1929.

THE PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA.

PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS.

REPORT

TOGETHER WITH

MINUTES OF EVIDENCE

RELATING TO THE PROPOSED ESTABLISHMENT OF AN

AUTOMATIC TELEPHONE EXCHANGE

AT

CAULFIELD EAST, VICTORIA.

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MEMBERS OF THE PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS.

(Sixth Committee.)

MALCOLM DUNCAN CAMERON, Esquire, M.P., Chairman.

Senate.	*House of Representatives.*
Senator John Barnes.	Percy Edmund Coleman, Esquire, M.P.
Senator Herbert James Mockford Payne.	Josiah Francis, Esquire, M.P.
Senator Mathew Reid.	The Honorable Henry Gregory, M.P.
	David Sydney Jackson, Esquire, M.P.
	David Charles McGrath, Esquire, M.P.

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VOTES AND PROCEEDINGS OF THE HOUSE OF REPRESENTATIVES, No. 9.

Dated 22nd February, 1929.

4. PUBLIC WORKS COMMITTEE—REFERENCE OF WORK—CAULFIELD EAST, VICTORIA—AUTOMATIC TELEPHONE EXCHANGE.—Mr. Gibson (Minister for Works and Railways) moved, pursuant to notice, That, in accordance with the provisions of the *Commonwealth Public Works Committee Act* 1913-1921, the following proposed work be referred to the Parliamentary Standing Committee on Public Works for investigation and report, viz.:—Caulfield East, Victoria—Establishment of Automatic Telephone Exchange.

Mr. Gibson having laid on the Table plans, &c., in connexion with the proposed work—

Debate ensued.

Question—put and passed.

LIST OF WITNESSES.

AUTOMATIC TELEPHONE EXCHANGE, CAULFIELD EAST, VICTORIA.

REPORT

THE PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS, to which the House of Representatives referred for investigation and report the question of the establishment of an automatic telephone exchange at Caulfield East, Victoria, has the honour to report as follows:—

PROPOSAL BEFORE THE COMMITTEE.

1. The proposal submitted for the consideration of the Committee is to erect, on a site which has been acquired by the Commonwealth in Waverley-road, near Burke-road, a modern fire-resisting building, and install therein an automatic telephone switching system having an initial equipment for 2,000 subscribers' lines, and an ultimate capacity of approximately 10,000 subscribers' lines. It is proposed that the initial equipment shall be capable of extension to the ultimate capacity named, and thus enable requirements in the proposed automatic exchange area to be met for twenty years after the proposed date of opening.

REASONS FOR THE PROPOSAL

2. The area which will be served by the proposed Caulfield East Telephone Exchange comprises the eastern and south-eastern portion of the present Malvern exchange area which includes the populous and rapidly developing areas of East Malvern, Caulfield East, and Glenhuntly. It is represented that the exchange is necessary in order to meet the rapid development in these areas, which cannot be catered for, in the future, in the existing Malvern Automatic Exchange, and to obviate unnecessarily high expenditure on external line plant. It is stated, also, that the installation of the proposed exchange will enable the department to provide cheaper and more efficient service to subscribers in the extreme limits of the areas mentioned.

ESTIMATED COST.

3. The estimated immediate cost of the work is set down at

	£
Site (already acquired)	2,090
Building	11,900
Air-conditioning plant, &c.	2,380
Exchange equipment, including that necessary at other exchanges	41,431
Line plant	1,299
Sundries	437
Total	59,537

COMMITTEE'S INVESTIGATIONS.

4. The Committee visited the existing automatic telephone exchange at Malvern, inspected the site of the proposed new building, and traversed portion of the area which would be served by the new exchange.

Evidence was taken from officials of the Works and Postmaster-General's Departments, and the Committee, by a study of plans of the building and samples of air-filtering devices proposed, endeavoured to familiarize themselves with the whole project submitted.

Site.

5. The site is level in character, situated in Waverley-road, near Burke-road, Caulfield East, and is Commonwealth property. It has a frontage of 110 feet to Waverley-road by a depth of 130 feet, and is located as near as practicable to the telephonic centre of the proposed exchange area It is good building land, and should be, in the opinion of the Committee, eminently suited for the purpose for which it is intended.

Building.

6. The building proposed is to be of brick with concrete floors and ceilings. Above the concrete ceiling of the switch room it is proposed to have a roof of galvanized iron. The window frames are to be of steel with the glazing of re-inforced glass for fire protection. Provision is included in the building for a switch room approximately 104 ft. 7 in. by 58 ft. 8 in., an air-conditioning room approximately 31 feet by 22 feet, a battery room 31 feet by 22 feet, a power room 31 feet by 21 feet, a store room 17 feet by 10 ft. 6 in., luncheon room 31 feet by 14 ft. 6 in, together with the usual lavatory accommodation. The walls of the switch room will be 13 ft. 3 in. high and those of the other rooms 11 feet.

7. In the opinion of the Committee the building has been designed with due regard for economy and in accordance with the requirements of the Postmaster-General's Department, and should prove suitable. Some members of the Committee, however, were of opinion that in view of the situation of the building in a prominent place in a main street of a high class suburb, it would be advisable to replace the proposed galvanized iron roof by one of red tiles. It was stated in evidence that this could be done at an increase of from £275 to £300 on the estimated cost of the building. After some discussion, however, and suggestions made that in view of the present need for economy in all directions, and the fact that but little of the roof would be visible from the street level, and that by suitable treatment it could be made to harmonize with its surroundings, it was decided that the extra cost was not justified.

The decision arrived at by the Committee in connexion with this matter is shown by the following extract from its minutes of proceedings, viz. :—

> Senator Barnes moved that the proposed building be roofed with galvanized iron coloured to harmonize with the roofs of the surrounding buildings.
>
> Seconded by Mr. Francis.
>
> The Committee divided on the motion—
>
> | Ayes (5). | Noes (3). |
> |---|---|
> | Senator Barnes. | Mr. Coleman. |
> | Senator Reid. | Mr. Gregory. |
> | Senator Payne. | Mr. McGrath. |
> | Mr. Cameron. | |
> | Mr. Francis. | |
>
> and so it was resolved in the affirmative.

Air-conditioning Plant.

8. It has been the custom to provide, in all recent automatic telephone exchanges, a plant to provide for the elimination of dust and moisture, and for the regulating of the air in the switch room, as the suppliers of the equipment do not guarantee reliability unless the atmosphere is kept free of dust, the temperature of the air not more than 70° Fah., and the relative humidity below 70 per cent.

The Committee has on previous occasions questioned the necessity for these plants under all circumstances, and as a result of a study of the humidity of the atmosphere, and investigations and experiments conducted by officials of the Postal and Works Departments, it is now suggested that in certain districts, where days of high temperature and high humidity seldom occur simultaneously, it is considered that the expensive apparatus required for eliminating moisture from the air may be dispensed with without any risk of impairing the efficiency of the telephone equipment.

In the case of Caulfield East, therefore, it is proposed to install:

a ventilating plant, including heater and dust filters at an estimated cost of	£1,750
a compressed air service at an estimated cost of	£220
a vacuum cleaning service at an estimated cost of	£410
Total	£2,380

The ventilating plant proposed for this exchange is of a cheaper type than that found necessary for exchanges in some other districts because, with the improved moisture resisting qualities of the more modern type of automatic telephone equipment now obtainable, the Postal Engineers consider that in Melbourne and district it is no longer necessary to reduce the natural moisture contents of the air in summer, therefore the refrigerator which forms an expensive part of an air-conditioning plant may now be dispensed with.

The proposed plant will be capable of cleaning and heating the air only, and distributing it into the exchange.

It is not practicable to wash the air with water sprays under the dehumidifying system without the installation of a refrigerator, and it is therefore necessary to eliminate the washer and clean the air by some other method. This, it is claimed, is very readily effected by means of viscous type air filters, several kinds of which are already on the market. The filters are coated with a thin film of special oil and the air entering the switch room will be passed through a battery of these filters, the dust adhering to the oily surface and the cleansed air passing through.

Severe tests carried out by the Works Department in collaboration with the Commonwealth Analyst and Postmaster-General's Department on several different types of these filters, have established the fact that satisfactory filters can be obtained, and it is stated that filters of the type proposed have been in use in industrial concerns for some time.

The plant will consist of a centrifugal multivane fan delivering about 12,000 cubic feet of air per minute; a battery of twelve dust filters; a heater battery; a cast iron hot water boiler; and the necessary ductwork and registers.

The air supply will be drawn through a duct from above the roof of the building. It will pass, firstly, through the dust filters, then through the heater battery which will only be operated when it is necessary to heat the air, through the fan, and then by means of suitable ducts and registers into the switch room, where it will be effectively distributed throughout the room. Ducts and registers are provided in suitable positions in the switch room to allow the foul air to escape into the roof space, thus maintaining a circulation of wholesome air in the room. Provision is also included for cleaning the filters when they become too dirty for efficient operation.

