom, die kwessie van hoe kapitaalbesteding 'n bietjie verminder kan word, en oormatige kapitaalbesteding vermy kan word. Die kwessie van foutvermoë van kabels: 'n vraag het gisteraand by die ledeforum voorgekom— ek wonder of dié aspek al tot sy uiterste nagevors is, dit kan, heelwat indien die foutvermoë van kabels verhoog kan word, kan dit heelwat bydra tot die vermindering van die kapitaaluitgawe wat 'n onderneming moet aangaan.

Die ander aspek van kapitaalkoste is die statutêre vereiste met betrekking tot spanning (dit is die Elektrisiteitswet van die Republiek), wat binne 5% van die verklaarde waarde gehandhaaf moet word. Nou, dit is nie duidelik of hierdie 5% van toepassing is ten alle tye of net 'n gemiddelde waarde is nie. Ek sal graag van mnr. de Jager wil weet of spannings-regulasie buitekant die 5% vedra kan word vir kort tydperke, en wat die tydsduur van sulke tydperke is.

Die ander saak wat ek mnr. de Jager wil vra, hy het hier gemeld van goedkoper elektrisiteit indien die belastingsfaktor of vragfaktor — ons het destyds geleer, belastingsfaktor — verbeter kan word deur die aanmoediging van lugreëling ens. Het hy in gedagte dat sodanige verbruik deur aparte meters afgemeet moet word? En indien dit die geval is, twyfel ek werklik of daar 'n besparing sal wees.

Die estetiese aspek van bogrondse retikulasie teenoor ondergrondse retikulasie is baie interessant. Hier wil ek vir mnr. de Jager vra hoeveel van sy verbruikers in Pretoria gewillig sal wees om houtpale in hulle gesogte woonbuurte te verdra in plaas van staalpale of konkreetpale?

Dankie meneer.

THE PRESIDENT: Thank you. Are there any further contributors to the discussion?

Clr. H. M. WEBB (Newcastle): Firstly I'd like to congratulate Mr. de Jager on his paper. There is only one aspect that I wish to comment on and that is an aspect which I feel has perhaps to some extent been glossed over and has been mentioned as such already.

The point I wish to bring up is these 4 fatal accidents in a matter of six years. Whilst I agree with the previous Pretoria speaker on the fact that road accidents shouldn't come into the picture, I want to remind you Mr. President that we have heard a lot about statistics during this Conference, and where, if you take the number of people killed in road accidents, against the population of a country, and you also take the number of people killed against the number of overhead linesmen employed. I think the conference itself will see that the percentage in the second case is much higher than in the first, so that I think any safety element that can be introduced is one that should not be overlooked.

THE PRESIDENT: I think this paper has been well discussed, and I would like to call on Mr. de Jager . . .

One more speaker.

Mr. P. VERGOTTINI (Brakpan): Ladies and gentlemen, Parkinson's law should be watered down to a level of common sense I think. This law refers to the high proportion of officers

to fighting men, compared to what was the case say about 30 years ago.

But to make his point for adoption he forgot that for modern warfare, with more highly technically developed means of shooting down very fast aircraft, missiles etc., that that can only be effectively done by the officer type of person.

Similarly a new trend of thought was followed by some municipalities who appointed their own O. & M. officers, but in order to increase efficiency they forgot that the O. & M. can only be adopted when you come to factories, producing one article.

That has been very clearly pointed out to me by the ex-Director of the Mint, and the man in charge of the Government munitions.

THE PRESIDENT: If there are no further contributors to this discussion, I'll ask Mr. de Jager to reply.

## WRITTEN CONTRIBUTION TO MR. J. P. J. DE JAGER'S PAPER by MR. M. SUTHERS (Johannesburg).

Mr. President, in his most interesting paper Mr. de Jager states that in distribution planning the frugal employment of capital requires not only technical proficiency, but also personal courage and presumption.

Although endorsing this phrase in general, I would like to emphasize the need to keep up to date in order to retain technical proficiency. This is particularly valid so far as the example mentioned by Mr. de Jager is concerned, namely that high voltage cables have an overload capacity which allows conductor temperatures of 120C° or even 135°C.

A finely controlled test on a short length of cable liberally laced with thermo-couples is a vastly different matter to the day to day operation of a long run of high voltage cable which will pass through many types of soil with varying thermal resistivities.

By using an extended range of temperatures, certain side effects are brought into play. There is greater thermo-mechanical stress and reduced resistance to ferrule creep at joint positions. The cable has a tendency to wander when surrounded by dry sand, and naturally such items as the short circuit current rating are also affected.

The most difficult part, however, is to ensure that hot spots do not occur which are in excess of the absolute maximum temperature. In the light of present knowledge, this requires not only a measurement of the soil thermal resistivity, but an extension of this, the derived or operational thermal resistivity.

This derived value can be up to three times greater than the measured value and is dependent on the drying effect of the loaded cable, the physical characteristics of the soil surround, and the local climatic conditions. Methods of soil compaction, granular arrangement of the soil, presence of trees and hedges, type of surface, all contribute to this operational value.

It can be seen, therefore, that up to date technical proficiency and close collaboration with the manufacturer are most essential when entering this particular field of the frugal employment of capital.

## WRITTEN CONTRIBUTION TO MR. J. P. J. DE JAGER'S PAPER by Mr. J. K. VON AHLFTEN.

Aangesien die tyd beperk was om 'n verdere bydrae te lewer ten opsigte van mnr. de Jager se referaat en ons almal graad die skrywer genoeg tyd wou gun om te antwoord op die verskillende vrae wat reeds gestel was, wil ek nou graag skriftelik van die geleentheid gebruik maak om eerstens die skrywer geluk te wens met die knap wyse waarop hy sy referaat voorgedra het en tweedens, kommentaar te lewer op 'n belangrike punt wat myns insiens in die referaat aanvegbaar is.

Ek verwys hier veral na die vergelyking wat getref is tussen die uitgawes daaraan verbonde om ondergrondse en bogrondse geleidingstelsels aan te lê. In die referaat word melding gemaak van 'n syfer van R150.00 wat dit in Pretoria meer sou kos om erwe in 'n sekere dorpsgebied ondergronds te bedien. Dit verteenwoordig op die syfer van R200.00 vir bogrondse geleidings 'n verhoging in koste van ruim 75%. Nou, die meeste van ons wat tans gemoeid is met die snelle ontwikkeling van die nywerheidsdorpe in die land waarvan Sasolburg seker een van die jongste, indien nie die jongste is nie; het almal voor dieselfde probleem te staan gekom en dit is van belang om daarop te let dat in nie een van hierdie dorpe nie 'n sekondêre bogrondse geleidingstelsel aangelê is nie. Nou kan argumenteer word dat daar miskien 'n oorvloed van goedkoop kapitaal beskikbaar was toe hierdie dorpe ontwikkel is maar indien die geskiedenis nagegaan word sal dit aan die lig kom dat dit geensins die geval was nie, veral nie in die geval van die Sasol-onderneming wat sy bruikbare kapitaal uiters versigtig moes aanwend aangesien weinig bekend was oor die prosesse wat beoog is. Die hoofsaaklike redes vir 'n ondergrondse stelsel in hierdie dorpe, kan myns insiens soos volg opgesom word:

1. Moderne dorpsbeplanning leen homself uiters moeilik, indien nie onmoontlik nie, aan bogrondse geleidingstelsels.

2. Die hele moderne idee van argitektoniese voorkoms van gebou en wonings kan belemmer word deur onooglike bogrondse geleidings, en in hierdie opsig mag die volgende berig soos dit onlangs in die pers verskyn het, interessant gevind word waarvolgens selfs nou in Kanada, waar bogrondse geleidings in die verlede meesal bo ondergrondse geleindings verkies is, stelselmatig oorgeskakel word, juis vir die redes hierbo genoem.

   *"Power Lines to be Buried.*

   MONTREAL, Thursday, 2nd May, 1963. Montreal, biggest city in Canada, is going to be the scene of a mass grave-digging operation during the next few years.
   The burial programme will mean the disappearance of more than 700 miles of overhead power lines and the poles supporting them. The civic administration regards the wires and poles as a blemish on the city and hopes to remove them in time for the 1967 World's Fair."

3. 'n Noukeurige kosteberekening van alle uitgawes sal aandui dat met hedendaagse toerusting die verskil tussen bogrondse en ondergrondse geleidings geleidelik uitgewis word.

Die probleem in Pretoria blyk dus eerder een van bergagtige of rotsagtige grondformasie te gewees het in die geval van die

vergelyking wat in die referaat getref is. Dit sou egter interessant wees om te verneem wat die werklike uitgawe sal wees vir 'n modern beplande dorpsgebied in Pretoria en kan 'n meer breedvoerige analise van die kostes moontlik 'n verrassing inhou, nieteenstaande enige stremminge wat met uitgrawings ondervind sou word.

Mr. J. P. J. DE JAGER (Pretoria): Mr. President, it was stated by Mr. Theron that councillors are in closer touch with the activities of the undertakinsg under their control, than perhaps the directors of most private undertakings, and therefore should be in a better position to exercise control.

The problem is that a person may be in close touch with the activities of an undertaking and yet not command the necessary tools and facilities to exercise control.

An engineer should be able to talk his council into virtually any scheme, on the grounds of required system capacity, choice of materials and design and to a large extent even on reliability considerations merely by clouding the issue with a few technicalities.

The Director of a private concern merely has to demand results to exercise control to a very large extent. It is for this reason that engineers should be fully aware of their responsibilities towards the public in regard to the spending of public money.

Mr. Murray-Nobbs has stated that he sees it the duty of the electrical engineer to ensure continuity of supply even in spite of the fact that consumers may be prepared to accept a lesser service. I cannot agree with this view as I think one should always ask at what cost and what degree of continuity of supply?

Mr. Murray-Nobbs also referred to the recent major power failure in Great Britain. I am afraid that this was an unhappy choice to illustrate his point, because, as pointed out in the paper, our weather conditions are not comparable with those that struck Europe this winter.

Several speakers commented on the cost comparison of overhead versus underground, and several cost figures per stand have been quoted including statements like "in our case the underground scheme was found to be only 10% more expensive than the overhead scheme", or "in our case the underground scheme was in fact cheaper than the overhead scheme".

I can only repeat the warning already given by other speakers that comparisons are most dangerous unless full details are given of the basis of comparison.

It is for instance most unrealistic to omit the cost of the service connection on the grounds that the consumer is paying for that, or to omit the cost of street-lighting on the grounds that street-lighting is funded from other sources.

The point is that the consumer has to pay for the lot. The object must be to render an overall service of a standard required by the consumer at the lowest cost.

I can only say that overhead reticulation must always be considerably cheaper than underground systems and I can almost guarantee a minimum cost differential of R100 per stand.

Anybody that wishes to argue this point further is invited to submit to me a design for underground reticulation and I will prepare for him an overhead design of comparable parameters to prove my point.

In referring to underground versus overhead in my paper, it was however not the intention to start an argument in this direction. The purpose was merely to illustrate to what extent the capital requirements of a network may be effected by the choice of materials and design.

However, whilst on the subject of overhead versus underground, the economic advantages to be had from the maxim "when in doubt — delay" can be illustrated as follows:—

At the members' forum the question was asked, "what after diversity loading per house should be allowed for, when planing a reticulation scheme?" Figures of up to 8 kW per house were mentioned, as compared with the present day demand of 3 to 3.5 kW for an average all electric house. If full provision has to be made at this stage for an ultimate loading of 8 kW per house with an underground system I pity the poor consumers that have to pay.

An overhead system is extremely flexible in this respect, and in general, no more than the immediate needs have to be provided with this type of system.

Should the consumers of Pretoria, for instance decide at a later stage, when uncertainties in connection with the ultimate maximum demand and other factors have been eliminated, to change to an underground system, the only loss would be the irrecoverable cost of the overhead scheme. When this cost is weighed up against the advantages they are at present enjoying, of lower capital charges on the overhead system, it will be realised that the economics of the overall scheme have already started to swing in their favour only 8 to 10 years after completion of the overhead scheme.

An engineer that has to design an underground system under such conditions, obviously has a clear advantage over his colleague that has started to experiment with an underground system several years earlier, in the face of many uncertainties.

In connection with Table I, Mr. Kane quoted some interesting figures of capital invested per unit sold, but here again, one must be careful in making comparisons. The capital investment reflected on a Council's books does not necessarily bear any relation to the plant and equipment actively used in the generation and distribution of units.

Mr. van der Walt mentioned the use of a consolidated loan fund for self financing of municipal departments.

This fund seems to function on the principle of a communal chest into which surpluses of all trading departments are paid and which is then used for general financing.

I can only warn against the principle of communal chests, as it may deprive the ratepayers and the consumers, of the means to determine exactly how much they pay for exactly what service.

Councillor Kalil also mentioned the fact that Councils are often faced with the difficult problem of financing the non revenue departments like parks etc. The only thing to be borne in mind is that the Council's bookkeeping system must be so designed that it will be possible for anybody to ascertain at a glance, exactly how much is spent on exactly what service.

Unfortunately it is not only engineers that sometimes resort to technicalities to cloud an issue. City Treasurers too, are usually quite clever at this game. Financial issues are often clouded by journal entries transferring monies from one fund to another and in the end . . . (Applause) . . . it is virtually impossible to find out how much a given service is costing the consumer.

Councillor Kalil and other speakers also mentioned that one should always bear in mind that it is most important to certain consumers to receive a reliable supply.

I tried to cover this aspect in the paper by saying that the frugal employment of capital requires the realistic assessment of the value of reliability of supply as well as the value of the marginal improvement in reliability afforded by any given additional investment in this respect.

The tariff structure should preferably be such that a consumer demanding a high degree of reliability will pay his fair share of the cost.

Mr. Simpson expressed concern about a policy of sailing too close to the wind on safety factors and loadings. On the other hand it must be realised that adding safety factor on safety factor is not the engineering solution to the problem and is certainly one of the most expensive forms of insurance against unknown eventualities.

Regarding Mr. Simpson's remarks on the method of operating the two 20 MVA 33/11.5 kV transformers at primary stepdown substations in Pretoria, that is, one on load and the other one as standby, I must explain that the standby transformers for two or three substations are teed to a single standby cable. It is therefore not possible to run all standby transformers in parallel with the main transformers as the standby cable will then be overloaded.

An economic study at the time had shown the present system to be more economical than the alternative of a larger capital outlay in separate cables to individual standby transformers with corresponding lower copper losses due to the fact that the transformers may then be run in parallel.

Regarding Mr. Groenewald's remarks on safety I think one should be careful not to lose the economic aspects of human safety out of sight. The public can only make limited funds available for spending on their general physical safety and it should be made a criminal offence for any person responsible for the spending of public monies in this respect to spend the money without due regard being given to the effect of the particular spending on the overall picture.

