

Public Service Superannuation Act - Part I

Report on Actuarial Examination
of the
Superannuation Account in the Consolidated Revenue Fund
as at December 31, 1962

In accordance with instructions and pursuant to section 33 of the Public Service Superannuation Act, we have completed an actuarial examination of the Superannuation Account in the Consolidated Revenue Fund and have the honour to report thereon.

The report has been divided into seven sections, as follows:

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I. TERMS OF THE SUPERANNUATION PLAN AS AT DECEMBER 31, 1962

Background

The last examination of the Account was made as at December 31, 1957. Since that time a number of changes have been made in the provisions of the Public Service Superannuation Act. The most significant of these changes were included in 1960 amendments to the Act which provided, among other things, for

- (a) an increase in the rate of contribution for male contributors from six per cent to six and one-half per cent of salary,
- (b) a reduction in the period of service used in calculating the average annual salary for purposes of the benefit formula from ten years to six years, and
- (c) the removal of the limit of fifteen thousand dollars on the amount of annual salary applicable for determination of contributions and benefits.

Membership

Persons covered by the Superannuation plan consist of

- (a) employees of the Public Service* other than
 - (i) employees who, on July 19, 1924, were subject to the provisions of the Retirement Act and did not subsequently elect to become contributors under the Civil Service Superannuation Act,
 - (ii) employees who, on December 1, 1931, were employed in the Mint and did not subsequently elect to become contributors under the Civil Service Superannuation Act,
 - (iii) temporary employees* with less than twelve months of service in the Public Service,
 - (iv) employees in receipt of salary at a rate less than \$900 per annum except those who were contributors under the Civil Service Superannuation Act immediately prior to January 1, 1954,
 - (v) employees engaged locally outside Canada,
 - (vi) any prevailing rate, seasonal or sessional employees, postmasters or assistant postmasters in a revenue post office and persons employed as clerks of works who have not been designated by the Governor in Council as persons required to contribute to the Superannuation Account, and
 - (vii) employees on leave of absence from employment outside the Public Service who continue to contribute under their former pension plan in respect of current service;
- (b) former employees of the Public Service who have become entitled to annuities or annual allowances payable out of the Superannuation Account; and
- (c) widows and children in receipt of annual allowances payable out of the Superannuation Account, that is, dependants of contributors who died either in service or while entitled to an annuity or annual allowance.

Pensionable Service

The amount of any annuity to which a contributor may become entitled under the Act depends upon the number of years of pensionable service to his credit at the date he ceases to be employed in the Public Service.

"Pensionable service" is described in detail in the Act. Very generally, the pensionable service of a contributor includes any period of service in the Public Service for which he has contributed or has elected to contribute and has been eligible to do so. It may also include

- (a) a period prior to April 14, 1927, during which the contributor was absent from the Public Service on leave of absence without pay,
- (b) one-half of a period of service in the Public Service before August 11, 1939, for which the contributor neither made nor elected to make contributions,

* As defined in the Public Service Superannuation Act.

- (c) a period of active service in the forces during World War I or World War II,
- (d) a period of service with the regular forces, with the Royal Canadian Mounted Police or with an employer with whom a reciprocal transfer agreement has been effected,
- (e) a period of service with the Government of Newfoundland prior to the union of Newfoundland with Canada, and
- (f) a period of service in pensionable employment prior to becoming employed in the Public Service.

Summary of Benefits

(a) Contributors with less than five years of pensionable service:

| <u>Type of Termination</u> | <u>Benefit</u> |
|----------------------------|-----------------------------------|
| All types | Return of contributions (Note 1). |

(b) Contributors with five or more years of pensionable service:

(i) Contributors employed in the Public Service

| <u>Type of Termination</u> | <u>Benefit</u> |
|--|---|
| Retirement because of age (Note 2) | Immediate annuity (Note 3). |
| Retirement because of disability (Note 2) | At option of contributor: A. immediate annuity; B. gratuity (Note 4); or C. return of contributions. |
| Termination for reasons other than age, disability, misconduct or death (Note 2) | At option of contributor: A. deferred annuity (Note 5); B. return of contributions; or C. with the consent of the Treasury Board, annual allowance (Note 6). |
| Dismissal because of misconduct | A. Return of contributions; or B. with the consent of the Treasury Board, immediate annuity, deferred annuity or annual allowance (Note 7). |
| Death leaving no widow or children under age 18 | Return of contributions to estate. |
| Death leaving widow or children under age 18 | Annual allowance (Notes 8 and 9). |

(ii) Contributors who have ceased to be employed in the Public Service:

| <u>Type of Termination</u> | <u>Benefit</u> |
|---|--|
| Death leaving no widow or children under age 18 | Return of excess contributions to estate (Note 9). |
| Death leaving widow or children under age 18 | Annual allowance (Notes 9 and 10). |

- Note 1: "Return of contributions" means return of a contributor's total current service and prior service contributions without interest.
- Note 2: "Retirement because of age" in this summary means ceasing to be employed in the Public Service at age 60 or over for any reason other than misconduct or death. It follows that "retirement because of disability" refers only to retirement before age 60, and "termination for reasons other than age, disability, misconduct or death" refers only to termination before age 60.
- Note 3: "Immediate annuity" means an annuity that becomes payable to a contributor immediately upon his becoming entitled thereto. The annual amount of annuity is equal to 2% of average annual salary in respect of any selected six-year period of pensionable service multiplied by the number of years of pensionable service up to a maximum of 35. The six-year period may consist of consecutive periods of pensionable service totalling six years. If a contributor has less than six years of pensionable service, the average annual salary is based on salary in respect of his total pensionable service. The annuity is ordinarily payable in equal monthly instalments in arrears until the end of the month in which the contributor dies.
- Note 4: "Gratuity" in this summary means one month's salary for each year of pensionable service, not exceeding ten, at the rate of salary authorized to be paid to the contributor at the time, in the usual case, that he ceases to contribute to the Superannuation Account.
- Note 5: "Deferred annuity" means an annuity that becomes payable to a contributor at age 60. The annual amount of annuity is computed as described in Note 3. If a contributor who has become entitled to a deferred annuity becomes disabled before attaining age 60, he ceases to be entitled to that deferred annuity and becomes entitled to an immediate annuity.
- Note 6: "Annual allowance" to a contributor means an allowance, payable immediately in the case of a contributor of age 50 or over, or payable at age 50 in the case of a contributor of age less than 50. The annual allowance is computed as the actuarial equivalent of the deferred annuity described in Note 5 in accordance with the $a(f)$ and $a(m)$ Ultimate tables of mortality and interest at 4% per annum. If a contributor who has become entitled to an annual allowance payable at age 50 becomes disabled before attaining age 50, he ceases to be entitled to that annual allowance and becomes entitled to an immediate annuity.
- Note 7: In the case of dismissal because of misconduct, the Treasury Board has the power to specify that the contributor become entitled to the whole or any part of the annuity or annual allowance to which he would have become entitled if he had ceased to be employed in the Public Service for a reason other than misconduct. However, the annuity or annual allowance cannot be reduced to the extent that its capitalized value, computed on the basis of the $a(f)$ and $a(m)$ Ultimate tables of mortality and interest at 4% per annum, is less than the contributor's own contributions.
- Note 8: "Annual allowance" to the widow of a contributor means one-half of the annual amount of annuity computed as described in Note 3. This is termed the "basic allowance". If the age of the contributor exceeds that of the widow by twenty or more years, the widow's allowance is reduced. If a contributor dies within five years after his marriage, the widow's allowance may be reduced if the Treasury Board is not satisfied that anticipation of impending death was not a consideration

affecting the agreement to marry. If a widow remarries, her allowance is (a) suspended during the period of remarriage, or (b) forfeited, if she receives, upon her request, a return of contributions less all payments made to the contributor, widow and children (such request can only be made during the period of remarriage and after the youngest child of the contributor has reached age 18).

"Annual allowance" to each child of a deceased contributor means one-fifth of the basic allowance, or, if there is no living widow of the contributor, two-fifths of the basic allowance. The allowance is payable until the child reaches age 18. The total amount of allowances payable to the children of a deceased contributor may not exceed four-fifths of the basic allowance, or, if there is no living widow, eight-fifths of the basic allowance. A child born to the widow of a contributor is not entitled to an annual allowance unless the child was conceived before the death of the contributor.

Note 9: At the time that (a) a contributor dies leaving no widow or children entitled to an allowance, or (b) a contributor's last dependant to whom an allowance is payable dies or otherwise ceases to be entitled thereto, any amount by which the amount of a return of contributions exceeds the aggregate of all amounts that have been paid to the contributor, his widow and his children, is paid to the contributor's estate, or, if less than five hundred dollars, as authorized by the Treasury Board.

Note 10: The allowances payable are computed in the manner and subject to the conditions described in Note 8. However, the widow of a contributor is not entitled to an annual allowance if the contributor married after he became entitled to an annuity or annual allowance payable out of the Superannuation Account and did not subsequently become employed in the Public Service. Also, a child who was born to or adopted by a contributor or who became the stepchild of a contributor after the contributor ceased to be employed in the Public Service is not entitled to an annual allowance unless, in the case of a child born to a contributor, the child was conceived before the contributor ceased to be so employed.

Contributions:

By Contributor -

(a) Current Service

The rates of contribution for contributors employed in the Public Service are

- (i) for males, $6\frac{1}{2}\%$ of salary, and
- (ii) for females, 5% of salary.

Contributions cease after a contributor has to his credit 35 years of contributory service. By "contributory service" is meant all pensionable service in respect of which contributions have been made or have been elected to be made as well as any period of absence from the Public Service on active service in the forces during World War I or World War II that is countable as pensionable service but for which contributions are not required.

(b) Prior Service

A contributor may elect to contribute in respect of any period of pensionable service served prior to becoming a contributor.

In general, if election for a period of pensionable service is made within one year after the employee becomes a contributor, the amount of contributions required is equal to the total contributions that would have been made during that period of service at the rate of contribution applicable for current service at that time, together with interest*. There are exceptions to this general rule. For example, the amount of contributions required from a contributor in respect of

- (i) active service in the forces in World War I or World War II where the contributor was not employed in the Public Service immediately prior to enlistment in the forces, or
- (ii) service in pensionable employment immediately prior to becoming employed in the Public Service,

is equal to twice the amount that would have been required in respect of a salary at the rate authorized to be paid to the contributor at the time he became employed in the Public Service subsequent to the period of prior service for which he has made election.

A contributor who fails to make an election for a period of pensionable prior service within one year after becoming a contributor may make election for that period of service at any time before he ceases to be employed in the Public Service if he is in good health at date of election. However, the amount of contributions required in respect of such period of service is equal to the amount that would have been required in respect of a salary at the rate authorized to be paid to the contributor at the time he makes election, together with interest.

Contributions in respect of prior service may be paid in a lump sum or by monthly instalments. If a contributor, at date of election for a period of prior service, is age 45 or under, the monthly instalment period may not extend beyond age 65; if the contributor is over age 45, the monthly instalment period may not be longer than 20 years. Monthly instalments are computed on the basis of the Canadian Life Table No. 2 (1941), Males or Females, as the case may be, and interest at 4% per annum.

By Government -

The Government credits to the Account

- (a) during each fiscal year, an amount equal to the total current service and prior service contributions paid by contributors during the preceding fiscal year, and
- (b) at the end of each quarter, interest equal to 1% of the balance to the credit of the Account at the end of the preceding quarter.