It is claimed that the installation of this plant will ensure a supply of clean air into the exchange, although of course it does not provide for any control over the weather conditions other than that obtainable by heating.

The windows of the switch room are hermetically sealed, and therefore practically the only dust which could enter the building is that which is carried in on boots and clothes, or which enters when the doors are opened.

The annual expenses of this plant are set down at—

	£
Interest and depreciation, 10 per cent. on £1,750	175
Power for fan 5 B.H.P. motor	114
Power for hot-water pump 1 B.H.P. motor	10
Oil for filters	25
Fuel for boiler	42
Total ..	366

To enable the dust to be cleansed from the intricate automatic telephone equipment, it is proposed to install a compressed-air service, similar to that provided at other automatic exchanges, at an estimated cost of £220. It is also proposed to install a vacuum cleaning system at an estimated cost of £410. Dust from the floor and fittings will be picked up by means of suitable tools and hoses, which may be connected through piping to a vacuum producer in the machine room.

9. Notwithstanding the fact that the telephone engineers and the representatives of the manufacturers of automatic telephone equipment have always specially emphasized the necessity for the installation of an elaborate and expensive plant to remove dust and eliminate moisture from the atmosphere of the switch room, the Committee, during the course of its investigations, found that the air-conditioning plants installed are not always utilized to the best advantage. In one exchange visited the switch room was found to be in a generally untidy condition, and the effect of the dust eliminating plant was entirely nullified by the fact that doors and windows of the switch room were left open, thus admitting dust, jeopardizing the efficiency of the telephone

service, and greatly increasing the rate of deterioration of the apparatus. When considerable expense is incurred in providing air-conditioning plants, the Committee is emphatic that their usefulness should not be neutralized by the laxity of the officials, and considers that the Postal Department should insist that some particular official or officials should be charged with the responsibility of seeing that these plants are utilized to the best advantage, and the intricate and expensive automatic telephone apparatus safeguarded to prevent deterioration, and ensure to the public the best and most efficient service of which it is capable.

On this understanding the Committee recommends that the modified air filter system as suggested in this instance, be installed.

Financial Aspect.

10. It was stated in evidence that the total annual charges for the proposed automatic system as at date of installation, namely, December, 1930, is estimated at £15,221
and five years later at £36,452
The estimated annual revenue as at December, 1930, is set down at £15,782
and five years later at £48,559
The assets thrown spare if the automatic system is installed on the new site in December, 1930, are estimated to have a recoverable value of £9,144

COMMITTEE'S RECOMMENDATION.

11 Under these circumstances the Committee recommends that the proposed establishment of an automatic telephone exchange at Caulfield East, as suggested by the Department, be put in hand as early as possible.

M. D. CAMERON,
Chairman.

Office of the Parliamentary Standing Committee on Public Works,
Parliament House, Canberra.
12th June, 1929.

MINUTES OF EVIDENCE.

(Taken at Melbourne.)

THURSDAY, 18TH APRIL, 1929.

Present:

Mr. M. Cameron, Chairman;

Senator Barnes	Mr. Gregory
Mr. Coleman	Mr. McGrath.
Mr. J. Francis	

Thomas Hill, Chief Engineer, Department of Works, sworn and examined.

1. *To the Chairman.*—I am responsible for the preparation of the estimates for the proposed new telephone exchange, Caulfield East. The estimated costs of the mechanical services are as follows:—

(1) Ventilating plant, including heater and dust filters	£1,750
(2) Compressed air service	220
(3) Vacuum cleaning service	410
Total	£2,380

The ventilating plant proposed for this exchange is of a cheaper type than that found necessary for exchanges in some other districts. With the improved moisture-resisting qualities of the more modern type of automatic telephone equipment now available, the postal engineers consider that in Melbourne and district it is no longer necessary to reduce the natural moisture contents of the air in summer. Therefore the refrigerator, which forms an expensive part of an air-conditioning plant, may now be dispensed with. The proposed plant will be capable of cleaning and heating the air only, and distributing it into the exchange. It is not practicable to wash the air with water spray without the installation of a refrigerator, and it is therefore necessary to eliminate the washer, and clean the air by some other means. This is very readily effected by means of viscous type air filters, several kinds of which are already on the market. The filters are coated with a thin film of special oil, a sample of which I submit, and the air entering the switch room will be passed through a battery of these filters, about twelve in number, the dust adhering to the oily surface and the cleansed air passing through. Severe tests carried out by the department in collaboration with the Commonwealth analyst and the Postmaster-General's Department on several different types of these filters have established the fact that satisfactory filters can be obtained. Greased cards showing clearly the effectiveness of the filters tested are submitted for your inspection. Filters of the type proposed have been in use in industrial concerns for some time. The plant will consist of a centrifugal multivane fan delivering about 12,000 cubic feet of air per minute, a battery of twelve dust filters, a heater battery, a cast-iron hot-water boiler, and the necessary ductwork and registers. The air supply will be drawn through a duct from above the roof of the building. It will pass firstly through the dust filters, then through the heater battery, which will only be operated when it is necessary to heat the air, through the fan, and then by means of suitable ducts and registers into the switch room, where it will be effectively distributed throughout the room. Ducts and registers are provided in suitable positions in the switch room to allow the foul air to escape into the roof space, thus maintaining a circulation of wholesome air in the room. Provision is also included for cleaning the filters when they become too dirty for efficient operation. The installation of this plant will ensure a supply of clean air into the exchange, although of course it does not provide for any control over the weather conditions other than that obtainable by heating. The windows in the switch room are hermetically sealed, and therefore practically the only dust which could enter the building is that which is carried in on boots and clothes, or which enters when the doors are opened.

Annual Charges of Ventilating Plant.

Interest and depreciation, 10 per cent. on £1,750	£175
Power for fan, 5 B.H.P. motor	114
Power for hot-water pump, 1 B.H.P. motor ..	10
Oil for filters	25
Fuel for boiler	42
Total	£366

To enable the dust to be cleaned from the intricate automatic telephone equipment, it is proposed to install a compressed-air service, similar to that provided in other automatic exchanges, at an estimated cost of £220. It is also proposed to install a vacuum-cleaning system at an estimated cost of £410. Dust from the floor and fittings will be picked up by means of suitable tools and hoses, which may be connected through piping to a vacuum producer in the machine room. Mr. Becher, in his evidence with regard to the City West Exchange, mentioned that the relative humidity in Melbourne ranged from 71 per cent. to 81 per cent., and that it was high in the winter months, so the proposal to heat the air will have the desired effect. The expansion of the air due to the increase in temperature will result in the absorption of the excessive moisture, which will not be deposited on the walls of the building or on the cables. Winter humidity in Melbourne is unlike the humidity experienced in Queensland. There it can be eliminated only by the installation of a refrigerator and the washing of the air with water sprays. I estimate that the installation of a dehumidifying plant would be £3,930, as against £2,380 for the plant recommended, and that the annual charge would be £650 as against £366 a year for the ventilating plant which is now recommended, the saving being about £284 per annum. This type of oil filter is in use in one or two automatic telephone exchanges in the United States of America. Mr. Becher, who gave evidence last year, mentioned having seen them in operation, and when I was in the United States of America last year I saw one in the St. Louis Exchange. I also saw them in operation in one or two factories, and I know that they are working satisfactorily. Even if we had not this evidence from the United States of America, we know from our own experience that we are on absolutely safe lines in recommending the installation of this type of air filter. The investigations have been carried out by my department in close collaboration with Mr. Becher and the Commonwealth Analyst, Dr. Wilkinson. I cannot say if the suppliers of the automatic equipment have been consulted, but we have been assured that they are prepared to guarantee their equipment under the atmospheric conditions as regulated by the proposed plant. We have been conducting a number of experiments with a British streamline machine. The oil to be used in the filters is supplied with the plant. An analysis shows it to be a certain kind of lubricating oil. We are experimenting with various types of oil, also glucose.

Castor oil, which has been tested, gives off an unpleasant odour at a temperature of 90 degrees, but *other oils are comparatively odourless.* We have a complete record of humidity and atmospheric conditions generally at all exchanges where plants have been installed. These records go back about ten or *eleven years.*

2. *To Mr. Coleman.*—The ventilating plant recommended is an innovation so far as certain districts are concerned. Its efficiency has been *proved to be equal* to that of the air-washing system. I would not say that it is more efficient, because the plants installed in other exchanges are efficient, but more costly.

3. *To Senator Barnes.*—Air-washing or air-filtering plants are essential for the efficient working of these exchanges. It is of the greatest importance that dust should be excluded, hence *these proposals to install air-filtering* or air-washing plants.

4. *To Mr. McGrath.*—I saw a number of these ventilating plants in use in various industrial organizations in the United States of America, notably in Detroit and Chicago. A plant similar to the one now recommended will be installed in the City West Exchange. I am quite satisfied, from my own observations of the working of the plant, that it will be entirely satisfactory.