One should bear in mind that it makes no difference whether a life is lost through an accidental electrocution or through a road accident or through lack of funds to improve hospital facilities. From both economic and sentimental points of view the problem remains the same, that is, the relatives have lost their means of support, the country has lost a productive worker and somebody has lost a friend or companion.

The economic aspects of this problem should be mainly the responsibility of the Government. The community on the other hand is best equipped to handle the sentimental aspects of the problem.

In conclusion I would like to say that the time has come for the engineer to show himself a real leader in our complex modern society.

The true leader must be able to see all the problems and needs of the society in the right perspective and should not be blinded by a particular facet of a particular problem. For this reason it is essential that leaders participate in all activities of the society.

If engineers would give heed to these basic principles it will not be necessary for them to demand social status by way of registration which would amount to wrapping themselves in cellophane before forcing themselves on to the public.

Thank you Mr. President. (Applause.)

THE PRESIDENT: Ladies and gentlemen, I think I am expressing your feelings in this matter, but it is a long time ago since we have had a paper that has created so much discussion, and given rise to discussion from all sections of our delegates, and I would like to add my quota and say that not only have I appreciated the paper but your discussions.

I would like to make one further remark, and that is this, if I am looking for trouble I am not going to Pretoria.

I should like to compliment Mr. de Jager on his very fine and spirited reply to all the discussions, but there is one thing I would suggest, and that is that he should change his name to Jaguar from de Jager. To me it has been most delightful listening to his spirited reply, and I think we ought to compliment him.

Finally, ladies and gentlemen, I want you to show your appreciation to all the speakers and to the author of the paper for a very fine and informative paper in the usual manner. (Applause.)

CONVENTION ADJOURNED FOR TEA.

*On resuming after tea.*

THE PRESIDENT: I now call upon Mr. A. P. BURGER to present his paper on "Some Aspects of the Statutes relating to Electricity Supply."

# Some Aspects of the Statutes relating to Electricity Supply

by A.P. BURGER, LL.M., F.I.T.C.

## 1. CLASSIFICATION

(1) Apart from creating various offences and thus adding to criminal law, the laws relating to electricity supply prescribe the constitution and inter-relations of state authorities, their relations to the citizen, their powers, and the way those powers must be exercised. Without going into legal theory, it is sufficient to say here that most jurists will classify such laws as falling under *administrative law*.

(2) Now it is precisely in the field of administrative law where the South African Legal system, as probably the legal systems of most countries, has not yet reached mature development. There are historical reasons for this, which do not concern us here.

(3) But what does concern the practical man is that administrative law is a field where opinions are liable to differ and to depend, perhaps more so than in other legal matters, on the level of knowledge and thought of the lawyer expressing the opinion. Be it noted too that the South African courts — probably more so than anywhere else in the world — scrutinize administrative dispositions with meticulous care to ensure fairplay to the citizen.

## 2. STATUTES

(1) The word "statute" has been used advisedly in the heading to this paper. I want to add that I use it (following Craies on Satute Law and not the South African definition) to *exclude* sub-ordinate legislation. In other words, I intend dealing with provisions in Acts of Parliament and in ordinances of the provincial councils and not with the vast body of by-laws and regulations which illuminates/obscures the Acts and ordinances.

(2) Even from the statutory provisions I shall try to select only a few aspects and problems of a topical nature. This must be done to avoid this paper becoming a lengthy textbook.

(3) There is, of course, no such textbook. He who wants to get to grips with our laws relating to electricity supply must confront a formidable array of statutes. The nucleus, as it were, of these are the following:—

(i) The various provincial ordinance provisions empowering municipalities to supply and conferring ancillary powers on them and powers of control on the administrators of the provinces. In Transvaal, Orange Free State and Natal these provisions are to be found in the local government ordinances of these provinces; but in the Cape there is a specialised ordinance, the Electric Power Ordinance, 6 of 1911, to be read with Ordinance 17 of 1916;

(ii) the Electricity Act, 40 of 1958, as amended by the Electricity Amendment Act, 9 of 1962;

(iii) the second chapter of the Railways Construction Act, 30 of 1922, which empowers the State President to have railway lines electrified and to erect power stations for railway electrification purposes;

(iv) The Commission's (Cost of Living) Powers Act, 6 of 1918, an Act incorporated by reference in to the Electricity Act to prescribe the procedure of the Electricity Control Board.

(4) Around this nucleus of supply statutes there are other important controlling statutes. The Electrical Wiremen and Contractors Act, 20 of 1939, and the Factories, Machinery and Building Work Act, 22 of 1941 and its related Act, the Mines and Works Act, 27 of 1956, are probably the most important of these; but section 88 of the Post Office Act, 44 of 1958, and certain provisions of the Industrial Conciliation Act, 28 of 1956, are equally important. A relic of colonial days still has a decisive bearing on electricity supply on the Witwatersrand and Free State gold fields. I am referring to the Precious and base Metals Act, 35 of 1908 (Transvaal), known as the Gold Law and made applicable to the Free State by Act 13 of 1936. The important provision here is section 74(1), amended as recently as 1961 by section 6 of Act 26 of 1961. This provision requires that a surface right permit be obtained before a power station or a power line can be erected on or over proclaimed land. Act 30 of 1918 extended the provisions of section 74(1) to land held under mining title but not proclaimed.

(5) Apart from these specific statutes, there are a number of general statutes which have a bearing on electricity supply.

## 3. THE MUNICIPALITY'S POWER TO SUPPLY ELECTRICITY

(1) There is no branch of law where correct orientation to a problem is more essential than in administrative law. The legal problems which so often bedevil municipal affairs in general and electricity supply in particular almost invariably arise in this field. A good illustration is *Johannesburg City Council v. Electricity Supply Commission and V.F.P. Co. Ltd.*, 1948(3) S.A. 316 (W), where the full statutory pattern of electricity supply was not presented to the court and where the result was a decision which disregards the cardinal point that the municipality derives its legal power to supply electricity from provincial ordinance provisions older than the Electricity Act and not obliterated by the Act. As a result the expanding municipality is left in uncertainty as to its power to supply in new areas incorporated by it.

(2) We find the Johannesburg case again looming large in the first part of the fifth interim report of the Borckenhagen Committee. Such a committee naturally makes a court judgement its legal point of departure.

(3) But the Committee saw that the judgment leads to trouble in practice. It now recommends that a tribunal, like the Electricity Control Board, should be empowered to decide whether a municipality should supply electricity in an area

later incorporated by it and also falling within one of the large supply areas of Escom. Of course, we can also get the case where the *whole* area of a new municipality is part of Escom supply area.

(4) From the point of view of administrative law the Committee has certainly not struck a false note in recommending that there should be an authority empowered to give such a decision.

(5) I would, however, like to be allowed to put forward for consideration the following approach to the problem:—

(i) Let us accept it as legally possible that an area can exist where Escom, in terms of one of its licences, is authorized to supply and where a new or an old urban local authority into whose area of jurisdiction such part of Escom supply area has been brought, is also legally empowered to supply. Possibly only one of these supply authorities ought to exercise the power. Possibly each ought to do so to some extent. The point is that at constitutional law and administrative law there is nothing unusual or shocking or repulsive to reason where two state authorities — and Escom and the local authority are state authorities —both have identical powers as to the doing of an identical thing. The point to grasp is that we are not dealing here with a situation in private law where private persons and their *rights* are concerned. We are dealing with creatures of public law and their *powers;* and in public law it often happens that two state authorities have identical legal powers. E.g. the Railways Administration and Escom are both empowered to erect power stations;

(ii) But the state acts (or ought to act) as a co-ordinated whole. Hence where two authorities created by the state to serve it, have the same functions and powers relative to the same area of state responsibility, and both want to fulfil the functions and exercise the powers, there ought to be a third state authority empowered to decide the administrative dispute;

(iii) It is often a question as to what state authority ought to be empowered to decide the particular type of administrative dispute. This question ought not to be answered in an arbitrary manner. It ought to be answered by looking at the constitutional set-up as a whole;

(iv) Let us examine the statutes relevant in the present case:

(a) At rock bottom we find that the state's control over Escom is exercised in major policy matters by the State President, but otherwise by the Minister of Economic Affairs. The Control Board is in ultimate reality an extension of the Minister, although (by way of paradox) controlling him in one respect.

(b) Over supply by the municipalities, control is, on the other hand, exercised by the administrators of the provinces.

(c) At this stage of the enquiry attention is drawn to the fact that although municipalities are by ordinance (in the Cape the position is, in my opinion, somewhat different, but this is not relevant here) given general powers to supply, the *exercising* of those powers, the actual erection of supply works, has in each particular case (except in the cases of Cape Town and Durban) even before the existence of the Electricity Act depended on an administrative disposition, namely administrator's authorization.

(d) Section 39 of the Electricity Act, 40 of 1958, seems to me to be directed particularly to erection and extension of power stations. But for present purposes this is neither here nor there. The point is that the ordinances already recognised, and the Act continued to recognise, the *administrator* as the proper state authority to decide whether a particular local authority should or should not establish a supply undertaking or extend an existing undertaking.

(e) Section 39 says that the administrator must obtain a report from Escom. In the report Escom must state, amongst others, whether it can provide a supply of electricity with advantage to the interests of ratepayers and consumers.

(f) It boils down to this, therefore, that it is, and has always been, the *administrator* who decides whether the particular local authority should *exercise within its area of jurisdiction* the power to supply conferred in general terms upon local authorities or whether — since Escom came into being — this should be left to Escom which may already be licensed to supply in the area or can apply to be so licensed.

(v) True enought, the Electricity Control Board is the body empowered by section 40(1) of the Electricity Act to authorize a municipality to supply *outside* its area of jurisdiction. We accept this. But we are *not* dealing now with supply by the local authority *outside* its area. We are dealing with supply by the local authority *inside* its area of jurisdiction, be it then inside a portion of the area which is also in Escom supply area. As far as supply *inside* the area is concerned, *the controller has always been the administrator.* I would put forward, therefore, that the administrator is the proper state authority to be empowered to decide to what extent, if any, the local authority should be authorized to supply in part of Escom supply area incorporated into the municipal area. The power can be conferred upon the administrator on the lines of section 39 of the Electricity Act which requires the administrator to obtain a report from Escom. As a matter of fact, section 13(6) of the Municipal Ordinance, 19 of 1951 (Cape) already empowers the Administrator of the Cape to determine any question arising out of the establishment of new municipalities or the changing of municipal boundaries. Such a determination is binding and has the force of law. It seems appropriate that upon incorporation of a new area into the municipal area, the administrator concerned should determine the question of whether the local authority should be authorized to supply electricity in the area.

(vi) "Administrator" is not defined by the Electricity Act. Therefore, the definition of "administrator" in section 2 of the Interpretation Act, 33 of 1957, applies, and the administrator decides the issue under section 39 *personally*. It is unlike his decisions under the ordinances where the decision is really given by the provincial executive committee. If the administrator is similarly empowered to decide the question of supply in the double

supply area, Escom cannot reasonably object, because the administrator is the direct represenative in the province of the highest executive power of the state. Where he is to decide an issue personally, it must be accepted that he will do so in the general interest of the state.

(vii) It is suggested then that the Borckenhagen Committee could give consideration to recommending outright that the *administrators* be those empowered to decide this issue, and not an unspecified tribunal or the Control Board.

## 4. CIVIL LIABILITY OF THE ELECTRICITY SUPPLIER

(1) As a result of the definition of "undertaker" in section 1 of the Electricity Act, 40 of 1958, section 50 of the Act applies to Escom, the municipality which supplies, and also to other suppliers.

(2) The precursor of section 50, section 49 of the Electricity Act, 42 of 1922, was considered by the court in *Botes v. Potchefstroom Municipality and Another*, 1941 T.P.D. 149. The judgment in this case would indicate that liability of the supplier under section 50 of the Act would depend upon *negligence*, and that the section goes no further than to transfer the incidence of onus of proof under the common law.

(3) Personally I have felt that section 50 imposes liability irrespective of negligence; that the only defences available to the supplier is the defence expressly given to him by sub-section (2) of the section and also of *casus fortuitus*, using this term following Dönges: "Liability for Safe Carriage of Goods", as a generic term including *vis major*.

(4) I have had to justify my views on the section to jurists who have made special studies of delictual liability. They gave me considerable guidance on section 50. They agreed that the section imposes liability regardless of negligence, but they felt that by accepting *vis major* as a defence, I was not stating the liability wide enough. They inclined to the view that the *only defence* is the defence given by sub-section (2) of the section. Now this might not be the practical approach of the courts at the moment, but after thinking it over, I must agree with the inescapable logic that the section leaves no room for the *via media* which I wanted to take between the Botes judgment and liability limited only by sub-section (2).

(5) I am mentioning this here because of the practical implications. Suppliers would be well advised to make certain that they are covered by insurance against claims under section 50 on the basis that the section imposes strict liability. Intending litigants may be put off the scent by the judgment in the case of Botes, but this is unlikely to happen forever.

## 5. VICARIOUS CRIMINAL LIABILITY OF OFFICIALS OF THE SUPPLY AUTHORITIES

(1) The prosecution recently availed itself of section 381(5) of the Criminal Procedure Act, 56 of 1955, to prefer a criminal charge against an electrical engineer personally.

(2) Section 381(5) of Act 56 of 1955 reads as follows:—

"(5) When an offence has been committed, whether by the performance of any act or by the failure to perform any act, for which any corporate body is or was liable to prosecution, any person who was, at the time of the commission of the offence, a director or servant of the corporate body, shall be deemed to be guilty of the said offence, unless it is proved that he did not take part in the commission of the offence, and that he could not have prevented it, and shall be liable to prosecution therefore, either jointly with the corporate body or apart therefrom, and shall on conviction be personally liable to punishment therefore."

(3) We must see the picture clearly: A local authority itself and Escom itself can be criminally charged. There is ample provision for this under sub-sections (1) and (2) of section 381 of the Criminal Procedure Act. An official is then charged as *representative* of the body charged. Modern jurisprudence accepts this procedure.

(4) But in the case referred to the official was not charged as representing the local authority. He was charged *personally*. Section 381(5) of the Act was invoked against him.

(5) Look again at section 381(5). It not only uses the word "servant". It also uses the word "director". Sub-section (10) of section 381 goes on to define "director" so widely that it would also include councillors and members of Escom.

(6) Section 381(5) does not *confine* itself to private corporations. It covers servants of all bodies corporate and, therefore, also those of state authorities with corporate personality at *public law* like Escom and the municipality. The sub-section does not distinguish between public law and private law, between people who are public servants and people who are pursuing private gain.