After any salary increase of general application to the Public Service, the Act provides that the Government credit to the Account the amount estimated to be necessary to provide for the excess of the value of the increase in benefits over the value of the increase in contributions resulting from the salary increase.

* Simple interest at 4% per annum from the middle of the fiscal year in which contributions would have been made, had the contributor been required to make those contributions during the period for which he elects to pay, until the time of making the election.

II. DESCRIPTION OF DATA AND MEMBERSHIP STATISTICS

Most of the basic information necessary for the statutory periodic examinations of the Account is maintained by the Superannuation Branch of the Department of Finance on punched cards designed for the purpose. For the current examination, files of punched cards were provided for

- (a) contributors employed in the Public Service on December 31, 1962,
- (b) contributors who ceased to be employed in the Public Service from January 1, 1958, to December 31, 1962, inclusive,
- (c) contributors entitled to an annuity or annual allowance on December 31, 1962,
- (d) contributors entitled to an annuity or annual allowance who died or became re-employed in the Public Service from January 1, 1958, to December 31, 1962, inclusive,
- (e) widows of deceased contributors entitled to an annual allowance on December 31, 1962,
- (f) widows of deceased contributors who ceased to be entitled to an annual allowance by reason of death or remarriage from January 1, 1958, to December 31, 1962, inclusive, and
- (g) children of deceased contributors entitled to an annual allowance on December 31, 1962, and children who ceased to be entitled to an annual allowance by reason of death or attainment of age 18 from January 1, 1958, to December 31, 1962.

In addition to the information maintained and provided by the Superannuation Branch, further data were required for the examination, namely, annual rates of salary of contributors employed in the Public Service as at December 31, 1962, total contributions paid by contributors to December 31, 1962, and number of months worked by contributors who are not full-time employees. These data, which were prepared by the Comptroller of the Treasury, were merged with the data provided by the Superannuation Branch into a single card record by the Central Computer Division of the Comptroller of the Treasury.

All processing of the basic data was performed by the Dominion Bureau of Statistics. In addition to the customary computations of ages and durations and the production of the tabulations required for the valuation of benefits and contributions and for ancillary investigations, some of the more complex actuarial calculations were, for the first time, carried out by electronic equipment.

In the following tables are shown pertinent statistics derived from the tabulations of the data for the period from January 1, 1958, to December 31, 1962:

Contributors Employed in the Public Service

| | Contributors on Jan. 1, 1958 | Entrants during the 1958-62 period | Terminations during the 1958-62 period | | | | Contributors on Dec. 31, 1962 | |
|---------------------|------------------------------|------------------------------------|--|---|-----------------|--------------|-------------------------------|----------------|
| | | | Less than 5 years of pensionable service | Five or more years of pensionable service | | | | |
| | | | Age(1) | Death | Dis-(2) ability | Other(3) | | |
| <u>Males</u> | | | | | | | | |
| Full-time (4) | 104,729 | 49,480 | 19,544 | 8,874 | 2,231 | 663 | 5,845 | 117,052 |
| Prevailing Rate (5) | 6,616 | 12,119 | 1,471 | 725 | 209 | 81 | 697 | 15,552 |
| Part-time (6) | <u>851</u> | <u>1,668</u> | <u>266</u> | <u>211</u> | <u>45</u> | <u>12</u> | <u>61</u> | <u>1,924</u> |
| Total | <u>112,196</u> | <u>63,267</u> | <u>21,281</u> | <u>9,810</u> | <u>2,485</u> | <u>756</u> | <u>6,603</u> | <u>134,528</u> |
| <u>Females</u> | | | | | | | | |
| Full-time (4) | 40,206 | 35,314 | 24,805 | 1,516 | 253 | 340 | 5,262 | 43,344 |
| Prevailing Rate (5) | 346 | 2,084 | 720 | 52 | 5 | 10 | 77 | 1,566 |
| Part-time (6) | <u>75</u> | <u>352</u> | <u>267</u> | <u>5</u> | <u>1</u> | <u>1</u> | <u>4</u> | <u>149</u> |
| Total | <u>40,627</u> | <u>37,750</u> | <u>25,792</u> | <u>1,573</u> | <u>259</u> | <u>351</u> | <u>5,343</u> | <u>45,059</u> |
| Grand Total | <u>152,823</u> | <u>101,107</u> | <u>47,073</u> | <u>11,383</u> | <u>2,744</u> | <u>1,107</u> | <u>11,946</u> | <u>179,587</u> |

- (1) Contributors who retired with entitlement to an immediate annuity at age 60 or over.
- (2) Contributors who ceased to be employed at ages under 60 because of disability. (The benefit received was either an immediate annuity, a gratuity or a return of contributions, at the contributor's option. About 75% of all such contributors elected to take the annuity benefit.)
- (3) Contributors who ceased to be employed at ages under 60 for reasons other than death or disability. (The benefit was either a return of contributions, a deferred annuity or an annual allowance equivalent in value to the deferred annuity. Between 80% and 90% of all such contributors elected to take the return of contributions benefit, the proportion ranging from over 90% for both males and females in the younger age groups to about 70% for males and 50% for females in the age group 55 to 59.)
- (4) Revenue postmasters, assistant revenue postmasters and clerks of works are included in this category.
- (5) The unusually large number of new contributors in this category is partly accounted for by the inclusion of employees of the Canadian Overseas Telecommunication Corporation and Canadian Arsenals Limited during the fiscal year ended March 31, 1962.
- (6) Seasonal, sessional and casual employees.

Persons Entitled to an Annuity or Annual Allowance

Contributors

| | Entitled Jan. 1, 1958 | Who became entitled during the 1958-62 period | Who ceased to be entitled during the 1958-62 period | | | Entitled Dec. 31, 1962 | | |
|---|-----------------------------|---|--|-----------------------------|-----------|---------------------------|--------------|---------------|
| | | | Died | Re-employed or recovered | Other* | In Pay't | Deferred | Total |
| <u>Males</u> | | | | | | | | |
| Entitlements for reasons other than disability | 11,924 | 11,013 | 3,713 | 42 | 7 | 18,157 | 1,018 | 19,175 |
| Entitlements because of disability | <u>2,467</u> | <u>596</u> | <u>763</u> | <u>10</u> | <u>-</u> | <u>2,290</u> | <u>-</u> | <u>2,290</u> |
| Total | <u>14,391</u> | <u>11,609</u> | <u>4,476</u> | <u>52</u> | <u>7</u> | <u>20,447</u> | <u>1,018</u> | <u>21,465</u> |
| <u>Females</u> | | | | | | | | |
| Entitlements for reasons other than disability | 1,802 | 2,143 | 243 | 24 | 12 | 3,094 | 572 | 3,666 |
| Entitlements because of disability | <u>630</u> | <u>214</u> | <u>100</u> | <u>-</u> | <u>-</u> | <u>744</u> | <u>-</u> | <u>744</u> |
| Total | <u>2,432</u> | <u>2,357</u> | <u>343</u> | <u>24</u> | <u>12</u> | <u>3,838</u> | <u>572</u> | <u>4,410</u> |
| Grand Total | <u>16,823</u> | <u>13,966</u> | <u>4,819</u> | <u>76</u> | <u>19</u> | <u>24,285</u> | <u>1,590</u> | <u>25,875</u> |

Widows

| Entitled Jan. 1, 1958 | Who became entitled during the 1958-62 period | Who ceased to be entitled during the 1958-62 period | | Entitled Dec. 31, 1962 |
|-----------------------------|---|---|-----------|------------------------------|
| | | Died | Remarried | |
| 7,696 | 5,274 | 1,302 | 225 | 11,443 |

Children

| Entitled Jan. 1, 1958 | Who became entitled during the 1958-62 period | Who ceased to be entitled during the 1958-62 period | | Entitled Dec. 31, 1962 |
|-----------------------------|---|---|--------------|------------------------------|
| | | Died | Att'd age 18 | |
| 1,412 | 2,211 | 5 | 1,053 | 2,565 |

* Contributors who ceased to be entitled to deferred annuities upon becoming entitled to disability annuities.

III. VALUATION BASES AND ASSUMPTIONS

1. General

With few exceptions, the bases and assumptions used for the actuarial examination as at December 31, 1957, were deemed to be satisfactory for purposes of the examination as at December 31, 1962. The only changes made were in the mortality basis used for female contributors retired for reasons other than disability, in the treatment of contributors other than full-time employees (for the current examination, the bases used for full-time contributors were considered applicable for all other groups of contributors), and in the age distribution of new entrants used for purposes of deriving average contribution rates.

In references to rates of termination in the remainder of this report, the terms "select" and "ultimate" are used from time to time. In this connection,

- (a) "select" means rates classified by age at beginning of pensionable service for active contributors, or by age at becoming entitled to an annuity or annual allowance for persons so entitled, and by number of complete years elapsed since that age, and
- (b) "ultimate" means rates classified by age only, derived from all the experience of the group being studied except that covering the years for which select rates have been determined.

2. Interest

The Public Service Superannuation Regulations provide that interest shall be credited to the Superannuation Account at the rate of 1% quarterly, that is, at the rate of 4% per annum, approximately. Also, where an interest basis is necessary for calculations under the Act, the Regulations prescribe a rate of 4% per annum. The interest basis for the valuation was therefore taken as 4% per annum.

3. Salary scales

The term "salary scale", as used in this report, denotes the predicted pattern of increase in salary from age to age over future years.

The manner in which salary will increase from age to age in the future must be predicted for valuation purposes because

- (a) annuity and annual allowance benefits depend on the average salary received during a selected six-year period of pensionable service (ordinarily, the period selected is the last six years of service),
- (b) the gratuity benefit depends on the rate of salary authorized at termination of service, and
- (c) future current service contributions depend on salary received during future years of service.

There are two main forces that tend to generate increases in the salary of an individual during his working lifetime. The first may be thought of as a "promotional" force. As an employee gains experience and attains new or higher skills in his work, he is normally rewarded by periodic increases in his salary. Such increases are hereinafter referred to as "promotional" increases. The second force is the resultant of the diverse forces that produce increases in the level of salaries generally or for certain classes of employees only. Increases in salary resulting from this force are hereinafter referred to as "economic" increases.

The pattern of average promotional increases in salary in most stable employment areas is fairly predictable on the basis of past experience. On the other hand, much less confidence can be placed in predictions of future increases in salary that depend on varying economic and social pressures. It is, therefore, usual in the valuation of pension plans under which pensions are determined as a percentage of salary to take account only of promotional increases in the development of salary scales and in the consequent calculations of the net liability in respect of current contributors and of contribution rates required in respect of new contributors. The result of this practice is that, if economic increases in salary between the dates of consecutive valuations do take place, each new valuation of a pension plan shows the creation of a deficit, an increase in the deficit or a decrease in the surplus in the fund during the inter-valuation period (depending on the financial state of the fund at the date of the previous valuation) unless special contributions are made to offset the net liability resulting from those economic salary increases.

As indicated earlier in this report, the Public Service Superannuation Act provides that an amount estimated to be equal to the additional net liability created by a salary increase of general application shall be credited to the Account as soon as possible after the increase. The implication in this provision is that the Government, as employer, has assumed responsibility for the additional net liabilities created under the plan as a result of general salary increases. In the development of the "basic" salary scale for this valuation, therefore, only promotional increases in salary were taken into account.