5. *To Mr. Francis.*—The cost of the air-conditioning plant for the City West Exchange will be about £14,100. I have no figures relating to the comparison of costs of air-conditioning plant for an exchange like City West and similar exchanges in other countries. I understand that Mr. George Vincent installed a number of plants in New Zealand exchanges, and I gather, from what he told me, that the cost there is about the same as in Australia. The dehumidifying plants I saw in the United States of America *were not superior in any* respect to plants which we have installed in the Commonwealth. There is very little difference between the two systems, but I think our design for eliminating dust *is rather better. I am satisfied that* all reasonable economy, having due regard to efficiency, has been embodied in this scheme now before the committee.

6. *To Mr. Gregory.*—In the *installation of an air-conditioning* or ventilating plant the first essential is to eliminate moisture and dust. If humidity rises to, say, 83 per cent. in Melbourne during winter months, it can be reduced by *heating the air in the room.* More attention is now being given to air-conditioning plants in the United States of America, but up to the present not many have been installed. A large amount of *money has* been *sunk* by the telephone companies in construction work there, and no doubt they are looking to get a return on their capital before they put in automatic exchanges and air-conditioning plants. The air ducts are so arranged in the proposed new exchange that there is no danger of a down draught. The air will enter the building almost silently and without motion. In the estimate of annual charges for the ventilating plant there is no provision for labour, because the ordinary attendants in the exchange will be able to do all that is necessary. I anticipate that the oil screens will have to be replaced once *a month*; but even if they had to be changed once a week the attendants could do the work without difficulty. The ventilating plant recommended will ensure the entry of warm and *fairly dry air. I am satisfied that* the scheme will be entirely successful. I hope shortly to be in a position to place before the committee fairly complete details of tests which we are making at Box Hill. *It would be splendid if* ventilating plants similar to the one which we recommend for this exchange were installed in factories and other industrial establishments. The upkeep is not heavy. A caretaker could do all *that is necessary.*

(Taken at Melbourne.)

TUESDAY, 23RD APRIL, 1929.

Present:

Mr. M. CAMERON, Chairman;

Senator Payne	Mr. Gregory
Mr. Coleman	Mr. Jackson
Mr. J. Francis	Mr. McGrath.

John Murray Crawford, Chief Engineer, Postmaster-General's Department, sworn and examined.

7. *To the Chairman.*—I am responsible for the proposal to establish an automatic telephone exchange at Caulfield East. The proposal is to erect a building *on a site which has been* acquired in Waverley-road, near Burke-road, Caulfield East, and install therein an automatic telephone switching system having an initial equipment for 2,000 subscribers' lines and an ultimate capacity of approximately 10,000 subscribers' lines. It is proposed that the initial equipment shall be capable of extension to the ultimate capacity named and thus enable requirements in the proposed automatic exchange area to be met for twenty years after the proposed date of opening.

The area which will be served by the proposed Caulfield East telephone exchange comprises the eastern and south-eastern portions of the present Malvern exchange area, which include the populous and rapidly developing areas of East Malvern, Caulfield East and Glenhuntly. The exchange is necessary in order to meet the rapid development in these areas, which cannot be catered for in the future in the existing Malvern exchange, *and to obviate unnecessarily high expenditure* on external plant. The installation of the proposed exchange will enable the department to provide a cheaper and more efficient service to subscribers in the *extreme limits of the* areas mentioned.

The estimated immediate cost of the work is:—

	£
Site (already acquired)	2,000
Building	11,000
Air-conditioning plant, &c.	2,380
Exchange equipment including that necessary at other exchanges	41,431
Sub-station equipment	*Nil*
Line plant	1,299
Sundries	437
Total	59,637

The actual revenue from the subscribers in the existing Malvern exchange area for the year ended 30th June, 1928, and the annual revenue it is estimated will *be obtained from the subscribers in* the proposed Caulfield East automatic exchange area on the date of opening, and five years thereafter, is shown hereunder:—

Average number of subscribers' lines connected during the year ended 30th June, 1928, in the existing Malvern Area	Actual total revenue received for the year ended 30th June, 1928.	Estimated number of subscribers' lines in proposed Caulfield East area as at December, 1930 (date of opening).	Estimated annual revenue on at December, 1930 (date of opening).	Estimated number of subscribers' lines in proposed Caulfield East area as at December, 1935 (five-year date).	Estimated annual revenue as at December, 1935 (five-year date).
8,310	£ 100,383	1,300	£ 15,782	4,000	£ 48,559.

The proposed site is Commonwealth property. It has a frontage of 110 feet to Waverley-road, and a depth of 130 feet, and is located as near as practicable to the telephonic centre of the proposed automatic exchange area.

It is proposed that the building shall be of simple *design and built on the latest fire resisting principles.* The immediate installation is for an equipment of 2,000 subscribers' lines, but the building will be designed to accommodate equipment having a capacity of approximately 10,000 subscribers' lines.

The financial aspect is shown in the following table:—

Item.	As at December, 1930.	As at December, 1935
	£	£
1. Estimated capital cost—new and in *situ*	59,637	148,116
2. Estimated capital cost new and in *situ*	129,318	315,339
3. Estimated annual working expenses of proposed automatic exchange	4,186	10,741
4. Estimated total annual charges for proposed automatic exchange	15,221	30,452
5. Annual revenue— Estimated as at December, 1930 Estimated as at December, 1935	15,782	48,559
6. Assets recoverable or thrown spare if an automatic exchange is established *on new site at December,* 1930—		
(i) Book value	10,917	
(ii) Recoverable value	9,144	
(iii) Cost of recovery	202	

Regarding item 6 of the foregoing statement, the difference between sub items (i) and (ii), namely £1,773, is an amount which will have to be written off in the departmental accounts as representing the proportion of the capital outlay on the original assets which is irrecoverable, and includes depreciation due to wear and tear and labour in installation. I submit a map showing the area of the proposed new telephone district, also ground plan of the proposed building. The estimated number of subscribers' lines in the area at date of opening is 1,300. Actually that represents only the number of lines connected to the existing Malvern exchange. We consider that for the moment it is better to leave lines connected with Malvern exchange until *we require accommodation in the Malvern telephone* area. When the Caulfield East exchange is in operation those lines will be transferred to the sub-exchange of the Malvern main exchange. The considerable *increase in the estimated total* annual charges at the end of the five-year period is due to the estimated heavy increase in the number of subscribers to be connected by that time. The recoverable value of the assets, as compared with the book value, is exceedingly high, because this is already an automatic area that is being worked from the Malvern main exchange. Consequently we shall not need to change much of the apparatus in use. The site selected is as near as possible to the telephonic centre. We purchased the property about three years ago. It is the policy of the department to make a survey of the telephonic needs of the metropolitan area from time to time, and to fix upon centres for the establishment of automatic exchanges. It is not always practicable to obtain *land at the exact centre,* because sometimes such land is occupied by expensive buildings. We endeavour to forecast our requirements for several years ahead, and in this way we are able to obtain suitable sites at reasonable *prices. The land upon which it is proposed to erect* the building is worth more than the price which we paid for it three years ago. We are not recommending the installation of the full air-conditioning plant, which, as I explained yesterday, includes a refrigerating equipment for cooling and washing the air. We suggest that the requirements will be met by a partial air-conditioning plant which includes an oil filter, a vacuum cleaning equipment and air compressor. We have made a special study of the use of air-conditioning plants in Great Britain, and the United States of America. When Mr. Brown and Mr. Becher were in England recently, they found that comparatively little had been done in that respect and they came to the conclusion that our department was quite up to date as regards air-conditioning of automatic exchanges. The department has benefited very materially from the inquiries which Mr. Brown and Mr. Becher made. We have obtained a considerable amount of valuable information as to building construction, lighting, ventilation, equipment, and external line plant. I can say that as regards the installation of automatic exchanges and the relative proportion of automatic telephones in use, we are in advance of practically every other country, with the exception, possibly, of New Zealand. I am satisfied with the provision for air-conditioning in the proposed new exchange. If it is found advisable to include the refrigerating as well as the air-washing plant that may be done later. The suppliers of automatic equipment approve of our proposals *generally. I cannot say that they have been consulted* with regard to the arrangements for this particular exchange, but they have been in respect of other and similar proposals, and they are prepared to guarantee the efficiency of their equipment under conditions as regulated by the proposal now before the committee. We do not ask for a guarantee, but they assure us of efficiency provided the humidity in the room does not rise above 70 per cent. Occasionally it does rise higher than that, but not for any lengthy period, and up to the present, we have had no difficulty on that account.

8. *To Mr. Jackson.*—The increased cost of installation per line as compared with Edgecliff, New South Wales, is largely governed by the calling rate. The traffic units at Caulfield East are only about 60 per cent. *of the traffic units at Edgecliff. This factor* governs the cost of installation per line. Caulfield East will be a sub-exchange of the Malvern main exchange, and the repeater selectors will run out at about £6 10s. per unit compared with about £15 per unit at Edgecliff. The position at Caulfield is somewhat exceptional. That area is at present included in the Malvern automatic area so the rate of increase, when the sub-exchange is established, will be greater than it would have been if we were merely connecting existing subscribers in a manual exchange to an automatic exchange. It is largely for this reason that we estimate a number of subscribers in the new area at 4,000 in December, 1935, and the expenditure at £36,000 as compared with £15,000 at the date of cutover.

