Twenty-Seventh Actuarial Valuation

of the Assets and Liabilities Under the Railroad Retirement Acts as of December 31, 2016 with Technical Supplement

U.S. Railroad Retirement Board

Bureau of the Actuary and Research

Chicago, Illinois

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by
Frank J. Buzzi, Chief Actuary

with Statements of the Railroad Retirement Board and the Actuarial Advisory Committee

U.S. Railroad Retirement Board
Bureau of the Actuary and Research
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STATEMENT OF THE RAILROAD RETIREMENT BOARD

Section 15(g) of the Railroad Retirement Act of 1974 requires that the Railroad Retirement Board, at intervals not longer than three years, estimate the liabilities created by the Act and include the estimate in its annual report. Section 22 of the Railroad Retirement Act of 1974 requires that the Board submit to the President and the Congress, by July 1 of each year, a report containing a five-year projection of the revenues to and payments from the Railroad Retirement Account. Section 502 of the Railroad Retirement Solvency Act of 1983, Public Law 98-76, requires that the Board submit to the Congress, by July 1 of each year, a report on the actuarial status of the railroad retirement system. The 27th valuation was prepared by the Board's Chief Actuary and meets these requirements. The Actuarial Advisory Committee reviewed the valuation as to assumptions and methods as required by Section 15(f) of the Railroad Retirement Act.

The Chief Actuary's report describes the results of three valuations, each valuation differing from the others as to the employment assumption on which it is based. Cash flow problems occur only under the most pessimistic employment assumption. Even under that assumption, the cash flow problems do not occur until the year 2047.

Section 502 of the Solvency Act requires recommendations with respect to tax rates and whether any part of the taxes on employers should be diverted to the Railroad Unemployment Insurance Account to aid in the repayment of any debt to the Railroad Retirement Account. The Chief Actuary's report does not recommend a change in the tax rate, nor does it recommend a diversion of taxes from the Railroad Retirement Account to the Railroad Unemployment Insurance Account.

The Board Members believe that the 27th valuation presents a fair picture of the financial condition of the railroad retirement system, and we support the conclusions reached in the report.

The Railroad Retirement Board wishes to thank the members of the Actuarial Advisory Committee for their assistance in this important project.

Walter A. Barrows

Steven J. Anthony

STATEMENT OF THE ACTUARIAL ADVISORY COMMITTEE
June 5, 2018

This statement sets forth the Committee's conclusions from their review of the twenty-seventh actuarial valuation of the railroad retirement system. This valuation, performed as of the triennial period ending December 31, 2016, was completed in the spring of 2018 by Mr. Frank J. Buzzi, Chief Actuary of the Railroad Retirement Board, and his staff. In both the planning and carrying out of the valuation, the Committee has counseled with Mr. Buzzi as to the structure, data, actuarial methods, actuarial assumptions, and procedures of the valuation and as to the scope and content of this report. In all, The Committee has met with the Chief Actuary and his staff on May 4, 2017, December 20, 2017, and June 5, 2018, for the purpose of reviewing and discussing the significant elements of the twenty-seventh valuation.

The Committee believes that the actuarial assumptions are reasonable, that the valuation results present a fair picture of the financial conditions of the railroad retirement system and that Mr. Buzzi and his staff's work conform to all the applicable Actuarial Standards of Practice as promulgated by the Actuarial Standards Board.

 Section 502 of the Railroad Retirement Solvency Act requires the Board to report to Congress on the actuarial status of the railroad retirement system each year. The report must include recommendations for any desirable financing changes. The Chief Actuary recommends no change in the payroll tax rates structure under the railroad retirement system based on the results presented in this report. The Actuarial Advisory Committee on review of the assumptions and results concurs with the recommendations of the Chief Actuary.

The Chief Actuary's report indicates that the average cost of the program over the projection period as measured by the excess of the present value of tier 2 payroll taxes over the actuarial surplus or (deficiency) ranges from 16.31 to 21.11% of payroll based on three projected future employment levels as support for the Chief Actuary's recommendation and detailed in table 6 of the report. These results compare to a range of 15.62% to 20.66% of payroll in the twenty-sixth valuation.

The Committee gratefully acknowledges the valuable help of the Board, the Chief Actuary and his staff in assisting the Committee's review of this valuation.

To the best of our knowledge, this report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices that are consistent with the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board. Furthermore, as credentialed actuaries, we meet the Qualification

Standards of the American Academy of Actuaries to render the opinion expressed here with regard to the valuation process and contents of this report.

Respectfully submitted,

Kenneth A. Kent, FSA, FCA, MAAA, EA, Chair

Keith T. Sartain, FSA, FCA, MAAA, EA

Janet M. Barr, ASA, MAAA

REPORT OF THE ACTUARY

I. INTRODUCTION

Section 15 of the Railroad Retirement Act of 1974 requires that the Railroad Retirement Board, at intervals of not more than three years, prepare actuarial valuations of the railroad retirement system.

Section 22 of the Railroad Retirement Act of 1974 requires the Railroad Retirement Board to prepare an annual report containing a five-year projection of revenues to and payments from the Railroad Retirement Account and to submit the report to the President and the Congress by July 1. This report must also contain a five-year projection of the account benefits ratio and average account benefits ratio. If the five-year projection indicates that funds in the Railroad Retirement Account will be insufficient to pay full benefits, (1) representatives of railroad employees, railroad carriers and the President must submit proposals to the Congress to preserve the financial solvency of the Railroad Retirement Account, and (2) the Railroad Retirement Board must issue regulations to reduce annuity levels during any fiscal year in which there would be insufficient funds to make full payments.

Section 502 of the Railroad Retirement Solvency Act of 1983 requires the Railroad Retirement Board to prepare an annual report on the actuarial status of the railroad retirement system and to submit the report to the Congress by July 1. The report must contain recommendations for any financing changes which might be advisable, including (1) changes in the tax rates, and (2) whether any part of the taxes on employers should be diverted to the Railroad Unemployment Insurance Account to aid in the repayment of any debt to the Railroad Retirement Account.

This report, the 27th actuarial valuation, is intended to meet these requirements for 2018. The recommendations required by Section 502 are presented below.

1. No change in the rate of tax imposed on employers and employees is recommended. The tier 2 tax rate schedule maintains a close balance between the present value of future income and expenditures. Although future financing problems are projected to occur under employment assumption III, as discussed below, the absence of projected cash flow problems for at least 29 years under each employment assumption indicates that an immediate change in the tax rate schedule is not required.

2. No diversion of taxes from the Railroad Retirement Account to the Railroad Unemployment Insurance Account is recommended. As of June 5, 2018, there are no loans outstanding from the Railroad Retirement Account to the Railroad Unemployment Insurance Account.

II. SUMMARY OF RECENT DEVELOPMENTS AND RESULTS

The level of railroad employment is important to the system's financial stability. The payroll tax on railroad employment has been the major source of income to the system since its establishment in

the 1930s. It is clear that with a fixed tax rate the fewer railroad workers there are, the less money the retirement account collects in payroll taxes, and the more likely the system is to require additional funds. Declines in railroad employment over a long period, coupled with inflation and subsequent benefit increases, required legislation to strengthen the system's financial condition in 1974, 1981, 1983, and 1987. With the introduction of the average account benefits ratio (page 34 item 36) to automatically adjust the payroll tax rates in 2004 and later, there is less need for corrective legislation.

The 26th valuation (2015 actuarial report) projected a surplus of 0.37 percent of tier 2 payroll and an average projected tier 2 tax rate of 18.20 percent under the intermediate employment assumption. Recent declines in railroad employment have exceeded that projected under the intermediate employment assumption leading to a lower projected tax base and resulting in higher average projected future tax rates. The average tier 2 tax rate has increased to 18.79 percent, and the surplus has declined to 0.32 percent of tier 2 payroll. The combined effect of a 0.59 percent of payroll increase in projected future tier 2 tax rates and a 0.05 percent of payroll decrease in projected surplus results in an increase in cost of 0.64 percent of tier 2 payroll.

The 27th valuation has been prepared under three assumptions as to the future behavior of railroad employment. These employment assumptions are similar to the employment assumptions used in the 26th valuation. Employment assumptions I and II assume stable passenger employment and different rates of decline in freight employment. Employment assumption III follows the structure of assumptions I and II, except that it has declines in passenger employment and steeper declines in freight employment than employment assumptions I and II. Employment assumptions I, II and III are intended to provide an optimistic, moderate and pessimistic outlook, respectively. The specific results of the projections made in this report of the railroad retirement system's financial condition are as follows:

1. Under employment assumption I, the average tier 2 tax rate is 16.78 percent, and an actuarial surplus of 0.47 percent of tier 2 payroll exists as of December 31, 2016. There are no cash flow problems during the 75-year projection period, and the tier 2 payroll tax rate ranges from 12.0% (in calendar years 2076-2079) to 18.0%.

2. Under employment assumption II, the average tier 2 tax rate is 18.79 percent, and an actuarial surplus of 0.32 percent of tier 2 payroll exists as of December 31, 2016. There are no cash flow problems during the 75-year projection period, and the tier 2 payroll tax rate ranges from 18.0% to 27.0%.

3. Under employment assumption III, the average tier 2 tax rate is 20.65 percent, and an actuarial deficiency of 0.46 percent of tier 2 payroll exists as of December 31, 2016. Cash flow problems arise in 2047 and remain to the end of the 75-year projection period. The tier 2 payroll tax rate ranges from 18.0% to 27.0%.

The average tier 2 tax rate is calculated by dividing the present value of tier 2 payroll taxes by the present value of tier 2 payroll as of January 1, 2017. The surplus or deficiency figures given above and illustrated in Table 6 represent the change in the average tier 2 tax rate which would produce a balance of zero in the combined National Railroad Retirement Investment Trust, Railroad

Retirement Account and Social Security Equivalent Benefit Account at the end of the 75-year projection period.

The conclusion is that, barring a sudden, unanticipated, large drop in railroad employment or substantial investment losses, the railroad retirement system will experience no cash flow problems during the next 29 years. The long-term stability of the system, however, is not assured. Under the current financing structure, actual levels of railroad employment and investment return over the coming years will determine whether additional corrective action is necessary.

Section V of this report presents details of the valuations under the three employment assumptions.

III. REGULAR AND SUPPLEMENTAL BENEFITS AND THEIR FINANCING

The Appendix contains a detailed description of the provisions of the current law. Sections III and IV provide a more general summary of the law.

Amounts available for payment of railroad retirement benefits are held in four Accounts: the National Railroad Retirement Investment Trust (NRRIT), the Railroad Retirement (RR) Account, the Social Security Equivalent Benefit (SSEB) Account, and the Dual Benefits Payments Account. Because of their intertwined nature, the NRRIT, RR Account and SSEB Account are discussed together in this section. Dual benefits and the Dual Benefits Payments Account are discussed in a separate section, Section IV.

Amounts held in the NRRIT, RR Account and SSEB Account are mainly used to pay monthly benefits to retired or disabled employees, their spouses, and survivors. The various types of benefits and their eligibility requirements are described in the Appendix. The Accounts also pay out relatively small amounts in lump sums to employees and their survivors in certain cases. The monthly benefits consist of three components, known as tier 1, tier 2 and supplemental annuity.

For all categories of recipients, the gross tier 1 benefit is generally equivalent to the benefit that the social security system would pay if all the employee's earnings (railroad and non-railroad) had been covered under the Social Security Act. Any benefit actually received from social security is subtracted to determine the net tier 1 benefit payable. Section IV explains the logic behind this determination. The cost-of-living increase paid to social security beneficiaries automatically carries over to the tier 1 component of railroad retirement annuities.

There are some differences between social security benefits and tier 1 benefits. The most significant are as follows:

1. An employee may not retire before age 62 under the social security system. Under the railroad retirement system, an employee may retire at age 60 with 30 years of service. A spouse of a 30-year employee may also retire at age 60. If the employee retired after 2001, there is no age reduction.

2. Railroad retirement pays an occupational disability benefit under tier 1 and tier 2. Social security requires total and permanent disability. A five-month waiting period applies under both systems.

3. Widow(er)s who retire at age 60 or 61 under railroad retirement are deemed age 62 in the computation of the tier 1 benefit, resulting in a smaller age reduction than under social security.

4. From the start of the railroad retirement system through 1984, earnings up to a monthly maximum amount were taxed and credited for benefit computation purposes. Social security has always used an annual earnings limit. The 1983 Solvency Act changed railroad retirement to an annual earnings limit for 1985 and later years, but benefit computations for new beneficiaries continue to reflect the pre-1985 use of a monthly limit primarily because of the use of the highest 35 years of indexed earnings in the tier 1 benefit formula.

The formula used to compute the tier 2 component of railroad retirement is comparable to a private pension formula. Under the formula adopted in 1981, the employee tier 2 benefit is equal to 0.7 percent of the employee's average monthly railroad earnings for the 60 months of highest earnings, multiplied by the number of years of railroad service, less 25 percent of any vested dual benefit. Unlike many private pensions, tier 2 benefits (1) provide automatic cost-of-living increases, and (2) are paid to spouses and survivors without any reduction in employee benefit for the payment of these auxiliary benefits.

Before applicable reductions, the tier 2 benefit for spouses and survivors is a specified percentage of the employee's tier 2 benefit. The Appendix lists the percentages and also describes the initial minimum widow(er)'s amount which became payable beginning in calendar year 2002.

The tier 2 cost-of-living increases for employees, spouses and survivors are equal to 32.5 percent of the percentage increase which is used in computing social security increases (and tier 1 increases). The increase is paid at the same time as the tier 1 cost-of-living increase.

The portion of tier 1 benefits which is considered equivalent to social security benefits is subject to Federal income tax under the rules that apply to social security benefits. Tier 2 benefits, the portion of tier 1 benefits in excess of social security benefits, supplemental annuity benefits, and vested dual benefits are subject to Federal income tax under the rules that apply to private pensions.

A railroad retiree may receive a supplemental annuity in addition to his regular annuity if (1) the retiree has a "current connection" with the railroad industry at the time of retirement, and (2) the retiree has attained age 65 with 25 years of railroad service, or attained age 60 with 30 years of railroad service. A current connection is generally defined as at least 12 months of railroad service in the 30 months preceding retirement.

The monthly supplemental annuity benefit is $23, plus $4 for each year of service in excess of 25, with a maximum benefit of $43. No cost-of-living increases are applied. Spouses and survivors do not receive a supplemental annuity.

If the recipient of a supplemental annuity receives a private pension from his railroad employer, the supplemental annuity is reduced by the portion of the private pension that is attributable to the employer's contributions. This reduction is not made if the private pension is reduced for receipt of the supplemental annuity.

The 1981 amendments added the requirement that an employee must have worked in the railroad industry before October 1, 1981, to receive a supplemental annuity. This provision results in phasing out the supplemental annuity over a long period. The last supplemental annuity check will probably not be paid until after 2060.

Benefits paid from the NRRIT, RR Account and SSEB Account are financed by the following sources of income:

1. Payroll tax. Employees and employers pay a tax at the social security rate on earnings in a year up to the social security, or tier 1, earnings limit. There is no limit to earnings subject to the hospital insurance portion of the tier 1 tax rate. Beginning in 2013, employees pay an additional 0.9 percent on earnings above $200,000 (for those who file an individual return) or $250,000 (for those who file a joint return).

    In addition, employers and employees pay a tier 2 tax equal to a percentage of the employee's earnings up to the tier 2 earnings limit. The tier 2 earnings limit is what the social security limit would be if the 1977 social security amendments had not been enacted. The 2018 earnings limits are $128,400 and $95,400 for tier 1 and tier 2, respectively.

    Tier 2 taxes on both employers and employees are based on a 10-year average of the ratio of certain asset balances to the sum of benefits and administrative expenses (the average account benefits ratio). Depending on the average account benefits ratio, the tier 2 tax rate for employers will range between 8.2 percent and 22.1 percent, while the tier 2 tax rate for employees will be between 0 percent and 4.9 percent. This calculation is described in the Appendix.

2. Income tax. The tax on tier 1 benefits up to the social security level is credited to the SSEB Account and then to social security through the financial interchange. Revenue derived from taxing certain RR Account benefits (tier 2 and the excess of tier 1 over the social security level) is transferred to the RR Account.

3. Investment income.

4. The financial interchange with the social security system. This extremely important arrangement, which will be discussed in detail in Section IV, has resulted in the large annual lump sum transfers of money from social security to railroad retirement shown in Table 11.

5. Advances from general revenues related to certain features of the financial interchange. Financial interchange transfers are made in a lump sum for a whole fiscal year in the June following the end of that fiscal year. For example, the transfer reflecting transactions which occurred from October 2015 through September 2016 (fiscal year 2016) took place in June

2017. At any time, therefore, there are between 9 and 21 months' worth of financial interchange transfers that are, in a sense, owed to the railroad retirement system. Railroad retirement receives interest on this money, so this practice does no long-term harm to the financial condition of the railroad retirement system. The lag in the transfers, however, could cause short-term cash flow problems.

In order to avoid the cash flow problems caused by this lag, the 1983 Solvency Act provided for monthly loans to railroad retirement from U.S. Treasury general funds. Each loan is equal to the transfer the Railroad Retirement Board estimates railroad retirement would have received in the preceding month, with interest, if the financial interchange with social security were on an up-to-date basis. Railroad retirement must repay these loans when it receives the transfer from social security against which the money was advanced.

The 1983 Solvency Act created the SSEB Account, effective October 1, 1984. Before that date, all tier 1 benefits, tier 2 benefits, lump sums and administrative expenses had been paid from the RR Account, and all the income described above had been credited to the RR Account. Since then, the SSEB Account has paid the social security level of benefits and the administrative expenses allocable to that level of benefits. The tier 1 portion of the payroll tax, the income taxes on the social security level of benefits, the income from the financial interchange, and the advances from general revenues are credited to the SSEB Account. Repayment of the advances is made from the SSEB Account.

In order to maximize investment returns to the Railroad Retirement system, the Railroad Retirement and Survivors' Improvement Act of 2001 created the National Railroad Retirement Investment Trust (NRRIT) to manage and invest amounts collected in the RR Account and SSEB Account. Since the initial transfer of assets to the NRRIT during calendar years 2002-2004, the NRRIT has been transferring funds back to the RR Account as needed for the payment of benefits. The balance of the SSEB Account not needed to pay current benefits and administrative expenses has generally been transferred annually to the RR Account, reducing the amount needed from the NRRIT.

IV. THE FINANCIAL INTERCHANGE AND DUAL BENEFITS

In the early 1950s, an arrangement known as the financial interchange was established between the railroad retirement and social security systems. The purpose of the financial interchange is to place the social security trust funds in the same financial position they would have been if railroad employment had always been covered under social security. If railroad employment had been covered under social security, social security would have collected taxes on railroad employment, and it would have paid benefits based on railroad employment. Under the financial interchange, the railroad retirement system gives the social security system the taxes social security would have collected, and the social security system gives the railroad retirement system the additional benefits social security would have paid to railroad workers and their families over what it actually pays them.