(7) The case where the prosecution against the engineer personally proceeds under section 381(5) of the Criminal Procedure Act is to be sharply distinguished from a case which has also occurred, namely where the engineer was personally charged as a "user" of machinery under the Factories Act. Now I have maintained and, for a variety of reasons, adhere to this view, that the engineer was wrongly charged as "user". It is significant that when a subsequent case occurred the prosecution steered away from the course of charging the engineer personally as "user" and relied upon section 381(5) of the Criminal Procedure Act.

(8) A charge or indictment under section 381(5) places the city or town electrical engineer — and also the Escom engineer — in a position which in effect comes down to this: However large his department and however wide-spread its activities, the engineer can be personally indicted with culpable homicide when negligent conduct in the undertaking concerned causes death.

(9) True enough, the engineer indicted under section 381(5) can escape conviction if he can prove that he did not take part in the commission of the offence *and* that he could not have prevented it — a difficult defence to establish — and a particularly difficult one where the offence, like culpable homicide, does not involve intent but only negligence. One pities the honest engineer who has to establish this defence in the face of the *post obitum* knowledge which is usually introduced into a negligence enquiry. But even where the engineer would be able to establish the defence, it is still his name which is being dragged through the criminal courts. He is still personally liable for the costs of his defence. Depending on complexity and duration of the case and appeals involved, the engineer can come out on the other side acquitted but poorer by more than a year's salary.

(10) One wonders why there should be this use of the law to charge the engineer personally. After all, it is far simpler to prefer the charge against the body concerned, be it the local authority or Escom. The evidence will show whether personal blame attaches to the engineer. If so, he will be ruined because of guilt. Why institute proceedings against him which can also ruin him financially where he is innocent?

(11) Corporate personally is a technical legal device. It so happens that our courts have held that the Railways Administration has no corporate personality. Yet, the Railways Administration is as much a specialised state authority as Escom is. Besides, it deals with electricity and can even erect power stations. The lack of corporate personality makes no difference to its activities. Yet, purely because of lack in the Administration's set-up of the technical legal device of corporate personality, the Railways servant is not exposed to a personal charge under section 381(5). Or compare the case of members of a provincial executive committee. They in all good faith decide on a course of action, say at a provincial hospital, which turns out to have involved negligence. Section 381(5) cannot be invoked against them. The Provincial Administration has no corporate personality separate from that of the state. If the members of the management committee of a Transvaal municipality were to have given such a decision say with reference to an infectious diseases hospital under municipal control, they could be personally charged under section 381(5) simply because the municipality has corporate personality.

(12) Granted that section 381 sets out to create machinery to get at the humans behind organizations, then it is still only because of the technical legal device of corporate personality being present in the set-up of Escom and the local authority that the Escom member and the municipal councillor are exposed to a personal charge under the section. This is so, because when section 381(7) deals with personal charges against executive members of non-corporate bodies, the kind of body there envisaged is certainly not a state authority or a state agency like Escom. The kind of non-corporate body there mentioned is an "association of persons", the kind of non-corporate body one finds at private law.

(13) Section 381(5) of the Criminal Procedure Act is no doubt a good device to get behind the veil of corporate personality to single out or to discourage those humans who may be inclined to float companies at private law and make their creatures do their dirty work. Where crime is being committed in the name of the company, such a person could point to the company and say that it is the criminal.

(14) I would suggest, however, that members and councillors and servants of such corporations created by or under public law as Escom and the local authority are, ought to be exempted from the operation of section 381(5).

## 6. THE 1962 AMENDMENTS TO THE ELECTRICAL WIREMEN AND CONTRACTORS ACT, 20 OF 1939, AS AMENDED

(a) *Supply to State Premises*

(1) One of the 1962 amendments to this Act does not unravel, but cuts, an old knot.

(2) It will be remembered that I maintained that the provision in section 19(1) of the Act providing for inspection, testing and approval by the supplier of wiring work before giving supply, also applies to installations by the state.

(3) In 1962 section 19(1) was substituted by a new subsection containing a proviso totally exempting wiring work carried on by or on behalf of the government, including the Railways Administration and the provincial administrations, from this provision.

(4) In other words, the position now is that once the state department has notified the supplier that it requires supply, and has paid any connection fee for which it may be liable, the supplier cannot refuse to connect the state installation on the ground that the installation has not been tested by the supplier or anybody else.

(b) *The Wiring Contractor*

(1) Section 21 of the Act is the pivotal provision as far as contractors are concerned.

(2) Until its substitution by Act 48 of 1962, it depended on local laws whether section 21 was operative in a given area. Only if a person was in terms of any law, or in terms of any by-law or regulation made by the supplier in the area, required to be the holder of a licence or to be registered before he could carry on the business of a contractor in the area, only then such person was prohibited by section 21 from carrying on business as wiring contractor in the area unless he was licensed or registered.

(3) Under the new section 21 there is a subtle but powerful difference. Whether the contractor is to be licensed or registered no longer depends on whether this is required by any law or by any by-law or regulation of the supplier. The contractor *must* now be licenced or registered save that, in terms of sub-section (2) of the new section 21, there is a twelve months' period of grace for contractors in areas where on 7th May 1962 there was no law or by-law or regulation saying that the contractor must be registered.

(4) The contractor *must* now be licensed or registered and the supplier *must* consider his application. *But which supplier?* Under the old regime this question probably did not arise, because in areas where both Escom and the local authority supply, Escom probably had no by-laws about licensing of contractors, and the local authority probably did have them. But where both Escom and the local authority supply, the question now does arise, because Escom, as supplier, *must* now consider an application directed to it for licensing or registration of a contractor irrespective of whether it has by-laws in this connection. If I were a contractor carrying on business say on the Reef, I would note that the Act defines "area" as including any number of areas whether or not contiguous; that it defines "supplier" as including Escom; that in terms of section 21 a supplier who is under any law authorized to supply in any area in which I carry on business must licence or register me; that Escom is under a law authorized to supply on the Reef, be it that the supply for some uses is confined to bulk supply; that a local authority asked to licence me for its area can refuse my application if I have no premises in its area. Having noted these points, I shall apply to Escom to register me as a contractor for the whole large area covered by its V.F.P.-Licence. If I carry

on business beyond this area, I shall probably apply for registration in respect of each and everyone of the Escom supply areas. Somebody may ask me: "What about the local by-laws made by local authorities?" This question will not embarrass me. My answer will be that these are overridden by an Act of Parliament which wants no more of me than that I shall be licensed or registered by a supplier who is under any law authorized to supply in the area or areas where I want to carry on business.

(5) Probably the new section 21 should have said that the municipality shall be the licensing authority where it supplies in its area, and the contractor intends carrying on business in its area.

(6) But ought the municipalities to worry about the position? Is this licensing or registration of contractors really worthwhile? I am not qualified to express an opinion on this question, but can point out, as I shall do in the next paragraph, that the control which the supplier has over the contractor is in any event tenuous.

(7) From an administrative law point of view, the precise discretion conferred on the supplier in regard to licensing or registration of the contractor is interesting. It can be summed up as follows:—

(i) The supplier has *unfettered* discretion to *grant* the application, because section 21 is so worded that even where each and everyone of the grounds for refusal of the application contained in sub-section (3)(a) of section 21 are present, the supplier can still grant the application;

(ii) The supplier can only refuse the application if one or more of the grounds for refusal contained in sub-section (3)(a) is present;

(iii) There is administrative appeal against the decision—first to the Registration Board and then to the Minister of Labour.

(8) How must the discretion be exercised? Even if one of the grounds for refusal is clearly present, the applicant must still be given an opportunity to meet the objection felt on this ground. (Section 23(1) of the Act, as substituted.) An intending contractor will probably be able to explain away objections felt on most of the grounds. Others can be taken care of by company floatation. I cannot help feeling that the licensing and registration system created is very much like an accounting system which puts obstacles in the way of the honest man without preventing the dishonest man from stealing.

(9) In exercising the strictly limited discretion to refuse, the supplier will have to act with great care to avoid review proceedings which can be brought without the applicant first exhausting his right of administrative appeal. One review case lost, say because of a grossly unreasonable insistence that the applicant must have business premises in the particular town, is likely to cost the average municipal council more than its revenue from the licensing fees for many years.

## 7. THE FUTURE OF THE ELECTRICITY SUPPLY LAWS

### (a) *The Local Authority's Power to supply as seen by the Borckenhagen Committee*

(1) The Borckenhagen Committee recommends in its fifth interim report that further extension of municipal *generation* in areas where Escom is able to supply, should be discouraged. This can be done everywhere in South Africa in terms of existing legislation by the suitable exercise by the administrators of their powers under section 39 of the Electricity Act, 40 of 1958, dealt with in section 3 of this paper.

(2) The Committee recommends further that Escom should, subject to certain exceptions, limit its activities to generation and bulk supply. This can also be done within the existing legal framework.

(3) Supply to industry seems to be the exception which is of major concern to the Committee. It wants to see industry protected against the possibility of unduly high tariffs being imposed by local authorities. If there is danger of this, existing laws certainly provide a strong control system as far as this is concerned. Take the case of Transvaal: The local authority must fix its supply tariff by *by-law*. Any by-law — consequently also the supply tariff — only becomes effective after approval by the Administrator of Transvaal. Furthermore, the Administrator is empowered to revoke by-laws even against the wishes of the local authority. He can, therefore, annul existing tariffs. What stronger control can there be?

(4) Admittedly a similarly all-powerful control system does not operate in all provinces. But the control is there all the same. In the Cape conditions of supply and tariffs are subject to the Administrator's approval, except in the case of Cape Town. Presumably this legal position would have been changed if the Cape Town industrialists had strong reason for complaint.

(5) It is generally known that municipalities make a profit on their electricity supply undertakings. Whether this is good or bad does not concern the lawyer who will in any event point out that taken as a whole the municipality is just as little a profit-making body as Escom. What is a legal question is whether a municipality is empowered to discriminate between consumers so as to supply some at a profit and others at no profit or less profit. This is probably why there is legal provision in Natal for special agreements with large consumers.

(6) The Borckenhagen Committee recommends special zoning in industrial townships for industry, to which cost of electricity supply is important, to take supply from Escom without forfeiting the other advantages which the town can offer. This step also does not appear to require special legislation, because the authorities empowered to approve the establishment of townships can insist on this. Whether it will be practical to so insist is a different matter. The authorities concerned are administrative bodies which must take into account that an industry cannot expect all the advantages of sewers and other municipal services and amenities and yet refuse to share any disadvantage.

### (b) *Streamlining the Supply and Control Systems*

(1) In creating in 1922 a specialised state authority to supply electricity, the South African Parliament did what was later to be done by the Parliament of the United Kingdom which, however, has since gone further and placed electricity supply in the hands of a specialised state authority directly tied to the Crown or the central executive power of the state.

(2) We too could take away electricity supply and control over it from the local and provincial levels of government.

Looking at the matter from a constitutional law point of view, I would, however, say that the present constitution, which has the provincial system inherent in it, does not lend itself to this. I have noticed that Scotland, for instance, was not included under the operation of the English Electricity Acts.

(3) It would be a more practical proposition to streamline the statutes and statutory provisions by codifying them and embodying them into an Act of Parliament so that all powers of supply and control over supply are derived from legislation from the highest level, thus at least eliminating many conflicting provisions and working towards standardization of law in a field where there cannot be real objection to standardization.

(4) The English jurist John Austin (1770—1859) defined a law as a rule laid down for the guidance of an intelligent being by an intelligent being having power over him. That the commanding intelligent being will express himself in a clearcut way seems inherent in this definition. But let us face facts. This is not done to-day. We may start with the ideal of simple codification but are likely to end up (if we end up) with a piece of legislation the very opposite of our ideal.

(5) Virtually no substantial amendments have been made to the Electricity Act since 1922. I am inclined to ascribe this to legal wisdom on the part of those responsible for administering the Act rather than to perfection on the part of the Act itself. Incidentally, one does not notice a strong tendency on the part of Escom towards subordinate legislation. It seems to be the democratically elected bodies which are so anxious to create legal controls that they eventually spin themselves in with laws, failing all the while to see that whether cost of administration is to be high or low must to a large extent depend on the number of laws to be administered and the complexity of legal procedure to be followed.

(6) I would say then: Do not let us change too readily what we have for fear of worse. Ironically enough, even the slight amendments to the text of the Electricity Act, have apparently not always been improvements. E.g. section 40 of the 1958 Act is not as clear as was its precursor, section 39 of the 1922 Act.

(7) In any event, when one comes to a vast and complex field of endeavour such as electricity supply, where the laws are linked up with the constitution of the state, and where the statutes have to embody so many compromises between the strong, one must be prepared to encounter laws which take a great deal of study.

(8) There is already a strong tendency towards standardization of local government's by-laws and regulations in regard to electricity supply. I feel that this should be the policy, and that this policy would in the end make the legal set-up far easier for the practical man working in the field of electricity supply. It would be a mistake to oppose this policy because of theoretical considerations in regard to local and provincial autonomy. Opposition to standardization of subordinate legislation does, however, also come from the realist — not only from the theorist of local autonomy. The realist does not want to see his municipality committed to the great detail of rule usually found in standard codes. A way must be sought to boil the standard code down to absolute essentials. Laws which set out to control everything in any event usually defeat their own end. The test should not be: How much can we control? The test ought to be: What is the minimum control that we really must impose? I am certain that application of this latter test will help our electricity supply undertakings to flourish.

THE PRESIDENT: Thank you, Mr. Burger. I very much regret that time does not permit the vote of thanks to Mr. Burger to be taken this afternoon. We will deal with his excellent paper tomorrow.

CONVENTION ADJOURNED.

# FOURTH DAY

*On resuming at* 9.30 *a.m.*

THE PRESIDENT: Good morning, gentlemen. I want to warn you this morning that you have a very tight schedule, so you'll have to forgive me if you feel I am getting a bit rough.

Mr. Hutton's paper is now open for discussion.

Mr. H. J. GRIPPER (Knysna): Mr. President, I'd like to add my congratulations to Mr. Hutton for a very interesting paper — one which, as you quite rightly said, is of interest to engineers, administrative types and councillors, too.

Way back in 1949 in a paper that I read to this Association I stressed the fact that meter readers should be looked upon as ambassadors of the Department, and Mr. Hutton makes that point too — that they should be a type who could, if necessary, discuss interesting items with the consumer, but at that time I felt there was a good case to be made for the deaf and dumb individual who wanted an outlet for his efforts — he could go round and take a reading—and would not be called upon to discuss things with the consumer, and thereby get round much quicker.

However, I am inclined to agree with Mr. Hutton that a dumb meter reader is not a good thing for the Department.

There is one thing that I would like to ask and that is whether Salisbury uses any cyclometer type or dial meters. They, of course, make self-reading very much easier, and the design of some of them is now greatly improved and I believe they can be used with greater confidence.