9. *To Mr. Francis.*—The installation of the new exchange will enable the department to provide a cheaper and more efficient service to subscribers in the extreme limits of the Malvern area. It will be cheaper because we shall require less line plant. We have not made inquiries to ascertain if the oil filter plant for the ventilating system can be made in Australia. That matter does not come within the ambit of my department. Investigations are conducted by the Works Department. We handle all purchases of equipment for line plant, but tenders for the erection of buildings are dealt with by the Works Department which also is responsible for the installation of air-conditioning plants, though we make recommendations with regard to such matters. When Mr. Brown and Mr. Becher *returned from their visit to the United States of* America and Great Britain there was a conference between executive officers of the Works Department and our department. Similarly, when Mr. Hill came back *from his tour abroad he conferred with the officers of* our department respecting the conclusions which he had arrived at with regard to certain matters. The erection of telephone exchange buildings is dealt with by the Works Department. We are responsible for certain mechanical equipment, such as pneumatic tubes and motor transport as well as the machinery for the handling of mails. The air-conditioning plant recommended for this building will not cool or wash the air; but we submit that it will function adequately for the

requirements of the exchange. Occasionally the temperature in Melbourne rises to 107 degrees, but generally in such case the humidity is low. In other words it is a dry heat, whereas in Sydney, Brisbane and Cairns and other coastal centres in those States the humidity in summer is high, thus necessitating the installation of refrigerating and air-washing plants to eliminate humidity in automatic exchange buildings. On extremely hot days, if the temperature in this proposed exchange building becomes oppressive, employees in the building may open the windows. We do not expect the windows to be sealed as is necessary at exchanges where a refrigerating and air-washing plant is working. I suggest that windows in exchanges equipped with a partial air-conditioning plant may occasionally be opened. Sometimes it is an advantage to have a breeze through a building. This would offset any disadvantage arising from dust, particularly in a place like Caulfield East where there is not much dust. I am satisfied that the employees will not suffer any inconvenience in the building.

10. *To Mr. Gregory.*—The site is not far from Dandenong-road. I cannot say if the local governing authorities have approved of the plan. This is a matter for the Works Department. I have seen the plan of the proposed building, and I consider it is quite suitable for our requirements. There is provision for a galvanized iron roof. I do not think that will be a disadvantage. I doubt that it will be visible from the street and therefore there should be no objection to it in a residential area. This, however, is a matter which we leave to the Works Department. All we are concerned with is that a building, as designed, meets our requirements, and I presume the Works Department presents a scheme that is at once economical and efficient. Personally, I would have no objection to the windows of the exchange being opened on extremely hot days so as to cool the building if it becomes oppressively hot. It is true that we are providing for the installation of a vacuum cleaning plant, air compressors, and generally for a ventilating system to eliminate dust; but however careful we may be, we cannot prevent a certain amount of dust from entering the building because employees must open the doors to enter or leave the exchange. I should like to make it clear, however, that I do not recommend that the windows be opened. I do not think that any harm would be done if they were opened for a short time when this can safely be done to allow a current of air through the building. The installation of a full air-conditioning plant would mean higher maintenance charges as well as a higher capital cost. At South Melbourne the full air-conditioning plant is in operation for only two or three months each year. The view I take is that if we can ensure efficiency in an automatic exchange without the expense of installing a full air-conditioning plant we should not incur unnecessary expenditure. If we found that the opening of the windows impaired the efficiency of the apparatus we could have the windows sealed and then install the additional plant required. I am satisfied that the foreman mechanic in charge of the exchange would not allow the windows to be opened if, in his opinion, there was any risk of the mechanism being affected by dust. I was not aware that Mr. Hill had stated in his evidence that it was contemplated that the windows in the switchroom should be hermetically sealed as a safeguard against dust entering the building. Up to the present we have not had experience with this modified Mid-west type of air filter. Therefore I must bow to Mr. Hill's judgment as to the advisableness of sealing the windows in the switchroom. He has made a more thorough investigation of the problem than I have.

11. *To Mr. Francis.*—In very hot weather I think the foreman mechanic might be allowed to use his discretion as to whether certain windows in the exchange should be opened. I believe, however, that the ventilation will be adequate even in the hottest days without the windows being opened. I have not seen this type of air filter working, so I am speaking with more or less theoretical knowledge on the subject.

12. *To Mr. Gregory.*—I am satisfied that the foreman mechanic would not allow the windows to be opened on hot, dusty days, and thus risk the efficiency of mechanism. The life of an automatic exchange equipment is fixed at 20 years and that of a manual exchange at fifteen years. The interest charge on capital cost is 5 per cent. Our annual charges include interest and depreciation. As regards the total number of telephones in use and the number of automatic exchanges we are ahead of most other countries. Our charges also are lower. There are so many varying factors to be considered that I believe it would be almost a waste of time to make any comparison between the cost of installing automatic equipment in Great Britain and Australia. The calling rate is one important factor. The cost of copper wire is another. In one year alone the department paid £130,000 more for copper wire in Australia than this material would have cost had it been purchased in England. Automatic equipment is manufactured practically only in Great Britain, America and Germany. We are not being charged undue prices for equipment. As a matter of fact, I ascertained some time ago that we were paying no more for our apparatus per unit than was being charged to the British Post Office. All these and many other items would have to be taken into account in any investigation as to whether we were installing exchanges as economically as is the case in England. I believe about two years ago we were paying slightly less for our equipment than the British Post Office were paying for theirs. I do not say that we are in the same position to-day; but I think I can say that the suppliers are not fleecing us. We have already adopted what precautions we regard as necessary to insure the interchangeability of parts. As far as is possible we have standardized all the main equipment in our exchanges, and we have provided that if a contractor varies certain aspects of our proposals, before entertaining his price we must take into account the factor of interchangeability so that we may load his quotation accordingly. All our contractors have agreed to certain main principles so as to facilitate interchangeability of apparatus. Sometimes a contractor submits a variation in the switching, relays, contacts or wiring terminals. If he is successful in his tender for an initial equipment he may have a slight advantage over other contractors when tenders are invited for an extension of the exchange; but as far as possible we take all the factors I have mentioned into consideration and load the tender price accordingly. We insist upon interchangeability of parts supplied by the various contractors.

13. *To Senator Payne.*—The site of the proposed new sub-exchange is, I think, in the Malvern postal district; but the postal designation does not in any way affect an automatic telephone exchange area. It is not likely to create any confusion. I am satisfied that the people of Australia are getting an efficient telephone service at a price lower than is charged to the people in Great Britain. This may be accounted for by the fact that the British postal authorities have to meet certain expenditure which is not incurred in Australia. For instance, they have to pay what are known as wayleave charges. Telephone lines in Great Britain are not all, as in Australia, fixed to supports along public thoroughfares. In certain areas they are carried over the roofs of houses for which privilege the postal authorities have to pay, sometimes rather heavily, I believe. I understand they had to pay 20s. per line per annum for all lines in Covent Garden. The provision which we are making for interest and depreciation is in conformity with the practice observed generally throughout the world.

14. *To Mr. Coleman.*—The oil filtering plant for this exchange will be either the first or second to be installed in Australia. It is in use in many American public buildings, including one or two automatic telephone exchanges. We are recommending it in preference to the full air-conditioning plant purely on the score of economy. We consider that it will be efficient and less costly. For some time we have been looking for a cheaper system for the ventilation of certain automatic telephone exchanges and we believe we have found it in the Mid-west air filter; but we shall have to try it out before we can say definitely that it is what we want.

15. *To the Chairman.*—We have our own tender board for the purchase of our material. It comprises the Chief Inspector of Finance, the Chief Inspector of Stores and Transport and myself. We make our recommendations to the Director-General, who is the purchasing authority. He might revise our recommendations, but only when he has good reason to do so. There has been no trouble between our department and the Works Department as regards the erection of buildings to meet our requirements. The arrangement may be regarded as efficient. Sometimes we have to point out that certain works are not quite what we ask for and the Works Department is always anxious to meet us in the matter. The arrangement has not operated adversely to the interests of the Public Service. If any delays have occurred in the erection of buildings for our requirements usually it is because some contractor has fallen down on his job. There will be about fourteen or fifteen employees in the proposed new telephone exchange, which will comprise several rooms. There will probably be eight men in the exchange itself. A manual exchange of the same size would employ five times the number of operators, so the air space provided for each person in this exchange will be ample.