The word "additional" in the preceding sentence is important, because it is possible for a railroad employee to be covered under both railroad retirement and social security. The social security

coverage may be based on earnings from moonlighting while in a railroad job or from coverage under the two systems at different times. Fulfilling the purpose of the financial interchange requires deducting from social security's fund only the difference between what social security would have paid had it covered railroad employment and what it actually pays the person based on his non-railroad employment. Under the financial interchange, therefore, social security subtracts an employee's social security benefit from the amount it would otherwise give to the railroad retirement system.

This arrangement gave rise to problems that became acute in the early 1970s. The problems arose from the weighting in the social security formula in favor of low-earning, short-service workers. A railroad employee's non-railroad earnings usually added little to the benefit social security would have paid on combined railroad and non-railroad earnings (called gross tier 1 today). However, the employee might qualify for the minimum social security benefit, receiving much more from social security than his non-railroad earnings added to his gross tier 1 benefit.

In order to improve the system's financial condition, the Railroad Retirement Act of 1974 provided that the tier 1 component of the railroad retirement annuity be reduced by any social security benefit. This essentially integrated the two systems and eliminated the advantage of qualifying for benefits under both systems.

It was generally considered unfair to eliminate this advantage entirely for those already retired or close to retirement when the 1974 Act became effective. The 1974 Act, therefore, provided for a restoration of social security benefits that were considered vested at the end of 1974. The restored amount is known as the "vested dual benefit."

Spouses and survivors were not awarded vested dual benefits after August 13, 1981, though they continue to receive these benefits if they were awarded before that date.

Since October 1981, vested dual benefits have been paid from a segregated Dual Benefits Payments Account, and appropriations have been made to that account. This means that, starting in fiscal year 1982, each annual appropriation is to be sufficient to pay the benefits for that year. If the appropriation for a fiscal year is less than required for full funding, the Railroad Retirement Board must reduce benefits to a level that the amount appropriated will cover.

The appropriation for vested dual benefits in fiscal years 1982, 1986 and 1988 were less than required for full funding, resulting in a cutback in benefits during those years. Benefits were cut back in January 1996 due to a lapse in government funding and then restored later that same month. For years other than those mentioned, full benefits have been paid.

Vested dual benefits are phasing out over a long period, and the last vested dual benefit payment will probably be made after 2040.

V. ASSUMPTIONS, METHODOLOGY, AND VALUATION RESULTS

A. Assumptions and Methodology

Average railroad employment is assumed to be 223,000 in 2017 under each of the three employment assumptions. This is the estimated average for the year (subject to later adjustment) and was within the range of 220,000 to 239,000 projected for 2017 under the employment assumptions contained in the 26th actuarial valuation.

Employment assumptions I and II, based on a model developed by the Association of American Railroads, assume that (1) passenger employment will remain at the level of 48,000, and (2) the employment base, excluding passenger employment, will decline at a constant annual rate (0.5 percent for assumption I and 2.0 percent for assumption II) for 25 years, at a reducing rate over the next 25 years, and remain level thereafter.

Employment assumption III differs from employment assumptions I and II by assuming that (1) passenger employment will decline by 500 per year until a level of 40,000 is reached and then remain level, and (2) the employment base, excluding passenger employment, will decline at a constant annual rate of 3.5 percent for 25 years, at a reducing rate over the next 25 years, and remain level thereafter.

Because inflation has been fairly stable at relatively low levels in recent years, only one set of earnings and price inflation assumptions was used in this valuation. The ultimate earnings increase and cost-of-living increase assumptions have been lowered from 3.7% and 2.7% in the 26th valuation to 3.6% and 2.6%, respectively, in the 27th valuation. Table 1. Employment and economic assumptions shows the assumptions used in the 27th valuation. A comparison of historical and projected employment is illustrated in Figure 1.

Only one combination of non-economic assumptions (for example, rates of mortality, disability, retirement, and withdrawal) was used in this valuation. These assumptions, some of which were changed from the 26th valuation to reflect recent experience, are discussed in the Technical Supplement to this report.

Projections were made for the various components of income and outgo under each employment assumption for the 75 calendar years 2017-2091. The projections of these components were combined and the investment income calculated to produce the projected balances in the combined NRRIT and RR Account and in the SSEB Account separately for each year. The results are summarized in Table 2. Present values of the various components of NRRIT and RR Account income and outgo were calculated by discounting amounts in each projection year to December 31, 2016, using a constant 7.0% interest rate. The present values were combined to calculate the NRRIT and RR Account actuarial surplus or deficiency. The derivation of the surplus or deficiency appears in Table 6.

B. Valuation Results

This section sets forth the results of the valuation in the form of a discussion of the tables in which the results appear. Because it is desirable for the discussion of a table to be reasonably self-contained, there is some repetition between tables and between this section and preceding sections of this report.

Table 2. Progress of the Combined National Railroad Retirement Investment Trust (NRRIT) and Railroad Retirement (RR) Account, and the Social Security Equivalent Benefit (SSEB) Account. Projections were made for the various components of income and outgo under each employment assumption for the 75 calendar years 2017-2091. The projections of these components were combined and the investment income calculated to produce the projected balances in the combined NRRIT and RR Account, and the SSEB Account at the end of each projection year. The results are summarized in Table 2.

Table 2 consists of three tables, one for each of employment assumptions I, II, and III. The tables show, for the SSEB Account and the combined NRRIT and RR Account for each projection year, (1) the various elements of income and outgo, (2) the account balance on December 31, and (3) the account benefits ratio, average account benefits ratio and combined employer and employee tier 2 tax rate.

The balances of the RR Account and NRRIT are combined because amounts not needed to pay current benefit and administrative costs are invested by the NRRIT. The SSEB Account is assumed to maintain a target balance of approximately 1.5 months of benefit payments in order to meet benefit obligations and contingencies, and to transfer any excess to the RR Account or NRRIT.

Table 2 indicates that no cash-flow problems arise under employment assumptions I and II (Tables 2-I and 2-II).

Under employment assumption I, the combined account balance decreases slightly through 2021 and increases thereafter. The combined employer and employee tier 2 tax rate remains at 18% through 2041, decreases to 14.0% in 2057 and 12% in 2076, and remains between 12.0% and 14.0% thereafter.

Under employment assumption II, the combined account balance is generally increasing with some declines primarily in 2019 through 2022, and 2040 through 2052. The combined employer and employee tier 2 tax rate remains at 18% through 2044, increases to 27% in 2057-2062, and then generally decreases until reaching 18.0% in 2073.

Under employment assumption III, the combined account balance declines until the balance becomes negative in 2047. Negative after-transfer balances indicate the amount that would be owed, including interest, if unreduced benefits were paid by borrowing from some unknown source. The combined account deficit grows through the end of the projection period, when the balance reaches -$222,507 million. The combined employer and employee tier 2 tax rate increases to 27% in 2042 and remains at that level through the end of the projection period. Under this assumption, the tax rate mechanism does not avoid cash flow problems.

Table 3. Present value of benefits in millions of dollars. This table shows, for each employment assumption, the present value of tier 2 benefits, supplemental annuity benefits and the portion of tier 1 benefits which exceeds the social security level of benefits. The portion of tier 1 benefits in excess of the social security level is referred to as "tier 1 liability." The most important components of this liability were described in Section III. Supplemental annuity benefits are included with tier 2 benefits in this table. The present values are shown separately by type of beneficiary (employee, spouse, survivor) and by employee status on the valuation date (retired, retired and deceased, active, inactive, future entrants).

Table 4. Present value of benefits as a percentage of the present value of tier 2 payroll. The format for this table is the same as for Table 3. Each number in Table 4 was obtained by dividing the corresponding number in Table 3 by the appropriate present value of one percent of tier 2 payroll. The payroll figures are shown in Table 6.

Table 5. Balance of the Combined National Railroad Retirement Investment Trust and Railroad Retirement Account, and the Social Security Equivalent Benefit Account as of December 31, 2016. This table derives the balance in the accounts as of December 31, 2016. No accrual adjustments are made either for financial interchange amounts due and unpaid on that date or for benefits due on January 2, 2017, because these amounts are included in the projected future cash flows. For the purpose of the present value calculations, an adjustment is made as discussed in Table 6 below.

Table 6. Actuarial surplus or (deficiency) for National Railroad Retirement Investment Trust and Railroad Retirement Account. The top half of Table 6 expresses the asset and liability components of the actuarial balance as present values in dollars. The bottom half expresses these components as a percentage of tier 2 payroll. The actuarial surplus or deficiency was calculated for the NRRIT and RR Account, but not for the SSEB Account, for the following reason.

The SSEB Account pays the social security level of benefits and administrative expenses allocable to those benefits, and it receives as income the social security level of taxes. If there were no other source of income or outgo during the course of a year, a surplus or deficiency would build up, depending on whether taxes exceeded or were less than benefits. However, the SSEB Account also receives or pays any financial interchange transfers. The financial interchange transfer, subject to qualifications described in the next paragraph, should be enough to offset any surplus or deficit for the year. Furthermore, this would be the case even if the social security level of benefits or taxes are raised or lowered. The SSEB Account can thus be regarded as automatically funded, the financial interchange being the mechanism for correcting any surplus or deficiency. Therefore, the concept of actuarial balance is not meaningful when applied to the SSEB Account.

The qualification mentioned above arises because, in a relatively small number of cases, the railroad retirement system does not pay benefits when social security would pay benefits. In these cases, mainly dependent children of retired railroad employees, the SSEB Account collects an amount through the financial interchange but does not pay a corresponding benefit. This imbalance between outgo and income is transferred from time to time to the RR Account or NRRIT. The value of these transfers, or amounts available for transfer, is included as an asset in Table 6 as "Available from SSEB Account."

Revenue derived from taxing NRRIT and RR Account benefits (tier 2 and the excess of tier 1 over the social security level) is transferred to the RR Account. The present value of these transfers is shown as an asset in Table 6 as "Income taxes on benefits."

Although the actual return of the trust funds during calendar year 2017 was approximately 16.7%, this rate is not used in the present value calculations. Instead, the present value calculations use 7.0% as the rate for 2017, as well as for the remaining 74 years of the projection. The adjusted balance as of December 31, 2016, is calculated so that, assuming a 7.0% rate of return for 2017, the combined RRA, NRRIT, and SSEBA balance projected on December 31, 2017, is equal to the actual balance on that date.

The cost of the system to the railroad industry may be considered as the excess of "Retirement taxes" over "Actuarial surplus or (deficiency)." Table 6 shows that the cost of the system is much more stable when expressed in dollars than when expressed as a percentage of payroll. For example, the cost of the system under employment assumption III is $63,385 million, or 21.11 percent of payroll, whereas the cost under employment assumption I is $71,811 million, or 16.31 percent of payroll. Using employment assumption III as the base, the percentage cost variation in dollars between the two valuations is 13.29 percent. As a percentage of payroll, the percentage cost variation is 22.74 percent.

Table 7. Unfunded accrued liability. The railroad retirement program is a social insurance program rather than a private pension plan. A private pension plan should build up funds in an orderly way over the working lifetimes of the participants. With a fully funded program, the value of the accumulated assets will be sufficient to discharge all liabilities for the accrued benefits. Pay-as-you-go funding, where the pension costs are charged to the retirement years as the benefits are paid, is not acceptable for a private pension plan because of a lack of participant security. Because private pension plans can terminate, they should, ideally, be fully funded to protect the rights of active and retired participants.

For a social insurance plan, however, the situation is different, and full funding is not necessary. The program is expected to operate indefinitely. Because the program is compulsory, new entrants will constantly be entering the program, and they and their employers will be paying taxes to support the program.

Unlike some other social insurance programs, the railroad retirement program relies on payroll taxes from the employers and employees of a single industry. Although the railroad retirement program is not subject to the funding standards of a private pension plan, it is still of interest to calculate the normal cost and the accrued liability for the plan.

Table 7 illustrates what the funded status would be for the railroad retirement system as of December 31, 2016, using the entry age normal actuarial funding method. The present value of future benefits and the present value of future administrative expenses for former and present employees are shown on lines 1 and 2, respectively. The portion of the actuarial present value of benefits assigned to a particular year is called the normal cost. For the entry age normal actuarial funding method, the normal cost rate is the average cost expressed as a level percentage of payroll

(line 4) that would fund the average employee's benefits, including dependent benefits, and expenses over the employee's working lifetime. The normal cost rate is 7.80% of tier 2 payroll. The accrued liability for the program, shown on line 6, is equal to the difference between the present value of benefits and administrative expenses for former and present employees and the present value of future normal costs. The unfunded accrued liability (line 8) is the difference between the accrued liability and the funds on hand as of December 31, 2016 (line 6 minus line 7). This is the amount needed, in excess of funds on hand and future normal costs, to fund combined NRRIT and RR Account benefits and expenses for former and present employees.

Table 8. Vested dual benefit amounts and average number of beneficiaries. This table shows a projection of vested dual benefit payments for every fiscal year from 2019 through 2030. After 2030, the amounts become insignificant. The amounts shown assume that the benefits are fully funded. Fiscal years are shown because vested dual benefit appropriations are made on a fiscal year basis. The table also indicates the average number of vested dual beneficiaries in each fiscal year. The table applies to all the employment assumptions discussed in this report.

The 1981 amendments removed much of the uncertainty from projections of future vested dual benefit payments. The volatility caused by inflation is gone, since future awards take into account cost-of-living increases from 1975 through 1981, rather than through the date of retirement. Also, awards of these benefits to spouses and widow(er)s ceased after August 13, 1981. The primary uncertainty which remains in projecting future vested dual benefit payments is estimating the relatively high rates of future mortality for the very old.

The projections of vested dual benefit payments by the Railroad Retirement Board are the basis for the agency's requests for appropriated amounts. Generally, a margin of about 2 percent is added to projected amounts to determine the appropriated amounts requested. This margin is needed because of the uncertainties in making projections and to ensure that adequate funds are available for the full payment of vested dual benefits. Appropriated amounts remaining in a fiscal year after all benefit payments have been made are returned to the Treasury.

Table 9. Supplemental annuity benefit amounts and average number of beneficiaries. This table shows a projection of supplemental annuity benefits for every calendar year from 2018 through 2053. Since service before October 1, 1981, is required for a supplemental annuity, benefit amounts after 2053 are relatively insignificant.

Table 10. Average number of railroad retirement annuitants and number of annuitants per full time employee. The left half of Table 10 shows the average number of annuitants under each employment assumption, and the right half shows the average number per full time employee. Under employment assumption I, the average number of annuitants per full time employee generally declines in the first half of the projection period and then remains relatively level. Under employment assumption II, the average number of annuitants per full time employee remains relatively level through 2055 and then declines. Under employment assumption III, the average number of annuitants per full time employee increases steadily to 3.33 in 2049 and declines thereafter.

VI. STATEMENT OF ACTUARIAL OPINION

I meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein. It is my opinion that (1) the techniques and methodology used to evaluate the financial and actuarial status of the Railroad Retirement System are generally accepted within the actuarial profession; and (2) the assumptions used and the resulting actuarial estimates are, in the aggregate, reasonable for the purpose of evaluating the financial and actuarial status of the trust funds, taking into consideration the experience and expectations of the program.

Frank J. Buzzi
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Fellow of the Society of Actuaries
Member of the American Academy of Actuaries
Enrolled Actuary #17-4940

Table 1. Employment and economic assumptions

Calendar year	Average employment (thousands)			Percentage increase over prior year		Investment return
	I	II	III	Earnings	Cost of living[a]	
2017	223	223	223	3.6%	0.3% b	16.7% b
2018	222	220	216	3.6	2.0 b	7.0
2019	221	216	210	3.6	2.6	7.0
2020	220	213	204	3.6	2.6	7.0
2021	220	209	198	3.6	2.6	7.0
2022	219	206	192	3.6	2.6	7.0
2023	218	203	186	3.6	2.6	7.0
2024	217	200	181	3.6	2.6	7.0
2025	216	197	176	3.6	2.6	7.0
2026	215	194	171	3.6	2.6	7.0
2027	215	191	166	3.6	2.6	7.0
2028	214	188	161	3.6	2.6	7.0
2029	213	185	156	3.6	2.6	7.0
2030	212	183	152	3.6	2.6	7.0
2031	211	180	147	3.6	2.6	7.0
2032	210	177	143	3.6	2.6	7.0
2033	210	175	139	3.6	2.6	7.0
2034	209	172	136	3.6	2.6	7.0
2035	208	170	132	3.6	2.6	7.0
2036	207	167	129	3.6	2.6	7.0
2037	206	165	126	3.6	2.6	7.0
2038	206	163	123	3.6	2.6	7.0
2039	205	160	120	3.6	2.6	7.0
2040	204	158	117	3.6	2.6	7.0
2041	203	156	114	3.6	2.6	7.0
2042	202	154	112	3.6	2.6	7.0
2043	202	152	109	3.6	2.6	7.0
2044	201	150	107	3.6	2.6	7.0
2045	200	148	105	3.6	2.6	7.0
2046	200	146	103	3.6	2.6	7.0
2047	199	145	101	3.6	2.6	7.0
2048	199	143	100	3.6	2.6	7.0
2049	198	142	98	3.6	2.6	7.0
2050	197	141	97	3.6	2.6	7.0
2051	197	139	96	3.6	2.6	7.0
2052	197	138	94	3.6	2.6	7.0
2053	196	137	93	3.6	2.6	7.0
2054	196	136	92	3.6	2.6	7.0
2055	195	135	92	3.6	2.6	7.0
2056	195	135	91	3.6	2.6	7.0
2057	195	134	90	3.6	2.6	7.0
2058	195	133	89	3.6	2.6	7.0
2059	194	133	89	3.6	2.6	7.0
2060	194	132	88	3.6	2.6	7.0
2061	194	132	88	3.6	2.6	7.0
2062	194	132	88	3.6	2.6	7.0
2063	194	131	87	3.6	2.6	7.0
2064	194	131	87	3.6	2.6	7.0
2065	193	131	87	3.6	2.6	7.0
2066	193	131	87	3.6	2.6	7.0
2067-2091	193	131	87	3.6	2.6	7.0

[a] Page 31 item 16.

[b] Actual.