There is no mention in Mr. Hutton's paper of the tariffs in Salisbury — I think most of us know them. But to complete the record of the proceedings I think it would be very helpful if a brief description was given of the tariffs, particularly to indicate whether there are any block tariffs, or any minimum quotas which have to be considered.

If you have either a block tariff where the rate changes after so many units, or a minimum of so many units which must be paid for willy-nilly, then you have trouble;; but if you haven't, if you have got a flat rate per unit, as well as a fixed charge of course, then I don't think dogs need worry you, and it needn't be any great concern if one particular month or so the reading is missed.

Disconnections for non-payment: here I was rather interested, and no little amused to find that Mr. de Jager, in his paper, calls this a consumer service.

If the Treasury Dept. does the work of this so-called service, that is the dis-connection for non-payment, I feel this is a case where the meter reader's status could be still further improved, and make it a more attractive occupation. Could not the operator who has to go along and disconnect, be also responsible enough to collect the money if it is offered, there and then? So often that would save a dreadful amount of time and trouble.

Make no mistake, I do not advocate that the meter reader should be a collector, but on the occasion where he goes out as a dis-connector, if he is offered the money I feel that he should be in a position to take it, and save all that moaning and wailing that would have gone on afterwards.

Now the accounting system requires an even flow of meter readings we know, but surely from the statistics point of view, I see the greater value of this self-reading to be in the fact that all readings could come in for the same day of the month, if need be. There is surely no need to feel that the accounts must all go out the same day of the month, but the statistician would be very glad to have his readings all on one day or all at the end of the month. They would then tally with the income as it were, from the bulk supply, or from the generating plant, and I am sure he would be very happy.

Thank you Mr. President.

THE PRESIDENT: If there are any other contributors to the discussion on Mr. Hutton's paper, may I suggest that you be extremely brief, and make your contributions in writing, as Mr. Hutton has agreed to be brief in his replies, and he will reply fully in the proceedings.

Are there any further contributors to the discussions on Mr. Hutton's paper.

Mr. E. C. LYNCH (Salisbury): I think we have all been very interested in Mr. Hutton's paper.

I would like to stress one advantage that this mechanised accounting gives to the Department, and that is the availability of proper statistical information regarding the financial results of the tariffs.

In Salisbury for domestic consumers we have a block tariff, based on a room quota; in other words, the more living rooms there are in a house, up to seven, the more units required to purchase at the high rate, that is 8d. per unit, and thereafter the follow on rate is .625d. per unit.

In addition there is a minimum charge in the municipal area of £1 per month.

Unfortunately tariff reviews do become necessary from time to time — usually to obtain an increase in revenue — and it is only if proper statistical information is available that one can make an assessment of the changes which are likely to accrue in the revenue received from the new tariff.

May I give an example: if you change the minimum charge from £1 to let us say £2 per month, it would be quite impossible to predict the additional revenue that would be received, unless one knows the number of consumers in each quota group that use say 50 units per month, 50—100 units per month, and so on.

Now it is only by mechanised accounting that this sort of information can be made available to the engineer considering tariff changes.

If you will just think for a moment you will see that the manual labour required to make such an assessment on 20 or 30,000 domestic consumers would render the compiling of such statistics utterly impracticable.

The second point, I think, which is of interest from this paper is the true cost that is revealed of sending out a man to read a meter, or letting someone read his own, and sending the account.

We know in Salisbury as Mr. Hutton has stated, that it is 43d. in addition of course to the cost of the meter, maintenance of the meter, and so the total is probably not far short of 4 to 5 shillings per month for a typical consumer.

You must remember that this average figure of 43d for the reading and accounting is an overall figure and hides a multitude of variables. It is obvious that the person who reads his own meter and pays promptly must cost less than that, whereas the person who is a bad payer and requires disconnection must cost more.

This illustrates that realistically assessed recommention fees are very important. I think we do tend to undercharge for this service.

The other point is that when considering native consumers, who can probably only afford say 10/- to £1 a month for their electrical services, the 4 to 5/- cost of metering, reading and accounting is disproportionately high, and I think this makes an overwhelming case for the use of load limiters and a fixed monthly charge for this type of consumer.

There is a point of danger, though, which we found in Salisbury where there are 7,000 such native consumers, and that is the amazingly large average consumption that the consumer can get through a 5 amp load limiter. Theoretically it is possible to use a maximum of about 700 units per month, and at present the average figure is running at about 200 units per month, but it is showing a steady tendency to rise. For that reason I do feel that load limiters should not be used above the size of about 5 amperes, for this type of supply.

Some authorities in Rhodesia are using considerably larger load limiters, up to 20 and more amps — and I do think that is a dangerous procedure, from the economic viewpoint.

Thank you Mr. President.

THE PRESIDENT: Ladies and gentlemen, I think our time is now up. If you have any other contributions to Mr. Hutton's paper, would you kindly hand them in in writing and Mr. Hutton will then be able to reply through the proceedings.

I now call on Mr. Hutton to reply.

Mr. L. J. J. HUTTON (Salisbury): Mr. President, ladies and gentlemen, I do thank everyone very much for the nice way in which they have treated me, as I am perhaps, as a Treasury official, a thorn amongst the roses: I do really appreciate it; I also appreciate the fact that my paper has caused some thought amongst you all.

I would commend you to one particular part of my paper— my favourite subject — self meter reading. Your president has first hand knowledge of this, having completed a card whilst he was in Rhodesia, and he can probably tell you a little about it.

It is a good system, it is an economical system and it is one which can, in my opinion, be used almost anywhere if it is organised correctly.

I do commend you to that part of my paper, and to study it carefully, as I do think it can help many of us in the problems which are facing us, particularly the increasing costs of meter reading.

The answers to many of the questions asked by some of the speakers are in actual fact contained in the paper itself. A further study of the paper will probably reveal this.

I will reply fully in writing to all other questions so that the answers can be incorporated in the record of the proceedings.

Mr. President, ladies and gentlemen, thank you. (Applause.)

WRITTEN REPLY BY MR. L. J. J. HUTTON.

As I stated in my short reply at the conference the answers to many of the questions asked can be found in the paper itself. I therefore respectfully suggest that if any of the speakers do not think that my written replies fully cover their questions, they seek the answers in the paper itself.

1. Mr. R. M. O. SIMPSON (Durban).

(a) *Self Meter Reading.*

It is my opinion that far too much emphasis is placed on the movement of consumers as a real difficulty in Self Meter Reading. Firstly let us consider what happens if a consumer moves without advising the Supply Authority.

1. The card sent to him is generally unclaimed, therefore, after a short period it is returned by the Postal Authorities with the envelope duly endorsed with the reason for return.
2. If this does not happen, an average consumption is charged in the absence of a completed card.
3. It is extremely unlikely that the account will be paid, which would result in a visit to the property itself for the purpose of non-payment disconnection, and this would bring the absence of or a change in consumer to notice.

In my paper the importance of close co-operation in meter reading and allied activities was stressed, and the foregoing highlights this need.

(b) *Security Deposits.*

The question of deposits is really outside the orbit of the paper but I am pleased to answer Mr. Simpson's question as it will also answer questions raised by others.

The amount of deposit required from a consumer is a sum sufficient to cover the estimated cost of two months supply. In the case of large consumers, letters of guarantee are accepted.

It is difficult to establish the amount of deposit required when an account is being opened, so initially, deposits for domestic consumers are scaled according to the size of the premises, for others, the Electricity Department assesses the amount according to anticipated load.

In the event of a consumer failing to make payment by the required date on more than one occasion, the adequacy of his deposit is examined and additional payment requested if necessary.

(c) *Meter Reading Staff.*

In Salisbury at present there are fourteen meter readers employed on the actual process of meter reading.

Non-payment disconnection activities are continuous and, a further four meter readers are regularly engaged on this work.

In addition to the foregoing, there are four readers engaged on the disconnection and reconnection of supply for consumers moving from one property to another, proceeding on or returning from leave, obtaining check readings and investigating complaints.

As indicated in my paper one of the main problems is with the "gypsy" population which regularly moves from house to house. I believe Salisbury has a particular problem with this which is not encountered in older and more settled cities and towns. I must say that Mr. Simpson's advice that meter readers in Durban are paid more than electricians came as a surprise, in fact, I heard gasps from many when he made this statement. This is not so in Salisbury, in fact, it is my own belief that the true worth of meter readers has yet to be fully appreciated.

A meter reader when recruited is given a certain amount of training, but this is limited because of the comparatively lowly paid position that he holds. As indicated in my paper, there is, however, opportunity for advancement to the higher paid meter reading posts and to clerical posts in the Accounting Branch.

The meters for large industrial undertakings and two part meters are read by staff of the Electricity Department. There could be argument on this, but we say that it is because they are usually situated in chambers with live equipment to which only authorised employees of the Eelectricity Department have access in terms of our regulations.

(d) *Use of Radio.*

Like most parts we also have our blind patches in certain areas, but they are known and present little difficulty in the use of radio.

I think I am safe in saying that errors due to the lack of clarity in speech are non existent; with radio meter reading it should be remembered that readings are being checked as received, therefore any suspect figures are immediately challenged.

Meter Readers using radio are tutored in the use of the sets and the recognised pronounciation of figures when transmitting, but B.B.C. standards are most certainly not required.

With the transistorised sets the battery drain is comparatively small and maintenance costs are low.

(e) *Motor Scooters.*

Mr. Simpson's questions on scooters were somewhat surprising, particularly the references to possible hazards to the rider from other traffic and danger to health. One only has to look at the traffic on the roads nowadays to see just how many motor scooters there are in use as means of essential transport and also for pleasure.

There is no evidence to indicate that the rider of a scooter is in any more danger than persons using other forms of transport, in fact, speaking from personal experience as one who used a motor scooter regularly for more than four years, I would say that they are one of the safer modes of transport. They are dependable, economical to operate, and parking presents no problems.

Whilst I do believe that racing motor cyclists have to wear special protective belts to prevent injury to kidneys etc, motor scooters are built for comfortable riding, and the type used in Salisbury have a maximum speed of approximately 45 miles per hour.

During the seven years which these machines have been used not one serious accident has occurred, and no evidence whatsover has emerged to suggest that riding a scooter is in any way injurious to the health of the rider.

I cannot recall any objections by staff when scooters were introduced, in fact, it is significant that other Departments followed the Treasury's lead and also use this type of transport.

2. Mr. D. MURRAY-NOBBS (Port Elizabeth).

(a) Many of the points raised by Mr. Murray-Nobbs have

already been covered in my reply to Mr. Simpson's enquiries, but I will deal with those still requiring explanation.

(b) *Vehicle Mileage.*

An examination of the figures in table No. 2 does indicate that the mileage under the heading of "other duties" has remained fairly constant although there are slight increases here and there. This factor is due solely to the increased number of special meter readings required. It will be recalled that this is mentioned in several parts of my paper and was referred to by me in my address. I stated that requests for special readings now regularly exceed 2,000 per month. Contrary to Mr. Murray-Nobbs assumption, there has been a considerable decrease in mileage travelled for the purpose of obtaining check meter readings.

(c) *Meter Reader's duties.*

I believe the duties of a meter reader must necessarily vary with the status he holds in his particular organisation. He must, of course, be capable of discussing readings and consumptions with a consumer in the course of his duties, but on the finer points of a tariff or the account itself he should refer the consumer to the responsible official.

As mentioned in my paper specially selected personnel are employed in the field of non-payment disconnections as they have a very special and often delicate task to perform.

There is no question of efficiency being sacrificed for speed or to use Mr. Murray-Nobb's words "to satisfy the voracious appetite of mechanical accounting machines." In fact, as I have already indicated, there has over the past few years been a very considerable reduction in the number of meter reading errors.

(d) *Self Meter Reading.*

I am forced to suggest that if the system of self meter reading used in Port Elizabeth has not met with success, then it has not been given the attention it deserves, and can do no better than to recommend a close study of the part of my paper dealing with this subject.

As for the possibility of such happenings as a go-slow postal strike disrupting a self reading scheme, it must be accepted that this would be troublesome, but it would at the same time of course delay delivery of accounts and receipt of payments and consumers' written complaints. A far worse position might arise if there were to be a go-slow strike of staff including readers.

3. Clr. DE LANGE (East London).

(a) The main questions raised by Councillor de Lange are fully covered in my paper and in answers to other speakers, but I would mention that in all matters relating to electricity and water supply we in Salisbury are concerned with the registered consumer, whether he is the owner of the property or not.

(b) *Quarterly meter reading with average interim accounts.*

This system appears to be gaining popularity and must be given serious thought, but it does have its complications which are always present when average consumptions are charged. The difficulty of reaching a "fair" figure to charge, with seasonal variations to consider, the unadvised absence of a consumer on leave, or unexpected increases or decreases in usage of energy, seem to suggest that it does not readily lend itself to happy supplier-consumer relations.

4. Mr. J. A. BARNETT (Johannesburg).

Mr. Barnett's comments are really outside the scope of my paper, but as a treasury official I can immediately foresee very strong objections, particularly from consumers, to any move to levy a charge for electricity merely based on an average of what was used in their particular suburb.

5. Mr. R. R. GILMOUR (Cape Town).

(a) *Position of Meters.*

It is estimated that in Salisbury approximately 7,500 meters are considered inaccessable to consumers. Of this number approximately one half are domestic supply meters. Some of the consumers do occasionally request that arrangements be made for them to see their meter but this does not often happen.

(b) *Radio Meter Reading.*

The transreceivers used in the first phase of the scheme were an extension of an existing network. Parts 9 and 12 of my paper explain this more fully.

The present system is amplitude modulated and the frequencies used are transmission, 85.015 MC/S; receiving 72.115 MC/S. I would mention that consideration is being given to introducing frequency modulated equipment when the radio reading system is extended.

The equipment is maintained by the suppliers under annual contract, which also covers the equipment used by the City Engineer's Department and the Department of African Administration.

6. Mr. L. J. HOOLEY (Salisbury).

(a) *Payment in Advance for Electricity.*

This question is really outside the subject of my paper, but it could be of interest to many.

As mentioned in reply to a previous enquiry a security deposit sufficient to cover the cost of two months' supply is required from consumers in Salisbury.

Accounts are due for payment one month after meters have been read, therefore, on due date a consumer has already received a further full month's supply. His total indebtedness at that stage is covered by his deposit, which could in effect be considered an advance payment, particularly as action to disconnect for non-payment cannot be taken until a further period has elapsed.

(b) *Disconnection for non-payment.*

The practice of sending final demands to all consumers whose accounts were unpaid was discontinued many years ago. It was a costly business and it was considered entirely wrong for all consumers to bear the cost of reminding a minority of their obligations.