16. *To Mr. Francis.*—Although the windows will not be opened the air will be perfectly clean and fresh. If you go into any air-conditioned automatic exchange in the Commonwealth on a hot day you will find the atmosphere much pleasanter than that outside. As a rule the temperature is reasonable and the air is almost entirely free of dust. The temperature in Melbourne has been as high as 107 degrees, but only for a few hours. Even when it is 107 degrees in the shade the temperature in an exchange building will be about 80 degrees, so the conditions in the proposed new exchange should never be oppressive.

(Taken at Melbourne.)

MONDAY, 29TH APRIL, 1929.

Present:

Mr. M. CAMERON, Chairman;

Senator Barnes	Mr. J. Francis
Senator Payne	Mr. Gregory
Mr. Coleman	Mr. McGrath.

Horace John Mackennal, Commonwealth Works Director, Victoria, sworn and examined.

17. *To the Chariman.*—The designation of the area upon which the proposed new telephone exchange is to be erected is to be changed from Caulfield East to Malvern East. I have had nothing to do with the preparation of the plan now before the committee. When the proposal was under discussion some time ago I prepared sketches of a building, but when it was considered further the postal authorities took the view that a larger building would be desirable. I approve of the present plan. The building will be erected under my supervision. Plans for Commonwealth public buildings in Victoria are always submitted to me for my concurrence As in the case of nearly all other automatic exchanges, the proposed building will be constructed in brick. There will be a switch room with its adjuncts, a small battery room, and a machine room for the air-conditioning plant. The floors will be of concrete, with a damp course. The ceiling will be of concrete, the idea being to minimize dust and humidity in the switch room. Above the concrete ceiling there will be a roof of galvanized iron. The window frames will be of steel, and the glazing of reinforced glass for fire protection. Steel window frames last very much longer than timber, and although they cost slightly more, the maintenance charges are light. I consider steel window frames better than timber. The drawings before you show that the windows in the switch room will be so constructed as not to permit of their being opened. Galvanized iron for the roof has been recommended because it is the cheaper form of construction. I am aware that nearly the whole of the buildings in that locality have tiled roofs. If a tile roof were substituted for galvanized iron the cost for the roof would be increased by approximately 75 per cent. An iron roof with timber construction works out at about £5 per square, and a tile roof about £8 a square. Only about 2 feet or 3 feet of the roof will be visible from the opposite side of Waverley-road. If a tile roof is substituted the pitch will have to be steeper, because tiles do not lie closely together, so unless the pitch of the roof were altered there would be a risk of drift rain getting under the tiles. I anticipate that the proposed building will last at least 100 years. I approve of the galvanized-iron roof because it is more economical, and even from the aesthetic point of view I consider it is desirable. At present there is a lack of verdure in that locality, so there is little of beauty in a great mass of red terra-cotta roofs. I suggest that the galvanized-iron roof to this building be painted green. I have not examined the site itself, but I am acquainted with the locality, and from the levels that have been given in the plan I am satisfied that the site is quite suitable. The postal authorities select the site. It is good building land for a one-storied building. I do not anticipate any difficulties with regard to the foundations. The land has a frontage of 110 feet to Waverley-road by a depth of 130 feet. The proposed building will occupy about seven-eighths of the site. On one side there will be a lane about 12 feet wide, and on the other side a lane of about 8 feet. The rear of the building will be about 25 feet from the back boundary. Should future requirements render an extension necessary, the main switch room could be extended 25 feet to the back boundary. This is tentatively provided for in the plan. I consider that there will be practically no fire risk in the building; but provision is always made to have a water main close to all automatic exchanges, and also a tapping in the switch room itself. In addition, special chemical extinguishers are installed for use in case of fire, because water will damage the automatic equipment. The construction of the switch room is in concrete, mainly for the purpose of eliminating dust. Ordinary timber construction with fibrous plaster ceiling would not be suitable, because a certain amount of dust would percolate through crevices into the switch room and damage the automatic equipment. As far as is possible, the whole of the building is made dust-proof, at the request of the postal authorities. There is also provision in all such buildings to reduce humidity so as to ensure the efficiency of the automatic equipment.

18. *To Mr. J. Francis.*—It is proposed to construct the windows so that they may be hermetically sealed. If air-conditioning and vacuum-cleaning plants were not installed, I presume that exhaust fans and some system for filtering the air would have to be substituted, because ventilation must be provided for the employees. I have not inspected the Malvern main exchange lately. It is the policy of the *department to* use Australian material for all construction, and failing Australian material, preference is given to British.

19. *To Mr. Gregory.*—It is considered that an air-conditioning plant is necessary for all automatic exchanges as a protection for the *electrical equipment in* switch room. If minute particles of dust are allowed to enter the switch room there will always be a risk of *short circuits.* I *was not aware that* the foreman mechanic at the Malvern exchange allows the windows to be opened. If I knew that this practice was followed generally in all automatic exchanges I should certainly challenge the necessity for the installation of expensive air conditioning plants for the elimination of dust and cleansing of the atmosphere. The Malvern main exchange has been in operation for two or three years. The plan does not show provision for a double set of doors to the proposed new exchange building. Entrance is through double doors directly from the street. It is almost impossible *to prevent absolutely the entrance of* dust to a building. It is proposed to put in a number of skylights. This is the first time it has been done in *automatic exchange buildings*; but in a sense it will be borrowed light, because it will enter the switch room through ceiling lights. All the glazing will, of course, be reinforced glass, which may crack but will not disintegrate. This is the reason for its use for fire protection purposes. There is another reason for adopting concrete ceilings, and that is the probable future need to erect an additional story to the building, in which case the ceiling would be used *as the first floor.* *This is* what is being done at the South Melbourne exchange. The ultimate capacity of the proposed new exchange *will be 10,000 subscribers.* I am aware that, as a rule, it is considered inadvisable to have more than that number connected to any single automatic exchange. From that point of view it would not appear necessary to have a concrete ceiling, but really concrete is recommended, because it will prevent dust from percolating through the ceiling into the switch room. Personally, I consider it would be unnecessary to go to all this expense to exclude dust *if the main doors are to be* opened to the public, and if the windows in the switch room may be opened at any time. The outer parapet *walls will be about 2 feet high*, and there is provision for additional lighting around the upper portion of the switch room. Personally, I see no reason for the *skylights. The switch-room* walls will be 13 ft. 3 in. high, and the walls of the annexes about 11 feet high, so it should be possible to make greater provision for lighting in the switch room. I believe it is possible to do without the skylights. I understand that the request for skylights has been made because of the difficulty which mechanics experience when working around the frames; but we always provide extra lighting in the corridors, and in certain positions they must use artificial lighting, otherwise a man would be working in his own shadow Malvern is regarded as a high-class *residential suburb Nearly all the residences* have tile roofs. Waverley-road is about one chain and a half wide, and the pitch of the exchange roof is so low that *from the opposite side* of the road not more than three or four feet of the roof should be visible. I agree that the Government should lead the way in regard to the erection of suitable buildings; but I would not regard an iron roof in Malvern as an eyesore. If a tile roof were substituted for galvanized iron the extra cost for it would be about £275 or £300. If galvanized iron were coated with cement and oil and mixed with bronze green colouring it would look quite well.

20. *To Senator Payne.*—I am aware that there is considerable traffic along Waverley-road, and that on certain occasions there must be a certain amount of dust about. There is no provision in the plan for an inner porch to minimize the risk of dust in the switch room. If the lay-out of the equipment permits of provision being made for an inner porch, there would be no difficulty whatever in building it. Certainly it would exclude a certain amount of dust which otherwise must get into the building. If I were erecting a building for myself and wished to exclude dust, I would design a different entrance. The proposed new building will not be used very much by the general public. I assume that double doors are provided in the front of the building so as to allow *the equipment to be taken into the* switch room, because there is not room at either side for lorries or other vehicles. An inner porch should *exclude about 75 per cent. of the dust that will enter* through an ordinary door. I suggest green painting for the roof because it has been proved to be very *serviceable.* Our cements are rather dark in colour. We find that if bronze-green mixed in oil is used, it fades a little, but retains a very pleasant moss-green colour. I had the roofs of the quarantine buildings painted in this way about fifteen years ago, and they are looking very well yet. The paint is also a preservative.

21. *To Senator Barnes.*—The painting of a galvanized-iron roof in the manner I suggest will lengthen *its life. The foreman mechanic in an automatic* exchange has control of the building, and must be regarded as responsible for the windows being opened or shut.

22. *To Mr. J. Francis.*—The estimated cost of the building is £11,000. An ordinary building to meet the requirements of the Postal Department, but without provision for an air-conditioning plant, and with a power room not quite so large as is shown in the plan, should be built for £2,500 less than that sum. I have been thinking, however, that the estimated cost is rather high. I believe that when tenders have been invited it will be found *that it can be built for about* £10,500.

(Taken at Melbourne.)

WEDNESDAY, 1st MAY, 1929.

Present:

Mr. M. CAMERON, Chairman;

Senator Barnes	Mr. Gregory
Senator Payne	Mr. Jackson
Mr. Coleman	Mr. McGrath.
Mr. J. Francis	

Edgar Becher, Supervising Engineer of Telephone Equipment, Central Office, Postmaster-General's Department, sworn and examined.