From December 31, 1957, that is, the date of the last examination of the Account, to December 31, 1962, the level of average salaries of contributors increased by about 21%. This represented an annual increase rate of about 4% over the five-year period. Also, during the decade from December 31, 1947, to December 31, 1957, the effective annual increase rate was of the order of 5%. Thus, because of the substantial cost arising from such economic increases in salary, it seemed appropriate to construct a "supplementary" salary scale based on the assumption that the pattern of promotional increases in salary from age to age would be that represented by the basic salary scale and, in addition, that the general level of salaries would increase by 3% per annum throughout the future. Substitution of this supplementary salary scale for the basic salary scale in the valuation functions would then provide the means to investigate what the state of the Account would have been as at December 31, 1962, and what contribution rate would be required in respect of new contributors after that date if the salary increase conditions represented by the supplementary salary scale were to prevail in future years and no special credits were to be made to the Account from time to time as a result of general salary increases.

The valuation data included the rate of salary authorized to be paid to each contributor employed in the Public Service on December 31, 1962. These data were tabulated in such manner that the average increase in salary from age to age could be studied for all persons of the same age at beginning of pensionable service. Preliminary examination of these average increases pointed toward minor modifications in the salary scales adopted for the 1957 valuation. Further extensive tests indicated not only that such modifications would have a negligible effect on the average contribution rates for the large group of full-time contributors but also that the salary scales developed for full-time contributors for the 1957 valuation could reasonably be used for all categories of contributors for the current valuation.

In Appendix 1 are shown the salary scales used for this valuation. In Appendix 2 is shown, for specimen ages, the manner in which an initial salary of \$1,000 would increase in the future on the basis of the salary scales shown in Appendix 1.

4. Rates of termination for all reasons (less than five years of pensionable service)

A return of contributions is the only benefit applicable in respect of a contributor who dies or otherwise ceases to be employed in the Public Service before he has to his credit five years of pensionable service. Thus, for valuation purposes, the rates of termination required for each of the first five years of pensionable service are the rates at which contributors cease to be employed for any reason. These are referred to hereinafter as "select rates of termination for all reasons."

For the 1957 valuation, select rates of termination for all reasons were derived for each of the first five years of pensionable service beginning at each age from 15 upwards from the experience of full-time contributors over the 1948-57 period. These rates, shown in Appendix 3, were used in the current valuation for all contributors.

It may be noted that the data obtained in respect of full-time contributors for the 1958-62 period indicated that any minor modifications in the 1957 rates that might have been made to take account of the experience over the later period would have had a negligible effect on the valuation results. Also, for other than full-time employees, the 1958-62 experience indicated that use of the 1957 rates for full-time contributors would be completely satisfactory except perhaps for male employees in the first two or three years of pensionable service. For the latter group, since a considerable proportion of other than full-time employees do not become contributors in the early years of service, the financial effect of even a substantial modification of the rates for the first two or three years would have been very slight.

5. Rates of termination for reasons other than age, disability or death (five or more years of pensionable service), and

Proportions of terminating contributors who elect to take a deferred annuity benefit

These rates and proportions pertain only to contributors who have not attained age 60.

As described in the "Summary of Benefits", contributors who terminate service for reasons other than age, disability or death and have five or more years of pensionable service, have the option* of electing to take any one of three benefits, namely, a return of contributions, a deferred annuity to commence at age 60, or an annual allowance to commence immediately if the contributor's age is 50 or over or at age 50 if the contributor's age is under 50. Relevant rates of termination were developed from the 1948-57 experience among contributors for purposes of the 1957 valuation. During the 1958-62 period, the actual number of terminations among males was very close to that expected on the basis of the 1957 rates and the number of terminations among females was somewhat higher than that expected. For the current valuation, it was considered appropriate to retain the 1957 rates for both males and females. They are shown in Appendix 4.

The value of a deferred annuity benefit is considerably greater than the value of a return of contributions benefit. For valuation purposes, therefore, it is necessary to determine the proportion of contributors who, on terminating service, elect to take a deferred annuity benefit (including those who elect to take an annual allowance which is calculated in such manner that its value, in accordance with certain mortality and interest assumptions, is equal to the value of the deferred annuity).

* Except in cases of misconduct.

For the 1957 valuation, proportions of contributors who elect to take a deferred annuity were developed from the experience of the 1948-57 period. It is interesting to note that, despite the increasing publicity given to portability of pensions in recent years, the experience of the 1958-62 period revealed no trend toward an increase in the proportion of contributors electing to take a deferred annuity. In fact, the actual proportions were generally slightly less than those expected in accordance with the 1957 basis but were so close to them that no change was considered necessary for the current valuation. The proportions used in the valuation are shown in Appendix 4.

6. Rates of retirement because of age

The provision of continuing income after completion of an employee's normal working lifetime is the primary purpose of most pension plans. Under the Public Service Superannuation plan, a contributor becomes entitled to an immediate annuity upon retirement at age 60 or over, provided that such contributor has at least five years of pensionable service. In this report, such retirements are termed "retirements because of age".

Rates of retirement because of age were developed for purposes of the 1957 valuation from the experience of the 1948-57 period. Since the experience of the 1958-62 period corresponded closely to that of the earlier period, the 1957 rates were used without modification for the current valuation. They are shown in Appendix 5.

As might be expected, these age-retirement rates do not increase smoothly from age to age. Instead, there is a slight heaping at age 60, that is, the earliest age at which a full immediate annuity benefit is available, and a sharp increase at age 65, the age that may be regarded as the "normal retirement age" and after which employment in the Public Service is contingent on special authorization from year to year.

As for the previous experience period, the data for the 1958-62 period showed that a negligible number of contributors remain employed in the Public Service beyond age 71. Thus, the assumption that all active contributors who attain age 70 cease to be employed during the following year was retained for valuation purposes.

7. Rates of retirement because of disability

Under the Superannuation plan, a contributor becomes entitled to an immediate annuity or other optional benefits in the event of disability, provided that such contributor has at least five years of pensionable service.

For the 1957 valuation, rates of retirement because of disability were developed from the experience of the 1948-57 period. These rates, shown in Appendix 6, were also used for the current valuation.

It may be mentioned that the rates developed for use in the 1957 valuation and retained for use in the current valuation were substantially lower than those developed from experience prior to 1948 and used in the 1947 valuation. It was, therefore, a matter of no little interest to find that the number of retirements because of disability during the 1958-62 period was substantially less than might have been expected even on the basis of the rather low rates of disability developed from the experience of the 1948-57 period.

8. Rates of mortality and remarriage

For valuation purposes, mortality rates expected to be experienced in the future are required for each of the following groups:

- (a) contributors employed in the Public Service with five or more years of pensionable service, males and females separately;

- (b) contributors entitled to an annuity or annual allowance for reasons other than disability, males and females separately;
- (c) contributors entitled to an annuity because of disability, males and females separately;
- (d) widows of deceased contributors;
- (e) children of deceased contributors.

Since widows' allowances are suspended on remarriage, rates of remarriage are needed for their valuation.

The bases used for the current valuation are described in the following paragraphs:

- (a) Contributors employed in the Public Service with five or more years of pensionable service

The mortality rates adopted for purposes of the 1957 valuation were selected so as to provide a small margin for improvement in mortality. In the case of males, the rates were those of the α -1949 Table* projected 10 years in accordance with Projection Scale B**. In the case of females, the rates were derived from the 1948-57 experience of full-time female contributors. The experience of the 1958-62 period indicated that these rates continue to provide a reasonable margin and, accordingly, they were deemed appropriate for use in the current valuation. They are shown in Appendix 7.

- (b) Contributors entitled to an annuity or annual allowance for reasons other than disability

For purposes of the 1957 valuation, both the male and female mortality rates of the α -1949 Table were deemed suitable to provide a margin for improvement in mortality over a considerable future period.

For males, the experience of the 1958-62 period indicated that the male rates of the α -1949 Table continue to be satisfactory and, accordingly, they were retained for the current valuation.

For females, the experience of the 1958-62 period indicated that improvement in mortality has been greater than had been anticipated. Thus, in order to provide a reasonable margin for the continued trend toward lower mortality, the rates adopted for females for purposes of the current valuation were the female rates of the α -1949 Table projected in accordance with Projection Scale C**, assuming year of birth 1910. (As a matter of interest, these rates are the basis of current Government Annuities for females born between 1911 and 1920, inclusive.)

The rates used for both males and females and the relevant annuity values are shown in Appendix 8.

- (c) Contributors entitled to an annuity because of disability

For purposes of the 1957 valuation, select and ultimate rates of mortality were developed from the experience of the 1948-57 period. The 1958-62 experience indicated that these rates continue to provide a reasonable margin for the secular trend toward lower mortality which may also be expected to affect disabled lives. Accordingly, these rates were retained for use in the current valuation.

* Transactions of the Society of Actuaries, Vol. 1, pp. 386-9

** Transactions of the Society of Actuaries, Vol. IV, p. 272

The ultimate rates of mortality, applicable after the first three years following retirement, are shown in Appendices 9 and 10 for males and females, respectively. Rates of mortality for the first, second and third years following retirement are assumed to be the following multiples of the ultimate rates:

- (i) for males, 250%, 175% and 125%, respectively, and
- (ii) for females, 190%, 145% and 115%, respectively.

The above multiples, which were determined on the basis of the 1948-57 experience, were considered to be appropriate for the current valuation although the 1958-62 experience gave some indication of a trend toward higher mortality in these early years.

Also shown in Appendix 9, for males, and in Appendix 10, for females, are annuity values based on the select and ultimate rates and on the ultimate rates only.

(d) Widows

The rates of mortality adopted for purposes of the 1957 valuation were derived from the 1948-57 experience of widows under the Superannuation plan, and were designed to provide some margin for future improvement in mortality. The 1958-62 experience indicated that there may be little, if any margin left in the rates applicable to ages below 85. However, it was considered satisfactory to retain the 1957 basis for the current valuation, particularly in view of the margin that appears to subsist in the rates of remarriage.

The rates of remarriage, varying by age and duration from widowhood, that were adopted for purposes of the 1957 valuation were developed from the experience during the period from January 1, 1940, to December 31, 1957, of widows awarded pensions from August 4, 1914, to December 31, 1957, under the Pension Act and previous Government administrative orders. Experience among widows of contributors under the Superannuation plan, for both the 1948-57 and 1958-62 periods, indicated that remarriage is somewhat more likely for such widows than for widows awarded pensions under the Pension Act. However, it was considered that the slight margin in the remarriage rates constituted a desirable offset to the lessening margin in the mortality rates and, accordingly, the 1957 remarriage basis was retained for the current valuation.

In Appendix 11 are shown

- (i) select remarriage rates for quinquennial ages at widowhood 25 to 55 and specimen durations from widowhood,
- (ii) ultimate remarriage rates and aggregate mortality rates for quinquennial ages commencing at age 39, and
- (iii) annuity values based on the probabilities of payments ceasing as a result of death or remarriage for the ages and durations noted in (i) and (ii).

(e) Children

Payments of allowances to children cease at age 18. Since the mortality of children under age 18 is very low, it was considered suitable to value children's allowances without taking account of mortality.

9. Proportions of male contributors married at death, and

Average ages of widows corresponding to ages of contributors at death

These proportions and average ages are needed to value prospective benefits of future widows of contributors who at the time of their death are either employed in the Public Service or are entitled to an annuity or annual allowance.

Proportions of male contributors married at death were derived for purposes of the 1957 valuation from the 1948-57 experience for employed and retired contributor groups, separately. During the 1958-62 period, the proportion married at death among employed contributors was very close to but slightly lower than the proportion expected in accordance with the 1957 basis and the proportion married at death among retired contributors was somewhat higher than that expected.