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Figure 1. Average Railroad Employment 1937-2091, Historical and Projected

Employment Assumption I

Employment Assumption II

Employment Assumption III

Calendar Year

Table 2-I. Progress of the Combined National Railroad Retirement Investment Trust (NRRIT) and Railroad Retirement (RR) Account, and
the Social Security Equivalent Benefit (SSEB) Account under Employment Assumption I
(Dollar amounts in millions)

Calendar year	Average Account benefits ratio[a]	Average account benefits ratio[b]	Tier 2 tax rate	Combined NRRIT and RR Account				SSEB Account				Combined balance, end year
				Benefits and admin-istration	Tax income[c]	Other income[d]	Balance, end year	Benefits and admin-istration	Tax income[c]	Other income and expense[e]	Balance, end year	
2018	4.92	5.20	18.0%	$5,629	$3,559	$2,163	$27,353	$7,320	$3,230	$4,043	$912	$28,265
2019	4.84	5.10	18.0%	5,696	3,670	1,938	27,264	7,545	3,348	4,225	940	28,204
2020	4.79	5.00	18.0%	5,753	3,785	1,939	27,234	7,753	3,471	4,308	965	28,199
2021	4.73	5.00	18.0%	5,798	3,903	1,837	27,177	7,954	3,600	4,365	977	28,154
2022	4.72	5.00	18.0%	5,835	4,025	1,934	27,301	8,147	3,733	4,452	1,014	28,315
2023	4.73	4.90	18.0%	5,873	4,151	1,965	27,544	8,326	3,869	4,480	1,037	28,581
2024	4.75	4.90	18.0%	5,917	4,278	1,990	27,895	8,496	4,006	4,511	1,058	28,953
2025	4.77	4.90	18.0%	5,968	4,408	1,939	28,274	8,663	4,145	4,538	1,078	29,352
2026	4.83	4.90	18.0%	6,021	4,604	2,057	28,914	8,831	4,357	4,495	1,099	30,013
2027	4.91	4.90	18.0%	6,080	4,740	2,107	29,681	9,001	4,503	4,519	1,120	30,801
2028	4.99	4.90	18.0%	6,156	4,879	2,166	30,571	9,173	4,651	4,543	1,142	31,713
2029	5.08	4.90	18.0%	6,250	5,022	2,233	31,576	9,348	4,788	4,582	1,163	32,739
2030	5.17	4.90	18.0%	6,354	5,169	2,307	32,698	9,528	4,928	4,622	1,186	33,884
2031	5.27	4.90	18.0%	6,466	5,320	2,357	33,910	9,719	5,072	4,670	1,209	35,119
2032	5.39	5.00	18.0%	6,574	5,476	2,478	35,289	9,922	5,222	4,726	1,235	36,524
2033	5.53	5.00	18.0%	6,671	5,637	2,579	36,833	10,140	5,378	4,789	1,262	38,095
2034	5.69	5.10	18.0%	6,785	5,803	2,693	38,544	10,359	5,539	4,847	1,289	39,833
2035	5.84	5.20	18.0%	6,933	5,976	2,817	40,403	10,576	5,703	4,900	1,316	41,719
2036	5.99	5.30	18.0%	7,091	6,154	2,946	42,412	10,804	5,872	4,960	1,344	43,756
2037	6.15	5.40	18.0%	7,258	6,338	3,095	44,587	11,044	6,047	5,027	1,374	45,961
2038	6.32	5.60	18.0%	7,443	6,529	3,251	46,925	11,287	6,228	5,089	1,404	48,329
2039	6.49	5.70	18.0%	7,630	6,728	3,419	49,441	11,537	6,418	5,150	1,435	50,876
2040	6.67	5.80	18.0%	7,821	6,936	3,599	52,155	11,798	6,616	5,213	1,467	53,622
2041	6.85	6.00	18.0%	8,042	7,150	3,790	55,053	12,069	6,820	5,283	1,501	56,554
2042	6.98	6.10	17.0%	8,294	6,998	3,982	57,739	12,361	7,028	5,369	1,537	59,276
2043	7.09	6.30	17.0%	8,565	7,216	4,171	60,561	12,671	7,245	5,465	1,576	62,137
2044	7.15	6.50	16.0%	8,865	7,048	4,354	63,098	12,997	7,470	5,567	1,616	64,714
2045	7.19	6.60	16.0%	9,191	7,272	4,532	65,710	13,343	7,704	5,682	1,659	67,369
2046	7.23	6.70	16.0%	9,515	7,506	4,714	68,414	13,716	7,951	5,811	1,705	70,119
2047	7.28	6.90	16.0%	9,821	7,751	4,904	71,247	14,123	8,215	5,959	1,756	73,003
2048	7.32	7.00	15.0%	10,126	7,556	5,087	73,764	14,557	8,492	6,120	1,810	75,574
2049	7.36	7.10	15.0%	10,424	7,808	5,267	76,415	15,009	8,786	6,279	1,866	78,281
2050	7.39	7.20	15.0%	10,773	8,072	5,456	79,171	15,468	9,089	6,436	1,923	81,094
2051	7.37	7.20	15.0%	11,201	8,345	5,652	81,967	15,923	9,395	6,584	1,979	83,946
2052	7.36	7.30	15.0%	11,593	8,626	5,845	84,845	16,432	9,719	6,776	2,043	86,888
2053	7.41	7.30	15.0%	11,910	8,916	6,047	87,899	17,007	10,065	7,013	2,114	90,013
2054	7.49	7.40	15.0%	12,203	9,220	6,271	91,187	17,587	10,431	7,227	2,186	93,373
2055	7.57	7.40	15.0%	12,550	9,538	6,512	94,687	18,150	10,808	7,412	2,256	96,943
2056	7.61	7.40	15.0%	12,977	9,868	6,765	98,344	18,698	11,190	7,576	2,324	100,668
2057	7.62	7.50	14.0%	13,398	9,600	7,000	101,545	19,286	11,587	7,772	2,397	103,942
2058	7.64	7.50	14.0%	13,794	9,929	7,226	104,906	19,926	12,002	8,003	2,477	107,383
2059	7.67	7.50	14.0%	14,204	10,270	7,468	108,440	20,579	12,432	8,228	2,558	110,998
2060	7.70	7.60	14.0%	14,640	10,625	7,722	112,148	21,247	12,877	8,453	2,641	114,789
2061	7.72	7.60	14.0%	15,105	10,994	7,988	116,024	21,934	13,337	8,682	2,726	118,750
2062	7.74	7.60	14.0%	15,591	11,376	8,264	120,073	22,647	13,814	8,921	2,815	122,888
2063	7.76	7.70	14.0%	16,093	11,772	8,553	124,305	23,388	14,309	9,172	2,907	127,212
2064	7.78	7.70	14.0%	16,617	12,184	8,855	128,727	24,158	14,822	9,431	3,002	131,729
2065	7.81	7.70	14.0%	17,162	12,612	9,170	133,347	24,959	15,356	9,703	3,102	136,449
2070	7.91	7.80	14.0%	20,285	15,014	10,962	159,604	29,464	18,339	11,245	3,662	163,266
2075	7.99	7.90	14.0%	24,122	17,899	13,156	191,740	34,944	21,917	13,174	4,342	196,082
2080	7.63	7.90	14.0%	28,775	21,360	15,015	218,424	41,609	26,206	15,582	5,171	223,595
2085	7.62	7.80	14.0%	34,387	25,504	17,915	260,634	49,698	31,354	18,561	6,176	266,810
2090	7.62	7.70	14.0%	41,030	30,456	21,380	311,046	59,478	37,525	22,214	7,391	318,437
2091	7.62	7.70	14.0%	42,507	31,555	22,149	322,243	61,666	38,896	23,042	7,663	329,906

[a] The fair market value of the assets in the RR Account and NRRIT as of the close of the fiscal year (September 30) divided by the total benefits and administrative expenses paid from the RR Account and NRRIT during the fiscal year.

[b] The average of the account benefits ratios for the 10 most recent fiscal years ending before the calendar year.

[c] Includes payroll taxes and income taxes on benefits.

[d] Includes investment income and transfers from SSEB Account.

[e] Other income includes financial interchange income, advances from general revenues, and interest income. Other expense includes repayment of advances from general revenues and transfers to the NRRIT or RRA.

Table 2-II. Progress of the Combined National Railroad Retirement Investment Trust (NRRIT) and Railroad Retirement (RR) Account, and
the Social Security Equivalent Benefit (SSEB) Account under Employment Assumption II
(Dollar amounts in millions)

Calendar year	Average Account benefits ratio[a]	Average account benefits ratio[b]	Tier 2 tax rate	Combined NRRIT and RR Account Benefits and administration	Tax income[c]	Other income[d]	Balance, end year	SSEB Account Benefits and administration	Tax income[c]	Other income and expense[e]	Balance, end year	Combined balance, end year
2018	4.92	5.20	18.0%	$5,629	$3,540	$2,163	$27,333	$7,320	$3,213	$4,060	$912	$28,245
2019	4.83	5.10	18.0%	5,696	3,614	1,934	27,186	7,545	3,300	4,273	940	28,126
2020	4.76	5.00	18.0%	5,753	3,693	1,930	27,056	7,753	3,391	4,388	965	28,021
2021	4.68	5.00	18.0%	5,797	3,772	1,819	26,850	7,954	3,485	4,480	976	27,826
2022	4.64	5.00	18.0%	5,834	3,853	1,904	26,773	8,147	3,580	4,605	1,014	27,787
2023	4.61	4.90	18.0%	5,871	3,935	1,920	26,757	8,326	3,676	4,672	1,037	27,794
2024	4.58	4.90	18.0%	5,915	4,015	1,925	26,783	8,495	3,771	4,745	1,058	27,841
2025	4.54	4.80	18.0%	5,964	4,096	1,850	26,764	8,662	3,865	4,817	1,078	27,842
2026	4.52	4.80	18.0%	6,016	4,239	1,937	26,924	8,829	4,029	4,820	1,099	28,023
2027	4.51	4.70	18.0%	6,073	4,321	1,952	27,123	8,998	4,125	4,894	1,120	28,243
2028	4.50	4.70	18.0%	6,147	4,403	1,969	27,348	9,168	4,219	4,969	1,141	28,489
2029	4.47	4.70	18.0%	6,239	4,485	1,987	27,581	9,339	4,301	5,060	1,162	28,743
2030	4.44	4.60	18.0%	6,340	4,569	2,005	27,816	9,516	4,383	5,155	1,184	29,000
2031	4.40	4.60	18.0%	6,448	4,655	1,990	28,013	9,701	4,465	5,259	1,207	29,220
2032	4.36	4.60	18.0%	6,552	4,742	2,038	28,241	9,898	4,550	5,372	1,232	29,473
2033	4.34	4.50	18.0%	6,644	4,831	2,056	28,483	10,107	4,640	5,493	1,258	29,741
2034	4.31	4.50	18.0%	6,752	4,923	2,076	28,731	10,316	4,730	5,611	1,283	30,014
2035	4.26	4.50	18.0%	6,892	5,018	2,096	28,952	10,520	4,821	5,725	1,309	30,261
2036	4.20	4.50	18.0%	7,041	5,115	2,106	29,133	10,734	4,913	5,848	1,335	30,468
2037	4.13	4.40	18.0%	7,198	5,215	2,125	29,275	10,958	5,008	5,977	1,363	30,638
2038	4.05	4.40	18.0%	7,371	5,318	2,136	29,358	11,180	5,105	6,103	1,391	30,749
2039	3.96	4.30	18.0%	7,543	5,426	2,143	29,384	11,406	5,207	6,227	1,419	30,803
2040	3.87	4.30	18.0%	7,716	5,539	2,145	29,352	11,639	5,315	6,353	1,447	30,799
2041	3.76	4.20	18.0%	7,917	5,654	2,142	29,231	11,878	5,423	6,485	1,477	30,708
2042	3.63	4.20	18.0%	8,144	5,772	2,133	28,991	12,132	5,532	6,632	1,509	30,500
2043	3.49	4.10	18.0%	8,388	5,896	2,115	28,614	12,399	5,647	6,785	1,542	30,156
2044	3.33	4.00	18.0%	8,657	6,028	2,087	28,071	12,675	5,767	6,942	1,576	29,647
2045	3.17	3.90	19.0%	8,950	6,468	2,057	27,646	12,965	5,892	7,109	1,612	29,258
2046	3.01	3.80	19.0%	9,237	6,621	2,025	27,056	13,275	6,027	7,286	1,650	28,706
2047	2.85	3.70	19.0%	9,501	6,784	1,982	26,321	13,611	6,176	7,477	1,692	28,013
2048	2.69	3.60	19.0%	9,753	6,955	1,932	25,455	13,962	6,334	7,672	1,735	27,190
2049	2.56	3.40	20.0%	9,989	7,473	1,888	24,827	14,317	6,508	7,853	1,779	26,606
2050	2.42	3.30	20.0%	10,266	7,676	1,847	24,084	14,668	6,687	8,025	1,823	25,907
2051	2.27	3.10	20.0%	10,593	7,884	1,798	23,174	15,007	6,867	8,183	1,865	25,039
2052	2.12	3.00	20.0%	10,845	8,103	1,734	22,166	15,394	7,065	8,378	1,913	24,079
2053	2.08	2.80	23.0%	11,023	9,446	1,709	22,298	15,820	7,279	8,593	1,966	24,264
2054	2.07	2.70	23.0%	11,187	9,725	1,733	22,568	16,221	7,509	8,762	2,016	24,584
2055	2.07	2.60	23.0%	11,394	10,015	1,765	22,955	16,596	7,744	8,899	2,062	25,017
2056	2.06	2.50	23.0%	11,652	10,315	1,804	23,422	16,945	7,981	9,008	2,105	25,527
2057	2.19	2.40	27.0%	11,869	12,306	1,906	25,765	17,325	8,231	9,141	2,152	27,917
2058	2.37	2.30	27.0%	12,066	12,683	2,080	28,462	17,729	8,494	9,285	2,202	30,664
2059	2.58	2.30	27.0%	12,281	13,076	2,285	31,543	18,117	8,766	9,399	2,250	33,793
2060	2.80	2.30	27.0%	12,512	13,486	2,514	35,031	18,506	9,048	9,507	2,298	37,329
2061	3.05	2.30	27.0%	12,761	13,913	2,771	38,954	18,900	9,340	9,609	2,347	41,301
2062	3.32	2.40	27.0%	13,020	14,359	3,059	43,353	19,304	9,644	9,711	2,397	45,750
2063	3.49	2.50	23.0%	13,288	12,789	3,303	46,157	19,721	9,961	9,812	2,448	48,605
2064	3.65	2.70	23.0%	13,565	13,208	3,510	49,311	20,149	10,291	9,911	2,501	51,812
2065	3.83	2.80	23.0%	13,855	13,646	3,742	52,844	20,595	10,637	10,013	2,556	55,400
2070	4.23	3.70	19.0%	15,562	13,559	4,636	65,237	23,092	12,600	10,560	2,866	68,103
2075	4.56	4.20	18.0%	17,745	15,323	5,671	80,339	26,204	14,975	11,313	3,253	83,592
2080	4.94	4.60	18.0%	20,555	18,230	7,052	100,844	30,129	17,837	12,399	3,740	104,584
2085	5.44	5.00	18.0%	24,025	21,730	9,027	130,241	35,079	21,296	13,918	4,354	134,595
2090	6.12	5.50	18.0%	28,177	25,922	11,836	172,130	41,247	25,466	15,947	5,120	177,250
2091	6.28	5.60	18.0%	29,107	26,853	12,524	182,399	42,647	26,393	16,427	5,294	187,693

[a] The fair market value of the assets in the RR Account and NRRIT as of the close of the fiscal year (September 30) divided by the total benefits and administrative expenses paid from the RR Account and NRRIT during the fiscal year.

[b] The average of the account benefits ratios for the 10 most recent fiscal years ending before the calendar year.

[c] Includes payroll taxes and income taxes on benefits.

[d] Includes investment income and transfers from SSEB Account.

[e] Other income includes financial interchange income, advances from general revenues, and interest income. Other expense includes repayment of advances from general revenues and transfers to the NRRIT or RRA.
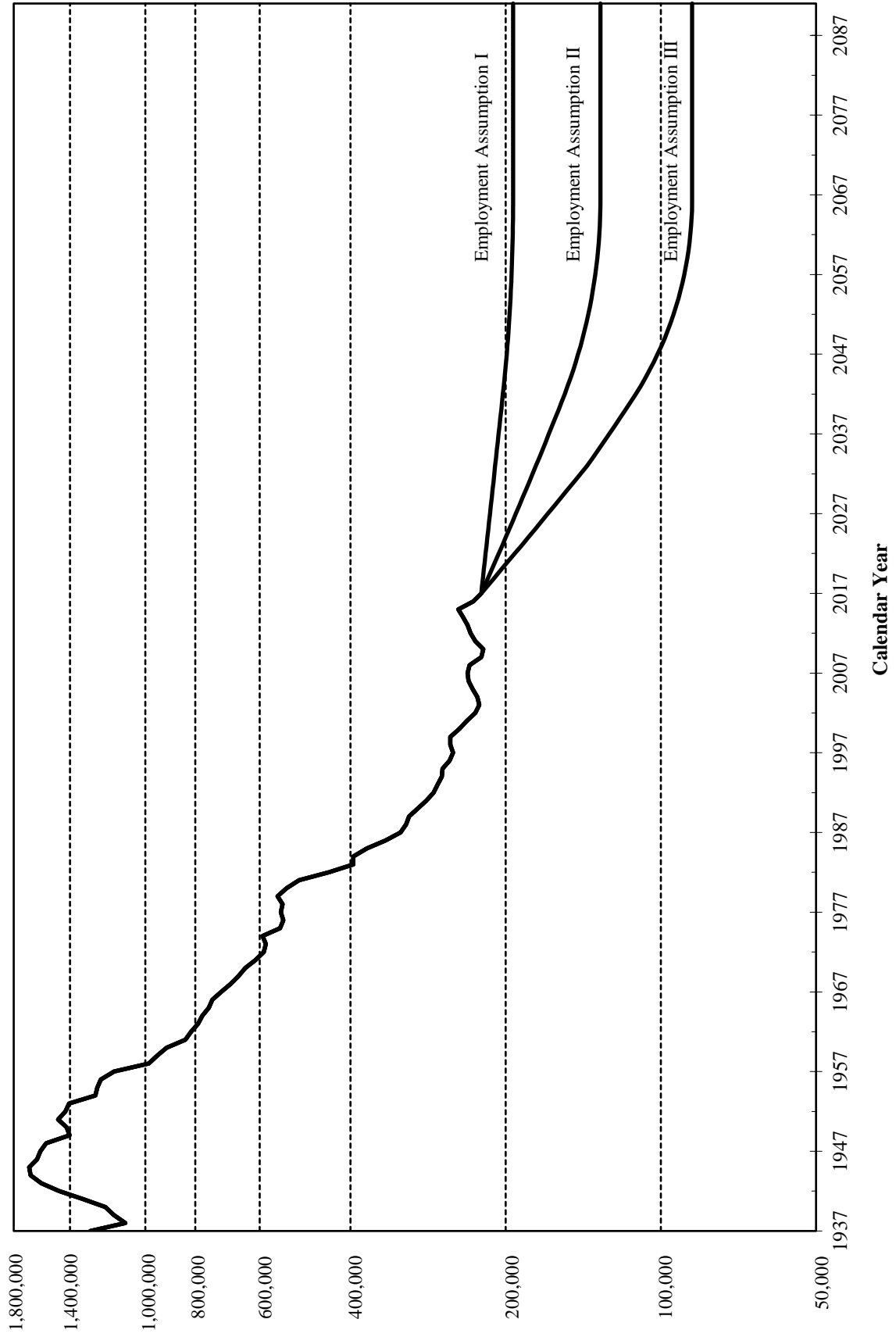
Table 2-III. Progress of the Combined National Railroad Retirement Investment Trust (NRRIT) and Railroad Retirement (RR) Account, and
the Social Security Equivalent Benefit (SSEB) Account under Employment Assumption III
(Dollar amounts in millions)