23. *To the Chairman.*—I am aware of the inquiry being made by the committee into the proposal to establish an automatic telephone exchange at Caulfield East, the designation of which is now Malvern East. The estimated cost of the air filter of the Reed or Midwest type is £2,380. I have given careful study for several years to the need for air-treatment plants for automatic telephone exchanges, and when I visited America and Great Britain I studied the systems installed in those countries. The manufacturers of automatic equipment stipulate that the relative humidity in the atmosphere in an exchange shall not exceed 70

per cent., otherwise they will not guarantee that the equipment will operate satisfactorily. I say positively, after a long experience in the operation and maintenance of automatic exchange equipment, that it will not operate efficiently in buildings that are not equipped with air-conditioning plants. I have been closely associated with the designing of most of the automatic equipment in Australia, and after careful consideration of the atmospheric conditions in Melbourne I am satisfied that an air-conditioning plant without refrigerating *machinery for the washing and cooling of air will prove* satisfactory for the proposed exchange at Malvern East. The atmospheric conditions at Edgecliff, in Sydney, are different from those in Melbourne and suburbs. In Sydney humidity is highest in the summer months, so full air-conditioning plants are necessary for automatic exchanges there. My observations in regard to air-conditioning of buildings extends over a period of about fifteen years in Australia. The proposed new exchange will be termed a branch exchange of the main exchange at Malvern. A branch exchange is one where the switches cannot completely function without the assistance of switches in the main exchange. The Malvern main exchange has been in operation since 12th July, 1919. *It was one of the first automatic exchanges* established in the Commonwealth, and the system adopted for air-conditioning there has not proved efficient. It is simply a heating and washing plant, while it does not in any way dehumidify the atmosphere. The main air ducts both into and out of the plant are exposed to the weather, and in summer the atmosphere in the exchange becomes uncomfortable. The main duct through which the air is taken into the system is on an outside wall, as also is the duct which takes the air from the plant to the switch room. As a result the atmosphere in the room is unpleasant, and in the absence of a dehumidifier the plant is ineffective. If I were called upon to remodel that plant I should put in *an entirely different system. After a long study of the* atmospheric conditions in Melbourne I find that there are only 20 or 30 days in the year during which the atmosphere in an exchange building becomes uncomfortable for the staff, so I think we may avoid the cost of installing an expensive plant for the refrigeration and the dehumidifying of the atmosphere. Personally, I am not satisfied with the Malvern exchange. I should like to see it operating more efficiently, although I claim that it is giving reasonably efficient service. During last summer it was necessary, in order to overcome the effects due to humidity, to heat the air passing into the switch room. I visited the Malvern exchange yesterday in company with Mr. Crawford, the Chief *Engineer, and the plant engineer controlling the* area. I noticed that the front door was open as we entered the building. Several windows were also open, not at the bottom, but from the top. There were no panes of glass broken, nor were any missing. The foreman mechanic explained, and his explanation was confirmed by the engineer in charge who accompanied me, that three or four weeks prior to the visit by members of the committee to the exchange he had submitted a requisition for material to effect repairs, but that it had not been supplied up to the time of the committee's visit. Immediately it was supplied he had new panels of three-ply wood put in and other repairs effected. I agree that it is inadvisable for *delay to take place in supplying material for automatic* exchange equipment, but it has to be remembered that hundreds of requisitions are received daily for different *items of material, and it is impossible always to dis*charge requisitions immediately. However, we are taking steps to prevent any future delay. Arrangements are being made to keep a certain number of spares at such exchanges to effect urgent repairs to equipment. I do not consider that the switch room was in a dirty condition. If it was dirty when the committee visited the exchange there was some justification. The installing staff has practically never been out of the exchange since it was opened in 1919. We have had the greatest difficulty in keeping pace with the demand for telephone connexions. If is my considered opinion that, while the installing staff is in an exchange, it cannot be kept as tidy as when they are out, because they have to cut certain lengths of cable and fit pieces of mechanism, *and it is impossible to do this work without creating a* certain amount of dirt or making the place look rather untidy. It is not practicable to have a workshop outside the switch room. It must be on the spot where the job has to be done. The men are allowed only a certain time to install the plant, and they have to adopt the shortest methods. The character of the work done by the installing staff does not as a rule interfere in any way with the equipment. There must be a bench in the exchange room for maintenance purposes. When a switch has to be overhauled *it has to be taken out of the shelf and* attended to on a bench, so that the mechanic may have easy access to all parts of the mechanism. The kind of work they are doing is not likely to create dust that would be injurious to the mechanism. When I visited the exchange yesterday it was reasonably tidy. I saw no evidence of dust or filings on the bench. It would be possible to have a workroom alongside the switch room, but that would increase our building costs appreciably. Although the Malvern exchange gives reasonably satisfactory service under existing conditions, I still say unhesitatingly that air-treatment plants are essential to the efficient working of automatic exchange equipment. If members of the com*mittee had visited any other exchange in the Melbourne* network, they would not have found conditions such as existed at the Malvern exchange on the day when they visited it. In my opinion, it is advisable to construct the windows in such a way as to permit of their being opened for cleaning purposes. If necessary, they may be sealed again. I approve of the porch-like entrance to the building; this prevents the admission of dust. Most up-to-date buildings now are equipped with central heating system and a vacuum cleaning plant. In a climate like Melbourne, if the temperature falls below 65 degrees, employees whose work is sedentary in nature are liable to catch influenza and other epidemic diseases. Vacuum cleaning is hygienic, and really it is the only proper way for the cleaning of a building. I contend, therefore, that the only additional expenditure which should be charged against an automatic telephone ex*change building is that which would be required for* the installation of an air-filtering device. I consider that employees in an automatic exchange are following *a sedentary occupation. I understand that when the* committee visited the Malvern exchange the windows and the doors were open, although the day was cold. I have made inquiries, and I have been informed that just prior to the arrival of the committee there were 27 men in the exchange for four hours, so I can readily imagine that the air in the building had become stuffy, with the result that the men opened the windows. It will not be necessary to open the windows in the proposed new exchange except, perhaps, on very hot days, and we do not expect to have more than twenty or thirty days in the year when the atmosphere becomes uncomfortable. We think it only reasonable that the staff should be expected to bear with those conditions on a *limited number of days.* The air-filtering plant will ensure an ample supply of fresh air in the building. It is desirable that the windows should be opened for *cleaning purposes, but it is intended that only the* upper portions should be opened.

24. *To Mr. J. Francis.*—I understand that Mr. Hill informed the committee that the windows were to be hermetically sealed. I think there may be misunderstanding in the minds of the committee as to the use of that term between the two departments.

25. *To the Chairman.*—We had a number of complaints from employees about the air in the Malvern exchange. I have not heard of complaints from other exchanges which are equipped with proper air-conditioning plants. Malvern is the second oldest exchange in Melbourne.

26. *To Senator Payne.*—Steps are being taken to make the Malvern exchange more efficient. A proposal for the extension of the building and for the installation of a proper air-conditioning plant has been approved. If this work is carried out more room will be provided for the staff and equipment. At present the building is overcrowded to a far greater extent than was anticipated. If the money is voted by Parliament the extension of the building should be finished this coming financial year. If the switches were covered with dust when members of the committee visited the exchange last week, the efficiency of the plant would be endangered. I have already admitted that the air-conditioning plant there is not satisfactory. Once dust becomes an integral part of any equipment it takes a pressure of 60 lb. per square inch to remove it. The only effective way to get rid of it is to use a small brush to loosen it, and then clean with the vacuum plant. If windows are opened in hot weather a certain amount of dust must enter a room, but it is unreasonable to expect men to work in a building with sealed windows unless provision is made for an ample supply of fresh air. It is not likely, however, that the windows will be left open for any length of time. The windows in the City South exchange, Sydney, are hermetically sealed, and we have to get the fire brigade to hose them whenever we wish to have them cleaned from the outside. Unless windows are cleaned properly they soon become streaky, and do not allow the proper amount of light to come through them.

27. *To Mr. McGrath.*—The foreman mechanic is entirely responsible for the maintenance of equipment in an exchange, and it should be his duty to see that requisitions for material are promptly complied with. I admit that the exchange was not as clean as I would have liked to see it yesterday; but bearing in mind that the installing staff were working there, it was reasonably clean. There appears to be a difference of opinion between Mr. Hill and myself as to what is meant by windows being hermetically sealed. I confess that the term is capable of misunderstanding.

28. *To Mr. Jackson.*—During my recent visit to America and Great Britain in nearly every city I visited there was an automatic telephone exchange. I saw exchanges in operation in Omaha, Kansas City, New York, and Chicago; and in England I visited the Holborn and Western exchanges. I am convinced that automatic exchanges are rapidly taking the place of manual exchanges. I made no inquiries as to the cost of installation in those countries, but I did inquire concerning maintenance, and I found that the practice everywhere was almost identical. After having studied the systems in other countries, I am more than satisfied with the position in Australia.