It does indicate what an excellent payer Mr. Hooley is, when he is obviously unaware of a system of reminders which has been used in Salisbury for some years.

In the first instance all unpaid accounts are listed in preparation for disconnection action, but they are then divided into three categories (a) consumers who have not been listed more than once during the past six months, (b) those who have appeared on the lists more than once during the same period and, (c) the known regular defaulters.

A notice is affixed to the disconnection instruction in respect of those consumers in section (a) which reminds them of the unpaid account and requests payment within 48 hours. These forms are enveloped and delivered by meter readers whilst they are disconnecting in that particular area.

The consumers under section (b) are not considered bad payers and the meter reader is permitted to use his discretion. He also accepts payment if it is offered issuing a temporary receipt.

Supply in respect of consumers falling in section (c) is disconnected without warning.

This only briefly outlines the system but I shall be pleased to advise anyone further who is interested.

The system works well and I believe that I am right in stating that Salisbury has one of the lowest rates of irrecoverable bad debts.

7. Mr. H. J. GRIPPER (Knysna).

(a) The old style cyclometer type meters did not find favour in Salisbury for various reasons which are probably well known, but some of the new "impulse" type cyclometer meters are now in use and our Test Engineer believes them to be excellent instruments and suggests that their use should be encouraged. These meters naturally aid all forms of meter reading considerably.

(b) I think that Mr. Gripper's points on meter readers generally have already been covered, particularly in the work of non-payment disconnection, and I entirely agree with his remarks regarding a case for improvement of status when readers are required to carry out the more responsible duties.

(c) On the question of the possibility of obtaining all readings on the same day each month, I suggest that even if it were possible to achieve this it would be undesirable to practice. One of the benefits of progressive meter reading is that it forms the basis for a cyclic billing system, which in turn has the virtue of affording all consumers the same period of credit and ensures an even flow of work throughout. The production of statistics is still a relatively easy matter particularly if punched card accounting is employed.

8. I hope that I have managed to cover all the various points raised by the speakers and those who put their questions in writing, but I shall be pleased to give any further information if required.

THE PRESIDENT: I think we have listened with great interest to Mr. Hutton's paper and to discussions on this paper. I very much regret that I had to cut the discussion on this paper, but I think you will realise that time is running out on us.

May I ask you now to accord in the usual manner your thanks to Mr. Hutton, and to all the contributors to the paper. (Applause.)

We will now open Mr. van Schalkwyk's paper for discussion. I want you to be extremely brief, please, gentlemen.

Mr. A. R. SIBSON (Honorary Member): I would like to congratulate Mr. van Schalkwyk for his very interesting description of 11 kV reticulation in Bloemfontein.

There is one adidtion that I'd like to make to the paper which I wrote myself in Bulawayo some ten or more years ago, which describes a somewhat similar overhead 11 kV reticulation to that described by Mr. van Schalkwyk.

The point at issue is obtaining adequate earth wire protection above the phases, and we have found in Bulawayo that the use of earth wires as such above the phases itself led to a considerable amount of trouble through the breaking of earth wires and fault conditions thus adding further to the fault hazards.

The point about an earth wire is that its purpose is served during the incidence of the lightning stroke—that's when you want it. The system that has now been evolved in Bulawayo is to make use of the top phase of a triangular construction as an earth wire. That may sound crazy but just wait a moment . . .

The top phase, of course, has a copper section equal to the other two and a very low impedence. It is under insulated deliberately and, in fact, a gap is provided to encourage this phase to flash over. It flashes over almost on the slightest provocation, and during the few milli-seconds that it is doing so it becomes, in effect, an earth wire, thereby protecting the other two phases.

The follow through current is prevented by the use of an arc suppression coil and the system works with remarkable precision. In fact we can say that there has been no failure of supply due to lightning on many, many miles of construction that have been introduced in recent years.

The design of this line was the responsibility of the present City Electrical Engineer of Bulawayo, Mr. R. E. Somers, and I think he would be delighted to let any of you know how it is designed and how it was constructed, but I can assure you that it is almost completely infallible in dealing with lightning strokes.

THE PRESIDENT: Thank you Mr. Sibson .(Applause.)

Mr. C. LOMBARD (Germiston): I did not intend to make a contribution to Mr. van Schalkwyk's paper, but seeing that my name was mentioned during the presentation of the paper, and also in view of my previous associations with him, I feel compelled to say something, even if only to congratulate him on his very fine paper and the manner in which is was presented.

When reading the paper I had the uneasy feeling that some of my past sins had been catching up on me, but it gives me great satisfaction to know that the original decision, taken some 15 or more years ago, to standardise on a 220-440 single phase three wire system for rural electrification in the Bloemfontein area is still regarded as a wise one.

While I am on my feet, I would like to touch on a few points mentioned in the paper.

Firstly the comparison between the cost of copper and A.C.S.R. was made in the paper, the comparison being based

on a conductor size of a .10 sq. in. copper equivalent. This comparison shows that there is a decided advantage in so far as ACSR is concerned. But I would like to point out (and I am not looking for votes from Rhodesia) that when you come to the smaller conductor sizes, this advantage disappears, and that we reach a point where copper is actually cheaper than ACSR.

Mention was made of the use of No. 8 SWG galvanised steel wire used as a conductor, but here I would like to sound a note of warning. My experience has been that fatigue failure can cause a considerable amount of trouble at a later date.

I feel, therefore, that the use of standard steel conductor is well worth the small extra cost involved. Thank you Mr. President.

THE PRESIDENT: Thank you Mr. Lombard. I'm afraid our time is up ladies and gentlemen. I very much regret this also. but this paper is the one and only one for this year on the Agenda that I consider to be a technical paper, and your papers committee had particularly asked for this paper, to be of benefit to the rural engineers.

I appreciate that it is necessary to have one paper for the benefit of engineers especially those in the country districts. This is the paper that has been presented for their benefit.

I will now ask Mr. van Schalkwyk if he will kindly reply.

Mr. A. P. VAN SCHALKWYK (Bloemfontein): Mr. President, the proposer of the vote of thanks and the seconder, did mention some omissions in the paper. I will be the first one to admit that no attempt was made to cover all the aspects of detailed construction etc. that could have been brought into a paper like this, but as the time to present the paper is limited, as well as the time for discussion, we did feel that only some of the aspects which might prove of interest should be included. Therefore I apologise for any omissions and I would have liked to elaborate on some of the omissions mentioned, but I think as time is running out I'll just have to abide by the fact that there certainly are omissions.

I would just mention this: sombody asked how aluminium wire is jointed? I think there is only one method of jointing which can be used with aluminium and that is the ordinary slip in sleeve which is twisted up and which has proved very effective in jointing aluminium conductors — there have been no occasions of breakages at this point.

Then the question of the stays. Somebody wanted to know whether there are stays pulling out of the ground, and I must say that in Bloemfontein we have very firm soil — too firm for our liking. If it is not rock it is a type of clay-ey ground which is most hard and difficult to dig holes in.

So actually we are not faced with the problem of stays pulling out.

Looking at the drawing which was referred to, Drawing 14, I think a mistake must have crept in showing the stays so very shallow. We do plant our stays at least five tc six feet down.

I was very interested in the type of reticulation in Rhodesia where there is a deliberate attempt at creating an earth fault under controlled conditions, and in that way eliminating the need for an earth wire, and using the phase as an earth wire under certain conditions.

I would definitely attempt to get some more information on that point from the people in Bulawayo.

Mr. Lombard's warning about steel wire is, I think, probably on account of corrosion. I don't think we are faced with that problem in the dry weather of the Free State, especially out in the rural areas where the possibility of corrosion due to acids in the atmosphere, which you would probably get in a city area, is largely absent.

So I think we are fairly safe there. This conductor would probably outlast the life of the wooden poles.

Mr. President, in conclusion, I would like to thank all the engineer members, and other gentlemen who attended this conference, in making not the chief engineer of any concern, but just one of the officials, feel absolutely at home in this very distinguished congregation of engineers, and it has really been a very educating and pleasant experience to attend this conference, and one leaves here with lots of new ideas which can be applied as one can never be stagnant; we always have to progress, and we always have to learn from the experience of others.

Now I have learned a lot in attending this conference and really it has been an honour which I appreciate.

Thank you Mr. President.

THE PRESIDENT: Thank you. I'm sorry we have had to conclude so quickly ladies and gentlemen, but may I ask you to accord your appreciation to the author of the paper and the speakers in the usual manner? (Applause.)

Now we will go on to Mr. Burger's paper, and I will ask Mr. Giles to second the vote of thanks, which Clr. Warman was going to make, but unfortunately he has been called back urgently to Durban.

I will ask Mr. Giles to continue.

Mr. P. A. GILES (East London): The broad canvas of constitutional law, as applied to electricity undertakings in South Africa, is so great that special study and thought has to be made if a clear picture is to emerge, and we are greatly indebted to Mr. Burger for undertaking this immense task.

As he said in his paper, a special text book should be written about this subject, which as we know consists of a large number of Acts of Parliament, Provincial Ordinances and other enactments applicable to the supply and use of electricity.

I think it can be taken that these enactments are the natural result of the great development of electricity supply which touches upon the citizens at so many points, and it has been found necessary for the legislators and other authorities to encompass and hedge the electricity authorities.

The rights of the common citizen at law, and the obligations of the supply authorities, to my mind, have to be defined in order that the citizen may be protected and the electricity supplies made available.

Mr. Burger has called these enactments, Administrative Law, and they are presumably part of the constitutional law and include such features as industrial legislation, private and company law and so on.

At any rate it is evident that the electrical engineer in charge of the supply authorities has to be something of a

lawyer as well as an engineer if he is to steer clear of trouble, and Mr. Burger has performed a signal service to this association in drawing attention to some aspects of the statutes relating to the supply of electricity.

When Parliament grants powers to persons, or associations of persons in authority, it naturally follows that duties, obligations and liabilities flow from the exercise of such powers, and when we deal with electricity, which besides being a servant is rightly regarded as a dangerous commodity, it is to be expected that a number of restrictive laws will come into being to protect the common citizen.

Mr. Burger has listed certain of these statutes and discussed their implications in an overall manner, in order, as he puts it, to illuminate/obscure their effects and results.

I think it can be taken that it is an axiom that excessive control leads to loss of control and I agree with the author that one should be very careful about tampering with existing laws in case the ultimate result is not what is expected.

We are indebted to Mr. Burger for his exellent paper, which to my mind shows the high responsibilities carried by the city or town electrical engineer, and I have very great pleasure in seconding the vote of thanks (which will be printed) by Clr. Warmen.

## WRITTEN ADDRESS PROPOSING VOTE OF THANKS TO MR. A. P. BURGER BY CLR. T. WARMAN.

Mr. Chairman, Mr. Burger, I must say at the outset that thanking someone for a service rendered is very difficult indeed. It does in fact remind me of the bridegroom who had to thank parents, relations and friends during his wedding reception. He was very nervous indeed and ended up by saying that finally he wished to thank everyone from the bottom of his heart, and his wife's bottom too! My difficulty is not as great as the bridegroom's because we, as an Association, are already wedded to the statutes which Mr. Burger has so ably spoken of.

Mr. Burger, as you know, is the Town Clerk of Parow and every Town Clerk is well versed in law. He wrote a treatise on Electricity Acts, of which this paper is an extract, for his Master's Degree in administrative law. I am sure you will agree with me after reading this extract from that treatise that it is not difficult to understand why he was awarded that Degree.

In his paper Mr. Burger deals with lawyers' expressions of opinion and I am always reminded of the client who took a brief to a solicitor and requested him to tell him whether he would win his case or not. The lawyer was enthusiastic in his assurance that his client could not lose the case, whereupon the client put on his hat, said "thank you" and stated that that was all he wanted to know because it was his opposition's case that he had put to his solicitor.

Mr. Burger's task has been an onerous one and it has been done exactly and meticulously and it must be understood that the study made of all the numerous statutes and supporting statutes relating to this subject must have been an onerous task. My first impression, reading this extract, is one of complete mystery as to how City Councils and their officials do not infringe the law.

And now dealing actually with the Report, I would like to make reference to the Chairman's comment, inviting more Councillors to speak at these Conferences. I should imagine the reason for more Councillors not speaking is because we are not technical men and therefore cannot deal with such a highly technical subject. Nonetheless I consider it an honour to be able to thank Mr. Burger for his paper and I shall make the best attempt possible.

You all know the history of the past when, in 1910 the Victoria Falls Power Company who had the authority to supply, this permission was not rescinded and thereupon left obsolescence to solve the problem of eventual disposal. Rightly gradual integration into the new Escom system and allowing the Electricity Supply Commission with authority to supply. The Borckenhagen Committee's 5th Interim Report deals with this aspect but bases its findings on an erroneous Court finding. A contentious point, with respect Mr. Chairman, is Mr. Burger's contention dealing with the third state party being able to decide authority to supply. A good case is made out for the Administrator to decide this authority through the use of the legal issue but in my opinion the Control Board is the better body to deal with this both inside and outside the local authority's area of jurisdiction.

Dr. Strasacker is a very good tactician indeed. During his most interesting address he expressed the desire that Escom should be a wholesaler alone and not a distributor and this statement alone in my opinion gives us the complete solution to the problem. Noticing certain delegates here taking notice of that comment, I must add that it is easy for Durban to say that because that is our precise position at the moment. Those local authorities who generate their own power would have further thought obviously in the matter but I do believe that if these Cities do continues to generate power themselves, the size of their plants which relatively speaking must be small, and because of this reason no benefits can accrue in cheaper units to consumers. A thought which I make on behalf of those cities generating their own power and obviously which can be criticized, is this aspect. The generating cities allowing or wrongly I base this thought on the contention that the bigger the plant, the cheaper must be the unit as finally sold.

A thought also for these cities, Mr. Chairman, is that if there is a normal rise and fall clause as Durban enjoys at the moment, if there happens to be a rise in the cost to the consumer, they can always blame Escom for it.

A paper which interested me a great deal, still bearing in mind what I have said, was Mr. de Jager's paper on capital and loan charges. When one considers the interest and redemption charges which must be borne by the Rate Fund when cities buy large generating plants, it does appear to me reasonable that if there is a body like Escom able and willing to wholesale units, that local authorities should take advantage of this and so save these large capital charges which always do accrue.

Section 5 of Mr. Burger's paper is very interesting indeed.

In hierdie verband wil ek graag u aandag daarop vestig dat Prof. Dr. P. C. de Wet, een van die bekendste autoriteite in die Republiek, sover dit Kriminele Wet betref, vandag hier teenwoordig is. Seksie 381 van die Kriminele Prosedure Wet wat handel oor die kriminele aanspreeklikheid van die Ingenieurs

en Maatskappye is soos ek verstaan een van die Professor se geliefkoosde onderwerpe. Ek glo dat indien ons hom kan oorweeg om hierdie onderwerp vandag hier te bespreek, hy ons 'n groot diens sal bewys.