Calendar year	Average Account benefits ratio[a]	Average account benefits ratio[b]	Tier 2 tax rate	Combined NRRIT and RR Account Benefits and admin- istration	Tax income[c]	Other income[d]	Balance, end year	SSEB Account Benefits and admin- istration	Tax income[c]	Other income and expense[e]	Balance, end year	Combined balance, end year
2018	4.92	5.20	18.0%	$5,629	$3,518	$2,162	$27,310	$7,320	$3,194	$4,079	$912	$28,222
2019	4.82	5.10	18.0%	5,696	3,550	1,930	27,094	7,545	3,244	4,330	940	28,034
2020	4.73	5.00	18.0%	5,753	3,586	1,920	26,847	7,753	3,297	4,482	965	27,812
2021	4.62	5.00	18.0%	5,797	3,622	1,799	26,471	7,954	3,352	4,613	976	27,447
2022	4.54	4.90	18.0%	5,832	3,657	1,870	26,165	8,147	3,406	4,779	1,014	27,179
2023	4.46	4.90	18.0%	5,869	3,691	1,868	25,855	8,326	3,459	4,889	1,037	26,892
2024	4.38	4.80	18.0%	5,912	3,721	1,850	25,514	8,495	3,508	5,008	1,058	26,572
2025	4.27	4.80	18.0%	5,960	3,749	1,748	25,051	8,661	3,554	5,127	1,078	26,129
2026	4.17	4.70	18.0%	6,011	3,839	1,802	24,681	8,827	3,669	5,179	1,099	25,780
2027	4.06	4.60	18.0%	6,066	3,864	1,778	24,257	8,994	3,712	5,302	1,120	25,377
2028	3.94	4.50	18.0%	6,138	3,888	1,749	23,757	9,162	3,753	5,429	1,140	24,897
2029	3.79	4.40	18.0%	6,227	3,911	1,714	23,156	9,330	3,779	5,571	1,161	24,317
2030	3.63	4.30	18.0%	6,324	3,934	1,672	22,437	9,501	3,803	5,719	1,182	23,619
2031	3.44	4.20	18.0%	6,428	3,956	1,588	21,553	9,680	3,827	5,876	1,205	22,758
2032	3.24	4.10	18.0%	6,527	3,978	1,558	20,561	9,870	3,850	6,043	1,228	21,789
2033	3.03	4.00	18.0%	6,614	4,004	1,488	19,438	10,070	3,879	6,215	1,253	20,691
2034	2.82	3.80	19.0%	6,715	4,228	1,418	18,370	10,267	3,911	6,380	1,277	19,647
2035	2.60	3.70	19.0%	6,848	4,264	1,343	17,129	10,458	3,943	6,539	1,301	18,430
2036	2.35	3.50	19.0%	6,988	4,301	1,250	15,691	10,657	3,976	6,705	1,326	17,017
2037	2.10	3.30	20.0%	7,135	4,538	1,160	14,254	10,862	4,011	6,876	1,351	15,605
2038	1.83	3.10	20.0%	7,297	4,582	1,059	12,599	11,063	4,047	7,040	1,376	13,975
2039	1.61	2.90	23.0%	7,455	5,233	965	11,342	11,262	4,087	7,200	1,401	12,743
2040	1.40	2.70	23.0%	7,613	5,291	877	9,897	11,465	4,132	7,359	1,426	11,323
2041	1.16	2.50	23.0%	7,796	5,352	772	8,225	11,671	4,176	7,521	1,451	9,676
2042	0.98	2.30	27.0%	8,002	6,239	685	7,147	11,886	4,219	7,694	1,478	8,625
2043	0.80	2.00	27.0%	8,224	6,316	607	5,846	12,107	4,267	7,867	1,505	7,351
2044	0.60	1.80	27.0%	8,467	6,401	514	4,294	12,330	4,319	8,039	1,533	5,827
2045	0.38	1.60	27.0%	8,730	6,494	401	2,459	12,563	4,375	8,217	1,562	4,021
2046	0.14	1.40	27.0%	8,983	6,597	269	342	12,810	4,440	8,401	1,592	1,934
2047	0.06	1.10	27.0%	9,209	6,712	1,744	(411)	13,075	4,515	6,968	-	(411)
2048	-0.21	0.90	27.0%	9,419	6,839	(13)	(3,004)	13,343	4,600	8,743	-	(3,004)
2049	-0.49	0.70	27.0%	9,601	6,985	(194)	(5,814)	13,600	4,700	8,901	-	(5,814)
2050	-0.79	0.50	27.0%	9,816	7,137	(391)	(8,884)	13,844	4,801	9,043	-	(8,884)
2051	-1.10	0.30	27.0%	10,046	7,295	(606)	(12,242)	14,070	4,904	9,166	-	(12,242)
2052	-1.43	0.10	27.0%	10,162	7,467	(837)	(15,773)	14,340	5,027	9,313	-	(15,773)
2053	-1.77	-0.30	27.0%	10,208	7,651	(1,077)	(19,407)	14,620	5,163	9,457	-	(19,407)
2054	-2.13	-0.50	27.0%	10,248	7,852	(1,323)	(23,126)	14,846	5,309	9,537	-	(23,126)
2055	-2.48	-0.80	27.0%	10,323	8,060	(1,577)	(26,966)	15,038	5,454	9,583	-	(26,966)
2056	-2.84	-1.10	27.0%	10,416	8,273	(1,839)	(30,948)	15,199	5,601	9,598	-	(30,948)
2057	-3.21	-1.40	27.0%	10,432	8,498	(2,109)	(34,992)	15,385	5,762	9,623	-	(34,992)
2058	-3.60	-1.70	27.0%	10,427	8,730	(2,381)	(39,070)	15,567	5,929	9,638	-	(39,070)
2059	-3.99	-2.00	27.0%	10,449	8,974	(2,657)	(43,201)	15,706	6,100	9,606	-	(43,201)
2060	-4.38	-2.40	27.0%	10,477	9,228	(2,936)	(47,387)	15,837	6,276	9,562	-	(47,387)
2061	-4.76	-2.70	27.0%	10,515	9,493	(3,220)	(51,629)	15,965	6,457	9,507	-	(51,629)
2062	-5.15	-3.10	27.0%	10,553	9,770	(3,506)	(55,920)	16,093	6,647	9,446	-	(55,920)
2063	-5.54	-3.50	27.0%	10,598	10,060	(3,796)	(60,254)	16,224	6,845	9,380	-	(60,254)
2064	-5.92	-3.90	27.0%	10,656	10,365	(4,089)	(64,635)	16,360	7,051	9,309	-	(64,635)
2065	-6.29	-4.20	27.0%	10,725	10,686	(4,385)	(69,059)	16,507	7,268	9,239	-	(69,059)
2070	-7.97	-6.10	27.0%	11,361	12,545	(5,917)	(92,039)	17,439	8,504	8,935	-	(92,039)
2075	-9.26	-7.80	27.0%	12,482	14,832	(7,576)	(117,065)	18,901	10,019	8,882	-	(117,065)
2080	-10.16	-9.10	27.0%	14,166	17,623	(9,445)	(145,400)	21,079	11,875	9,203	-	(145,400)
2085	-10.82	-10.10	27.0%	16,298	21,017	(11,589)	(177,972)	24,087	14,159	9,928	-	(177,972)
2090	-11.35	-10.80	27.0%	18,760	25,102	(14,008)	(214,693)	27,975	16,944	11,031	-	(214,693)
2091	-11.44	-10.90	27.0%	19,299	26,008	(14,523)	(222,507)	28,865	17,565	11,300	-	(222,507)

[a] The fair market value of the assets in the RR Account and NRRIT as of the close of the fiscal year (September 30) divided by the total benefits and administrative expenses paid from the RR Account and NRRIT during the fiscal year.

[b] The average of the account benefits ratios for the 10 most recent fiscal years ending before the calendar year.

[c] Includes payroll taxes and income taxes on benefits.

[d] Includes investment income and transfers from SSEB Account.

[e] Other income includes financial interchange income, advances from general revenues, and interest income. Other expense includes repayment of advances from general revenues and transfers to the NRRIT or RRA.

Table 3. Present value[a] of benefits in millions of dollars

| | Employment assumption I | | | Employment assumption II | | | Employment assumption III | | |
	Tier 2[b]	Tier 1 liability[c]	Total	Tier 2[b]	Tier 1 liability[c]	Total	Tier 2[b]	Tier 1 liability[c]	Total
Employee annuities									
Retired	$24,401	$ 8,416	$ 32,817	$24,401	$ 8,416	$ 32,817	$24,401	$ 8,416	$ 32,817
Active	20,857	8,633	29,490	20,857	8,633	29,490	20,857	8,633	29,490
Inactive	1,051	201	1,253	1,051	201	1,253	1,051	201	1,253
Future entrants	7,793	2,940	10,733	5,447	2,057	7,505	3,361	1,265	4,626
Total	54,101	20,191	74,293	51,756	19,308	71,064	49,670	18,516	68,186
Spouse annuities									
Retired	7,120	2,777	9,897	7,120	2,777	9,897	7,120	2,777	9,897
Active	5,299	2,881	8,179	5,299	2,881	8,179	5,299	2,881	8,179
Inactive	236	57	293	236	57	293	236	57	293
Future entrants	1,816	851	2,668	1,271	596	1,867	782	365	1,148
Total	14,471	6,566	21,037	13,926	6,311	20,237	13,437	6,080	19,517
Survivor annuities									
Retired & deceased	6,623	858	7,481	6,623	858	7,481	6,623	858	7,481
Active	2,217	275	2,492	2,217	275	2,492	2,217	275	2,492
Inactive	32	13	44	32	13	44	32	13	44
Future entrants	642	119	761	450	83	533	273	51	324
Total	9,514	1,264	10,778	9,321	1,228	10,550	9,144	1,196	10,340
All annuities combined									
Retired & deceased	38,144	12,051	50,195	38,144	12,051	50,195	38,144	12,051	50,195
Active	28,372	11,789	40,161	28,372	11,789	40,161	28,372	11,789	40,161
Inactive	1,319	271	1,590	1,319	271	1,590	1,319	271	1,590
Future entrants	10,251	3,910	14,162	7,168	2,737	9,905	4,416	1,681	6,097
Total annuities	$78,086	$28,022	$106,107	$75,003	$26,848	$101,851	$72,250	$25,793	$ 98,043
Lump sum payments			46			46			46
Total benefits			$106,153			$101,896			$ 98,089

Note: Detail may not add to totals due to rounding.

[a] Present values are determined using a 7% interest rate for all years.

[b] Includes supplemental annuity benefits.

[c] Tier 1 benefits in excess of social security level.

Table 4. Present value[a] of benefits as a percentage of the present value[a] of tier 2 payroll

| | Employment assumption I | | | Employment assumption II | | | Employment assumption III | | |
| | Tier 1 | | | Tier 1 | | | Tier 1 | | |
	Tier 2[b]	liability[c]	Total	Tier 2[b]	liability[c]	Total	Tier 2[b]	liability[c]	Total
Employee annuities									
Retired	5.54%	1.91%	7.46%	6.70%	2.31%	9.01%	8.13%	2.80%	10.93%
Active	4.74	1.96	6.70	5.72	2.37	8.09	6.95	2.88	9.82
Inactive	0.24	0.05	0.28	0.29	0.06	0.34	0.35	0.07	0.42
Future entrants	1.77	0.67	2.44	1.50	0.56	2.06	1.12	0.42	1.54
Total	12.29	4.59	16.88	14.21	5.30	19.50	16.54	6.17	22.71
Spouse annuities									
Retired	1.62	0.63	2.25	1.95	0.76	2.72	2.37	0.93	3.30
Active	1.20	0.65	1.86	1.45	0.79	2.24	1.77	0.96	2.72
Inactive	0.05	0.01	0.07	0.06	0.02	0.08	0.08	0.02	0.10
Future entrants	0.41	0.19	0.61	0.35	0.16	0.51	0.26	0.12	0.38
Total	3.29	1.49	4.78	3.82	1.73	5.55	4.48	2.03	6.50
Survivor annuities									
Retired & deceased	1.50	0.19	1.70	1.82	0.24	2.05	2.21	0.29	2.49
Active	0.50	0.06	0.57	0.61	0.08	0.68	0.74	0.09	0.83
Inactive	0.01	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.01
Future entrants	0.15	0.03	0.17	0.12	0.02	0.15	0.09	0.02	0.11
Total	2.16	0.29	2.45	2.56	0.34	2.90	3.05	0.40	3.44
All annuities combined									
Retired & deceased	8.67	2.74	11.40	10.47	3.31	13.78	12.71	4.01	16.72
Active	6.45	2.68	9.12	7.79	3.24	11.02	9.45	3.93	13.38
Inactive	0.30	0.06	0.36	0.36	0.07	0.44	0.44	0.09	0.53
Future entrants	2.33	0.89	3.22	1.97	0.75	2.72	1.47	0.56	2.03
Total annuities	17.74%	6.37%	24.10%	20.59%	7.37%	27.95%	24.07%	8.59%	32.66%
Lump sum payments			0.01			0.01			0.02
Total benefits			24.11%			27.97%			32.67%

Note: Detail may not add to totals due to rounding.

[a] Present values are determined using a 7% interest rate for all years.

[b] Includes supplemental annuity benefits.

[c] Tier 1 benefits in excess of social security level.

Table 5. Balance of the Combined National Railroad Retirement Investment Trust
and Railroad Retirement Account, and the Social Security
Equivalent Benefit Account as of December 31, 2016
(Dollar amounts in millions)

	Combined NRRIT and RR Account	SSEB Account
Securities:		
Market value of NRRIT investments	$ 24,866	$ -
Par value specials[a] (including accrued interest)	425	718
Cash accounts	23	22
Balance	25,314	740
Adjustment for present value calculation[b]	2,434	-
Adjusted balance for use in present value calculation	$ 27,748	$ 740

[a] Par value specials are securities issued by the Treasury directly to the RR and SSEB Accounts, maturing on the first business day of the month following the month of issue. Their yield rate each month is the average yield rate, computed as of the last day of the previous month, of marketable Treasury notes with maturity dates not less than three years away.

[b] This adjustment accounts for the difference between the actual assets on December 31, 2017, used in Tables 2-I, 2-II and 2-III, and the assets that would have been projected starting with the December 31, 2016 assets using a 7.0% rate. With this adjustment the present value of the ultimate combined account values in Tables 2 discounted at a 7.0% rate will equal the surplus or deficiency shown in Table 6.

Table 6. Actuarial surplus or (deficiency) for National Railroad Retirement
Investment Trust and Railroad Retirement Account

	Employment assumption		
	I	II	III
	Present values in millions of dollars		
Adjusted funds on hand, 12/31/2016	$ 27,748	$ 27,748	$ 27,748
Retirement taxes	73,874	68,469	61,993
Income taxes on benefits	8,537	8,178	7,856
Available from SSEB Account	1,825	1,760	1,703
Total, present and prospective assets	111,984	106,155	99,300
Benefit payments	106,153	101,896	98,089
Administrative expenses	3,768	3,085	2,603
Total liabilities	109,921	104,981	100,692
Actuarial surplus or (deficiency)	2,063	1,174	(1,392)
One percent of tier 2 payroll	$ 4,402	$ 3,643	$ 3,002
	Present values as a percentage of tier 2 payroll		
Adjusted funds on hand, 12/31/2016	6.30%	7.62%	9.24%
Retirement taxes	16.78	18.79	20.65
Income taxes on benefits	1.94	2.24	2.62
Available from SSEB Account	0.41	0.48	0.57
Total, present and prospective assets	25.44	29.14	33.08
Benefit payments	24.11	27.97	32.67
Administrative expenses	0.86	0.85	0.87
Total liabilities	24.97	28.81	33.54
Actuarial surplus or (deficiency)	0.47	0.32	(0.46)

Table 7. Unfunded accrued liability
(Dollar amounts in millions)

		Amount or rate
1.	Present value of benefits for former and present employees	$ 91,991
2.	Present value of administrative expenses for former and present employees	2,785
3.	Present value of tier 2 payroll for present employees	192,273
4.	Normal cost as a level percentage of tier 2 payroll	7.80%
5.	Present value of future service costs for present employees = (3) x (4)	14,997
6.	Accrued liability = (1) + (2) - (5)	79,779
7.	Funds on hand, 12/31/2016[a]	28,488
8.	Unfunded accrued liability = (6) - (7)	51,291

[a] The amount shown is the sum of the NRRIT, RR Account and SSEB Account balances shown in Table 5.

Table 8. Vested dual benefit amounts and average number of beneficiaries

Fiscal year	Vested dual benefit amounts[a] (Millions)	Average number of beneficiaries
2019	$19	9,000
2020	16	8,000
2021	13	6,000
2022	11	5,000
2023	9	4,000
2024	8	4,000
2025	6	3,000
2026	5	2,000
2027	4	2,000
2028	3	2,000
2029	3	1,000
2030	2	1,000

[a] When projected amounts are used to determine the appropriation needed for benefit payments, a margin must be added to ensure payment of full benefits.

Table 9. Supplemental annuity benefit amounts and average number of beneficiaries

Calendar year	Supplemental benefit amounts (Millions)	Average number of beneficiaries[a]
2018	$61	121,000
2019	60	118,000
2020	58	115,000
2021	56	112,000
2022	54	108,000
2023	52	103,000
2024	50	99,000
2025	47	94,000
2026	45	90,000
2027	43	85,000
2028	40	80,000
2029	38	75,000
2030	36	71,000
2031	33	66,000
2032	31	62,000
2033	29	57,000
2034	27	53,000
2035	25	49,000
2036	22	45,000
2037	20	41,000
2038	19	37,000
2039	17	33,000
2040	15	30,000
2041	13	26,000
2042	12	23,000
2043	10	20,000
2044	9	17,000
2045	7	15,000
2046	6	13,000
2047	5	11,000
2048	4	9,000
2049	4	7,000
2050	3	6,000
2051	2	5,000
2052	2	4,000
2053	1	3,000

[a] Average number in a year. Excludes cases where the supplemental annuity is totally eliminated because of a private pension. On January 1, 2017, there were about 34,000 of these cases.