Average ages of widows corresponding to ages of contributors at death were derived for purposes of the 1957 valuation from the 1948-57 experience for employed and retired contributors combined. During the 1958-62 period, the average ages of widows who became entitled to an annual allowance were slightly higher than expected in accordance with the 1957 basis.

Because of the offsetting effects of indicated trends in the two factors under consideration, it was considered appropriate to retain the 1957 bases for the current valuation. Values are shown in Appendix 12 for quinquennial ages of contributors at death.

10. Children's benefits

For each age at death of contributors, there is needed the average value of children's benefits per \$1.00 of the annuity payable to a contributor or that would have been payable to a contributor if he had retired on immediate annuity at the date of his death. Such values were derived from the 1948-57 experience data for purposes of the 1957 valuation. These values were considered to remain appropriate for purposes of the current valuation. Sample values are shown in Appendix 12.

11. Treatment of contributors other than those classed as full-time

As noted at the beginning of this section of the report, contributors other than those classed as full-time employees were treated differently for the current valuation than for the 1957 valuation. For the 1957 valuation, special salary scales were used for prevailing rate and part-time employees and the rates of termination assumed applicable to full-time contributors with five or more years of pensionable service were used for prevailing rate and part-time employees regardless of the length of pensionable service. For the current valuation, it was considered appropriate to use the same valuation bases, assumptions and methods for prevailing rate and part-time employees as for full-time employees.

Some of the reasons leading to the decision noted in the preceding paragraph were mentioned in earlier discussion of the specific bases. The main reason was that for most contingencies the experience among prevailing rate and part-time employees was surprisingly similar* to that of the large group of full-time employees. Thus, when the diversity of the various classes of employees that constitute the whole group of full-time employees was considered, it was difficult to justify continued separate treatment for the relatively small groups of prevailing rate and part-time employees for valuation purposes.

* Perhaps the most surprising feature was the fact that very few contributors classed as seasonal, sessional or casual employees were reported as having been employed for less than twelve months in 1962, and that, consequently, the average annual period of employment for contributors in these groups was very close to a full year.

It is estimated that the total effect of using the same valuation bases for all contributors regardless of type of employment (instead of the 1957 valuation bases for the prevailing rate and part-time employees) was an increase in the net liability of about \$6.7 million.

12. Capitalized values of annuity or annual allowance benefits

In Appendix 13 are shown, for quinquennial ages, the values of annuities or annual allowances emerging

- (a) on retirement below age 60 for reasons other than disability,
- (b) on retirement because of age,
- (c) on retirement because of disability, and
- (d) on death leaving dependants.

For retirements below age 60 for reasons other than disability, the values shown are in respect of a deferred annuity benefit to commence at age 60. For all male retirements, the values include provision for prospective allowances to widows and children. For all cases except deaths of retired contributors, the values include provision for payment of an aggregate amount of benefit at least equal to the contributor's total contributions without interest.

IV. CONTRIBUTION RATES

As described earlier in this report, contributions for current service are equal to $6\frac{1}{2}\%$ of salary for male contributors and 5% of salary for female contributors. Contributions for periods of prior service are, for males, ordinarily based on 6% of salary for periods prior to August 1, 1960, and on $6\frac{1}{2}\%$ of salary for periods subsequent to July 31, 1960, and, for females, on 5% of salary for all periods. In addition, Government credits to the Account equal all current service and prior service contributions made by contributors. Thus, total contributions and credits to the Account are currently made at a rate of approximately 13% of salary received by male contributors and 10% of salary received by female contributors for any period of pensionable service.

As indicated in the preceding section under the heading "Salary scales", it seemed appropriate to estimate the contribution rates required in respect of new contributors to pay for the benefits provided under the Act,

- (a) when only promotional increases in salary are taken into account, and
- (b) when both promotional increases in salary and economic increases in salary at an assumed rate of 3% per annum are taken into account.

This was accomplished by separate use of the "basic" and "supplementary" salary scales shown in Appendix 1. The resulting contribution rates are shown in the following schedule:

Average Total* Contribution Rates required
in respect of New Contributors

| | <u>Males</u> | <u>Females</u> |
|---|--------------|----------------|
| (A) <u>Promotional Increases Only</u> | | |
| Benefits to contributor | 10.1% | 11.6% |
| Benefits to dependants | <u>2.8</u> | <u>-</u> |
| Total benefits | 12.9% | 11.6% |
| (B) <u>Promotional and Economic Increases</u> | | |
| Total benefits | 17.9% | 16.1% |

In the foregoing schedule, it is shown that the total contribution rate estimated to be required in respect of new female contributors on the basis of "Promotional Increases Only" is 11.6% of salary. Thus, contributions received from new female contributors on the basis of the current statutory contribution rate of 5% of salary, together with matching Government credits, are estimated to be deficient to provide for future benefits by an amount equal to 1.6% of salary. (In the two preceding actuarial examinations, it was estimated that a 10% contribution rate would be a little more than sufficient to provide for benefits.) The three main reasons for the estimated increase in the required contribution rate for new female contributors are

- (a) the strengthening of the mortality basis for female contributors to take account of the continuing trend to lower mortality,
- (b) the increase in the average age at entry caused by
 - (i) the inclusion, for the first time, of prevailing rate and part-time employees in the computation of such age, and
 - (ii) the trend toward increasing re-entry into employment of married women at the higher ages (when the demands of their families tend to diminish), and
- (c) the change from a ten-year average salary to a six-year average salary as the base for computing benefits.

Also in the foregoing schedule, it is shown that the total contribution rate estimated to be required in respect of new male contributors on the basis of "Promotional Increases Only" is 12.9% of salary. Thus, contributions received from new male contributors on the basis of the current statutory contribution rate of 6½% of salary, together with matching Government credits, are estimated to be sufficient to provide for future benefits. It may be noted, however, that the estimated required contribution rate of 12.9% is higher by 0.5% of salary than the corresponding rate that was estimated at the time of the 1957 valuation. The reasons for this estimated increase in the required contribution rate are the same as those described for new female contributors in b(i) and (c) of the paragraph just above.

* For contributors and Government combined.

Examination of the contribution rates estimated to be required on the basis of "Promotional and Economic Increases" reveals that, if future economic increases in salary should average 3% per annum and no special credits were made by the Government following salary increases of general application, it would be necessary for the Government to credit the Account on a continuing basis with amounts equal to about 11.4% of salary in respect of new male contributors and 11.1% of salary in respect of new female contributors in order to provide for future benefits (assuming that the current statutory contribution rates for contributors were retained).

The age distributions of new contributors used in the development of the rates shown in the above schedule were based on the experience of the 1958-62 period. They are shown in Appendix 14.

V. VALUATION BALANCE SHEETS AND OBSERVATIONS

In Balance Sheet A below, the results of the valuation are summarized and the financial status of the Account as at December 31, 1962, is shown when only promotional increases in salary are taken into account in determining the present values of benefits and contributions. In the construction of this balance sheet it was assumed that current service contributions of contributors would continue at the rate of 6½% of salary for males and the rate of 5% of salary for females and that credits to the Account on behalf of the Government would equal the total contributions by contributors on a continuing basis. Implicit in this approach is the assumption that, in the event of general salary increases, credits equal to the net liabilities created thereby would be made to the Account on behalf of the Government at the time of such increases.

In Balance Sheet B below, the results of the valuation are summarized and the financial status of the Account as at December 31, 1962, is shown when both promotional increases in salary and economic increases in salary at the rate of 3% per annum are taken into account in determining the present values of benefits and contributions. In the construction of this balance sheet it was assumed that, in respect of current service, contributions by contributors together with matching credits by the Government would equal 18% of salary in respect of male contributors and 16% of salary in respect of female contributors, and that, in respect of prior service, the Government would credit the Account with amounts equal to contributions made by contributors. With this approach, no special lump sum credits would be required in respect of general salary increases if such increases were to average 3% per annum throughout the future.

Valuation Balance Sheets as at December 31, 1962

Balance Sheet A (Promotional Increases Only)

| <u>Assets</u> | | |
|---|--------------------|------------------------|
| Balance of Account | | \$1,703,439,000 |
| Government matching credits due in respect of past contributions by contributors | | 49,746,000 |
| Amount due from Canadian Overseas Telecommunication Corporation | | 801,000 |
| Present value of future contributions by contributors: | | |
| <u>Employed contributors</u> | | |
| <u>Current service</u> | | |
| Males | \$482,570,000 | |
| Females | <u>72,772,000</u> | \$555,342,000 |
| <u>Prior service</u> | | |
| Males | 14,426,000 | |
| Females | <u>1,494,000</u> | 15,920,000 |
| <u>Retired contributors</u> | | |
| Males | 3,960,000 | |
| Females | <u>435,000</u> | <u>4,395,000</u> |
| | | 575,657,000 |
| Present value of future matching credits by the Government: | | <u>575,657,000</u> |
| | Total Assets | \$2,905,300,000 |
| Deficit | | <u>110,536,000</u> |
| | | <u>\$3,015,836,000</u> |
| <u>Liabilities</u> | | |
| Present value of prospective benefits to employed contributors: | | |
| Males | \$2,101,756,000 | |
| Females | <u>423,010,000</u> | \$2,524,766,000 |
| Present value of benefits to persons entitled to an annuity or annual allowance: | | |
| <u>Retired contributors</u> | | |
| Entitled for reasons other than disability - | | |
| Males | \$320,149,000 | |
| Females | 47,407,000 | |
| Entitled because of disability - | | |
| Males | 29,328,000 | |
| Females | <u>9,020,000</u> | \$405,904,000 |
| <u>Widows</u> | | 81,721,000 |
| <u>Children</u> | | <u>1,199,000</u> |
| Contributions held pending refund to former contributors | | 1,143,000 |
| Estimated value of benefits pending exercise of benefit option by former contributors | | <u>1,103,000</u> |
| | Total Liabilities | <u>\$3,015,836,000</u> |

In Balance Sheet A above, it is shown that an estimated actuarial deficit of about \$110.5 million developed in the five years following December 31, 1957. An analysis of this deficit is described in the following numbered paragraphs. (Except for the \$137.7 million figure referred to in paragraph 1, all amounts mentioned in the analysis are applicable as at December 31, 1962.)

1. The Report on the Actuarial Examination of the Superannuation Account as at December 31, 1957, revealed an estimated deficit as at that date of \$137.7 million. The fact that this amount was not credited to the Account until March, 1961, meant that less interest was credited to the Account than would have been credited if the Account had been in balance as at December 31, 1957. It is estimated that the value of this loss of interest was about \$19 million.

2. Over an extended period during the year 1960 and again during 1962, salary adjustments were announced for various classes of contributors. These adjustments were considered not to constitute "an increase of general application" for purposes of subsection (2) of section 32 of the Act and, therefore, no special credits to the Account were made to provide for the consequent increases in the net liability. It is estimated that the additional net liability created by the noted salary adjustments was about \$113 million.

3. In July, 1960, as noted in Section I of this report, the period of service used in calculating the average salary for purposes of the benefit formula was reduced from ten years to six years. It is estimated that the increase in the net liability resulting from this change was about \$31 million.

4. As indicated in Section IV of this report, it has been estimated that contributions by females who became contributors during the 1958-62 period and matching credits by the Government have been less than those required to support the benefits by an amount nearly equal to 1.6% of salary (on the basis of "Promotional Increases Only"). A similar deficiency equal to about 0.4% of salary occurred in respect of males who became contributors during the period from January, 1958, to August, 1960. It is estimated that the total value of these deficiencies was about \$15 million.