A point in question is that of the S.A. Railways standing in this matter. The same contractor can do work for the Railways and somebody else but in the case of Railway installations, testing is not laid down as a law. If this Railway installation is within a local authority's area of jurisdiction, who is the responsible body if an accident or fatality occurs through a faulty installation? Possibly this can be answered by Mr. Burger when he replies.

There is also the question of which supplier registers the contractor, but I shall not dwell on this problem because it has been discussed in detail by the Executive, but briefly I believe the solution lies in dealing with licences in one area, that the registration must be made with the suppliers authority in that area and will then work anywhere in the country. If this aspect is adopted it does seem to me that it will not matter who registers the contractor.

Dealing with paragraph No. 7 on page 71, which deals with the future of the Electricity Supply Laws, the Borckenhagen Committee comes right out against generating cities where Escom supply is available and goes so far as to say that this should be discouraged.

Mr. Burger deals with high tariffs under paragraph 3 but it is quite clear that local by-laws will cover this.

Mr. Burger rightly says that it is not the concern of the lawyer whether Municipalities make a profit on their supply undertakings or not, and I deem it wise to remind all present that the ratepayers do provide the assets whereby local authorities secure their loans and as such even lawyers must accept that the ratepayers must be given a benefit and that benefit insofar as Durban is concerned, is that an annual contribution from the Electricity surplus is made to the Borough Fund, which is our Rate Fund.

Mr. Burger makes out a potent argument for and against the aspect of streamlining the systems but the one which interests me a great deal is one whereby statutes would be codified and then embodied in an Act of Parliament. I believe that this view of Mr. Burger's alone should be enough to stimulate discussion.

Ten slotte mnr. die Voorsitter, doen dit my 'n groot genoë om mnr. Burger baie hartlik te bedank vir 'n mees interessante en leersame referaat. Ek glo dat die belangrike punte wat hy onder ons aandag gebring het, en wat nog nie op hierdie stadium deur die Uitvoerende Komitee bespreek is nie, wel deeglik ons aandag moet geniet en die aanbevelings aan die nodige liggame of organisasies gestuur moet word.

Baie dankie mnr. Burger en mnr. die Voorsitter.

THE PRESIDENT: The paper will be open for discussion. I have a few remarks to make on Mr. Burger's paper.

First of all the law of supply and demand exists in South Africa, and from the remarks made by Mr. Burger on the personal responsibilities of the engineer, it does appear to me that the engineer's personal responsibilities, are far greater than those of the town clerk or the town treasurer.

During this Convention, and during the past year, I have had repeated complaints from people all over the country that they cannot get engineers. That also applies to our own undertaking. It is well known and accepted in Europe, that South Africa is known to be the worst country in the world for paying its engineers. In other words the engineers in South Africa are the worst paid in the world, and if we are to overcome our difficulty of the shortage of the right engineers, then I would suggest that our councillors should take note of this remark of mine, and take it back to their councils, and tell them that if they are to get the engineers they require to give the service they need, carrying the responsibilities enumerated by Mr. Burger, then it is time they considered re-grading their engineers' salaries. (Applause.)

Mr. W. H. MILTON (Escom): Mr. President, I think you have had an extremely valuable paper from Mr. Burger, and one which will constitute a source of reference for a very long time to come.

I notice that the printers' devils got busy, possibly correctly in this case, by dealing with the paper presented at Margate and of course their tides are always those of ebb and flow.

Coming to a more serious side, the problems facing Escom have been discussed, and there have been certain implications in the paper, which to a large extent were removed in the opening address (or should have been).

I would like to point out that Escom has adopted as a principle, that where you get the expansion of the area of jurisdiction of a municipality, very serious sympathetic consideration is given by Escom to the transfer of any such district to the municipality.

There are difficulties in connection with industry which I'll touch on a little later.

Examples of that willingness to transfer of course I can quote in respect of dealings with the Nelspruit municipality, where we undertook to transfer to them an area which would be developed as a residential township which is at present in Escom's area of supply in that region. The same thing has been undertaken as far as the White River Municipality is concerned, and Somerset West has already appreciated such a transfer.

Reference has been made to the Railways and their power to generate. It seems that the author was not aware that the Railways do actually generate and do supply.

I could quote the case of Belfast, recently taken over by Escom, because the Railways did not consider that they should continue to expand their own local generation to continue to supply to Belfast, White River, Waterval Boven where they actually reticulated, and where we are now actually taking over, virtually, the supply in bulk to White River by way of the Railway Administration system; we now supply the Railways at Waterval Boven. There is another case at Alicedale where they supplied the village of Alicedale and where the supply will, in future be furnished in bulk by Escom, both to the railways and that village.

Now as regards the location of industries, we have encountered cases where the industries have agreed that they

will only establish those industries in certain towns, or on town lands, provided they can obtain a direct supply from Escom.

The value of those industries to those towns has been such that the municipal councils have agreed to that condition of supply in order to acquire the industry and its spending power and the associated revenue which flows from the establishment of an industry of that description.

That occurred in the case of Witbank, with the establishment of the Rand Carbide Factory, which would otherwise have been established in the Vereeniging complex. The same applied to the cyanimide requirements in the Witbank area. There are others in Natal, and I don't think it would be right for me to mention the name of the town in Natal, in case the town regards it as a reflection, but in that particular case three industries were proposed in that area, and they would under no circumstances agree to establish the industries in the industrial area; unless they could get a direct supply.

The more recent case of Middelburg, Transvaal, where the establishment of a steel industry was involved, and there the municipality definitely wanted to wash its hands of the responsibility of undertaking a supply to a consumer with a load approximately 10 times that of the town.

There again it was the municipality that was rather keen that the authority be given to Escom direct.

The big benefit of course to the towns in a case of that description is the source of revenue which flows to it, and which should be sufficient to cover the amenities provided.

Now, as regards the reference to Escom's unwillingness to publish by-laws, they provided Mr. Burger with the information which he used, but as that was done in a conversation outside this hall, you will appreciate that it was only a brief one, and not a very serious discussion, and I feel that that remark should be amplified.

The only by-laws which Escom has felt that it was necessary and advisable to consider publishing as by-laws, in terms of the Act, was that to introduce the Wiring Regulations.

The way we overcame that difficulty was to incorporate that requirement in each of Escom's licences.

On this subject of the licensing, Mr. Burger has stressed the desirability (I don't know whether I am using the right word, but I hope so), that the Provincial Administrators should be the arbiters in cases of difficulty.

Now with that I am not inclined to agree, from the point of view that the Electricity Act has established the Electricity Control Board as the body responsible for granting rights and permissions of supply.

Granting rights according to the establishment of areas; if it's a new undertaking then it also requires the approval of the Minister. So that the Act itself does lay down that the State, in the name of the Minister, is invoked, not the, shall we say, underling of the Provincial Administrator, and it does lay down definitely that the E.C.B. which is a body appointed by the State shall be the arbiter in dealing with the granting of rights of supply.

The only peopie over whom the control board has no jurisdiction is a municipality within that municipality's area between Escom's area of supply and that of an expanded municipal area of supply, the Control Board can still be the arbiter, and in that connection we have agreed with the control board to incorporate in our licence a provision that that particular aspect be dealt with in terms of a specific clause in all our licences.

There is no intention to modify those licences until the necessity for provision on some other account arises, but the undertaking has been firmly given.

As regards the licencing of contractors, an instruction has been issued to all our managers that those licences must be granted, making use of the same terms and conditions as regards the granting of a licence as are applicable in the neighbouring town.

In other words, we will not grant a licence to a licencing contractor if that contract could not get a licence for his premises from the neighbouring town. And from that point of view, we are safeguarding, as far as we possibly can, the rights of municipalities to control the licencing of contractors.

Of course, as I understand the position, and I would like it confirmed: when a contractor has been licenced he is entitled to work anywhere from those licenced premises. He is not restricted to the area of jurisdiction of the town within which that licence has been granted.

If from those premises he can work elsewhere, he is entitled to do so.

Speaking to our President's point just now, where he very feelingly spoke of the salaries paid to the administrative staff, which compared with those paid to the technical staff, a case in point arose quite recently in Swaziland.

I don't know whether many of you saw the advertisement for an engineer to take charge of the construction of their new hydro-scheme as a Government servant.

The thing that amazed most of the administrative staff in Swaziland, was that his salary was greater than that of the Resident Commissioner himself, so that it was quite clear that the government realised if they wanted the right man they would have to pay for him.

There is one further point, in reading through the proceedings of the last Convention, I noticed that the replies were not present. It seems to me a very great pity that when people have taken the trouble to study a paper, never mind what trouble the author has taken, with a view to discussions and asking questions, it is a very great pity that the value of the paper is not rounded off by a reply from the author being printed.

If you will examine the proceedings of the last conference, you'll find that there are a couple of brief replies, but one paper has no reply whatsoever.

I think something should be done by the executive to insist on full replies being printed.

Thank you, Mr. President.

Mr. T. S. KALIL (Bloemfontein): Net voor ek met die referaat van mnr. Burger handel, wil ek graag u, en die lede van hierdie vereniging, baie gelukwens met die wonderlike gees waarmee u u verrigtinge dryf.

Alhoewel daar sekere tegniese sienswyse voor hierdie konvokasie gelê is moet ek, as 'n leek, sê dat oor die algemeen het ek u taal verstaan.

The very high standard of various papers placed before us, and the level of the subsequent debate, must place these conferences on the very top level of any get-together in the country.

Ek is vereerd dat die geleentheid aan my verleen is om die vergaderings by te woon, and since I was placed on the council as the result of faulty meter reading, bad rendition of water and light accounts — (and Mr. de Lange, I didn't pay those accounts for the voters!) — I hope that I will again have the opportunity of attending some of your future conventions.

Now, with regard to Mr. Burger's paper, I would like to say at the outset that most of the points I intended making have been clarified by the statement in regard to the Natal Ordinance which will cover the personal criminal liability of officials. I think that is most important.

I was amazed to learn of the proceedings that had been prompted — in fact I think it must have been a persecution of action — against one of the engineers under the criminal code.

However, I don't think it would be out of place to stress the importance of other provinces taking immediate steps to afford the same protection and indemnification to its engineers and other officials acting in their official capacities.

There appears to be an abundance of legislation building up around electricity, and electricity supply matters, that unless some form of codification takes place, even lawyers, I think, will be fogged.

Councils must be vitally interested in the welfare of their officials, and because of the various factors, limiting the scope of their undertakings, factors such as finance, lack of sufficient experts and so forth, it becomes their bounden duty to take steps such as full insurance cover and other means to protect their citizens as well as their officials.

I personally was not enamoured of the suggestion made by Mr. Burger about the Administrator acting as a sort of arbitrator between his own local authorities and eventually I think it would be the Minister of Economic Affairs on the other side.

We have been told that, in fact, the Electricity Control Board exercises that right. I think, arising out of the discussions here at the conference, Mr. President, it appears to me that there is such a wonderful spirit of co-operation between all parties that with the assistance of Escom's very senior officials, and the co-operation they obtain, I think, from these engineers (you gentlemen who are present here), who are able to persuade your Councils, that the suggestion made by Mr. Burger is perhaps not altogether "uncalled for"—I don't think that is the right word — it's not such a bad suggestion, although again the matter of personal likes, dislikes, and the parochial attitude I think that is inherent in us all as human beings, will arise and perhaps after all the electricity control board is the right body to control these matters.

In conclusion, I personally do think that Mr. Burger himself has streamlined the law for us, he has simplified his subject, and I must say that I have enjoyed this together with all the matters discussed at this conference.

Mr. J. L. McNEILL (Stanger): I think it was at the Durban conference that I draw attention to the sweeping implications of Section 50 of the Electricity Act, particularly with regard to the smaller municipalities, and it may be of interest to members if I mention that we did obtain from our Insurance Company a letter stating that they would hold us covered under that Clause.

Mr. R. W. KANE (Johannesburg): I want to be very brief. Really I want to ask Mr. Burger (and I don't think he should reply today) why the Wiremen's Act refers to licensing and/or registration. They use the two terms.

Coming back to something Mr. Milton said, in our discussions with Escom, I think it is appreciated that on many occasions Escom will not be able to inspect the premises of a contractor, unless those premises are very much in the country.

They will be in the majority of cases under the control of some urban authority, and I think Escom will be seeking the advice of that urban authority to pass an approval, from a public health, town-planning point of view, for acceptability of the premises, before they in turn will agree to a licence.

Our thoughts generally are that except where people have introduced by-laws, that one licence will be issued to any contractor; thereafter that licence should be registered by the other authorities in which area he seeks to work. Don't forget that the Act says every one of us must still register or licence, and the thought is that the contractor will have only one licence but many registrations of that licence, and consequently any endorsement on that licence at any other time will be available to anyone else.

THE PRESIDENT: Are there any other contributors to the discussion.

Mr. E. DE C. PRETORIUS (Potchefstroom): Mnr. die President, dit is vir my verbasend dat so min van die afgevaardigers nog gepraat het oor die Wet op Elektrotegniese Aannemers en Draadwerkers. Dit is vir ons die een wat op die oomblik die meeste hoofpyn gee.

In Potchefstroom het ons die eer om 'n professor in die regte op ons Raad te hê, en erger of beter: hy is ook op die bestuurskomitee! (Stellenbosch, tot my wete, is die enigste ander stadsraad in die Republiek wat in dieselfde penarie verkeer!)

Nou, professore is slim mense — hulle is te slim vir my — hulle redenasies is vir my gewoonlik onpeilbaar. Daarom neem ek nou my toevlug tot u mnr. Burger, om asseblief tog lig te werp op die volgende aspekte van hierdie besondere wet, Nr. 20 van 1939 en soos onlangs gewysig.

Eerstens, wie moet, reken u, toesien dat artikel 20 van die Wet nagekom moet word? U weet, dit gaan oor die persone wat gemagtig is om bedradingswerk te doen.

Tweedens, het die voorsiener die reg om van 'n draadwerker wat bedrading doen te vereis om sy lisensie te toon? Ek dink dit is nie in die mag van die voorsiener om dit te doen nie.

Derdens, het die voorsiener insgelyk die reg om insae te hê in die leerlingkontrak van beweerde vakleerlinge wat onder toesig bedradingswerk doen?

Dan, artikel 21 wat gaan oor die lisensiëring en registrasie van aannemers, net 'n baie kort vraag: is u nie van mening dat die lisensiëring en registrasie van aannemers 'n taak en plig van die Staat is nie?

Dankie.

THE PRESIDENT: Thank you, Mr. Pretorius.