Table 10. Average number of railroad retirement annuitants[a] and number of annuitants per full time employee

Calendar year	Average number of annuitants under each employment assumption			Average number of annuitants per full time employee		
	I	II	III	I	II	III
2018	518,100	518,100	518,100	2.33	2.36	2.39
2019	513,100	513,100	513,100	2.32	2.37	2.44
2020	507,300	507,300	507,300	2.30	2.38	2.49
2021	500,900	500,900	500,900	2.28	2.39	2.53
2022	494,100	494,100	494,100	2.26	2.40	2.57
2023	486,800	486,800	486,800	2.23	2.40	2.61
2024	479,300	479,300	479,300	2.21	2.40	2.65
2025	471,700	471,600	471,600	2.18	2.39	2.68
2026	464,000	463,900	463,800	2.15	2.39	2.72
2027	456,300	456,200	456,000	2.13	2.39	2.75
2028	449,000	448,700	448,500	2.10	2.38	2.79
2029	441,900	441,500	441,100	2.08	2.38	2.82
2030	434,900	434,500	433,900	2.05	2.38	2.86
2031	428,300	427,600	426,900	2.03	2.38	2.90
2032	421,800	420,900	419,900	2.00	2.37	2.93
2033	415,300	414,200	413,000	1.98	2.37	2.97
2034	409,100	407,700	406,200	1.96	2.37	3.00
2035	403,400	401,600	399,700	1.94	2.37	3.02
2036	397,900	395,800	393,500	1.92	2.37	3.05
2037	392,700	390,200	387,500	1.90	2.37	3.08
2038	387,700	384,800	381,500	1.89	2.37	3.11
2039	382,800	379,300	375,500	1.87	2.37	3.13
2040	378,000	373,900	369,500	1.85	2.37	3.15
2041	373,800	369,000	363,800	1.84	2.37	3.18
2042	370,100	364,600	358,600	1.83	2.37	3.21
2043	366,800	360,500	353,600	1.82	2.38	3.23
2044	364,000	356,700	349,000	1.81	2.38	3.26
2045	361,700	353,400	344,600	1.81	2.39	3.28
2046	359,600	350,200	340,400	1.80	2.39	3.30
2047	357,600	347,100	336,100	1.80	2.40	3.31
2048	355,800	344,000	331,700	1.79	2.40	3.32
2049	354,000	340,700	326,900	1.79	2.40	3.33
2050	352,700	337,700	322,200	1.79	2.40	3.32
2051	351,800	334,900	317,500	1.79	2.40	3.32
2052	351,000	331,900	312,400	1.79	2.40	3.31
2053	350,000	328,600	306,700	1.78	2.39	3.28
2054	348,700	324,900	300,600	1.78	2.38	3.25
2055	347,400	321,100	294,400	1.78	2.37	3.22
2060	341,800	301,100	260,900	1.76	2.27	2.95
2065	336,400	280,700	228,000	1.74	2.14	2.62
2070	332,000	262,800	200,700	1.72	2.01	2.31
2075	329,200	248,600	180,600	1.70	1.90	2.08
2080	328,000	238,600	167,500	1.70	1.82	1.93
2085	328,300	232,300	159,800	1.70	1.77	1.84
2090	329,300	228,600	155,300	1.70	1.75	1.79
2091	329,600	228,100	154,600	1.70	1.74	1.78

[a] Excludes partition payments to spouses and divorced spouses where the employee is deceased or not otherwise entitled to an annuity. On December 31, 2016, there were 1,568 of these cases.

Table 11. Transfers to railroad retirement system under financial interchange with social security system, 1937-2018[a]
(Millions of dollars)

Determination number	Fiscal years covered	Benefit credits to railroad retirement[b]	Tax credits to social security	Cash transfers to[c] railroad retirement	
				Amount	Year of transfer
1-25	1937-76 d	20,912.4 e	9,743.9	11,826.7 d	1953-77 d
26	1977 f	2,556.6 e	1,060.8	1,618.5	1978
27	1978	2,230.3	902.6	1,477.4	1979
28	1979	2,389.5	1,089.9	1,429.9	1980
29	1980	2,683.4	1,204.8	1,614.4	1981
30	1981	2,973.7	1,322.5	1,819.6	1982
31	1982	3,321.9	1,296.0	2,278.6	1983
32	1983	3,471.8	1,287.9	2,425.6	1984
33	1984	3,524.1	1,472.8	2,352.9	1985
34	1985	3,658.5	1,443.1	2,652.8	1986
35	1986	3,744.8	1,398.7	2,614.2	1987
36	1987	3,864.4	1,305.0	2,851.3	1988
37	1988	4,028.8	1,427.3	2,933.5	1989
38	1989	4,149.5	1,418.9	3,049.1	1990
39	1990	4,415.3	1,451.1	3,456.7	1991
40	1991	4,434.7	1,476.5	3,206.4	1992
41	1992	4,720.1	1,523.1	3,435.4	1993
42	1993	4,796.5	1,583.3	3,525.5	1994
43	1994	5,199.6	1,515.5	4,120.1	1995
44	1995	4,836.2 e	1,545.1	3,556.3	1996
45	1996	5,008.0	1,566.8	3,747.2	1997
46	1997	5,114.1	1,615.4	3,819.1	1998
47	1998	5,173.5	1,641.9	3,816.0	1999
48	1999	5,195.6	1,767.5	3,697.6	2000
49	2000	4,767.8 e	1,750.9	3,282.8	2001
50	2001	5,180.5	1,756.9	3,646.8	2002
51	2002	5,217.5	1,748.2	3,747.3	2003
52	2003	5,350.6	1,731.1	3,843.5	2004
53	2004	5,480.8	1,820.0	3,917.3	2005
54	2005	5,527.6	1,906.1	3,846.3	2006
55	2006	5,746.8	1,976.5	4,019.8	2007
56	2007	5,853.6	2,076.6	4,049.9	2008
57	2008	6,005.5	2,095.6	4,137.3	2009
58	2009	6,212.0	2,035.4	4,391.6	2010
59	2010	6,431.5	2,074.1	4,574.3	2011
60	2011	6,524.1	2,143.3	4,651.0	2012
61	2012	6,714.8 e	2,442.5	4,499.0	2013
62	2013	6,939.1	2,433.4	4,700.8	2014
63	2014	7,053.1	2,575.3	4,676.6	2015
64	2015	7,226.7	2,747.6	4,662.7	2016
65	2016	7,013.8 e	2,654.3	4,522.5	2017
66	2017	7,318.7	2,562.9	4,942.4	2018
Total	1937-2017	222,967.8	80,591.1	153,436.5	

[a] Financial interchange transactions with the Hospital Insurance Trust Fund are not included. These involve mainly a transfer of collected taxes to the Centers for Medicare & Medicaid Services, with some adjustments for difference in earnings bases under the two systems.

[b] Amounts include allowances for administrative expenses and adjustments to previous determinations.

[c] Transfers include interest which is not shown in table.

[d] First determination covered period January 1937-June 1952. Initial balance of $488.2 million was never transferred to social security; only interest was paid until debt was liquidated by subsequent offsets in favor of railroad retirement.

[e] Includes adjustment for pre-1957 military service.

[f] 1977 figure covered 15 months (July 1976 - September 1977) because of change in definition of fiscal year.

A P P E N D I X

Outline of the benefit and financing provisions
of the railroad retirement system as amended through December 31, 2017

EMPLOYEE BENEFITS

1. Normal age annuity

Requirement of 10 years of service or 5 years of service after 1995 for retirement at social security retirement age (see definition at end of outline). Employees with less than 10 years of service must meet Social Security Act eligibility requirements to receive a tier 1 benefit.

2. Prenormal age annuity

   A. Eligible for unreduced benefit upon later of (1) attainment of age 60 and (2) completion of 30 years of service (60/30 eligibility).

   B. Eligible for reduced benefit with less than 30 years of service upon later of (1) attainment of age 62 and (2) completion of 10 years of service or 5 years of service after 1995. The benefit is reduced by 1/180 for each of the first 36 months and by 1/240 for each additional month the employee is under social security retirement age. (Reduction for age in excess of 36 months applies only to tier 1 benefit if employee had any service before 8-12-1983.)

3. Total and permanent disability annuity

10-year service requirement or 5 years of service after 1995. Benefit may not begin earlier than the later of (1) the first day of the sixth month following date disability begins and (2) the first day of the twelfth month before the month in which the application is filed. Employees with less than 10 years of service and at least 5 years of service after 1995 who meet Social Security eligibility requirements may qualify for a tier 1 benefit only (with an age reduced tier 2 benefit payable at age 62).

4. Occupational disability annuity

Requirement of 20 years of service or attainment of age 60 with 10 years of service; current connection (see definition at end of outline) required. Benefit may not begin earlier than the later of (1) the first day of the sixth month following date disability begins and (2) the first day of the twelfth month before the month in which the application is filed.

5. Supplemental annuity

Requirement of attainment of age 60 with 30 years of service if retired on or after 7-1-1974, or age 65 with 25 years of service. Must have service before 10-1-1981. Current connection required.

6. Vested dual benefit

   A. Requirement of fully insured (see definition at end of outline) status under Social Security Act effective 12-31-1974 and either (1) 25 years of railroad service before 1975 or (2) 10 years of railroad service before 1975, with some railroad work in 1974 or a current connection on 12-31-1974 or at the time the annuity begins, or

   B. Requirement of fully insured status under Social Security Act as of last year of railroad work before 1975 and 10 years of railroad service before 1975.

7. Work restrictions

Suspension of annuity for any month annuitant is employed by a railroad. For disabilities in 2018, loss of one month's annuity for each $920 in excess of $11,040 earned in a year with the last $460 of such excess treated as $920 (no annuity is lost for any month with earnings below $920). In addition, the tier 1 portion of a regular annuity based on railroad earnings (see definition at end of outline) after 1974 and all social security earnings (see definition at end of outline) is subject to social security work restrictions, unless a social security benefit is also being paid. If annuitant is employed by last non-railroad employer preceding retirement, the tier 2 portion and the supplemental annuity are reduced by one dollar for each two dollars of earnings, subject to a maximum reduction of 50 percent.

8. Creditable service (continuity not required)

All service after December 31, 1936. Service before 1937 may be used if annuitant had employment relation on August 29, 1935 or 6 months of service after August 29, 1935 and before 1946. No limit on service except 30-year maximum if pre-1937 service used. Additional service months may be deemed, for years after 1984, where employee does not work in every month of year, but railroad earnings exceed monthly prorations of annual tier 2 maximum earnings creditable.

9. Creditable and taxable railroad earnings

From 1966 through 1978, the maximum monthly earnings were one-twelfth of the annual social security maximum. The 1977 social security amendments introduced a difference between the maximum monthly earnings creditable for tier 1 and tier 2 benefits starting in 1979.

				Tier 1	Tier 2
before July 1, 1954	$ 300				
July 1, 1954 - May 31, 1959	350	1979		$1,908.33	$1,575
June 1, 1959 – Oct. 31, 1963	400	1980		2,158.33	1,700
Nov. 1, 1963 – Dec. 31, 1965	450	1981		2,475	1,850
1966-67	550	1982		2,700	2,025
1968-71	650	1983		2,975	2,225
1972	750	1984		3,150	2,350
1973	900				
1974	1,100				
1975	1,175				
1976	1,275				
1977	1,375				
1978	1,475				

Starting in 1985, earnings are credited on an annual rather than a monthly basis. The annual maximums are:

	Tier 1	Tier 2		Tier 1	Tier 2
1985	$39,600	$29,700	2002	$84,900	$63,000
1986	42,000	31,500	2003	87,000	64,500
1987	43,800	32,700	2004	87,900	65,100
1988	45,000	33,600	2005	90,000	66,900
1989	48,000	35,700	2006	94,200	69,900
1990	51,300	38,100	2007	97,500	72,600
1991	53,400	39,600	2008	102,000	75,900
1992	55,500	41,400	2009	106,800	79,200
1993	57,600	42,900	2010	106,800	79,200
1994	60,600	45,000	2011	106,800	79,200
1995	61,200	45,300	2012	110,100	81,900
1996	62,700	46,500	2013	113,700	84,300
1997	65,400	48,600	2014	117,000	87,000
1998	68,400	50,700	2015	118,500	88,200
1999	72,600	53,700	2016	118,500	88,200
2000	76,200	56,700	2017	127,200	94,500
2001	80,400	59,700	2018	128,400	95,400

10. Creditable military service and earnings

Military service is creditable in war and national emergency periods, and in some cases between June 15, 1948 and December 15, 1950, if preceded by railroad service in the year of entry into military service or the preceding year.

Earnings: $160 before 1968
$260 after 1967 but before 1975
For each calendar year after 1974, earnings are the same as that credited under social security.

11. Basic monthly annuity computation

Tier 1: Social security benefit based on combined railroad and social security earnings, less social security benefit actually payable (based on social security earnings only). See item 2 for computation of tier 1 benefit for employees with 60/30 eligibility.

Tier 2: 0.7% of the average monthly compensation (AMC) multiplied by the number of years of service. This amount is then reduced by 25% of the employee's gross vested dual benefit. The AMC is the average of an individual's highest 60 months of railroad earnings up to the tier 2 maximum. For each month of service in a year for which the Railroad Retirement Board's records do not show earnings on a monthly basis, the total earnings for the year divided by the months of service in that year will be considered the monthly earnings for each month of service in the year.

12. Vested dual benefit computation

   A. For employees satisfying requirements in item 6.A., benefit is social security benefit based on railroad earnings through 1974, plus social security benefit based on social security earnings through 1974, less social security benefit based on combined railroad and social security earnings through 1974.

   B. For employees satisfying requirements of item 6.B., benefit is the same as in A., except for the exclusion of all earnings after last pre-1975 year employee had railroad employment.

   In both cases, benefit might be proportionally reduced so that the total amount paid out in vested dual benefits in any fiscal year does not exceed the total amount appropriated for that year (see item 39).

13. Supplemental annuity computation

For employees first entitled or potentially entitled after 1974, the monthly benefit is a minimum of $23 increased by $4 for each year of service over 25, with a maximum benefit of $43. Supplemental annuity will be reduced if employee receives a private pension from railroad employer based on employer contributions.

14. Tax rebate lump sum

Employee who has at least 10 years of railroad service and is not eligible for the vested dual benefit will receive a lump sum at retirement computed by summing for each year from 1951 through 1974 the product of the social security tax rate for the year times the excess of the employee's combined railroad and social security earnings for the year over (approximately) the maximum creditable for the year under the 1937 Act. Survivors of employee may receive refund if employee dies before receiving it.

15. Separation/severance lump sum

Lump sum, equal to tier 2 payroll taxes deducted from separation or severance payments, will be paid at retirement to employees with at least 10 years of service or 5 years of service after 1995 to the extent that separation or severance payments did not yield additional tier 2 service credits.

16. Cost-of-living increases (annually, effective with January 1 payments)

Tier 1: Same as social security increases.

Tier 2: 32.5% of social security increases.

Vested dual benefits: Frozen at the 1974 level, except that social security cost-of-living increases effective between 12-31-1974 and the earlier of January 1, 1982 and the annuity beginning date are included in the benefit computation.

Supplemental annuity: None.

SPOUSE BENEFITS

17. Eligibility

    A. Unreduced annuity:

        1. Spouse retiring at age 60 if the employee retired with an unreduced annuity, has 30 or more years of service and is age 60 or over.

        2. Spouse retiring at social security normal retirement age or any age with a child in care, if (a) employee is age 62 or over, or (b) employee has 30 or more years of service and is age 60 or over.

    B. Reduced annuity:

        1. Spouse retiring at age 60 if employee attained 60/30 eligibility after 6-30-1984 and retired with a reduced age annuity before 1-1-2002 before attaining age 62.

        2. Spouse retiring at age 62, if employee has less than 30 years of service, is retired, and has attained age 62. Age reduction is 1/144 for each of the first 36 months spouse is under social security retirement age and 1/240 for each month in excess of 36 that spouse is under retirement age. (Reduction for age in excess of 36 months applies to tier 1, but not tier 2, if employee had any service before 8-12-1983.)

18. Work restrictions

Same as employee; in addition, spouse is not paid for any month employee annuity is not payable by virtue of work restrictions, and spouse is reduced $1 for each $2 of employee's earnings for last non-railroad employer preceding employee's retirement (see item 7).

19. Annuity computation

Tier 1: One-half of social security benefit based on employee's combined railroad and social security earnings. See item 17 for computation of spouse tier 1 in cases where employee is receiving a reduced 60/30 benefit. If spouse is entitled to a social security benefit, tier 1 is reduced by the amount of the benefit, but not below 0. If spouse is entitled to employee annuity or a public service pension, certain additional restrictions apply.

Tier 2: 45% of employee's tier 2 benefit. Spouse receives additional benefit if spouse is also an employee annuitant and either the employee or spouse has railroad service prior to 1975.

20. Vested dual benefit

A spouse receiving a vested dual benefit on August 13, 1981 will continue to receive a benefit (adjusted as described in item 12). No vested dual benefits will be awarded after that date.

21. Divorced spouse, partitioned spouse and partitioned divorced spouse

A divorced spouse is entitled to a tier 1 benefit if the employee is retired, the employee and divorced spouse have been married for at least 10 consecutive years and have both attained age 62, and the divorced spouse is unmarried. If the employee is not retired, but has sufficient railroad service to otherwise be eligible for an annuity, the divorced spouse can receive a tier 1 benefit if the above conditions are met and the parties have been divorced for a period of not less than 2 years, and the employee is fully insured under the Social Security Act using combined railroad and social security earnings.

If the employee is retired, a court ordered partition of tier 2, supplemental annuity, vested dual benefit or minimum guarantee amounts (see item 42) is payable with the employee's monthly annuity reduced by the amount of the partition payment. If the employee is not retired, a court ordered partition of tier 2 or vested dual benefit payments is payable if (1) the employee has 10 years of service or 5 years of service after 1995, and (2) both the employee and spouse or former spouse have attained age 62.

22. Cost-of-living increases for spouses

Each tier is subject to same percentage increase as corresponding tier of employee benefit.

SURVIVOR AND DEATH BENEFITS

23. Employee requirement for survivor benefits

All benefits except residual lump sum require deceased employee to have 10 years of railroad service or 5 years of service after 1995 and a current connection. If employee does not meet above conditions, his or her earnings record is transferred to social security, which pays any survivor benefits.

24. Aged widow's and widower's eligibility

A widow or widower must be age 60 and unremarried. Those age 60-61 are deemed age 62 in computing the benefit. The age reduction for each month of age under social security retirement age is 28.5% divided by the number of months from age 60 to social security retirement age.

25. Disabled widow's and widower's eligibility

A widow or widower must be at least age 50 and under age 60, unremarried, and totally and permanently disabled if disability occurs within 7 years of employee's death or within 7 years after widowed mother's or father's status terminated. Age reduction is 28.5%. Benefit may not begin earlier than the later of (1) the first day of the sixth month following the date disability begins and (2) the first day of the twelfth month before the month in which the application is filed.

26. Widowed mother's and father's eligibility

Unremarried surviving spouse of a deceased employee who is under social security retirement age and who at the time of filing an application has in his or her care a minor or disabled child of the deceased employee.

27. Divorced widow(er)'s, remarried widow(er)'s eligibility, partitioned surviving spouse and partitioned surviving divorced spouse

The following are eligible for a tier 1 benefit.