29. *To Mr. J. Francis.*—The proposed new building has been designed to keep out the dust from the switch room. To minimize the risk, when employees enter the building a notice is posted at the entrance door advising them to wipe their boots. It is, of course, impossible to prevent a certain amount of dust from getting in. If Mr. Hill has stated that destruction to the extent of £30,000 a year is being caused at the Malvern exchange on account of excessive dust due to open doors, broken windows, and damaged cabinets, I should not like to challenge the statement without further information. I am positive, however, that it is advisable to install air-conditioning plants to ensure the efficiency of automatic equipment, notwithstanding what the committee saw at the Malvern exchange. It should be possible to prevent that in future; but it is not possible to avoid the doors or windows being opened occasionally, because the air-conditioning plant there is inefficient. We came to this conclusion some little time ago. I have given this subject careful study for the past fifteen years, and I am not by any means satisfied that even with our present knowledge we can overcome all our difficulties. We make observation tests at automatic exchanges every month. The tests at the Malvern exchange do not disclose that it is glaringly inefficient, though, as I have said, I am not satisfied with the conditions which I find existing there. It is possible that Mr. Partington did not take such a serious view of the conditions as the committee did on the day of its visit. He has spoken to me since then, and did not describe the conditions as anything so unusual as to call for special comment. I may say, however, that immediate attention has been given to the matter. The Chief Engineer and myself paid a visit to the exchange yesterday, and instructed the foreman mechanic to keep the windows and doors closed as much as possible, as well as the doors of the line switch units. Mr. Partington is responsible to the Chief Engineer. I am not aware if he made a report following on the visit to the exchange by the committee; but I imagine that, as he is the responsible officer, he would take steps at once to have the matter attended to. It would not be necessary for him to report to Mr. Crawford on such a matter. I understand that Mr. Mackennal has estimated that if an air-conditioning plant were not necessary an ordinary exchange building for Caulfield East could be erected for £4,980 less than the estimate for the plan now before the committee; but I have no hesitation in saying that the departmental scheme should be adopted. It is imperative that the building should be made dust proof. The contemplated alterations to the Malvern main exchange will also make that building dust proof. This proposal, I believe, has been approved by the Director-General, and the work will be put in hand as soon as the money is available.

30. *To Mr. Gregory.*—I learned during my visit abroad that automatic telephone exchanges are replacing manual exchanges when the latter reach the end of their economic life. The automatic system is regarded as infinitely superior to the manual exchange, and it is the policy of most administrations to install them whenever possible. I made no inquiries as to the cost of installation abroad, because labour and material costs, which are important factors, are not comparable with costs in Australia. We consider that we can dispense with the dehumidifying equipment in Melbourne, where humidity is high in the winter months, so we are recommending the installation of an air-filtering and heating plant. We are also obtaining improved cables and special wire for the switches. These, we hope, will stand up to the climate in Melbourne. So far as the maintenance men are concerned there will be no necessity to open the windows at all except, perhaps, for cleaning purposes. There is a back entrance to the Malvern main exchange, where there are double doors and an inner porch. We are also providing double doors and an inner porch as the entrance for employees at the proposed new exchange. When the plant has been installed the double entrance doors on the Waverley-road frontage will be closed and locked. The value of the automatic equipment in the Malvern exchange is about £150,000. Mr. Partington did not make special mention of the conditions which were

found by the committee to exist when they visited that exchange a few days ago. He did not inform me that 25 per cent. of the cabinet doors were open. As a matter of fact, he has full power to take whatever measures he deems necessary. This is the first time that I have heard, first hand, about the condition of the exchange when the members of the committee visited it recently. When I visited it yesterday in company with Mr. Crawford there was nothing to which I could take exception. If, as has been stated, the glass panes in about twenty of the cabinets were missing, and about twenty-five of the doors had been left open during the luncheon hour, there would certainly be grave risk of dust getting into the equipment, which would have to be cleaned up again. The foreman mechanic informed me yesterday that this condition of affairs does not always obtain. He is an experienced man, and runs his exchange more economically than any other foreman. When the installing staff is in an exchange it is difficult for the foreman to prevent the doors from being opened. Some of the maintenance men may have been responsible. I do not consider that a special departmental inquiry is necessary. The conditions which the committee found there may be regarded as an isolated instance. You will not find the same conditions in any other exchange, because they are equipped with up-to-date air-conditioning plants. Mr. Partington is the responsible engineer. It is his duty to examine plants and to ensure their efficiency. The introduction of skylights in a roof is an innovation, the object being to reduce our bills for artificial lighting in automatic exchange buildings. Mr. Murdoch, the Director of Works, and I have been in the closest co-operation over the designs for the skylights. It is highly improbable that any damage will result from heavy storms. The roof glass will be reinforced. The question whether the roof should be of galvanized iron or tiles is a matter for Mr. Murdoch to decide. We are concerned only with the accommodation provided for our needs. The building will have a parapet wall all round for fire protection.

31. *To the Chairman.*—The foreman mechanic is not quite in the same position as a postmaster, in that he has not authority to incur expenditure up to a certain sum if the materials required are held in store. He can only spend a small amount from petty cash. Therefore, he must requisition for all materials required for repairs. It is not possible always to deal promptly with requisitions, because hundreds are received every day, and the stores officer has to consider transport facilities when sending out supplies. I shall, however, see that sufficient stocks of materials are kept in automatic exchanges to effect urgent repairs. I cannot say off hand how many complaints are received weekly or monthly with regard to the inefficiency of the Malvern main exchange. If the employees were absent at lunch during the visit of the committee to the exchange last week, that is all the more reason why the cabinet doors should have been closed. There were about 27 men in the building for four hours that day prior to the committee's visit. Of this number twelve or fifteen would be on maintenance work, and the remainder on construction.

32. *To Mr. J. Francis.*—The doors should have been closed so as to prevent the entrance of dust to the mechanism.

33. *To Senator Payne.*—The plans for the proposed building were prepared on my advice. The entrance for employees and others is through a side porch with inner doors. The Waverley-road entrance will be closed and locked after the equipment has been installed. The ultimate development provided for is 10,000 subscribers' lines. I consider that the provision made is ample. The plans have been prepared for an extension to the Malvern main exchange. When that work is put in hand the Works Department will erect a screen behind the existing wall so as to prevent dust from entering the switch room. That is a simple matter.

34. *To Mr. Gregory.*—It is a mistake to suppose that 10,000 subscribers' lines is a maximum capacity of an automatic exchange. When I was in New York I visited an exchange where it was intended to install equipment for 80,000 subscribers' lines, and it was expected that ultimately there would be 100,000 lines in that building. In City West, Melbourne, we anticipate there will be ultimately 30,000 lines, and in City East from 25,000 to 30,000 lines. The disadvantage of an exchange with 100,000 lines is that all the eggs will be in one basket. We propose to divide the risk in Melbourne.

35. *To Mr. McGrath.*—Recently the services of between 30 or 40 returned soldier mechanics were dispensed with, not because we have been over-staffed, but because there was then no work for them. I cannot say how long the Works Department will take to erect the proposed new exchange at Caulfield East, but it will take us about nine months to install our equipment. The plant for the Oakleigh exchange is due to arrive on the 10th April, 1929.

(Taken at Melbourne.)

THURSDAY, 2ND MAY, 1929.

Present:

Mr. M. CAMERON, Chairman;

Senator Barnes	Mr. Gregory
Senator Payne	Mr. Jackson
Mr. Coleman	Mr. McGrath.
Mr. J. Francis	

John Murray Crawford, Chief Engineer, Postmaster-General's Department, recalled and further examined.