5. As mentioned in the first paragraph of Section III, a few changes in the 1957 valuation bases were considered appropriate for purposes of the current valuation. It is estimated that these changes resulted in an increase in the net liability of about \$34 million.

6. As noted in Section I of this report, the contribution rate for male contributors was increased, effective August 1, 1960, from 6% to $6\frac{1}{2}$ % of salary. The estimated effect of this increase taken together with the simultaneous increases in benefits is that contributions by new male contributors and matching Government credits based on the current contribution rate are sufficient to provide for future benefits (on the basis of "Promotional Increases Only"). In respect of male contributors in employment on December 31, 1957, and still in employment on August 1, 1960, the change in the contribution rate from 6% to $6\frac{1}{2}$ % of salary meant that from the latter date onward contributions by contributors of this group and matching Government credits would be greater than those assumed during the 1957 valuation by an amount equal to 1% of salary. It is estimated that the value of these additional contributions and credits was \$64 million.

7. Statistics for contributors, widows and children provided for the current examination indicated that an overstatement as respects the number of persons covered in various classes had occurred in the statistics provided for the 1957 examination. For example, the number of active male contributors appears to have been overstated by about 1.7% and the number of widows in receipt of pension by about 4.3%. It is estimated that corrections for these overstatements had the effect of reducing the net liability by about \$34 million.

8. Deduction of the amounts noted in paragraphs 6 and 7 above from the sum of the amounts noted in paragraphs 1 to 5 above would point to the emergence of a deficit of about \$114 million. The difference between this \$114 million figure and the estimated deficit of about \$110.5 million shown in Balance Sheet A may be explained as the net effect of a number of minor "gains" and "losses" largely arising out of differences between actual and expected experience.

Finally, in addition to the deficit revealed by Balance Sheet A, it has been broadly estimated that an additional net liability of \$22 million was created prior to December 31, 1962, as a result of a salary adjustment, effective October 1, 1962, for employees classed as Group D for purposes of the cyclical salary review carried out by the Civil Service Commission. Since this adjustment was not announced until July, 1963, it was not feasible to substitute the revised salaries in the basic valuation data which were then in an advanced state of preparation.

Balance Sheet B is included simply to illustrate what the state of the Account would have been as at December 31, 1962, if normal contributions by contributors and credits by the Government were sufficient to provide, on a continuing basis, for economic salary increases at an average rate of 3% per annum.

VI. SUMMARY

1. When account is not taken of possible future increases in the general level of salaries, the average contribution rate estimated to be required to provide for benefits in respect of new contributors is, for contributors and Government combined, 12.9% of salaries in respect of male contributors and 11.6% of salaries in respect of female contributors.

If increases in the general level of salaries were to take place throughout the future at an average rate of 3% per annum and no special credits were to be made to the Account in respect of such increases, the average contribution rate estimated to be required to provide for benefits in respect of new contributors would be, for contributors and Government combined, 17.9% of salaries in respect of male contributors and 16.1% of salaries in respect of female contributors.

2. If the rate of contribution, for contributors and Government combined, remains at 13% of salary in respect of male contributors and 10% of salary in respect of female contributors and the Government continues to credit the Account with amounts equal to contributions made by contributors in respect of prior service and with special lump sum amounts representing the additional net liabilities created by general salary increases, the estimated deficit in the Account as at December 31, 1962, was \$110.5 million. This figure does not include an estimated additional net liability of \$22 million incurred as a result of a salary adjustment, effective October 1, 1962, as respects "Group D" employees.

3. A deficit of about \$2 million may be expected to result each year in respect of new female contributors because of the estimated deficiency in contributions by such contributors based on the current statutory contribution rate and in matching Government credits.

In conclusion, it is a pleasure to acknowledge the co-operation and able assistance of the staff of the Dominion Bureau of Statistics and the staffs of the Superannuation Branch and Central Pay Office of the Comptroller of the Treasury throughout the examination.

Respectfully submitted,


Chief Actuary

Department of Insurance,
Ottawa, Canada
July 17, 1964

VII. A P P E N D I C E S

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- 2 Illustration of Increases in Salary in accordance with salary scales
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- 4 Rates of Termination for reasons other than age, disability or death (five or more years of pensionable service), and Proportions of Contributors Electing to Take a Deferred Annuity
- 5 Rates of Retirement because of age (five or more years of pensionable service)
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- 13 Capitalized Values of Annuity or Annual Allowance Benefits per \$1.00 "earned" annuity of contributors at retirement or death
- 14 Age Distribution of employees who became contributors during the period from January 1, 1958, to December 31, 1962

A P P E N D I X 1

Salary Scales

| <u>Age</u> | <u>Basic</u> | | <u>Supplementary</u> | |
|------------|--------------|----------------|----------------------|----------------|
| | <u>Males</u> | <u>Females</u> | <u>Males</u> | <u>Females</u> |
| 15 | 0.344 | 0.356 | 0.068 | 0.070 |
| 16 | 0.356 | 0.368 | 0.072 | 0.075 |
| 17 | 0.370 | 0.382 | 0.077 | 0.080 |
| 18 | 0.385 | 0.396 | 0.083 | 0.085 |
| 19 | 0.401 | 0.412 | 0.089 | 0.091 |
| 20 | 0.418 | 0.429 | 0.095 | 0.098 |
| 21 | 0.436 | 0.447 | 0.102 | 0.105 |
| 22 | 0.455 | 0.466 | 0.110 | 0.113 |
| 23 | 0.475 | 0.486 | 0.118 | 0.121 |
| 24 | 0.496 | 0.507 | 0.127 | 0.130 |
| 25 | 0.517 | 0.529 | 0.137 | 0.140 |
| 26 | 0.539 | 0.551 | 0.147 | 0.150 |
| 27 | 0.561 | 0.573 | 0.157 | 0.161 |
| 28 | 0.583 | 0.596 | 0.168 | 0.172 |
| 29 | 0.605 | 0.619 | 0.180 | 0.184 |
| 30 | 0.627 | 0.642 | 0.192 | 0.197 |
| 31 | 0.649 | 0.664 | 0.205 | 0.210 |
| 32 | 0.670 | 0.686 | 0.218 | 0.223 |
| 33 | 0.691 | 0.707 | 0.231 | 0.237 |
| 34 | 0.711 | 0.728 | 0.245 | 0.251 |
| 35 | 0.731 | 0.748 | 0.260 | 0.266 |
| 36 | 0.750 | 0.767 | 0.275 | 0.281 |
| 37 | 0.769 | 0.785 | 0.290 | 0.296 |
| 38 | 0.787 | 0.802 | 0.306 | 0.311 |
| 39 | 0.804 | 0.819 | 0.322 | 0.328 |
| 40 | 0.820 | 0.834 | 0.338 | 0.344 |
| 41 | 0.836 | 0.849 | 0.355 | 0.360 |
| 42 | 0.850 | 0.863 | 0.372 | 0.377 |
| 43 | 0.863 | 0.876 | 0.389 | 0.394 |
| 44 | 0.876 | 0.888 | 0.406 | 0.412 |
| 45 | 0.887 | 0.899 | 0.424 | 0.429 |
| 46 | 0.898 | 0.910 | 0.442 | 0.448 |
| 47 | 0.908 | 0.919 | 0.460 | 0.466 |
| 48 | 0.917 | 0.928 | 0.479 | 0.484 |
| 49 | 0.926 | 0.936 | 0.498 | 0.503 |
| 50 | 0.934 | 0.943 | 0.517 | 0.522 |
| 51 | 0.941 | 0.950 | 0.537 | 0.542 |
| 52 | 0.948 | 0.956 | 0.557 | 0.562 |
| 53 | 0.954 | 0.962 | 0.577 | 0.582 |
| 54 | 0.960 | 0.967 | 0.598 | 0.603 |
| 55 | 0.965 | 0.971 | 0.619 | 0.623 |
| 56 | 0.969 | 0.975 | 0.641 | 0.645 |
| 57 | 0.973 | 0.979 | 0.663 | 0.667 |
| 58 | 0.977 | 0.982 | 0.685 | 0.689 |
| 59 | 0.980 | 0.985 | 0.708 | 0.712 |
| 60 | 0.983 | 0.988 | 0.731 | 0.735 |
| 61 | 0.986 | 0.990 | 0.756 | 0.759 |
| 62 | 0.988 | 0.992 | 0.780 | 0.783 |
| 63 | 0.990 | 0.994 | 0.805 | 0.808 |
| 64 | 0.992 | 0.995 | 0.831 | 0.833 |
| 65 | 0.994 | 0.996 | 0.857 | 0.859 |
| 66 | 0.995 | 0.997 | 0.884 | 0.886 |
| 67 | 0.997 | 0.998 | 0.912 | 0.913 |
| 68 | 0.998 | 0.998 | 0.941 | 0.941 |
| 69 | 0.999 | 0.999 | 0.970 | 0.970 |
| 70 | 1.000 | 1.000 | 1.000 | 1.000 |

A P P E N D I X 2

Illustration of Increases in Salary
in accordance with salary scales

| <u>Age</u> | <u>Basic Salary Scale</u> | | | | | |
|------------|---------------------------|---------|---------|----------------|---------|---------|
| | <u>Males</u> | | | <u>Females</u> | | |
| 20 | \$1,000 | | | \$1,000 | | |
| 25 | 1,237 | | | 1,233 | | |
| 30 | 1,500 | \$1,000 | | 1,497 | \$1,000 | |
| 35 | 1,749 | 1,166 | | 1,744 | 1,165 | |
| 40 | 1,962 | 1,308 | \$1,000 | 1,944 | 1,299 | \$1,000 |
| 45 | 2,122 | 1,415 | 1,082 | 2,096 | 1,400 | 1,078 |
| 50 | 2,234 | 1,490 | 1,139 | 2,198 | 1,469 | 1,131 |
| 55 | 2,309 | 1,539 | 1,177 | 2,263 | 1,512 | 1,164 |
| 60 | 2,352 | 1,568 | 1,199 | 2,303 | 1,539 | 1,185 |
| 65 | 2,378 | 1,585 | 1,212 | 2,322 | 1,551 | 1,194 |

| <u>Age</u> | <u>Supplementary Salary Scale</u> | | | | | |
|------------|-----------------------------------|---------|---------|----------------|---------|---------|
| | <u>Males</u> | | | <u>Females</u> | | |
| 20 | \$1,000 | | | \$1,000 | | |
| 25 | 1,442 | | | 1,429 | | |
| 30 | 2,021 | \$1,000 | | 2,010 | \$1,000 | |
| 35 | 2,737 | 1,354 | | 2,714 | 1,350 | |
| 40 | 3,558 | 1,760 | \$1,000 | 3,510 | 1,746 | \$1,000 |
| 45 | 4,463 | 2,208 | 1,254 | 4,378 | 2,178 | 1,247 |
| 50 | 5,442 | 2,693 | 1,530 | 5,327 | 2,650 | 1,517 |
| 55 | 6,516 | 3,224 | 1,831 | 6,357 | 3,162 | 1,811 |
| 60 | 7,695 | 3,807 | 2,163 | 7,500 | 3,731 | 2,137 |
| 65 | 9,021 | 4,464 | 2,536 | 8,765 | 4,360 | 2,497 |