A. Divorced widow(er) - must (1) have been married to employee at least 10 years, be unmarried or remarried after age 60 (after age 50 and disability onset if disabled), and have attained age 60 or age 50 if disabled, or (2) be unmarried at any age with a child of the employee in care.

B. Remarried widow(er) - must have remarried after age 60 (after age 50 and disability onset if disabled), or the remarriage must have ended. Widow(er) must have attained age 60, be between 50 and 59 and disabled or be any age with a child in care.

Benefits for divorced aged widow(er)s and remarried aged widow(er)s are reduced for the full number of months under social security retirement age.

Where court ordered partition of tier 2, supplemental annuity and vested dual benefit payments are in effect at the time of the employee's death, such payments will continue after the employee's death unless the court order requires termination upon the employee's death. Where the employee dies before partition payments are initiated, and the employee acquired 120 months of railroad service, or 60 months of service after 1995, such payments may be made when both the surviving spouse/divorced spouse, and the employee if he or she had survived, would be 62.

28. Child's eligibility

A child of a deceased employee must be under 18 or under 19 and a full-time elementary or secondary school student. Unmarried children continuously disabled since before age 22 are also eligible, regardless of age.

29. Parent's eligibility

A parent of a deceased employee who has attained age 60 and received at least one-half of his or her support from the employee will be eligible for an annuity. If the employee died leaving a widow, widower or child who is or might become eligible in the future, the parent will be eligible for a tier 1 benefit only. In certain instances, a remarried parent of a deceased employee will be eligible for a tier 1 benefit.

30. Work restrictions

Annuity not payable for any month in which survivor engages in railroad employment. Entire benefit subject to social security work restrictions.

31. Annuity computation

Tier 1: Amount payable to survivor under Social Security Act, based on the deceased employee's combined railroad and social security earnings after 12-31-1936, less the amount of any social security benefit received. Additional restrictions exist for a widow or widower who also receives an annuity as a railroad employee or who receives a public service pension.

Tier 2: Widow or widower   - 50% of employee tier 2 benefit
Parent   - 35% of employee tier 2 benefit
Children   - 15% of employee tier 2 benefit for each child
The total family tier 2 benefit has a minimum of 35% and a maximum of 80% of the employee's tier 2 benefit (a maximum of 130% is used for the purpose of calculating the widow(er) intitial minimum amount).

For a widow or widower an "initial minimum amount" based on the two-tier annuity amount that would have been payable to the railroad employee at the time the widow(er)'s annuity is awarded is computed with a widow(er)'s tier 2 amount equal to 100 percent of the employee's tier 2 amount. Widow(er)s' annuities computed on the basis of the initial minimum amount are not adjusted for annual cost-of-living increases until the total annuity amount is exceeded by the annuity amount the widow(er) would have been paid under prior law (tier 2 amount equal to 50 percent of the employee's tier 2 amount), with all interim cost-of-living increases otherwise payable.

For an aged widow or widower, the total benefit exclusive of any vested dual benefit may not be less than amount received as spouse in month before employee's death.

All percentages are before deductions for work or entitlement to social security benefit or railroad retirement employee annuity.

32. Vested dual benefit for widow or widower

A widow or widower receiving a vested dual benefit on August 13, 1981 will continue to receive a benefit (adjusted as described in item 12). No vested dual benefits will be awarded after that date.

33. Insurance lump sum

Payable if employee leaves no survivor eligible for monthly benefits in the month of his or her death.

    A. If employee had 10 years of service before 1-1-1975, the benefit is 10 times the basic amount. The basic amount is 52.4% of the first $75 of average monthly remuneration (AMR), plus 12.8% of the remainder, increased by 1% for each year before 1975 with earnings of $200 or more. The AMR is based on combined railroad and social security earnings before 1975 and after 1936.

    B. If employee had less than 10 years of service as of 12-31-1974, the amount will be the amount social security would have paid (currently $255). This amount will only be paid to a widow or widower living with the employee at the time of the employee's death.

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34. Residual lump sum death benefit

Payable when it appears no further benefits will derive from deceased employee except possibly to a widow, widower or parent at a future date. In this case, survivor must waive the right to all future benefits based on the deceased employee's railroad service. The amount payable is the sum of 4% of taxable railroad earnings from 1-1-1937 to 12-31-1946, 7% from 1-1-1947 to 12-31-1958, 7-1/2% from 1-1-1959 to 12-31-1961, 8% from 1-1-1962 to 12-31-1965, 8.1% from 1-1-1966 to 12-31-1966, 8.65% from 1-1-1967 to 12-31-1967, 8.8% from 1-1-1968 to 12-31-1968, 9.45% from 1-1-1969 to 12-31-1970, 9.85% from 1-1-1971 to 12-31-1972, 10.1% from 1-1-1973 to 9-30-1973, 5.35% from 10-1-1973 to 12-31-1973, and 5.45% from 1-1-1974 to 12-31-1974. Railroad earnings after 1974 are not taken into account. The amount actually paid is reduced by the amount of benefits paid deriving from the deceased employee.

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35. Cost-of-living increases for survivors

Each tier is subject to same percentage increase as corresponding tier of employee benefit.

FINANCING, INVESTMENTS AND TAXATION OF BENEFITS

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36. Employee and employer payroll taxes

Employees and employers contribute at the prevailing social security rate up to the tier 1 earnings limit. There is no limit to earnings subject to the hospital insurance portion of the tier 1 tax rate. Beginning in 2013, employees pay an additional 0.9 percent on earnings above $200,000 (for those who file an individual return) or $250,000 (for those who file a joint return).

In addition, employees and employers pay a tier 2 tax up to the tier 2 earnings limit. Tier 2 taxes on both employers and employees are based on the ratio of certain asset balances to the sum of benefits and administrative expenses (the average account benefits ratio). At the end of each fiscal year (September 30), an Account Benefits Ratio (ABR) is calculated by dividing the fair market value of the assets in the RR Account and the NRRIT (and for years before 2002, the SSEB Account) as of the close of such fiscal year by the total benefits and administrative expenses paid from the RR Account and the NRRIT during such fiscal year. The Average Account Benefits Ratio (AABR), with respect to any calendar year, is then calculated as the average of the account benefits ratios for the 10 most recent fiscal years ending before such calendar year. If the AABR is not a multiple of 0.1, it is increased to the next highest multiple of 0.1. The tier 2 tax rate is determined from a tax rate table based on the AABR.

AABR		Tier 2 tax rate	
At least	But less than	Employer	Employee
	2.5	22.1	4.9
2.5	3.0	18.1	4.9
3.0	3.5	15.1	4.9
3.5	4.0	14.1	4.9
4.0	6.1	13.1	4.9
6.1	6.5	12.6	4.4
6.5	7.0	12.1	3.9
7.0	7.5	11.6	3.4
7.5	8.0	11.1	2.9
8.0	8.5	10.1	1.9
8.5	9.0	9.1	0.9
9.0		8.2	0.0

Contributions to 401(k) deferred compensation plans and the value of employer-paid premiums for group term life insurance coverage in excess of $50,000 are included in railroad earnings for payroll tax purposes.

37. Financial interchange

Railroad retirement system pays to social security system the taxes social security would have collected and receives the additional amount of benefits and administrative expenses social security would have paid if railroad employment had been covered under social security. The net difference (including interest) is transferred in the June after the fiscal year for which the transfer is made.

The Railroad Retirement Board estimates the amount and direction of the financial interchange transfer that would be made for each month if transfers were on a current monthly basis. If this estimate favors the railroad retirement system, Treasury advances the amount with interest to the Railroad Retirement Account, as a loan from the general fund, by the middle of the succeeding month. Within 10 days after receipt of the annual financial interchange for a fiscal year, the RRB must repay the amount, with interest, advanced during the fiscal year.

38. Investments

Amounts in the Railroad Retirement Account and in the Social Security Equivalent Benefit Account not needed to pay current benefits and administrative expenses are invested by the National Railroad Retirement Investment Trust, whose Board of seven trustees is empowered to invest Trust assets in non-governmental assets, such as equities and debt, as well as in governmental securities. The Trust transfers funds back to the Railroad Retirement Account as needed for the payment of benefits.

39. Financing of vested dual benefits

General revenue appropriations finance all vested dual benefit payments since September 1981. Beginning October 1, 1981, each annual appropriation is placed in the Dual Benefits Payments Account. Total benefits paid in any fiscal year (starting with 1982) may not exceed the total available in the account. The account may borrow at the end of a fiscal year the amount that the Railroad Retirement Board estimates will be necessary to pay vested dual benefits for the first month of the next fiscal year.

40. Taxability of benefits

The portion of tier 1 benefits equivalent to social security benefits is taxed under the same rules as are social security benefits. Tier 1 benefits in excess of social security equivalent benefits, tier 2 benefits, vested dual benefits, and supplemental annuities are taxed under the rules by which private pensions are taxed.

Revenues from taxes on social security equivalent benefits are transferred to the social security system through the financial interchange. Revenues from taxes on tier 1 benefits in excess of social security equivalent benefits and tier 2 benefits are transferred to the Railroad Retirement Account. Revenues from taxes on vested dual benefits are transferred to the Dual Benefits Payments Account.

MISCELLANEOUS PROVISIONS

41. Benefit preservation

Each year the Railroad Retirement Board must report to the President and Congress the results of a five-year projection of anticipated revenues to and payments from the Railroad Retirement Account. If the results show that the funds in the account will be insufficient to pay full benefits at any time during the five-year period, the report must indicate (1) the first fiscal year in which benefits would have to be reduced because of insufficient funds in the absence of any changes, and (2) the amount of adjustments necessary to preserve financial solvency. Within 180 days after publication of this report, representatives of railroad labor and management are obligated to submit proposals designed to preserve the fund's solvency. The Railroad Retirement Board will publish regulations necessary to provide a constant level of benefits at the maximum level possible and to insure that no individual receives less than what he or she would have had all his earnings been covered under social security. The Railroad Retirement Board's regulations will take effect beginning with the first year in which benefit reductions will be necessary and continue until legislative action supersedes them.

42. Minimum annuity

The overall minimum guaranty for employees and dependents is 100% of the amount, or the additional amount, the family would receive under the Social Security Act if the employee's railroad earnings after 1936 were credited as social security earnings.

43. Automatic benefit eligibility adjustments

A liberalization of entitlement provisions enacted for title II of the Social Security Act will be applied to provide entitlement to a tier 1 benefit under the Railroad Retirement Act.

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44. Transfer of credits

Transfer of railroad retirement credits is made to social security if an employee had less than 10 years of railroad service and less than 5 years of service after 1995 or, in the case of a survivor, if the employee lacked a current connection.

DEFINITIONS

The meanings of terms used in the outline are defined below:

Railroad earnings - earnings derived from covered railroad employment, up to the maximums specified in item 9.

Social security earnings - earnings derived from employment covered under the Social Security Act (excludes railroad earnings), up to the maximums allowed.

Current connection - generally defined as having at least 12 months of railroad service in the 30 months preceding death or retirement. An employee whose last 12 months of railroad service occurred prior to the 30 months before retirement or death may maintain a current connection if the employee did not perform any regular employment between the end of the 30 month period containing the last 12 months of railroad service and the month of retirement or death. For purposes of the supplemental annuity or survivors' benefits, an employee who was terminated involuntarily and without fault on or after October 1, 1975, after 25 years of service and did not thereafter decline an offer of employment in the same class or craft in the railroad industry is deemed to have a current connection.

Fully insured - insured for retirement at age 62 under social security; does not necessarily imply an insured status for disability benefits or for survivor benefits for death before age 62.

Social security benefit - when used in describing the computation of the vested dual benefit, the term "social security benefit" means a primary insurance amount computed by using the social security formula in effect in 1974 and the specified earnings; it does not imply an actual benefit.

Social security retirement age - the age at which an individual may receive an unreduced benefit at retirement under the Social Security Act, as follows:

Year of attainment of early retirement age (62 for employees and spouses, 60 for widows and widowers)	Retirement age (age for unreduced benefit)
1999 or earlier	65 years, 0 months
2000	65 years, 2 months
2001	65 years, 4 months
2002	65 years, 6 months
2003	65 years, 8 months
2004	65 years, 10 months
2005-2016	66 years, 0 months
2017	66 years, 2 months
2018	66 years, 4 months
2019	66 years, 6 months
2020	66 years, 8 months
2021	66 years, 10 months
2022 or later	67 years, 0 months

TECHNICAL SUPPLEMENT
GENERAL METHODOLOGY AND ASSUMPTIONS

1. Approach. The 27th valuation presents results under three different employment assumptions. The same set of earnings inflation, price inflation, and investment return assumptions was used with each of the three employment assumptions. This set of assumptions is discussed in Section V and listed in Table 1 of the valuation report.

   A projection of the progress of the railroad retirement fund through 2091 is shown under each of the three employment assumptions. All the projections are based on an open group (that is, they include future entrants). The calculations were arranged so that closed-group valuations, limited to former and present employees, could be obtained as a by-product. A balance sheet deriving actuarial surplus or deficiency is also shown.

2. Basic data. All data concerning current beneficiaries were derived from "universe" files (files including all beneficiaries as of December 31, 2016). These files included information needed to project benefits for current beneficiaries. Information needed to derive exposures and terminations for mortality and remarriage studies was obtained from similar universe files created at an earlier date.

   Active and inactive census data and data needed to study the withdrawal, mortality, and age and disability retirement experience of active employees were also compiled from universe files.

3. Service tables. For the projections of employees in active service and new entrants, a service month table was prepared.

   Five sets of withdrawal rates were used with the differentiation made by attained age. Four sets of rates for disability retirement and two sets of rates for age retirement were used, with the differentiation made by completed years of service. Rates of death in active service are aggregate.

4. Actuarial assumptions.

   Mortality after age retirement. Mortality studies for nondisability retirements covering the period 2012-2015 showed that mortality improvement during the period was less than expected. The overall ratio of actual to expected deaths based on the 2010 Base Year RRB Annuitants Mortality Table projected to 2013 using the 2013 RRB Mortality Improvement Scale was 101.4%. The greatest improvement in mortality occurred in the age 60-64 group, where the ratio of actual to expected deaths was 96.4%. Although the actual to expected ratios were close to 100%, it was decided that some improvement in fit by five-year age groups could be obtained by the graduation of a new table. As a result, the 2013 Base Year RRB Annuitants Mortality Table was produced. The 2013 Base Year RRB Annuitants Mortality Table is intended to be projected using the 2013 RRB Mortality Improvement Scale.

Mortality after disability retirement. The overall ratio of actual to expected deaths after disability retirement with disability freeze based on the 2010 Base Year RRB Disabled Mortality Table for Annuitants with Disability Freeze projected to 2013 using the 2013 RRB Mortality Improvement Scale was 99.5%. The overall ratio of actual to expected deaths after disability retirement without disability freeze based on the 2010 Base Year RRB Disabled Mortality Table for Annuitants without Disability Freeze projected to 2013 using the 2013 RRB Mortality Improvement Scale was 100.3%. The projections were very close to 100% overall. Although, based on the experience, new mortality tables would not be required, a slightly better fit by age could be obtained with new tables. The new tables, the 2013 Base Year RRB Disabled Mortality Table for Annuitants with Disability Freeze and the 2013 Base Year RRB Disabled Mortality Table for Annuitants without Disability Freeze, were based on experience between the anniversaries of retirement in 2012 and 2015. The tables are intended to be projected using the 2013 RRB Mortality Improvement Scale.

Mortality of employees in active service. Mortality studies for active employees showed an overall ratio of actual to expected deaths of 94.1%. Based on the recent improvement in the mortality experience, a new table, the 2012 Active Service Mortality Table, was constructed. Because of the relatively low rates of active service mortality, the relatively small impact on the valuation results, and the lack of consistency in improvement in active service mortality, we continue to provide no margin for active service mortality improvement.

Total termination for spouses. Total termination rates are used in projecting future tier 1 and tier 2 benefits for spouses receiving these benefits on the valuation date. Spouse benefits terminate at either the spouse's or the employee's death. A spouse receiving benefits at the time of the employee's death would begin to receive survivor benefits if the employee maintained a current connection.

The overall ratio of actual terminations to those expected on the basis of the 2010 Base Year RRB Spouse Total Termination Table projected to 2013 using the 2013 RRB Mortality Improvement Scale was 102.2%. The greatest improvement in terminations was in the age group 60-64. In aggregate, improvement was somewhat less than projected. So that the assumed termination rates will more closely reflect recent actual experience, a new table, the 2013 Base Year RRB Spouse Total Termination Table, was constructed. The table is intended to be projected using the 2013 RRB Mortality Improvement Scale.

Probability of a retired employee having an eligible spouse. Projected tier 1 and tier 2 benefits for spouses of active employees and future entrants were determined by applying factors to the projected employee tier 1 and tier 2 benefits, respectively. These factors, shown in Table S-6, reflect the age-by-age probability that an employee annuitant has a spouse receiving benefits. Although the overall ratio of the actual number of spouses on December 31, 2015, to the expected number based on the 26th valuation standard was 99.2% and 100.7%, for employees with fewer than 30 years of service and employees with 30 or more years of service, respectively, it has been past practice to update this table for each new valuation.

Mortality of widow annuitants. The ratio of actual to expected deaths for widow annuitants was 107.0% based on the 26th valuation standard, the 2013 RRB Mortality Table for Widows. The 2013 Mortality Table was graduated with a 6% margin to provide for future mortality improvement. Since the current 7% margin continues to be adequate both overall and at most ages, the 26th valuation standard was retained. A one-year rateback in age is used to provide for longer-term mortality improvement for widows coming from future employee deaths.

Remarriage of widows. The overall ratio of actual to expected remarriages on the basis of the 26th valuation standard, the 1997 RRB Remarriage Table, was 80.6%. Based on the sparsity of data, relative newness of the current standard, relatively small number of remarriages, and relatively small impact of a change in remarriage rates on the valuation results, the 26th valuation standard was retained.

Total termination for disabled children. The overall ratio of actual terminations to those expected on the basis of the 26th valuation standard, the 2004 RRB Total Termination Table for Disabled Children, was 112.2%. Based on the relatively small number of terminations and the accompanying higher volatility of termination rates, the 26th valuation standard was retained.

Withdrawal from the railroad industry. The overall ratio of actual final withdrawals (withdrawals net of re-entrants) to those expected on the basis of the 26th valuation standard was 78.8%. Based on the continuing decline in withdrawal rates, a new valuation standard for withdrawal rates was adopted for the 27th valuation.

Age retirement. A normal age annuity is payable at social security normal retirement age (SSNRA) with 10 years of total service or 5 years of service after 1995. For employees with 30 or more years of service, an unreduced benefit is payable to those who retire after the attainment of age 60. Benefits are reduced for employees who retire from age 62 to SSNRA with 5-29 years of service. A supplemental annuity is payable to employees with service before October, 1981, who have attained age 60 with 30 or more years of service, or attained age 65 with 25 or more years of service.