36. *To the Chairman.*—I am aware that a few days ago members of the committee paid a visit to the Malvern main exchange. Subsequently I met Mr. Gregory, who informed me briefly of the conditions which the committee found existing at that exchange. I was considerably perturbed at what he told me, and immediately arranged to visit the exchange myself. Accordingly I visited it the day before yesterday, accompanied by Mr. Becher. I would have taken Mr. Partington, the officer who accompanied members of the committee, but he was on a visit of inspection to country exchanges, and I have not had an opportunity to speak to him since Friday last, the day of the visit to the exchange by the committee. I questioned Mr. Beckley the exchange foreman mechanic, who, I may add, is a man of considerable resource, and is one of the best in the service, as to the conditions in the exchange when members of the committee were there. He informed me that members were at the exchange during the luncheon hour. He said he was unaware that the doors had been left open, or that the place was in a state of disorder with tools lying about and a number of doors to the switch panels left open. He admitted, of course, that they should have been closed. There was only one man on duty at the time, and he was engaged at the testing desk. I may add that the Malvern Exchange is about the worst which the committee could have visited to get any idea as to the manner in which automatic exchanges are conducted. The air-conditioning plant there is of the very earliest type, and has never been efficient. From the date of

its opening we have not been able to keep the installing staff out of the building. The demands for new connexions have been so continuous that the installing staff has been working in the exchange ever since the cut-over. Malvern is the only exchange in the Commonwealth where the installing staff has been so continuously engaged. It is the first exchange at which we put in an air-conditioning plant, though it is not the first automatic exchange. Geelong, in Victoria, and Glebe, Balmain and Newtown, in New South Wales, were opened prior to Malvern, but those exchanges were not at the time equipped with air-conditioning plants. It will be understood, therefore, that we knew very little about air-conditioning when we put in the plant at Malvern, and we encountered grave difficulties. In the first place it is only a partial air-conditioning plant, that is to say, the air is changed one and a half times per hour as compared with six changes per hour with modern equipment, so it is only 25 per cent. efficient from the point of view of what is now required of air-conditioning plants. Owing to lack of experience sufficient space was not allowed between the aisles, which are only 21 inches apart as against 24 inches and occasionally 30 inches in later exchanges. As a result, the men have to be exceedingly careful to prevent breaking the glass panels when they are stooping to effect repairs. Sometimes they forget, and, when stooping, they bump into a panel behind and break it. Members of the committee will have noticed that the breakages occurred in the lower panels. Experience has shown that it is better to replace these broken panes of glass with three-ply wood. The foreman mechanic had put in a requisition for three-ply wood panels for repair purposes, but there had been delay in supplying the material. Instructions have now been issued to hold at the exchange a sufficient supply of this material to effect immediate repairs in future. I understand also that members of the committee found the work bench in a state of disorder. It is necessary to have a work bench in the exchange, but, apparently, it was being used for purposes other than those for which it was intended. I understand that sawdust and filings were found on the bench. I saw some filings on the occasion of my visit. It is not the type of bench that is supplied for that class of work, and it should not have been so used. We have since found that there is a space downstairs for this large bench, and I have given instructions that it be taken out of the switchroom and a smaller bench put in its place. The fluming which supplies the air to the plant is outside the building, and as it is constructed of galvanized iron, the air in it gets abnormally hot in summer, and excessively cold in winter time. Altogether it may be regarded as a purely experimental plant, and quite inadequate for the efficient washing or cleansing of the air. It is without a dehumidifying apparatus, and as there is no provision for exhaust fans, it is necessary, on the hot days, to open the windows to allow the hot air to escape. The extent to which the upper portions of the windows may be opened is left to the discretion of the foreman mechanic. He should not have allowed the lower portions of windows to be opened. I do not know that they were opened on the occasion of the committee's visit, and the foreman himself has told me that he is not quite sure on that point; but we do allow the foreman of an exchange like this to use his discretion as regards the opening of windows. If dust is in the air, he should not allow them to be opened; but on an ordinarily fine day there is no reason why they should not be opened for a time to ensure the comfort of the staff. The Malvern exchange is giving a moderately good service to the public, though it is not by any means as good as we would like it to be. We have had a number of complaints from subscribers. Compared with the average manual exchange, the Malvern automatic exchange is more efficient. We could keep all the windows open, and, indeed, we could operate switches in the open, but maintenance costs would be very high. The manufacturers of the equipment stipulate that to ensure its efficient working, the humidity in an exchange room must not exceed 70 per cent. We endeavour to comply with their requirements. Dust settling on vital parts of an automatic plant might not immediately affect the working, but if there were a considerable deposit of dust efficiency would be interfered with. The foreman mechanic is in charge of the switch-room. Automatic exchanges are visited regularly by the supervising engineer, who might attend once a week. I presume that if he found conditions such as the committee noticed on Friday last, he would immediately direct the attention of the foreman mechanic to the matter. I cannot say when last the engineer visited the Malvern exchange, but I will ascertain and inform the committee. Maintenance charges increase with the age of an exchange. The design of the switches at Malvern is not nearly so good as the later designs. There are numerous types of switches in operation there, including some of the more modern kinds. I visit the exchanges whenever an opportunity presents itself, and I have been to Malvern two or three times since I have taken up my duties as Chief Engineer. If I have any fault to find with the manner in which an exchange is carried on, I immediately take steps to put the matter right. It is not my practice to advise the foreman mechanic of an impending visit. Usually I inspect an exchange without any previous reference to the staff. Sometimes even the superintending engineer is not aware of my visit.

37. *To Mr. McGrath.*—It is not unusual for delays to occur in supplying requisitions for material. All requisitions have to be put through in accordance with the ordinary routine of the departments, and sometimes the method is somewhat circumlocutory. I presume that when the foreman mechanic at Malvern requisitioned the stores branch for material to effect repairs, the branch did not have the material in stock. This would account for the delay, but it was unduly long. Probably the stores branch was not as prompt as it should have been in getting supplies. We have now arranged to keep supplies of these three-ply panes in the exchange itself. I admit that it is necessary to take all reasonable precautions to keep the dust out of an exchange, but as the air-conditioning plant at Malvern is not efficient, in the interests of the employees the windows must at times be opened. I am surprised to know that it was possible to write your name in the dust on the covers for the registering dials. There was no dust on that portion of the mechanism when I visited the exchange on Tuesday. Evidently it had been cleaned up. Unfortunately, owing to the inefficiency of the air-conditioning plant, any measures which we can take at present for the comfort of the staff on hot days, must allow of the entry of a certain amount of dust. I would not say that dust renders the equipment practically useless, but certainly it increases maintenance costs and is responsible for a less efficient service to the public. It follows, therefore, that the object in installing an air-conditioning plant is to reduce maintenance and improve efficiency in working. I do not say, and I have never said, that an automatic switch will not work with a certain amount of dust on it, but the less dust there is, the better from the point of view of efficiency.

38. *To Mr. Francis.*—The vacuum-cleaning plant is used daily. I do not say that the whole of the automatic equipment is cleaned, but some portion is gone over every day with the vacuum-cleaning plant. I can ascertain and inform the committee when last the vacuum cleaner was used at Malvern.

39. *To Mr. Jackson.*—I would be safe in saying that the vacuum cleaner was used on the day that the committee visited the exchange.

40. *To Mr. McGrath.*—Immediately Mr Becher heard that the requisition for materials had not been complied with, he made inquiries. I have not inquired as to the reason for the delay, but I know that, in nearly every case, if the material is not in store, some delay occurs before it is made available. The fact that recently 30 or 40 returned soldier mechanics were dismissed, has not the slightest bearing on the condition of the Malvern exchange or the delay in supplying material on requisition. We have not reduced the maintenance staff at Malvern by a man.

41. *To Mr. Francis.*—If there have been serious complaints from the staff as to the condition of the Malvern exchange, they have not been brought under my notice. I spoke to the foreman mechanic yesterday about this matter, and he informed me that, on certain days, the staff were greatly inconvenienced owing to the absence of ventilation. Whenever complaints are made to me I at once institute inquiries, and I am doing so now in respect of the Malvern exchange. It is possible that you have not a correct impression of what I meant when I said that the foreman mechanic had told me of the complaints from the staff. So far as I remember, I said to him, "Do you find that the staff needs the windows open to make the conditions in the exchange more comfortable?", and he answered, "Yes." I then said to him, "Do you get those complaints very often?", and his reply was, "Oh, not very often, but every now and again the men complain that the windows should be opened, and I allow them to be opened if it is not a windy or dusty day." The exchange has been opened for about fourteen years. It would be incorrect to assume that complaints now made about the ventilation would have been justified when it was opened, because there are now about 27 men nearly always working in the building. Five years ago there would be about seven or eight, and ten years ago, not more than four or five. I wish to make it clear that the foreman mechanic is allowed to exercise his discretion, and whenever he thinks it advisable, he allows the windows to be opened. It is not a fact that the manufacturers of the automatic equipment specially emphasize the disadvantage of allowing dust to settle on the contact points; but they do stipulate that, to ensure the efficiency of the apparatus, the humidity in an exchange building must not be above 70 degrees for any lengthy period. We endeavour to comply with those conditions. On the day that the committee visited the exchange, the humidity was 53 degrees. It would be difficult to say what amount of damage has been caused to the plaint owing to neglect due to conditions which the committee saw on the day referred to. I believe that Mr. Hill has stated that an additional 10 per cent. must be added to depreciation on that account, and that the loss is approximately £30,000 a year. We have no figures to confirm or dispute that conclusion. Plans have been approved for the extension and modernization of the exchange. We have the proposal down on next year's works estimates. The plans were prepared several months ago, and were, I think, approved by the Director-General about three months ago. I do not consider it necessary to have the double doors opened. The foreman told me that he did not know they were opened on the day of your visit. If he had known he would have been blameworthy. It is unfair to blame him for what happened. I ask the committee to remember that the exchange building is not equipped with an up-to-date plant. I must say, however, that the men should not have been allowed to eat their luncheon in the switch-room and allow crumbs of food to remain on the bench or the floor. There is a proper luncheon room provided for the staff. I can give the committee an assurance that the matter is being attended to, and that steps are being taken to bring the exchange up to date.

By Authority: H. J. Green, Government Printer, Canberra.