A P P E N D I X 3

Select Rates of Termination for all reasons

| Age at beg. of Pens. Svc. | <u>Males</u> | | | | | <u>Females</u> | | | | |
|---------------------------------|---|----------|----------|----------|----------|---|----------|----------|----------|----------|
| | <u>Completed Years of Pensionable Service</u> | | | | | <u>Completed Years of Pensionable Service</u> | | | | |
| | <u>0</u> | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> | <u>0</u> | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> |
| 15 | .3714 | .3116 | .2725 | .1842 | .1174 | .2071 | .1934 | .1895 | .1918 | .1557 |
| 16 | .3492 | .2918 | .2300 | .1674 | .1084 | .2232 | .2171 | .2033 | .2048 | .1707 |
| 17 | .3280 | .2711 | .2080 | .1513 | .0995 | .2391 | .2427 | .2171 | .2178 | .1868 |
| 18 | .3067 | .2491 | .1836 | .1362 | .0907 | .2563 | .2703 | .2318 | .2313 | .2040 |
| 19 | .2856 | .2266 | .1631 | .1228 | .0824 | .2769 | .2999 | .2480 | .2424 | .2142 |
| 20 | .2641 | .2044 | .1422 | .1110 | .0751 | .2990 | .3266 | .2665 | .2496 | .2201 |
| 21 | .2432 | .1827 | .1250 | .1009 | .0691 | .3199 | .3445 | .2840 | .2492 | .2193 |
| 22 | .2218 | .1630 | .1122 | .0922 | .0643 | .3372 | .3505 | .2901 | .2469 | .2120 |
| 23 | .2013 | .1460 | .1025 | .0849 | .0606 | .3490 | .3479 | .2871 | .2395 | .2015 |
| 24 | .1830 | .1325 | .0950 | .0788 | .0574 | .3525 | .3417 | .2794 | .2308 | .1891 |
| 25 | .1715 | .1218 | .0891 | .0738 | .0549 | .3484 | .3331 | .2691 | .2202 | .1765 |
| 26 | .1645 | .1136 | .0845 | .0697 | .0529 | .3421 | .3214 | .2572 | .2079 | .1641 |
| 27 | .1597 | .1073 | .0809 | .0664 | .0511 | .3352 | .3090 | .2455 | .1961 | .1520 |
| 28 | .1564 | .1023 | .0780 | .0638 | .0497 | .3281 | .2970 | .2330 | .1844 | .1401 |
| 29 | .1538 | .0983 | .0757 | .0616 | .0484 | .3206 | .2852 | .2202 | .1729 | .1289 |
| 30 | .1520 | .0952 | .0738 | .0599 | .0475 | .3125 | .2734 | .2077 | .1620 | .1165 |
| 31 | .1504 | .0928 | .0723 | .0585 | .0467 | .3034 | .2620 | .1951 | .1519 | .1089 |
| 32 | .1491 | .0910 | .0710 | .0573 | .0460 | .2953 | .2508 | .1822 | .1422 | .1000 |
| 33 | .1481 | .0897 | .0700 | .0564 | .0455 | .2822 | .2397 | .1697 | .1331 | .0920 |
| 34 | .1474 | .0888 | .0691 | .0557 | .0452 | .2698 | .2286 | .1574 | .1249 | .0850 |
| 35 | .1468 | .0881 | .0684 | .0552 | .0450 | .2571 | .2181 | .1466 | .1178 | .0790 |
| 36 | .1462 | .0877 | .0679 | .0547 | .0448 | .2441 | .2075 | .1375 | .1115 | .0741 |
| 37 | .1458 | .0875 | .0675 | .0544 | .0449 | .2321 | .1972 | .1300 | .1061 | .0699 |
| 38 | .1453 | .0875 | .0672 | .0543 | .0450 | .2212 | .1871 | .1241 | .1017 | .0666 |
| 39 | .1448 | .0876 | .0670 | .0542 | .0452 | .2120 | .1771 | .1195 | .0980 | .0636 |
| 40 | .1444 | .0878 | .0669 | .0542 | .0456 | .2043 | .1676 | .1159 | .0949 | .0614 |
| 41 | .1440 | .0881 | .0669 | .0544 | .0460 | .1977 | .1579 | .1130 | .0924 | .0595 |
| 42 | .1436 | .0885 | .0671 | .0546 | .0465 | .1925 | .1494 | .1107 | .0903 | .0583 |
| 43 | .1432 | .0890 | .0672 | .0549 | .0470 | .1882 | .1423 | .1089 | .0889 | .0574 |
| 44 | .1429 | .0895 | .0675 | .0553 | .0476 | .1848 | .1364 | .1074 | .0877 | .0568 |
| 45 | .1425 | .0901 | .0679 | .0559 | .0484 | .1822 | .1317 | .1064 | .0869 | .0566 |
| 46 | .1422 | .0908 | .0682 | .0565 | .0493 | .1800 | .1280 | .1056 | .0864 | .0567 |
| 47 | .1419 | .0916 | .0688 | .0573 | .0503 | .1785 | .1253 | .1050 | .0861 | .0572 |
| 48 | .1416 | .0924 | .0695 | .0582 | .0516 | .1774 | .1233 | .1046 | .0859 | .0581 |
| 49 | .1412 | .0933 | .0703 | .0593 | .0530 | .1765 | .1219 | .1046 | .0860 | .0593 |
| 50 | .1409 | .0942 | .0713 | .0606 | .0547 | .1759 | .1211 | .1047 | .0864 | .0611 |
| 51 | .1406 | .0952 | .0725 | .0621 | .0567 | .1754 | .1208 | .1052 | .0871 | .0633 |
| 52 | .1404 | .0964 | .0741 | .0642 | .0590 | .1750 | .1208 | .1059 | .0881 | .0661 |
| 53 | .1401 | .0978 | .0759 | .0666 | .0618 | .1748 | .1213 | .1069 | .0896 | .0694 |
| 54 | .1397 | .0993 | .0783 | .0685 | .0650 | .1748 | .1222 | .1082 | .0917 | .0737 |
| 55 | .1394 | .1013 | .0812 | .0730 | .0688 | .1749 | .1234 | .1100 | .0942 | .0790 |

A P P E N D I X 4

Rates of Termination for reasons other
than age, disability or death
(five or more years of pensionable service)*

and

Proportions of Contributors Electing to Take
a Deferred Annuity**

| <u>Age</u> | <u>Males</u> | | <u>Females</u> | |
|------------|-----------------------------|---|-----------------------------|---|
| | <u>Rate of Termination*</u> | <u>Proportion Electing Deferred Annuity</u> | <u>Rate of Termination*</u> | <u>Proportion Electing Deferred Annuity</u> |
| 20 | .0685 | .044 | .1091 | .009 |
| 21 | .0631 | .049 | .1207 | .012 |
| 22 | .0581 | .055 | .1140 | .014 |
| 23 | .0534 | .061 | .1589 | .018 |
| 24 | .0491 | .066 | .1606 | .022 |
| 25 | .0451 | .072 | .1571 | .026 |
| 26 | .0415 | .078 | .1468 | .031 |
| 27 | .0384 | .084 | .1310 | .037 |
| 28 | .0357 | .090 | .1148 | .043 |
| 29 | .0333 | .096 | .1019 | .050 |
| 30 | .0311 | .102 | .0908 | .058 |
| 31 | .0291 | .109 | .0810 | .067 |
| 32 | .0273 | .115 | .0724 | .077 |
| 33 | .0257 | .121 | .0649 | .087 |
| 34 | .0242 | .128 | .0583 | .099 |
| 35 | .0228 | .135 | .0524 | .111 |
| 36 | .0215 | .141 | .0471 | .124 |
| 37 | .0203 | .148 | .0424 | .137 |
| 38 | .0192 | .155 | .0382 | .152 |
| 39 | .0182 | .162 | .0345 | .167 |
| 40 | .0172 | .170 | .0313 | .183 |
| 41 | .0162 | .177 | .0285 | .200 |
| 42 | .0153 | .185 | .0261 | .218 |
| 43 | .0145 | .192 | .0240 | .236 |
| 44 | .0137 | .200 | .0221 | .254 |
| 45 | .0130 | .209 | .0204 | .274 |
| 46 | .0123 | .217 | .0189 | .294 |
| 47 | .0117 | .225 | .0176 | .314 |
| 48 | .0111 | .234 | .0165 | .335 |
| 49 | .0106 | .243 | .0156 | .357 |
| 50 | .0101 | .252 | .0148 | .379 |
| 51 | .0097 | .260 | .0141 | .401 |
| 52 | .0093 | .270 | .0135 | .424 |
| 53 | .0089 | .279 | .0130 | .447 |
| 54 | .0086 | .288 | .0126 | .470 |
| 55 | .0083 | .297 | .0123 | .493 |
| 56 | .0081 | .307 | .0120 | .517 |
| 57 | .0079 | .316 | .0117 | .541 |
| 58 | .0077 | .326 | .0114 | .565 |
| 59 | .0075 | .336 | .0112 | .588 |

* See Note 2 on page 4.

** Contributors dismissed because of misconduct do not have the option of electing to take a deferred annuity.

A P P E N D I X 5

Rates of Retirement because of age*

| <u>Age</u> | <u>Males</u> | <u>Females</u> |
|------------|--------------|----------------|
| 60 | .0870 | .0950 |
| 61 | .0679 | .0799 |
| 62 | .0640 | .0765 |
| 63 | .0734 | .0863 |
| 64 | .0926 | .1060 |
| 65 | .5496 | .5600 |
| 66 | .4312 | .3996 |
| 67 | .3330 | .2674 |
| 68 | .3000 | .2170 |
| 69 | .3654 | .3236 |
| 70 | 1.0000 | 1.0000 |

* See Note 2 on page 4.

A P P E N D I X 6

Rates of Retirement because of disability*

| <u>Age</u> | <u>Males</u> | <u>Females</u> |
|------------|--------------|----------------|
| 15 | .0001 | .0011 |
| 16 | .0001 | .0011 |
| 17 | .0001 | .0011 |
| 18 | .0001 | .0011 |
| 19 | .0001 | .0011 |
| 20 | .0002 | .0011 |
| 21 | .0002 | .0011 |
| 22 | .0002 | .0011 |
| 23 | .0002 | .0011 |
| 24 | .0002 | .0012 |
| 25 | .0002 | .0012 |
| 26 | .0003 | .0012 |
| 27 | .0003 | .0012 |
| 28 | .0003 | .0012 |
| 29 | .0003 | .0012 |
| 30 | .0004 | .0012 |
| 31 | .0004 | .0013 |
| 32 | .0004 | .0013 |
| 33 | .0004 | .0013 |
| 34 | .0005 | .0013 |
| 35 | .0005 | .0014 |
| 36 | .0006 | .0014 |
| 37 | .0006 | .0015 |
| 38 | .0007 | .0015 |
| 39 | .0008 | .0016 |
| 40 | .0009 | .0017 |
| 41 | .0010 | .0018 |
| 42 | .0011 | .0020 |
| 43 | .0013 | .0022 |
| 44 | .0015 | .0024 |
| 45 | .0017 | .0027 |
| 46 | .0020 | .0031 |
| 47 | .0024 | .0036 |
| 48 | .0029 | .0041 |
| 49 | .0035 | .0047 |
| 50 | .0042 | .0054 |
| 51 | .0050 | .0062 |
| 52 | .0059 | .0072 |
| 53 | .0070 | .0085 |
| 54 | .0082 | .0100 |
| 55 | .0095 | .0118 |
| 56 | .0109 | .0139 |
| 57 | .0124 | .0162 |
| 58 | .0140 | .0187 |
| 59 | .0157 | .0214 |

* See Note 2 on page 4.