A comparison between the rates of age retirements assumed in the 26th and 27th valuations and the crude rates during calendar years 2013-2015 is shown in Table S-30. For employees with 5-29 years of service, the assumed 27th valuation rates are close to the 2013-2015 crude rates at ages under 68 and smoothed thereafter for ages over 67. For employees with 30 or more years of service, the assumed 27th valuation rates are close to the crude rates at ages under 66 and smoothed thereafter for ages over 65.

Disability retirement. An employee is eligible for disability retirement based on total and permanent disability at any age with at least 10 years of service or 5 years of service after 1995. Eligibility for occupational disability requires (i) permanent disability for an employee's regular railroad occupation, (ii) attainment of age 60 with 10 years of service or any age with 20 years of service, and (iii) a current connection.

For employees with 10-19 years of service, the ratio of actual disability retirements during 2013-2015 to those expected based on the 26th valuation standard was 73.9%. The ratio of actual to expected disability retirements for employees with 20-24 years of service was 71.2%, and for employees with 25-29 years of service it was 70.8%. For employees with 30 or more years of service the ratio of actual to expected disability retirements was 78.1%. The overall ratio of actual to expected disability retirements for all employees was 74.6%. Because of the recent volatility of experience, current experience was combined with that of the period 2010-2012, and a new table of rates of disability retirement was constructed based on the combined 2010-2015 experience.

Disability retirements are not projected for participants with 5-9 years of service because the benefits are limited to what social security would pay and are reimbursed through the financial interchange. These employees become eligible for tier 2 benefits at age 62 and are treated as vested withdrawals in our projections.

The ratio of actual to expected disability retirements qualifying for a disability freeze based on the 26th valuation standard was 100.5% and 100.3% for employees with 10-19 years of service and 20 or more years of service, respectively. A new table of percentages eligible for a disability freeze was constructed for the 27th valuation. In the current experience, as shown in table S-35, the disability freeze rates for the 20-24 years of service group, the 25-29 years of service group, and the 30 or more years of service group are close, and therefore a single set of rates is assumed for employees with 20 or more years of service. These rates are shown in Table S-12.

Mortality Improvement. For the 26th valuation, the mortality experience of aged and disabled annuitants and the spouse termination experience for the period 1957 through 2011 were studied to see how mortality had improved in the past. As well as reviewing the RRB historical experience, other sources, such as the mortality experience of the U. S. population and the mortality assumptions in the 2014 OASDI Trustees' Report, were taken into account in developing the 2013 RRB Mortality Improvement Scale shown in Table S-10.

For the 27th valuation, the RRB historical mortality and spouse termination experience was updated through 2014, as shown in Table S-29, and other sources, such as the mortality experience of the U. S. population through 2013 and the mortality assumptions in the 2016 OASDI Trustees' Report, were reviewed. Based on the results of this review, the 26th valuation standard was retained.

Other assumptions. Assumptions involving (1) service months and salary scales, (2) family composition, and (3) the age distribution of new entrants are shown in Tables S-14, S-15, and S-44, respectively.

Investment and administrative expenses. For investment and administrative expenses, best estimates are used in the initial projection years. Thereafter, investment expenses are assumed to equal 0.3% (30 basis points) of the prior year end combined NRRIT and RR Account fund balance. Administrative expenses are assumed to increase at the same rate as the wage increase assumption shown in Table 1 of the valuation report, subject to the following limits.

Administrative expenses for the RR Account are limited to 2% of benefits paid from the RR Account and NRRIT. Administrative expenses for the SSEB Account are limited to 0.7% of benefits paid from the SSEB Account.

A complete list of the assumptions and the tables that present them follows.

List of assumptions and tables used in the 27th valuation

Item	Assumption or table
A. Mortality and total termination rates	
1. After age retirement	Table S-1 with Table S-10
2. After disability retirement	
(a) with Disability Freeze	Table S-2 with Table S-10
(b) without Disability Freeze	Table S-3 with Table S-10
3. Employees in active service	Table S-4
4. Spouses	Table S-5 with Table S-10
5. Nondisabled widows	
(a) Widows of deceased employees	Table S-7
(b) Widows coming from future employee deaths	Table S-7 with a 1-year rateback in age
6. Disabled widows	Table S-2 with Table S-10
7. Children under age 18	Disregarded
8. Disabled children age 18 and over	Table S-9
9. Mortality improvement	Table S-10
B. Remarriage rates for widows	Table S-8
C. Retirement rates	
1. Age retirement	Table S-11
2. Disability (with "disability freeze" percentages)	Table S-12
D. Withdrawal rates	Table S-13
E. Other assumptions	
1. Probability of a retired employee having an eligible spouse	Table S-6
2. Economic assumptions	Table 1 of valuation report
3. Service months and salary scales	Table S-14
4. Family composition	Table S-15
5. Age distribution of future entrants	Table S-44

Table S-1. 2013 Base Year[a] RRB Annuitants Mortality Table

Age[b]	$1,000q_x$	Age[b]	$1,000q_x$
60	5.69	95	268.47
61	6.41	96	291.65
62	7.21	97	312.77
63	8.12	98	332.03
64	9.14	99	349.64
65	10.28	100	365.75
66	11.58	101	380.52
67	13.03	102	394.09
68	14.66	103	406.58
69	16.49	104	418.11
70	18.56	105	428.79
71	20.86	106	438.71
72	23.44	107	448.72
73	26.32	108	458.56
74	29.54	109	468.22
75	33.13	110	1,000.00
76	37.13		
77	41.58		
78	46.52		
79	52.02		
80	58.12		
81	64.88		
82	72.36		
83	80.62		
84	89.75		
85	99.80		
86	110.86		
87	123.00		
88	136.30		
89	150.85		
90	166.73		
91	184.00		
92	202.75		
93	223.04		
94	244.93		

[a] For use with 2013 RRB Mortality Improvement Scale.

[b] Age nearest birthday.

Table S-2. 2013 Base Year[a] RRB Disabled Mortality Table for Annuitants with Disability Freeze[b]

Age[c]	$1{,}000q_x$	Age[c]	$1{,}000q_x$	Age[c]	$1{,}000q_x$
30	15.55	65	27.94	100	376.26
31	15.96	66	29.45	101	390.98
32	16.36	67	31.29	102	404.80
33	16.75	68	33.50	103	417.65
34	17.13	69	36.19	104	429.44
35	17.50	70	39.43	105	440.10
36	17.86	71	42.95	106	449.57
37	18.21	72	46.79	107	459.39
38	18.54	73	50.95	108	469.03
39	18.86	74	55.48	109	478.51
40	19.17	75	60.39	110	1,000.00
41	19.45	76	65.72		
42	19.73	77	71.51		
43	19.98	78	77.79		
44	20.21	79	84.59		
45	20.43	80	91.95		
46	20.62	81	99.92		
47	20.79	82	108.54		
48	20.94	83	117.85		
49	21.07	84	127.90		
50	21.18	85	138.74		
51	21.27	86	150.42		
52	21.37	87	162.98		
53	21.49	88	176.48		
54	21.64	89	190.97		
55	21.83	90	206.49		
56	22.05	91	222.90		
57	22.32	92	239.96		
58	22.65	93	257.44		
59	23.04	94	275.14		
60	23.52	95	292.87		
61	24.10	96	310.44		
62	24.80	97	327.70		
63	25.66	98	344.51		
64	26.69	99	360.73		

[a] For use with 2013 RRB Mortality Improvement Scale.

[b] Qualified under social security definition of disability.

[c] Age nearest birthday.

Table S-3. 2013 RRB Base Year[a] Disabled Mortality Table for Annuitants without Disability Freeze[b]

Age[c]	1,000q_x	Age[c]	1,000q_x	Age[c]	1,000q_x
40	4.53	70	29.95	100	368.74
41	4.71	71	32.96	101	384.04
42	4.91	72	36.26	102	398.35
43	5.12	73	39.88	103	411.58
44	5.35	74	43.86	104	423.65
45	5.60	75	48.22	105	434.47
46	5.87	76	53.00	106	443.98
47	6.15	77	58.25	107	453.90
48	6.47	78	64.00	108	463.64
49	6.83	79	70.29	109	473.21
50	7.22	80	77.17	110	1,000.00
51	7.65	81	84.70		
52	8.13	82	92.93		
53	8.68	83	101.91		
54	9.28	84	111.70		
55	9.95	85	122.36		
56	10.44	86	133.97		
57	11.00	87	146.58		
58	11.63	88	160.27		
59	12.34	89	175.09		
60	13.15	90	191.13		
61	14.06	91	208.20		
62	15.09	92	226.02		
63	16.26	93	244.32		
64	17.58	94	262.87		
65	19.07	95	281.47		
66	20.75	96	299.90		
67	22.65	97	318.00		
68	24.80	98	335.60		
69	27.22	99	352.56		

[a] For use with 2013 RRB Mortality Improvement Scale.

[b] Not qualified under social security definition of disability.

[c] Age nearest birthday.

Table S-4. 2012 RRB Active Service Mortality Table[a]

Age[b]	$1{,}000q_{x-1/2}$		Age[b]	$1{,}000q_{x-1/2}$
			45	1.46
			46	1.54
17	.73		47	1.64
18	.73		48	1.74
19	.73		49	1.85
20	.73		50	1.97
21	.73		51	2.10
22	.73		52	2.23
23	.73		53	2.39
24	.73		54	2.55
25	.73		55	2.73
26	.73		56	2.92
27	.73		57	3.13
28	.73		58	3.35
29	.73		59	3.60
30	.73		60	3.86
31	.76		61	4.15
32	.79		62	4.46
33	.82		63	4.79
34	.85		64	5.16
35	.89		65	5.55
36	.92		66	5.98
37	.97		67	6.44
38	1.01		68	6.95
39	1.06		69	7.49
40	1.12		70	8.08
41	1.17		71	8.72
42	1.24		72	9.41
43	1.30		73	10.16
44	1.38		74	10.97
			75	11.85

[a] Deaths in active service are those of employees who last worked in the railroad industry in the year in which death occurred or in the preceding calendar year. The exposures correspond to this definition.

[b] Age attained in calendar year of exposure.

Table S-5. 2013 Base Year[a] RRB Spouse Total Termination[b] Table

Age[c]	$1,000q_x^t$		Age[c]	$1,000q_x^t$
60	17.46		95	375.44
61	19.21		96	394.72
62	21.13		97	413.33
63	23.23		98	431.25
64	25.55		99	448.46
65	28.09		100	464.93
66	30.88		101	480.65
67	33.95		102	495.61
68	37.31		103	509.80
69	41.00		104	523.22
70	45.05		105	535.86
71	49.48		106	547.72
72	54.34		107	558.81
73	59.66		108	569.13
74	65.48		109	578.67
75	71.85		110	1,000.00
76	78.81			
77	86.41			
78	94.71			
79	103.76			
80	113.62			
81	124.35			
82	136.01			
83	148.67			
84	162.40			
85	177.25			
86	193.30			
87	210.61			
88	229.23			
89	249.23			
90	270.65			
91	292.55			
92	314.04			
93	335.05			
94	355.54			

[a] For use with 2013 RRB Mortality Improvement Scale.

[b] Mainly death of employee or death of spouse.

[c] Age nearest birthday.

Table S-6. Probability of a retired employee having a spouse eligible for railroad retirement benefits

Age[a] of employee	Employees with 30 or more years of service	Employees with less than 30 years of service
59 and under	0.000	0.000
60	0.252	0.000
61	0.356	0.000
62	0.462	0.084
63	0.547	0.177
64	0.614	0.258
65	0.664	0.328
66	0.701	0.387
67	0.728	0.438
68	0.746	0.480
69	0.760	0.514
70	0.770	0.541
71	0.777	0.562
72	0.782	0.578
73	0.784	0.589
74	0.784	0.597
75	0.781	0.602
76	0.776	0.605
77	0.768	0.605
78	0.758	0.603
79	0.746	0.599
80	0.731	0.592
81	0.714	0.582
82	0.695	0.569
83	0.673	0.553
84	0.650	0.534
85	0.624	0.511
86	0.596	0.485
87	0.567	0.455
88	0.536	0.424
89	0.503	0.391
90	0.470	0.357
91	0.437	0.323
92	0.403	0.290
93	0.369	0.258
94	0.335	0.228
95	0.302	0.201
96	0.269	0.177
97	0.238	0.158
98	0.208	0.139
99 & over	0.181	0.119

[a] Age nearest birthday.

Table S-7. 2013 RRB Mortality Table for Widows

Age[a]	$1,000q_x$	Age[a]	$1,000q_x$	Age[a]	$1,000q_x$
20	0.39	55	4.79	90	128.04
21	0.41	56	5.25	91	141.79
22	0.42	57	5.76	92	157.64
23	0.43	58	6.32	93	175.10
24	0.45	59	6.92	94	193.69
25	0.47	60	7.59	95	212.98
26	0.48	61	8.32	96	232.53
27	0.50	62	9.12	97	251.99
28	0.52	63	9.99	98	271.00
29	0.54	64	10.95	99	289.28
30	0.56	65	12.00	100	306.54
31	0.58	66	13.16	101	322.55
32	0.61	67	14.42	102	337.10
33	0.65	68	15.80	103	349.99
34	0.70	69	17.31	104	361.04
35	0.76	70	18.96	105	370.06
36	0.83	71	20.77	106	376.89
37	0.91	72	22.76	107	382.53
38	1.00	73	24.92	108	388.11
39	1.10	74	27.30	109	393.63
40	1.20	75	29.89	110	1,000.00
41	1.32	76	32.78		
42	1.45	77	35.98		
43	1.59	78	39.55		
44	1.74	79	43.51		
45	1.91	80	47.90		
46	2.09	81	52.78		
47	2.30	82	58.19		
48	2.52	83	64.18		
49	2.76	84	70.82		
50	3.03	85	78.17		
51	3.32	86	86.29		
52	3.64	87	95.26		
53	3.99	88	105.15		
54	4.37	89	116.05		

[a] Age nearest birthday.

Table S-8. 1997 RRB Remarriage Table
(Probabilities of remarriage)

Age[a] at widowhood [x]	$1{,}000q^m_{[x]+n}$ for n equal to					Age[a] x	$1{,}000q^m_x$
	0	1	2	3	4		
20	24.76	56.57	66.98	72.11	61.24	25	45.66
21	23.57	53.82	63.69	68.54	58.18	26	43.35
22	22.42	51.18	60.54	65.12	55.24	27	41.14
23	21.32	48.64	57.51	61.83	52.42	28	39.02
24	20.27	46.21	54.61	58.67	49.71	29	36.98
25	19.25	43.88	51.82	55.64	47.12	30	35.02
26	18.28	41.64	49.14	52.73	44.62	31	33.14
27	17.35	39.49	46.58	49.94	42.23	32	31.34
28	16.45	37.42	44.11	47.27	39.93	33	29.61
29	15.59	35.44	41.74	44.69	37.73	34	27.95
30	14.77	33.54	39.47	42.23	35.61	35	26.36
31	13.97	31.72	37.29	39.86	33.58	36	24.83
32	13.21	29.97	35.20	37.59	31.63	37	23.36
33	12.48	28.29	33.20	35.40	29.76	38	21.95
34	11.78	26.67	31.27	33.31	27.97	39	20.60
35	11.11	25.13	29.42	31.30	26.24	40	19.30
36	10.47	23.64	27.64	29.37	24.59	41	18.05
37	9.85	22.21	25.94	27.52	23.00	42	16.86
38	9.25	20.84	24.31	25.74	21.48	43	15.71
39	8.68	19.53	22.74	24.04	20.02	44	14.61
40	8.14	18.27	21.23	22.40	18.61	45	13.55
41	7.61	17.06	19.79	20.83	17.26	46	12.53
42	7.11	15.90	18.40	19.32	15.97	47	11.56
43	6.62	14.78	17.07	17.88	14.73	48	10.63
44	6.16	13.71	15.79	16.49	13.54	49	9.73
45	5.71	12.69	14.56	15.15	12.40	50	8.87
46	5.29	11.70	13.38	13.87	11.30	51	8.04
47	4.87	10.75	12.25	12.65	10.25	52	7.25
48	4.48	9.85	11.17	11.47	9.24	53	6.49
49	4.10	8.98	10.13	10.34	8.27	54	5.76
50	3.74	8.14	9.13	9.25	7.33	55	5.06
51	3.39	7.34	8.17	8.21	6.44	56	4.38
52	3.06	6.57	7.25	7.21	5.58	57	3.74
53	2.74	5.83	6.37	6.25	4.76	58	3.12
54	2.43	5.12	5.52	5.33	3.97	59	2.52
55	2.13	4.44	4.71	4.44	3.21	60	8.29
56	1.85	3.78	3.93	3.60	14.84	61	4.17
57	1.58	3.15	3.18	15.76	8.28	62	5.24
58	1.31	2.55	14.26	8.24	9.93	63	4.67
59	1.06	13.76	8.54	10.16	8.98	64	4.16
60	7.27	8.49	9.95	9.11	8.13	65	3.71
61	3.77	9.78	9.10	8.16	7.35	66	3.31
62	4.67	8.98	8.32	7.32	6.65	67	2.95
63	4.18	8.24	7.60	6.56	6.01	68	2.63
64	3.74	7.56	6.95	5.88	5.44	69	2.34
65	3.35	6.94	6.35	5.27	4.92	70	2.08
66	3.00	6.38	5.81	4.72	4.45	71	1.85
67	2.68	5.86	5.31	4.23	4.03	72	1.64
68	2.40	5.38	4.85	3.79	3.60	73	1.45
69	2.15	4.94	4.43	3.36	3.17	74	1.27
70	1.92	4.54	4.02	2.95	2.77	75	1.10
71	1.72	4.13	3.60	2.56	2.38	76	0.94
72	1.54	3.73	3.21	2.20	2.03	77	0.81
73	1.39	3.34	2.83	1.86	1.70	78	0.69
74	1.26	2.96	2.47	1.57	1.42	79	0.58
75	1.14	2.61	2.14	1.30	1.16	80	0.49
76	1.04	2.28	1.84	1.08	0.95	81	0.40
77	0.95	1.97	1.57	0.88	0.76	82	0.33
78	0.87	1.70	1.33	0.71	0.60	83	0.27
79	0.79	1.45	1.11	0.57	0.47	84	0.22
80	0.73	1.22	0.92	0.45	0.37	85	0.18
81	0.68	1.03	0.76	0.35	0.28	86	0.15
82	0.63	0.85	0.62	0.27	0.22	87	0.12
83	0.59	0.71	0.50	0.21	0.16	88	0.09
84	0.48	0.38	0.32	0.16	0.12	89	0.06

[a] Age nearest birthday.