Mr. R. M. O. SIMPSON (Durban): Mr. President, gentlemen, Councillor Trevor Warman has asked me to apologise for his non-attendance this morning. Unfortunately he had to return to Durban first thing on urgent business matters. Mr. Warman has prepared a vote of thanks to Mr. Burger for his most interesting and valuable address which will be available for publication in the Journal. He is particularly interested in the subject and is very appreciative of Mr. Burger's efforts to clarify many of the legal aspects of Electricity Supply problems in South Africa. I would also like on my own behalf to thank Mr. Burger very much indeed for his very fine and interesting address. His efforts I am sure, will be much appreciated by Electrical Engineers and Supply Authorities throughout the country.

Thank you.

THE PRESIDENT: Ladies and gentlemen, I'll now ask Mr. Burger to reply.

Mr. A. P. BURGER (Parow): Mr. President, ladies and gentlemen, I first of all would like to thank those who have made comments on my paper, and the proposer and seconder, and all those delegates who have spoken on it.

I would first like to mention the points raised by Mr. Pretorius of Potchefstroom.

Mnr. die President, wat daardie punte betref sal ek vir u skriftelike antwoorde daarop gee. Ek is bevrees omdat die tyd 'n bietjie kort is sal dit nie moontlik wees om met almal van hulle op hierdie stadium te handel nie.

Mr. President, in regard to the question raised by Mr. Milton, and also by Clr. Kalil in regard to whether the Administrator should be the determiner of any difficulty or counter claims that may arise in a disputed area where that area is in fact within the local authority's area of jurisdiction. I of course hold no personal views on this; I could only follow the law where it led me. Well, it led me to the Administrator.

Of course, that is a matter of policy; it is a matter which has to be thrashed out by the various Government authorities and by the engineers, and by all concerned with that.

It is just that I have to point out that as the law is at the moment, and where the Administrator (as Mr. Milton has mentioned) is at the moment, the arbitrator with regard to inside the Municipality, and where the area of conflict also arises inside the municipal area, there, as the legal position is today, the logical arbitrator is, again, the Administrator.

That is a matter of constitutional law as far as I am concerned. As far as others are concerned, it is a matter of policy, and it is something which will have to be worked out.

But what is important, and very important, is that there should be an authority which can determine such a matter. At present no authority is so empowered.

Mr. President, in regard to the, I must say, very remarkable point which occurs in the Act, in regard to licensing and registration, I will investigate that further, but I must say immediately that it is a point which has puzzled me quite a lot. I could not understand why the legislature used both those terms. The only deduction which I have been able to make (and I can check up on my deduction to make absolutely certain whether it is a correct deduction) . . . is that the Act uses both terms because in the various provinces a variety of terminology has arisen, than in the Transvaal the by-laws would say "licensing" and in another province they would use the word "registration" in their by-laws, so that both those two terms had come into use regarding electrical contractors, and that in the result the draftsman, not being in a position to select which term to use, decided to use both. Actually of course, as the Act stands today, they have in effect the same meaning. They are just differfent terms for what is in effect the same thing. The wording has an historical origin.

Mr. President, the point raised by Mr. Milton in regard to the contractor who is licensed, that is dealt with by Section 21 of the Act.

The way I read the Act is that the contractor is licensed only in the supply area of the supplier in whose area of jurisdiction he has in fact applied for his license.

In other words, if the contractor applicant wanted to apply to Escom which has a large supply area, then he would be licensed for the whole of that area, if he is licensed by Escom. On the other hand if he applies in the municipal area to the municipal supplier, then he will be only licensed for that particuar area. He will not be licensed for all areas everywhere in the country.

He will be confined to the municipal area where he has had himself licensed or registered as a contractor, and the same position arises in regard to Escom. The contractor must be licensed or registered by each supply authority in whose area he wants to carry on the business of a contractor. He need not be the occupier of premises in more than one of the areas for which he wants to be licensed.

With these few replies, and time running short, I would like to thank you very much again for giving me the opportunity of reading this paper to you. I would like to say that I tackled my task with some trepidation, in the face of the eminence of this convention — not only of the engineers present, but also of councillors who themselves are eminent in various spheres, and also for the fact that amongst the councillors there were included some very well known legal practitioners, and, amongst others, also one of South Africa's most famous jurists, and therefore one is placed in a difficult position, not knowing exactly from which side the critics are going to approach you.

Nevertheless it has been very pleasant, Mr. President, to be able to read this paper to you.

Thank you, again. (Applause.)

THE PRESIDENT: Ladies and gentlemen, I do appreciate that the time is extremely short to discuss and dispose of Mr. Burger's paper, but I am sure if some of you have papers or contributions you wish to hand in in writing I am sure Mr. Burger will be pleased to reply through the channel of the proceedings.

I'll now ask you to show your appreciation to the speakers and to the author in the usual way. (Applause.)

CONVENTION ADJOURNED FOR TEA.

## WRITTEN REPLY BY MR. A. P. BURGER TO MR. R. W. KANE

Use of the words 'Licensing" or "Registration" in the Electrical Wiremen and Contractors Act, 20 of 1939, with reference to Electrical Contractors.

(i) The inference which I drew from the Act is that it is using both the term "licensing" and "registration" in recognition of the underlying Provincial legislation which in one Province uses the term "registration" and in another Province the term "licensing".

(ii) In this connection it is of interest to note the difference between the Cape Province and the Transvaal regarding trade licensing in general: Before a receiver of revenue can issue certain trading licences referred to in the Licences Act, 44 of 1962, the person concerned requires a concession from the local authority concerned. In the Transvaal this concession takes the form of a licence certificate. In the Cape the concession takes the form of a *business registration* certificate, because the relevant section of the Cape Registration of Businesses Ordinance, 15 of 1953, provides that no licence to carry on a business shall be issued to any person and that no person shall carry on a business unless he is in possession of a certificate of *registration* issued to him in terms of the Ordinance. Although there are certain important differences between the Cape and Transvaal legislation dealing with this certificate which the trader needs before he can get a licence from a receiver of revenue, the effect of the legislation is basically the same. Yet, it is to be noted that the Cape's system is that of *registration* of the business and the issuing of a *registration certificate*.

(iii) When it comes to electrical contractors, we find a rather similar state of affairs. I have before me Transvaal by-laws dealing with electrical contractors. These talk of the *licensing* of the contractor. The Cape's Standard Electricity Supply Regulations speak of the *Registration* of electrical contractors and the issuing of *certificates of registration* to them; yet, in substance, these Cape Regulations are very much the same as their Transvaal counter parts namely the by-laws of the individual Transvaal local authorities. A Cape Ordinance dating as far back as 1921 empowers the Cape local authority to make Regulations for the *registration* of *contractors* undertaking electrical work. A fee can be charged for this registration just as the Transvaal local authority can charge a fee for the licensing of the Contractor.

(iv) The following are extracts from a memorandum prepared by the Johannesburg Town Clerk's Department in 1948:

"The word 'licensing' appears to have changed its meaning or, more correctly, its application very considerably in the course of the last forty years and licensing today, at least in areas under the control of municipal authorities or even of Health Committees, is no longer merely a matter of accepting payment of fees or taxes . . . ."

"If the word 'Licence' is to have any meaning at all, it must signify that it is a lawful authority to carry on a business or trade; it is in the public interest that licences should not be issued over the counter as merchandise but should be granted only after due investigation of the merits of each case by the authority issuing the licence."

It appears then that we have in South Africa licensing in two senses of the word. In one sense "licensing" is used merely in a tax collecting sense as in the Licences Act, 44 of 1962. In another sense "licensing" is used in an Administrative Law sense, meaning thereby that the licensing authority investigates and considers the merits of the case before issuing the licence. The Transvaal legislation obviously uses the term "licensing" in this second sense with reference to electrical contractors. The Cape Provincial legislature has apparently elected to use the term "registration", but in effect this term has precisely the same meaning in legal substance as the term "licensing" when used in the Transvaal with reference to electrical contractors. In the case of both Provinces a fee can be charged and in the case of both Provinces there is investigation and consideration of the merits of the application with reference to certain rules in regard to premises etc. contained in the local authority's Regulations or by-laws.

(v) It is apparent that the draftsman of the Electrical Wiremen and Contractors Act has taken note of this Provincial difference in terminology. When the draftsman of section 21 of the Act as it originally stood wanted to provide that the person carrying on the business of an electrical contractor must hold such concession as he is in terms of local laws required to hold, he realised that one Province called the concession *registration* and another Province called the concession a licence. The draftsman wanted to cover both cases, and he accordingly used both terms. Both terms have survived, and both are still to be found in the latest amendment of section 21.

It will be remembered that in section 4 of my paper (CIVIL LIABILITY OF THE ELECTRICITY SUPPLIERS) I examined section 50 of the Electricity Act, 40 of 1958, and concluded that section 50 imposes liability irrespective of negligence, and that the only defences available to the supplier is the defence expressly given him by sub-section (2) of the section.

I suggested that suppliers would be well advised to make certain that they are covered by insurance against claims under section 50 on the basis that the section imposes what is called *strict liability*. Looking at my own Council's public liability policy, issued by a well-known Insurance Company, I notice that the policy only indemnifies my Council in respect of liability for accidental bodily injury (fatal or non-fatal) to persons and accidental damage to property caused through the *fault of negligence* of my Council or its employees actually engaged on its business.

In the case of my Council liability under section 50 of the Electricity Act cannot arise; but it can arise in the case of those Municipalities which supply electricity.

In other words, the chances are that there are at the moment a large number of local authorities supplying electricity and not fully covered by insurance in the event of a claim based on the provisions of section 50 of the Electricity Act.

In the circumstances I would strongly recommend to all local authorities supplying electricity that they should have their insurance policies examined with reference to section 4 of my paper.

You will recall that one delegate at the Convention actually mentioned that section 50 had worried his Council, and that they actually took out specific cover in respect of section 50.

At the Convention I suggested a clause for the relevant policies, containing the following wording:—

> "Notwithstanding anything in this policy contained, and without in any way limiting the cover given to the insured under any other provision of this policy, this policy shall cover the insured in respect of any claim or cause of action or proceedings at law which may be brought against the insured under section 50 of the Electricity Act, 40 of 1958, or any amendment thereof."

The above suggested wording may not fit in with all policies, and it may be necessary to adapt the wording to the particular policy — as long as it is quite clear that the policy, in addition to the coverage it already gives, clearly, and without qualification, indemnifies the insured against any claim which can be brought against it in terms of section 50 of the Electricity Act, 40 of 1958.

It is for the local authorities concerned to get the precise wording of the policy in consultation with their own legal advisers. I can only draw their attention to the fact that my conclusion *is* that section 50 imposes strict liability, which means liability regardless of fault or negligence.

A point which I would also like to mention here is with regard to section 6(a) of my paper. It came out at the Convention that despite the 1962 amendment of section 19(1) of the Electrical Wiremen and Contractors Act, 20 of 1939, state departments (including the provincial administrations) still ask the City and Town Electrical Engineers to test installations on state premises. As I mentioned in reading my paper, I consider it most advisable that City and Town Electrical Engineers should, where such testing is to be done, obtain resolutions of their Councils authorising them thus to test installations at State premises. It must be remembered that as the law now stands, wiring work carried on by or on behalf of the Government, including the Railways Administration and the provincial administrations, has been expressly exempted from testing and approval by the supplier. A Council which has not specifically resolved that its Town Electrical Engineer should, upon request by the Department concerned, test at state premises, can, therefore, repudiate the Electrical Engineer as having acted beyond the scope of his employment when it comes to any claim arising from such testing.

*On resuming at* 11.00 *a.m.*

THE PRESIDENT: Please be seated, ladies and gentlemen. I have been requested (and I think this is a very good request), that should anyone wish to make a contribution in writing, the list will not close for at least one month.

This will enable you to go home and prepare your contributions to the discussions, and submit them to the Secretaries. The authors can then reply through the proceedings.

We now come to the Closing session, and I am going to call on the Mayor of Springs to say a few words to you.

Clr. F. F. DEYSEL (Springs): Geagte mnr. die President, dames en here, toe die gedagte verlede jaar ontstaan het om die Kongres hier in Margate te hou, het ek geweet dat Margate 'n baie aangename plek is. Ek het ook geweet dat die weer hierdie tyd van die jaar baie vriendelik is. Ek het ook geweet dat die stadsraad van Margate bereidwillig sou wees om ons hier te ontvang. Maar wat ek nie geweet het nie, was dat ons op hierdie wyse hier in Margate ontvang, op die hande gedra, en onthaal sou word nie.

Dit is nie vir my nodig om u geheue te vervris en weer aan te haal van al die vriendelikheid wat ons hier in Margate ontvang het nie.

Laat my toe, mnr. die President, om namens die hele Kongres aan sy Edelagbare die Burgemeester van Margate baie hartlik dankie te sê; aan hom sowel as sy mede raadslede, dat hulle dit vir ons so aangenaam gemaak het, dat hulle dit vir ons moontlik gemaak het om hierdie Kongres hier in Margate te kon hou.

Ons sal dit baie, baie lank onthou. Dit sal een van ons uitstaande Kongresse bly Raadslid Baker, namens die hele Kongres, en namens die Stadsraad van Springs, baie hartlik dank. Ons waardeer die wyse waarop u hierdie Kongres vir ons aangenaam gemaak het.

THE PRESIDENT: I'll now ask His Worship the Mayor of Margate to say a few words.

Clr. R. L. BAKER (His Worship the Mayor of Margate): Mr. President, ladies and gentlemen, I would like to express my own appreciation, and on behalf of my Council, thank Mr. Deysel the Mayor of Springs very sincerely for his very fine words.

I also want to take this opportunity of thanking the ladies attending conference for the very fine gesture they have made to my wife.

I don't know whether the menfolk are aware of it, but my wife was handed a sum of money this morning by the lady president for her to give to her favourite charity. I don't know whether I'm first on the list or not. That remains to be seen!

Mr. President, may I say how happy we here in Margate have been to have you with us once again. We do hope that you have enjoyed yourselves, and we do hope that it will not be long before you come back to Margate again.

We here in Margate are very conscious of the fact that we rely on good publicity, and we rely on the personal contact that is made, especially through the various conferences that are held in this town.

I have said this on many occasions: this part of the coast is one of the finest in the world. There is nowhere else where you could find a better climate and all that goes with it, and a healthy and happy holiday; and Mr. President, this part of the coast is the heritage of the country; it is not the right of the few individuals who live here.

We here, who do act as custodians of this part of the coast, on behalf of the rest of the country, look to you people as visitors to come along and assist us in developing this coast for the benefit of the country.

Mr. President, may I once again wish you, sir, and your executive committee, and all the delegates a safe journey home, and we do hope that it will not be long before we have the pleasure of having you with us once again.