A P P E N D I X 7

Rates of Mortality for employed contributors

| <u>Age</u> | <u>Males</u> | <u>Females</u> |
|------------|--------------|----------------|
| 20 | .0006 | .0006 |
| 21 | .0006 | .0006 |
| 22 | .0006 | .0006 |
| 23 | .0006 | .0006 |
| 24 | .0006 | .0006 |
| 25 | .0007 | .0006 |
| 26 | .0007 | .0006 |
| 27 | .0007 | .0007 |
| 28 | .0008 | .0007 |
| 29 | .0008 | .0007 |
| 30 | .0009 | .0007 |
| 31 | .0009 | .0007 |
| 32 | .0010 | .0007 |
| 33 | .0011 | .0008 |
| 34 | .0011 | .0008 |
| 35 | .0012 | .0008 |
| 36 | .0013 | .0008 |
| 37 | .0014 | .0008 |
| 38 | .0015 | .0009 |
| 39 | .0017 | .0009 |
| 40 | .0018 | .0010 |
| 41 | .0020 | .0010 |
| 42 | .0022 | .0011 |
| 43 | .0025 | .0011 |
| 44 | .0028 | .0012 |
| 45 | .0032 | .0013 |
| 46 | .0036 | .0014 |
| 47 | .0041 | .0015 |
| 48 | .0046 | .0016 |
| 49 | .0052 | .0018 |
| 50 | .0058 | .0019 |
| 51 | .0064 | .0021 |
| 52 | .0071 | .0023 |
| 53 | .0078 | .0025 |
| 54 | .0085 | .0028 |
| 55 | .0093 | .0030 |
| 56 | .0101 | .0033 |
| 57 | .0110 | .0037 |
| 58 | .0119 | .0040 |
| 59 | .0128 | .0044 |
| 60 | .0138 | .0049 |
| 61 | .0149 | .0054 |
| 62 | .0161 | .0060 |
| 63 | .0175 | .0067 |
| 64 | .0190 | .0075 |
| 65 | .0206 | .0084 |
| 66 | .0225 | .0094 |
| 67 | .0245 | .0106 |
| 68 | .0268 | .0120 |
| 69 | .0292 | .0137 |
| 70 | .0320 | .0157 |

A P P E N D I X 8

Rates of Mortality for contributors retired
for reasons other than disability
and
Annuity Values based thereon

Value of Annuity of \$1.00 per
annum to commence at age 60 or
immediately if age is 60 or over
(interest at 4% per annum)

| <u>Age</u> | <u>Rate of Mortality</u> | | <u>Value of Annuity of \$1.00 per annum to commence at age 60 or immediately if age is 60 or over (interest at 4% per annum)</u> | |
|------------|--------------------------|----------------|--|----------------|
| | <u>Males</u> | <u>Females</u> | <u>Males</u> | <u>Females</u> |
| 50 | .0066 | .0027 | \$ 6.923 | \$ 9.668 |
| 51 | .0073 | .0029 | 7.272 | 10.082 |
| 52 | .0080 | .0031 | 7.650 | 10.516 |
| 53 | .0088 | .0034 | 8.061 | 10.971 |
| 54 | .0097 | .0036 | 8.509 | 11.448 |
| 55 | .0106 | .0039 | 8.999 | 11.949 |
| 56 | .0115 | .0042 | 9.537 | 12.476 |
| 57 | .0125 | .0046 | 10.129 | 13.030 |
| 58 | .0135 | .0049 | 10.785 | 13.613 |
| 59 | .0145 | .0054 | 11.515 | 14.228 |
| 60 | .0157 | .0058 | 12.331 | 14.877 |
| 61 | .0169 | .0064 | 11.999 | 14.540 |
| 62 | .0182 | .0069 | 11.665 | 14.195 |
| 63 | .0197 | .0076 | 11.326 | 13.842 |
| 64 | .0213 | .0083 | 10.985 | 13.481 |
| 65 | .0231 | .0091 | 10.642 | 13.113 |
| 66 | .0250 | .0099 | 10.297 | 12.738 |
| 67 | .0272 | .0109 | 9.950 | 12.355 |
| 68 | .0296 | .0119 | 9.603 | 11.965 |
| 69 | .0322 | .0131 | 9.256 | 11.567 |
| 70 | .0351 | .0144 | 8.909 | 11.162 |
| 71 | .0383 | .0160 | 8.563 | 10.751 |
| 72 | .0418 | .0179 | 8.219 | 10.334 |
| 73 | .0456 | .0201 | 7.878 | 9.915 |
| 74 | .0499 | .0225 | 7.540 | 9.492 |
| 75 | .0545 | .0252 | 7.206 | 9.066 |
| 76 | .0596 | .0285 | 6.876 | 8.639 |
| 77 | .0652 | .0322 | 6.551 | 8.213 |
| 78 | .0714 | .0365 | 6.232 | 7.788 |
| 79 | .0781 | .0414 | 5.920 | 7.367 |
| 80 | .0855 | .0470 | 5.614 | 6.950 |
| 81 | .0936 | .0534 | 5.316 | 6.539 |
| 82 | .1024 | .0608 | 5.026 | 6.135 |
| 83 | .1121 | .0693 | 4.744 | 5.740 |
| 84 | .1227 | .0790 | 4.471 | 5.355 |
| 85 | .1342 | .0901 | 4.208 | 4.982 |
| 86 | .1467 | .1030 | 3.954 | 4.623 |
| 87 | .1603 | .1177 | 3.709 | 4.280 |
| 88 | .1751 | .1345 | 3.475 | 3.955 |
| 89 | .1912 | .1539 | 3.251 | 3.652 |
| 90 | .2085 | .1762 | 3.037 | 3.375 |

A P P E N D I X 9

Rates of Mortality for male contributors retired
because of disability
and
Annuity Values based thereon

| Age | Ultimate Rate (applicable after at least 3 yrs. have elapsed from date of retirement) | Value of Annuity of \$1.00 per annum (interest at 4% per annum) | |
|-----|---|--|--|
| | | At date of retirement | Applicable after at least 3 yrs. have elapsed from date of retirement |
| 25 | .0072 | \$18.232 | \$18.550 |
| 26 | .0073 | 18.093 | 18.408 |
| 27 | .0074 | 17.945 | 18.261 |
| 28 | .0075 | 17.791 | 18.110 |
| 29 | .0076 | 17.630 | 17.952 |
| 30 | .0077 | 17.462 | 17.789 |
| 31 | .0078 | 17.291 | 17.621 |
| 32 | .0080 | 17.113 | 17.445 |
| 33 | .0082 | 16.929 | 17.265 |
| 34 | .0084 | 16.740 | 17.080 |
| 35 | .0086 | 16.543 | 16.889 |
| 36 | .0088 | 16.340 | 16.693 |
| 37 | .0090 | 16.132 | 16.490 |
| 38 | .0093 | 15.918 | 16.281 |
| 39 | .0096 | 15.700 | 16.066 |
| 40 | .0100 | 15.467 | 15.845 |
| 41 | .0103 | 15.232 | 15.620 |
| 42 | .0107 | 14.990 | 15.389 |
| 43 | .0111 | 14.743 | 15.152 |
| 44 | .0116 | 14.494 | 14.909 |
| 45 | .0122 | 14.232 | 14.661 |
| 46 | .0128 | 13.976 | 14.410 |
| 47 | .0135 | 13.712 | 14.154 |
| 48 | .0142 | 13.441 | 13.894 |
| 49 | .0150 | 13.160 | 13.630 |
| 50 | .0158 | 12.858 | 13.364 |
| 51 | .0167 | 12.530 | 13.093 |
| 52 | .0177 | 12.184 | 12.819 |
| 53 | .0188 | 11.868 | 12.543 |
| 54 | .0200 | 11.600 | 12.264 |
| 55 | .0212 | 11.379 | 11.985 |
| 56 | .0225 | 11.190 | 11.703 |
| 57 | .0240 | 11.028 | 11.419 |
| 58 | .0256 | 10.883 | 11.135 |
| 59 | .0273 | 10.750 | 10.851 |
| 60 | .0292 | | 10.567 |
| 65 | .0400 | | 9.167 |
| 70 | .0549 | | 7.798 |
| 75 | .0751 | | 6.479 |
| 80 | .1044 | | 5.234 |
| 85 | .1464 | | 4.092 |
| 90 | .2085 | | 3.037 |

A P P E N D I X 10

Rates of Mortality for female contributors retired
because of disability
and
Annuity Values based thereon

| Age | Ultimate Rate (applicable after at least 3 yrs. have elapsed from date of retirement) | Value of Annuity of \$1.00 per annum (interest at 4% per annum) | |
|-----|---|--|--|
| | | At date of retirement | Applicable after at least 3 yrs. have elapsed from date of retirement |
| 25 | .0069 | \$19.275 | \$19.469 |
| 26 | .0070 | 19.171 | 19.365 |
| 27 | .0071 | 19.062 | 19.257 |
| 28 | .0072 | 18.950 | 19.147 |
| 29 | .0073 | 18.834 | 19.034 |
| 30 | .0074 | 18.716 | 18.917 |
| 31 | .0075 | 18.595 | 18.796 |
| 32 | .0076 | 18.469 | 18.672 |
| 33 | .0077 | 18.340 | 18.544 |
| 34 | .0078 | 18.209 | 18.411 |
| 35 | .0079 | 18.067 | 18.274 |
| 36 | .0080 | 17.920 | 18.132 |
| 37 | .0081 | 17.770 | 17.985 |
| 38 | .0082 | 17.619 | 17.833 |
| 39 | .0084 | 17.461 | 17.675 |
| 40 | .0086 | 17.297 | 17.514 |
| 41 | .0088 | 17.133 | 17.348 |
| 42 | .0090 | 16.960 | 17.177 |
| 43 | .0092 | 16.782 | 17.002 |
| 44 | .0094 | 16.597 | 16.821 |
| 45 | .0096 | 16.405 | 16.635 |
| 46 | .0098 | 16.214 | 16.443 |
| 47 | .0100 | 16.013 | 16.245 |
| 48 | .0103 | 15.808 | 16.040 |
| 49 | .0106 | 15.593 | 15.830 |
| 50 | .0109 | 15.369 | 15.614 |
| 51 | .0112 | 15.132 | 15.392 |
| 52 | .0116 | 14.892 | 15.163 |
| 53 | .0120 | 14.645 | 14.928 |
| 54 | .0124 | 14.408 | 14.688 |
| 55 | .0128 | 14.175 | 14.441 |
| 56 | .0133 | 13.952 | 14.186 |
| 57 | .0138 | 13.736 | 13.926 |
| 58 | .0144 | 13.532 | 13.658 |
| 59 | .0150 | 13.333 | 13.384 |
| 60 | .0157 | | 13.104 |
| 65 | .0203 | | 11.610 |
| 70 | .0277 | | 9.978 |
| 75 | .0401 | | 8.242 |
| 80 | .0620 | | 6.468 |
| 85 | .1048 | | 4.789 |
| 90 | .1762 | | 3.375 |