THE PRESIDENT: Thank you Mr. Mayor. We won't call that advertising because we know that the mayor has proved to us that every word he says about the south coast is perfectly true. We have thoroughly enjoyed ourselves.

I now have pleasure in calling on Mr. John Morrison to speak on behalf of the affiliates.

MR. JOHN MORRISON (Johannesburg): Mr. President, Mr. Mayor, ladies and gentlemen, there is a saying that birds of a feather flock together and surely this gathering at Margate has seen the greatest migration of electrical brain-power for many a year.

As a humble member of the gaggle of affiliates here present, may I say how very much we have enjoyed this happy Convention for, not only has it given us a respite from our humdrum yet exacting task of "beating the living daylights out of each other", but it has also provided us with the wonderful opportunity of observing the more learned and eloquent of our feathered friends in action away from the confines of their municipal nests.

We have, for example, listened with rapt attention to innumerable reports presented by that overworked bird — the LOMBARDI EAGLE—although we were a little disappointed that he did not discourse on his favourite subject "The treatment of dogs that have been bitten by wild meter readers." We have watched with growing admiration the gyrations of the MILTON ESCOMBUS who, ever-lively, ever alert, has so successfully flitted over the lures of maximum demand tariffs and load shedding cunningly laid to entice him.

We have compared, with pleasure, the measured deliberations of our coastal friends—the GOLDEN HEADED ALBATROS or the not so ancient mariner from Durban and, of course, the PERCY PUFFIN—who may sometimes be seen dimly emerging through his built-in smoke screen—with the more deliberate aggressiveness of our city slicker who, living amidst the towering structures of the Reef has, by voluminous reference to the Electrical Wiremens & Contractors Act, been able to shower bull and baloney upon his lesser fellows from a great height.

Amongst those migrants from the far north, we welcome once again that BIRD OF PARADISE — the one with the multi-coloured plumage—residing now near the Congo Border. We are indeed grateful that he has spared the time from sponsoring the Central Government to regale us in his broad Lancashire dialect.

His place on Members Forum has, once more, been happily occupied by the SHORT BILLED BARTON, who has succeeded in sitting on the fence whilst tossing scraps of contentious tit-bits to his more voracious companions below.

To these and to many others, we extend our sincere appreciation — but I am sure that you will agree with me when I say that the success and enjoyment of this wonderful Convention has been due mainly to the hard work, sacrifice and patience of the two most important members of our species. Firstly, I refer to Dick Ewing—our SECRETARY BIRD — who, for eleven months of the year can be seen hovering lovingly over the lush meadows of East London growing fat on pineapples. However, in May, a feverish activity overtakes him and his normal placid and calm countenance assumes an aspect of fearful apprehension.

Last, but not least, I pay tribute to our President — known, of course, as the SMOOTH HAIRED DOWNEY OWL — because of the wise and careful manner in which he has guided our deliberations and also for his inherent habit of lining his nest with the appreciation and praises from the many committees and associations upon which he has served. Too soon we receive the news of his pending retirement, but let us hope that the warmth of our acclamation will remain with him and for years to come we shall continue to enjoy the pleasure of his happy company.

To you, Jack, to your Council, and to our hosts the Mayor and Councillors of Margate — our very sincere thanks for a most enjoyable and successful Convention. (Applause.)

THE PRESIDENT: Thank you, Mr. Morrison. I now have much pleasure in calling on Clr. Mrs. Davis of Benoni to speak on behalf of the ladies.

Clr. Mrs. C. DAVIS: Of course this being a men's conference, the ladies come last, but I can assure you men that we are not the least.

Mr. President, Members of the A.M.E.U., representatives of all firms interested in the Association, Mayors and Town Councillors, Wives, Delegates and Visitors:

I have been asked to propose a vote of thanks on behalf of all the women. Before doing that I would say a few words on my own behalf. Being the only woman delegate I wish to express my sincere thanks to you Mr. President, and to all the gentlemen present for the utmost courtesy and consideration I received from you all. Thank you very much indeed.

As a layman I have found the Conference most stimulating, and listened with interest to the papers and comments. The few (I repeat the few) times that some point was beyond my knowledge, I had a very able interpreter in Benoni's electrical engineer, Mr. Scotty Lees, who made everything very lucid to me where I didn't quite understand it.

Thank you all very much gentlemen.

Mr. President and Members, on behalf of the women I would like you all to know how very much we have appreciated and enjoyed the entertainment organised and provided for us by your Association.

Firstly to the mayor and mayoress of Margate, our thanks for a delightful cocktail party where we all got to know each other quite well, and the Naughty Nineties, thanks for a wonderful and very hilarious evening. I didn't think I could be so uninhibited!

And now a most important gesture, we say a very big thank you to the A.M.E.U. and Associates for all their efforts to make the lighter side of the Conference such a memorable and outstanding one. The mannequin parade was most enjoyable. I noticed even some of the men sneaked out to watch. They were standing five deep in the foyer.

The trip to Oribi Gorge was invigorating and the scenery beautiful. The morning tea party was a delightful interlude and I can assure all the men that their womenfolks' clothes and hats were equal to any professional mannequin parade. You all looked lovely, girls.

The highlight, of course, was the good dinner and excellent variety concert which everybody enjoyed so much last night. In fact at times I thought I had got into a men's smoking concert by mistake. But I enjoyed it all very much.

Again, gentlemen, please accept the sincere thanks of all the women, for the wonderful way you have looked after us.

Ek sal nie alles herhaal in Afrikaans wat ek in Engels gesê het nie. Ek kan net mnr. die President en al die lede hartlik bedank vir al die wonderlike plesier wat al die dames hier geniet het. Ons stel dit baie hoog op prys. Baie dankie.

"Au revoir" to you all, and may the deliberations of this Conference solve many of your problems.

"Totsiens." (Applause.)

THE PRESIDENT: Thank you Clr. Mrs. Davis.

I now have to call on Mrs. Peggy Mitchell. I think she wants to say a few words.

Mrs. PEGGY MITCHELL (Kitwe, N. Rhodesia): Honorary Member Mitchell's *still* Honourable Wife. More thoughts from the Ladies, Margate Convention 1963:—

Hibiscus in Margate in May, tra la,
Has something to do with the case, and hurrah
There are also some beautiful damsels, which may
Have something to do with the case, we say,
Although their statistics and various capers
Would never be found in Convention papers!
Whatever it is, we all do agree,
That here is a good place for having a spree.
Now at these conventions we hold year by year
Some incidents happen, as you now shall hear.
Last year at a party a man we know well
Introduced there his wife, seems quite simple to tell,
There's nothing at all seen in that to perturb,
Except *his* little wife was still then in Jo'burg!
Now this goes to show he was all out of rhythm,
And proves wives, if possible, should always go with 'em.
Which excuses his blunder, it was more or less,
Just because of their being 'apart I'd' guess!
Then Paddy O'Dowd thought of finding a name
To describe all the wives of Convention fame.
Well how about Miniwatts, Voltanns or Milliamps?
To go with the latter the men could be Billiamps!
Or A.M.E.U.-ettes or Ampettes or Unitanns?
But the men cannot possibly call themsleves Puritans!
And we are just thinking that if there's a prize
Don't make it a 'frig of prodigious size,
But keeping to something I always have said,
Please, Paddy, we would like the money instead!
This year lots of changes are surely to follow,
One Member is shortly to leave Bulawayo
To help sell the Power away up in the North,
That's where we have 'pence' and get our copper's worth!
Then one Member's daughter has recently found
That over Limpopo happiness does abound,
So will that same Member consider a scheme—
There's always Kariba, it is not a dream.
An office up North and he's sure of relief
If ever he needs more supply on the Reef!
The drive, golf and bowls, done with sanction official
Saved Delegates from feelings of guilt—superficial!
We're hoping in future it is the intent
To make them appear as an annual event, —
And having annexed my husband's nice prize
I'm hoping by next year they increase the size!
At this stage I say that Convention has found
A compére whose talent has been underground,
With prizes and jokes Jack showed excellent sense —
All properly phased in negative sequence!
Morning Tea with the President's wife as our Hostess
Gave us the chance to give thanks to the Mayoress,
We also were pleased to be able to say
A real Happy Birthday to our dear friend May.
The Nineties so Naughy was another highlight,
The Variety Show also gave us delight,
And as Dances are changing so quickly these days
Please may I suggest one to suit all our ways?
A 'line' that is simple, it must be 'A.C.' —
Electricals know all about this you see,
When 'weaving' from Institute Dinners they'd save
Explanations by saying, "It's our Dance the 'SINE WAVE'."
Jack Downey holds three high offices this year,
That's a 'hat trick' so maybe he'll stand us a beer!
He came very early to Durban, oh yes,
To 'Sell all the Towns' with good lighting, he says.
Now some like good lighting when out in the park,
The others prefer to be left in the dark,
So don't go *too* far Jack, remember the day
When *you* were in some place in May WITH MAY!
We hope Jack's remarks re Supply and Demand
Will give all the ladies lots more cash in hand.
Here now comes the moment when we would express
Our thanks to the husbands, the Mayor and the Mayoress,
The Council and everyone else who did share
In making our visit a happy affair.
We've enjoyed every minute and hope for some more
Conventions at Margate, so say "au revoir".

THE PRESIDENT: Thank you very much, Mrs. Mitchell. I am proposing, without any opposition I am sure, that your little talk will be incorporated in the proceedings. (Applause.)

It is now left to me to say a word of thanks in appreciation to those who have made this Convention a success.

First of all I'd like to pay tribute to the Town Clerk of Margate, and members of his staff, for the assistance we have received from them; the Margate Chamber of Commerce who has been always ready and helpful, and Mr. Dennis Levitt, and members of his staff for the assistance they have given us in our difficulties at times.

Mrs. van der Merwe, Mr. L. Ramsay, and members of the staff at the Margate Hotel who, I think, have attended to our needs throughout the Convention, and especially at the dinner last night, which I think was a marvellous effort on their part.

To the British Petroleum Co. and Mrs. Jean Béchet for the attention at the information desk, for the convenience of all the delegates. I think we have appreciated this very much indeed.

To Mr. Denis Burd for the efficient service of recording, and Mrs. Lee whom, I think, we now regard as part of the A.M.E.U., she is so efficient at her job. I know that has shaken many here. They have spoken in the morning before tea, and after tea have had to do their homework!

And the Secretaries, I think we must thank for the work they have done. Mr. Ewing and your staff, we do appreciate

all you have done; it makes things so much easier for all of us.

You probably have noticed once or twice, he had a bit of a harrassed look, but he has overcome that all right.

I want to thank the affiliates for arranging the sporting events on Wednesday afternoon. It is quite a new innovation, and those who participated in the sporting events thoroughly enjoyed it. Those who didn't take part, I think enjoyed the presentation of the prizes at the Forum.

There is one other not usually thanked, but I think it deserves mentioning this time, and that is the photographer. He has bobbed around and given you records of all sorts of positions, and it has made a very happy record of a happy Convention, and I think we ought to thank him for what he has done.

I also want to thank my wife for acting hostess to the lady delegates to this Convention, and at the same time, thank her for having put up with me with all my idiosyncrasies for so long. She has been extremely tolerant as you can appreciate.

Lastly, I want to thank the authors of the papers, and also the delegates for the discussions but I want to make one particular point about this: some of you have known the experience of being a chairman and pushing the wheelbarrow. This Convention has been one over which I have presided, and I have never found it wanting, nor have I had to pick up the wheelbarrow and push it myself.

I want to thank you one and all for that, because it has been most easy conducting the proceedings here.

You have never, at any time, left me pushing the wheelbarrow. As a matter of fact, I found it the other way round. I had to apply the axe with great regret, this morning, because of the spontaneous discussions on the papers, and to have to cut them is of great regret to all of us.

With those words I thank you one and all.

Clr. W. F. MEYER (Welkom): Mr. President, ladies and gentlemen, I have a piece of paper here but I am not going to deliver another paper.

Mr. President, I'd like to undermine your authority for a brief minute or two.

In a Convention of this nature, you have persons delivering papers and there are persons contributing to the discussion. Then there are quite a number — to thank them for the work they have done. Quite rightly so we are very prompt in showing our appreciation to them.

But I would like to make sure before we disperse that everybody present shows you their appreciation for the wonderful way in which you have handled this Convention.

Ons wil u bedank vir die bekwame manier waarop u alle verrigtinge gehanteer het, die regverdige en die beslissende manier waarmee u hierdie Kongres hanteer het.

Ons sal hier weggaan met aangename herinneringe aan hierdie Kongres.

And now, ladies and gentlemen, I ask you to show your appreciation in the usual manner to the President for the very fine way in which he handled this Convention in the usual manner.

We wish him and his wife "Godspeed". (Applause.)

THE PRESIDENT: Thank you Clr. Meyer.

Dames en here, baie dankie vir die bewoning van hierdie Konvensie en vir die geduld wat u uitgeoefen het.

I thank you very much indeed, ladies and gentlemen.

I now have much pleasure in recording that the 37th Convention of the A.M.E.U. held in Maragte, is now closed, and wish you all a safe journey home.

CONVENTION ADJOURNED.

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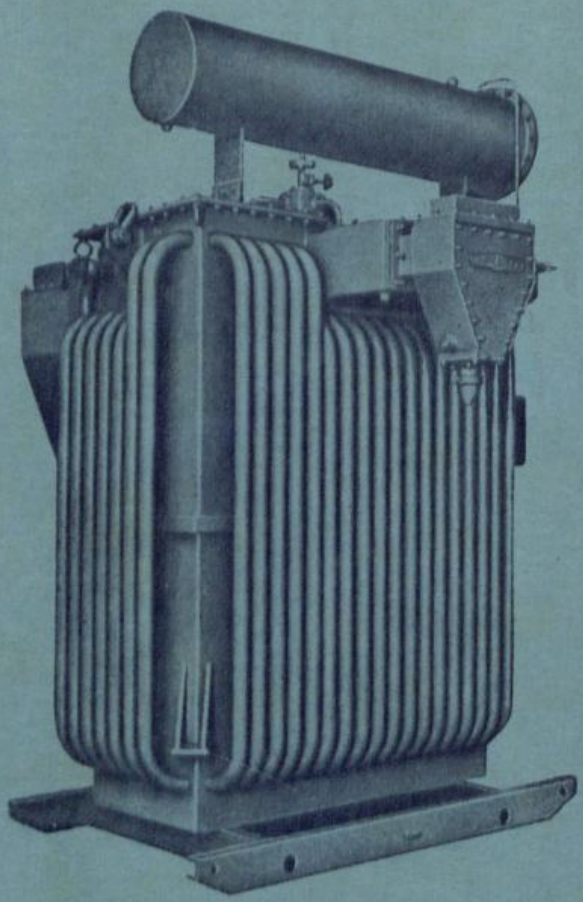

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