A P P E N D I X 11

Rates of Remarriage and Mortality for widows

| <u>Age at Widowhood</u> | <u>Rate of Remarriage</u> | | | | | <u>Attained Age</u> | <u>Rate of Mortality</u> |
|-----------------------------|---------------------------|----------------|----------------|-----------------|-----------------|-------------------------|------------------------------|
| | <u>Year of Widowhood</u> | | | | | | |
| | <u>1st yr.</u> | <u>3rd yr.</u> | <u>5th yr.</u> | <u>10th yr.</u> | <u>Ultimate</u> | | |
| 25 | .050 | .148 | .132 | .060 | .028 | 39 | .0022 |
| 30 | .029 | .086 | .076 | .035 | .016 | 44 | .0026 |
| 35 | .018 | .048 | .042 | .019 | .009 | 49 | .0033 |
| 40 | .011 | .027 | .023 | .010 | .004 | 54 | .0050 |
| 45 | .006 | .015 | .012 | .005 | .002 | 59 | .0083 |
| 50 | .004 | .008 | .006 | .002 | .001 | 64 | .0141 |
| 55 | .002 | .004 | .003 | .001 | 0 | 69 | .0232 |
| | | | | | | 74 | .0367 |
| | | | | | | 79 | .0559 |
| | | | | | | 84 | .0822 |
| | | | | | | 89 | .1180 |

Value of Annuity of \$1.00 per annum payable
to death or remarriage of widow
(interest at 4% per annum)

| <u>Age at Widowhood</u> | <u>Year of Widowhood</u> | | | | | <u>Attained Age</u> |
|-----------------------------|--------------------------|----------------|----------------|-----------------|-----------------|-------------------------|
| | <u>1st yr.</u> | <u>3rd yr.</u> | <u>5th yr.</u> | <u>10th yr.</u> | <u>Ultimate</u> | |
| 25 | \$ 8.393 | \$ 8.687 | \$10.453 | \$14.731 | \$16.465 | 39 |
| 30 | 11.992 | 12.306 | 13.644 | 16.232 | 16.854 | 44 |
| 35 | 14.821 | 14.954 | 15.692 | 16.759 | 16.423 | 49 |
| 40 | 16.326 | 16.249 | 16.494 | 16.407 | 15.429 | 54 |
| 45 | 16.717 | 16.421 | 16.279 | 15.414 | 14.013 | 59 |
| 50 | 16.209 | 15.757 | 15.349 | 14.013 | 12.386 | 64 |
| 55 | 15.142 | 14.553 | 13.977 | 12.386 | 10.681 | 69 |
| | | | | | 9.008 | 74 |
| | | | | | 7.447 | 79 |
| | | | | | 6.040 | 84 |
| | | | | | 4.789 | 89 |

A P P E N D I X 12

Proportions of Male Contributors Married at Death;
Average Ages of Widows corresponding to ages of
contributors at death;

and

Values of Children's Benefits per \$1.00 "earned"
annuity per contributor at death

| <u>Age of Contributor at Death</u> | <u>Proportion of Male Contributors Married at Death</u> | | <u>Average Age of Widows</u> | <u>Value of Children's Benefits</u> | |
|--|---|---------------------------------|--------------------------------------|---|---------------------------------|
| | <u>Employed Contributors</u> | <u>Retired Contributors</u> | | <u>Employed Contributors</u> | <u>Retired Contributors</u> |
| 25 | .811 | .315 | 24.36 | \$1.624 | \$0.576 |
| 30 | .826 | .455 | 29.01 | 1.679 | .832 |
| 35 | .844 | .575 | 33.61 | 1.628 | .991 |
| 40 | .864 | .673 | 38.16 | 1.417 | .977 |
| 45 | .885 | .749 | 42.68 | 1.025 | .763 |
| 50 | .901 | .802 | 47.20 | .618 | .476 |
| 55 | .909 | .828 | 51.68 | .316 | .243 |
| 60 | .898 | .826 | 56.14 | .139 | .106 |
| 65 | .867 | .797 | 60.57 | .051 | .039 |
| 70 | .832 | .737 | 64.94 | .016 | .011 |
| 75 | | .646 | 69.19 | | .003 |
| 80 | | .526 | 73.20 | | |
| 85 | | .392 | 76.57 | | |
| 90 | | .263 | 78.58 | | |

A P P E N D I X 13

Capitalized Values of Annuity or Annual Allowance Benefits
per \$1.00 "earned" annuity of contributors at retirement or death
(interest at 4% per annum)

| <u>Age of Contributor at Retirement</u> | <u>On Retirement for reasons other than disability</u> | | <u>On Retirement because of age</u> | |
|---|--|----------------|-------------------------------------|----------------|
| | <u>Males</u> | <u>Females</u> | <u>Males</u> | <u>Females</u> |
| 50 | \$ 9.452 | \$ 9.959 | | |
| 55 | 11.433 | 12.075 | | |
| 60 | | | \$14.138 | \$14.895 |
| 65 | | | 12.437 | 13.141 |
| 70 | | | 10.621 | 11.207 |

On Retirement because of disability

| <u>Age of Contributor at Retirement</u> | <u>Males</u> | <u>Females</u> |
|---|--------------|----------------|
| 25 | \$19.648 | \$19.311 |
| 30 | 19.146 | 18.755 |
| 35 | 18.492 | 18.108 |
| 40 | 17.658 | 17.342 |
| 45 | 16.642 | 16.455 |
| 50 | 15.392 | 15.426 |
| 55 | 14.068 | 14.242 |
| 59 | 13.482 | 13.441 |

On Death leaving dependants entitled to annual allowance

| <u>Age of Contributor at Death</u> | <u>Employed Male Contributors</u> | <u>Retired Male Contributors</u> |
|------------------------------------|-----------------------------------|----------------------------------|
| 25 | \$6.562 | \$5.804 |
| 30 | 8.039 | 7.489 |
| 35 | 9.224 | 8.811 |
| 40 | 9.726 | 9.406 |
| 45 | 9.585 | 9.352 |
| 50 | 9.042 | 8.878 |
| 55 | 8.362 | 8.243 |
| 60 | 7.646 | 7.547 |
| 65 | 6.916 | 6.809 |
| 70 | 6.198 | 6.052 |
| 75 | | 5.312 |
| 80 | | 4.635 |
| 85 | | 4.095 |
| 90 | | 3.787 |

A P P E N D I X 14

Age Distribution of employees who became contributors
during the period from January 1, 1958, to December 31, 1962

| Age | Number | <u>Males</u> | | Number | <u>Females</u> | |
|-----------|--------|----------------------------|------------------------------|--------|----------------------------|------------------------------|
| | | <u>Proportion of Total</u> | <u>Cumulative Proportion</u> | | <u>Proportion of Total</u> | <u>Cumulative Proportion</u> |
| 15 | 4 | - | - | 5 | - | - |
| 16 | 184 | 0.3% | 0.3% | 345 | 0.9% | 0.9% |
| 17 | 736 | 1.2 | 1.5 | 1,988 | 5.3 | 6.2 |
| 18 | 1,214 | 1.9 | 3.4 | 2,960 | 7.8 | 14.0 |
| 19 | 1,929 | 3.0 | 6.4 | 2,672 | 7.1 | 21.1 |
| 20 | 2,097 | 3.3 | 9.7 | 2,071 | 5.5 | 26.6 |
| 21 | 2,087 | 3.3 | 13.0 | 1,814 | 4.8 | 31.4 |
| 22 | 2,193 | 3.5 | 16.5 | 1,745 | 4.6 | 36.0 |
| 23 | 2,208 | 3.5 | 20.0 | 1,606 | 4.2 | 40.2 |
| 24 | 2,110 | 3.3 | 23.3 | 1,393 | 3.7 | 43.9 |
| 25 | 2,060 | 3.3 | 26.6 | 1,240 | 3.3 | 47.2 |
| 26 | 1,886 | 3.0 | 29.6 | 1,091 | 2.9 | 50.1 |
| 27 | 1,820 | 2.9 | 32.5 | 1,021 | 2.7 | 52.8 |
| 28 | 1,755 | 2.8 | 35.3 | 905 | 2.4 | 55.2 |
| 29 | 1,669 | 2.6 | 37.9 | 817 | 2.2 | 57.4 |
| 30 | 1,627 | 2.6 | 40.5 | 788 | 2.1 | 59.5 |
| 31 | 1,509 | 2.4 | 42.9 | 737 | 2.0 | 61.5 |
| 32 | 1,471 | 2.3 | 45.2 | 710 | 1.9 | 63.4 |
| 33 | 1,541 | 2.4 | 47.6 | 778 | 2.1 | 65.5 |
| 34 | 1,615 | 2.5 | 50.1 | 776 | 2.1 | 67.6 |
| 35 | 1,632 | 2.6 | 52.7 | 786 | 2.1 | 69.7 |
| 36 | 1,800 | 2.8 | 55.5 | 787 | 2.1 | 71.8 |
| 37 | 1,894 | 3.0 | 58.5 | 862 | 2.3 | 74.1 |
| 38 | 1,839 | 2.9 | 61.4 | 802 | 2.1 | 76.2 |
| 39 | 1,869 | 2.9 | 64.3 | 830 | 2.2 | 78.4 |
| 40 | 1,692 | 2.7 | 67.0 | 735 | 1.9 | 80.3 |
| 41 | 1,645 | 2.6 | 69.6 | 677 | 1.8 | 82.1 |
| 42 | 1,569 | 2.5 | 72.1 | 659 | 1.7 | 83.8 |
| 43 | 1,384 | 2.2 | 74.3 | 542 | 1.4 | 85.2 |
| 44 | 1,423 | 2.2 | 76.5 | 552 | 1.5 | 86.7 |
| 45 | 1,325 | 2.1 | 78.6 | 523 | 1.4 | 88.1 |
| 46 | 1,288 | 2.0 | 80.6 | 551 | 1.5 | 89.6 |
| 47 | 1,214 | 1.9 | 82.5 | 484 | 1.3 | 90.9 |
| 48 | 1,136 | 1.8 | 84.3 | 461 | 1.2 | 92.1 |
| 49 | 1,072 | 1.7 | 86.0 | 416 | 1.1 | 93.2 |
| 50 | 1,055 | 1.7 | 87.7 | 347 | 0.9 | 94.1 |
| 51 | 1,068 | 1.7 | 89.4 | 360 | 0.9 | 95.0 |
| 52 | 933 | 1.5 | 90.9 | 318 | 0.8 | 95.8 |
| 53 | 850 | 1.3 | 92.2 | 285 | 0.7 | 96.5 |
| 54 | 705 | 1.1 | 93.3 | 274 | 0.7 | 97.2 |
| 55 | 666 | 1.0 | 94.3 | 182 | 0.5 | 97.7 |
| 56 | 610 | 1.0 | 95.3 | 162 | 0.4 | 98.1 |
| 57 | 567 | 0.9 | 96.2 | 155 | 0.4 | 98.5 |
| 58 | 484 | 0.8 | 97.0 | 120 | 0.3 | 98.8 |
| 59 | 432 | 0.7 | 97.7 | 104 | 0.3 | 99.1 |
| 60 | 371 | 0.6 | 98.3 | 106 | 0.3 | 99.4 |
| 61 | 307 | 0.5 | 98.8 | 73 | 0.2 | 99.6 |
| 62 | 227 | 0.4 | 99.2 | 58 | 0.1 | 99.7 |
| 63 | 207 | 0.3 | 99.5 | 32 | 0.1 | 99.8 |
| 64 | 161 | 0.3 | 99.8 | 24 | 0.1 | 99.9 |
| 65 & over | 127 | 0.2 | 100.0 | 21 | 0.1 | 100.0 |
| All ages | 63,267 | | | 37,750 | | |