Table S-9. 2004 RRB Total Termination Table for Disabled Children

Age[a]	$1,000q_x^t$	Age[a]	$1,000q_x^t$	Age[a]	$1,000q_x^t$
		50	16.97	85	142.28
		51	17.85	86	152.12
		52	18.79	87	162.66
18	21.92	53	19.79	88	173.96
19	21.83	54	20.87	89	186.07
20	21.54	55	22.03	90	199.04
21	21.06	56	23.27	91	212.94
22	20.39	57	24.59	92	227.83
23	19.53	58	26.01	93	243.79
24	18.50	59	27.54	94	260.90
25	17.30	60	29.17	95	279.22
26	15.95	61	30.92	96	298.86
27	14.45	62	32.79	97	319.90
28	13.19	63	34.80	98	342.44
29	12.14	64	36.96	99	366.60
30	11.30	65	39.26	100	379.29
31	10.65	66	41.73	101	384.08
32	10.17	67	44.38	102	386.52
33	9.85	68	47.22	103	387.90
34	9.68	69	50.26	104	389.28
35	9.63	70	53.52	105	390.66
36	9.70	71	57.01	106	392.03
37	9.88	72	60.75	107	393.39
38	10.14	73	64.76	108	394.76
39	10.47	74	69.05	109	396.12
40	10.86	75	73.65	110	1,000.00
41	11.30	76	78.58		
42	11.77	77	83.87		
43	12.27	78	89.53		
44	12.81	79	95.60		
45	13.39	80	102.10		
46	14.01	81	109.06		
47	14.68	82	116.53		
48	15.39	83	124.53		
49	16.15	84	133.10		

[a] Age nearest birthday.

Table S-10. 2013 RRB Mortality Improvement Scale

Age[a]	Annual rate of mortality improvement
85 & under	1.00%
86	0.95%
87	0.90%
88	0.86%
89	0.81%
90	0.77%
91	0.74%
92	0.70%
93	0.66%
94	0.63%
95	0.60%
96	0.57%
97	0.54%
98	0.51%
99	0.49%
100	0.46%
101	0.44%
102	0.42%
103	0.40%
104	0.38%
105	0.36%
106	0.34%
107	0.32%
108	0.31%
109	0.29%
110	0.00%

[a] Age nearest birthday.

Table S-11. Calendar year rates[a] of immediate[b] age retirement
(Retirements per 1,000 exposed)

| Age[c] | Years of service | |
	5-29	30 & over
60		590
61		460
62	90	350
63	90	320
64	80	320
65	170	340
66	330	300
67	270	300
68	250	300
69	250	300
70	250	300
71	250	250
72	200	250
73	200	250
74	200	250
75 & over	200	250

[a] Technically probabilities.

[b] Immediate retirements are defined as those for which the calendar year of retirement is the same as, or the year following, the calendar year of last employment in the railroad industry.

[c] The age interval is from x-.5 to x+.5, except as indicated below:

| | | Interval for | |
Age	Years of service	Exposure	Retirements
60	30 or more	59.5-60.5	60-60.5
62	5-29	61.5-62.5	62-62.5

Table S-12. Rates[a] of immediate[b] disability retirement and of eligibility for disability freeze[c]

| Age[d] | Calendar year rates per 1,000 exposed | | | | Percent of retirements eligible for disability freeze | |
	10-19 years of service	20-24 years of service	25-29 years of service	30 or more years of service	10-19 years of service	20 or more years of service
Under 35	1.2	3.5	3.5	3.5	97.8%	44.8%
35	1.3	3.7	3.7	3.7	97.8	44.8
36	1.3	3.8	3.8	3.8	97.8	44.8
37	1.3	4.0	4.0	4.0	97.8	44.8
38	1.4	4.2	4.2	4.2	97.8	44.8
39	1.5	4.5	4.5	4.5	97.8	44.8
40	1.6	4.8	4.8	4.8	97.8	44.8
41	1.7	5.2	5.2	5.2	97.8	44.8
42	1.8	5.6	5.6	5.6	97.8	44.8
43	2.0	6.2	6.2	6.2	97.8	44.8
44	2.1	6.8	6.8	6.8	97.8	44.8
45	2.4	7.6	7.6	7.6	97.8	44.9
46	2.6	8.5	8.5	8.5	97.8	44.9
47	2.9	9.6	9.6	9.6	97.8	45.1
48	3.3	10.8	10.8	10.8	97.8	45.3
49	3.8	12.2	12.1	12.1	97.8	45.8
50	4.3	13.7	13.5	13.5	97.8	46.8
51	4.9	15.2	14.8	14.8	97.8	48.9
52	5.7	16.8	16.2	16.2	97.8	53.3
53	6.6	18.5	17.5	17.5	97.8	62.1
54	7.7	20.4	18.8	18.8	97.8	80.0
55	9.0	22.4	20.2	20.2	97.8	94.6
56	10.6	24.7	21.7	21.7	97.8	94.6
57	12.5	27.4	23.4	23.4	97.8	94.6
58	14.8	30.6	25.4	25.4	97.8	94.6
59	17.5	34.5	27.9	27.9	97.8	94.6
60	23.9	39.3	31.1	14.4	94.3	94.6
61	29.1	56.5	35.4	10.3	94.3	94.6
62	32.2	51.7	44.4	7.0	94.3	94.6
63	33.8	45.4	38.0	4.6	94.3	94.6
64	25.7	36.9	29.6	2.9	94.3	94.6
65	20.7	25.7	18.3	2.0	94.3	94.6
66	5.2	10.8	3.4	1.9	94.3	94.6

[a] Technically probabilities.

[b] Immediate retirements are defined as those for which the calendar year of retirement is the same as, or the year following, the calendar year of last employment in the railroad industry.

[c] Qualified under the social security definition of disability.

[d] Age attained in calendar year of exposure.

Table S-13. Calendar year rates[a] of final withdrawal

Years of service[b]	Attained age[c]				
	Under 25	25-34	35-44	45-54	55 & over
0	0.158	0.110	0.146	0.188	0.198
1	0.119	0.082	0.084	0.095	0.103
2	0.069	0.053	0.046	0.050	0.066
3	0.049	0.037	0.029	0.032	0.050
4	0.041	0.031	0.025	0.028	0.042
5	0.037	0.028	0.023	0.025	0.037
6	0.033	0.026	0.021	0.023	0.033
7	0.030	0.024	0.020	0.021	0.028
8	0.027	0.022	0.018	0.019	0.025
9	0.024	0.020	0.017	0.017	0.022
10	0.022	0.018	0.015	0.016	0.019
11		0.016	0.014	0.014	0.017
12		0.014	0.013	0.013	0.016
13		0.012	0.012	0.012	0.014
14		0.011	0.011	0.011	0.013
15		0.010	0.010	0.010	0.012
16		0.010	0.009	0.010	0.012
17		0.009	0.009	0.009	0.011
18		0.009	0.008	0.008	0.011
19		0.008	0.007	0.008	0.010
20		0.008	0.006	0.007	0.010
21			0.006	0.007	0.010
22			0.005	0.006	0.010
23			0.005	0.006	0.009
24			0.004	0.005	0.009
25			0.004	0.005	0.008
26			0.004	0.005	0.007
27			0.003	0.005	0.006
28			0.003	0.004	0.004
29			0.002	0.004	0.003
30 & over			0.005	0.005	0.010

[a] Technically probabilities.

[b] Rounded up to nearest whole year.

[c] Age attained in calendar year of exposure.

Table S-14. Service months and salary scales

Years of service[a]	Service months	Increase in average monthly salary from prior service level	
		Tier 1	Tier 2
0	6.4		
1	11.5	21.3%	20.8%
2	11.6	9.4%	8.3%
3	11.7	5.3%	4.3%
4	11.7	4.3%	3.4%
5	11.7	3.5%	2.8%
6	11.8	2.8%	2.2%
7	11.8	2.3%	1.8%
8	11.8	1.8%	1.4%
9	11.8	1.5%	1.1%
10	11.8	1.1%	0.8%
11	11.8	0.9%	0.6%
12	11.8	0.7%	0.4%
13	11.8	0.5%	0.3%
14	11.8	0.4%	0.2%
15	11.8	0.4%	0.1%
16	11.8	0.4%	0.1%
17	11.8	0.4%	0.1%
18	11.8	0.4%	0.1%
19	11.8	0.4%	0.1%
20	11.8	0.4%	0.1%
21	11.8	0.3%	0.1%
22	11.8	0.3%	0.1%
23	11.8	0.3%	0.1%
24	11.9	0.3%	0.1%
25	11.9	0.3%	0.1%
26	11.9	0.3%	0.1%
27	11.9	0.3%	0.1%
28	11.9	0.3%	0.1%
29	11.9	0.3%	0.1%
30	11.9	0.3%	0.1%
31	11.9	0.3%	0.1%
32	11.9	0.3%	0.1%
33	11.9	0.3%	0.1%
34	11.9	0.3%	0.1%
35	11.9	0.3%	0.1%
36	11.9	0.3%	0.1%
37	11.9	0.3%	0.1%
38	11.9	0.3%	0.1%
39	11.9	0.3%	0.1%
40	11.9	0.3%	0.1%
41	11.9	0.3%	0.1%
42	11.9	0.3%	0.1%
43	11.9	0.3%	0.1%
44	11.9	0.3%	0.1%
45 & over	11.9	0.3%	0.1%

[a] Rounded up to nearest whole year.

Table S-15. Family characteristics of railroad employees assumed for the valuation of survivor benefits

Age of employee[a]	Percent married							Percent with eligible child	
					Widow under 60 with eligible child				
	Total	Widow age 62 & over	Widow age 60-61	Widow under age 60	Youngest child under 16	Youngest child age 16-17	Youngest child disabled	Minor child	Disabled child
Under 35	68.0	-	-	68.0	60.3	-	-	84.8	-
35 - 39	68.0	-	-	68.0	59.7	2.4	-	88.4	1.9
40 - 44	68.0	-	-	68.0	58.9	4.7	-	84.8	1.9
45 - 49	68.0	-	-	68.0	34.7	8.7	0.6	60.0	1.9
50 - 54	68.0	2.2	1.2	64.6	15.4	6.8	1.0	31.3	1.9
55 - 59	68.0	4.4	3.7	59.9	5.2	2.2	1.2	11.0	1.9
60 - 64	68.0	19.5	14.5	34.0	1.9	0.6	0.6	4.0	1.9
65 - 69	68.0	51.2	6.9	9.9	0.6	0.4	0.2	2.1	1.4
70 - 74	68.0	62.1	2.3	3.6	0.3	0.1	0.1	0.8	1.2
75 - 79	68.0	65.4	0.9	1.7	0.1	-	-	0.3	1.0
80 - 84	60.7	59.7	0.4	0.6	-	-	-	0.2	0.8
85 - 89	51.7	51.2	0.1	0.4	-	-	-	0.1	0.7
90 & over	35.1	34.8	0.1	0.2	-	-	-	-	0.6

Age of employee[a]	Average ages of widows						Average ages of children			Average number of minor children[c]
				Widow under 60 with eligible child						
	Widow age 62 & over	Widow age 60-61	Widow under age 60	Youngest child under 16	Youngest child age 16-17	Youngest child disabled	Youngest child under 16[b]	All minor children	All disabled children	
Under 35	-	-	32	32	-	-	5	6	-	2.2
35 - 39	-	-	37	37	38	-	7	8	20	2.2
40 - 44	-	-	41	41	42	-	9	10	20	1.9
45 - 49	-	-	46	44	47	48	11	12	22	1.7
50 - 54	64	61	51	47	50	52	11	12	24	1.5
55 - 59	65	61	54	50	51	55	12	13	27	1.4
60 - 64	66	61	56	50	52	56	12	13	31	1.3
65 - 69	67	61	56	50	53	56	12	13	35	1.3
70 - 74	70	61	55	50	53	57	12	13	39	1.2
75 - 79	74	61	55	50	-	-	12	13	44	1.2
80 - 84	79	61	55	-	-	-	-	13	48	1.2
85 - 89	83	61	55	-	-	-	-	13	52	1.2
90 & over	87	61	55	-	-	-	-	-	56	-

[a] Age nearest birthday at time of death.

[b] Includes families with widows under 60 and children under 16 only.

[c] Includes families with minor children only.

MORTALITY, REMARRIAGE, AND RELATED EXPERIENCE

1. <u>Mortality of age annuitants</u>. The mortality studies conducted for age annuitants are summarized in Tables S-16 through S-18. The tables show actual-to-expected ratios by age, sex, year and duration on the basis of the 26^h and 27th valuation standards.

2. <u>Mortality after disability retirement</u>. The mortality studies conducted for disability annuitants are summarized in Tables S-19 through S-21. The tables show select, ultimate and aggregate crude death rates, actual-to-expected ratios, and disability freeze percentages.

3. <u>Mortality in active service</u>. The mortality experience of active railroad employees is shown in Table S-22. The table provides crude rates and actual-to-expected ratios.

4. <u>Total termination, mortality and probability of spouse</u>. Tables S-23 and S-24 show, respectively, the total termination and mortality experience of spouse annuitants between anniversaries of retirement in 2012 and 2015. Spouse mortality is not used directly in any part of the valuation. Table S-25 shows, as of December 31, 2015, the number of retired employees and the number of eligible spouses of employees, by age of employee. The probabilities shown in Table S-6 are based on the results shown in Table S-25.

5. <u>Mortality and remarriage of widows</u>. Table S-26 shows ratios of actual deaths of widow annuitants to those expected on the basis of the 26th and 27th valuation standards. Table S-27 shows ratios of actual remarriages to those expected on the basis of the 1997 RRB Remarriage Table.

6. <u>Termination of disabled children</u>. Table S-28 shows ratios of actual terminations of disabled children annuitants to those expected on the basis of the 2004 RRB Total Termination Table for Disabled Children.

7. <u>Mortality improvement.</u>   Table S-29 shows average annual improvement in annuitant mortality and spouse total termination from 1957 through 2014.

Table S-16. Mortality experience of railroad age annuitants[a] between anniversaries of retirement in 2012 and 2015, by sex and type of retirement

	All ages	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95 & over
					Age[b]				
A. Both sexes combined									
Exposed	585,082	98,361	133,032	95,614	76,360	74,618	68,484	30,720	7,893
Actual deaths	30,125	731	1,740	2,242	3,222	5,381	8,418	5,968	2,423
Age specific death rates (per thousand)	51.5	7.4	13.1	23.4	42.2	72.1	122.9	194.3	307.0
Ratio of actual to expected deaths									
1994 GAM males[c]	98.3%	69.1%	73.2%	83.3%	92.3%	95.1%	106.8%	110.4%	115.6%
2010 Base Year RRB[d]	98.7%	93.5%	98.0%	100.3%	100.4%	97.5%	99.0%	98.1%	101.0%
2010 Base Year RRB projected to 2013[e]	101.4%	96.4%	101.0%	103.4%	103.5%	100.5%	101.7%	100.2%	102.7%
2013 Base Year RRB[f]	100.0%	97.5%	100.5%	101.2%	100.6%	98.3%	100.9%	99.6%	100.1%
B. Male									
Exposed	523,163	90,425	119,454	86,167	68,600	67,481	58,973	25,587	6,476
Actual deaths	27,168	688	1,631	2,102	2,973	5,011	7,574	5,157	2,032
Age specific death rates (per thousand)	51.9	7.6	13.7	24.4	43.3	74.3	128.4	201.5	313.8
Ratio of actual to expected deaths									
1994 GAM males[c]	101.5%	71.0%	76.5%	86.7%	94.8%	97.8%	112.0%	114.5%	118.6%
2010 Base Year RRB[d]	102.4%	96.0%	102.3%	104.4%	103.1%	100.3%	103.9%	101.7%	103.6%
2013 Base Year RRB[f]	103.7%	100.1%	104.9%	105.3%	103.4%	101.1%	105.9%	103.3%	102.6%
C. Female									
Exposed	61,919	7,936	13,578	9,447	7,760	7,137	9,511	5,133	1,417
Actual deaths	2,957	43	109	140	249	370	844	811	391
Age specific death rates (per thousand)	47.8	5.4	8.0	14.8	32.1	51.8	88.7	158.0	275.9
Ratio of actual to expected deaths									
2013 RRB Widows[g], 1-year rateback	100.3%	61.2%	61.3%	72.1%	97.0%	97.4%	101.0%	115.8%	117.6%
2010 Base Year RRB[d]	74.2%	66.4%	60.2%	63.4%	76.1%	70.5%	69.5%	79.9%	89.6%
2013 Base Year RRB[f]	75.1%	69.2%	61.8%	63.9%	76.3%	71.0%	70.9%	81.2%	88.5%
D. Immediate[h]									
Exposed	381,499	77,752	86,404	60,356	46,042	42,751	41,927	20,732	5,535
Actual deaths	19,030	546	1,071	1,440	1,893	3,120	5,182	4,048	1,730
Age specific death rates (per thousand)	49.9	7.0	12.4	23.9	41.1	73.0	123.6	195.3	312.6
Ratio of actual to expected deaths									
2010 Base Year RRB[d]	98.7%	89.6%	93.2%	102.3%	98.2%	98.6%	99.2%	98.2%	102.9%
2013 Base Year RRB[f]	99.9%	93.5%	95.6%	103.2%	98.4%	99.4%	101.1%	99.7%	102.0%
E. Deferred[h]									
Exposed	203,583	20,609	46,628	35,258	30,318	31,867	26,557	9,988	2,358
Actual deaths	11,095	185	669	802	1,329	2,261	3,236	1,920	693
Age specific death rates (per thousand)	54.5	9.0	14.3	22.7	43.8	71.0	121.9	192.2	293.9
Ratio of actual to expected deaths									
2010 Base Year RRB[d]	98.9%	107.2%	106.7%	97.0%	103.7%	96.0%	98.6%	97.8%	96.6%
2013 Base Year RRB[f]	100.1%	111.6%	109.4%	97.9%	104.0%	96.8%	100.5%	99.4%	95.7%

[a] Nondisability retirement.

[b] Age nearest birthday at the beginning of the year of exposure.

[c] 1994 Group Annuity Mortality Static Table.

[d] 2010 Base Year RRB Annuitants Mortality Table.

[e] 2010 Base Year RRB Annuitants Mortality Table projected to 2013 using 2013 RRB Mortality Improvement Scale.

[f] 2013 Base Year RRB Annuitants Mortality Table.

[g] 2013 RRB Mortality Table for Widows.

[h] Immediate retirements are those which occur in the same calendar year as, or the calendar year following, the year of last employment
   in the railroad industry; all others are deferred retirements.

Table S-17. Mortality experience of railroad age annuitants[a] between anniversaries of retirement in 2012 and 2015, by year

	All ages	60-64	65-69	70-74	Age[b] 75-79	80-84	85-89	90-94	95 & over
1. 2012-2015 experience									
Exposed[c]	585,082	98,361	133,032	95,614	76,360	74,618	68,484	30,720	7,893
Actual deaths	30,125	731	1,740	2,242	3,222	5,381	8,418	5,968	2,423
Crude rate per 1,000	51.5	7.4	13.1	23.4	42.2	72.1	122.9	194.3	307.0
Ratio Act./Exp. I[d]	98.7%	93.5%	98.0%	100.3%	100.4%	97.5%	99.0%	98.1%	101.0%
Ratio Act./Exp. II[e]	101.4%	96.4%	101.0%	103.4%	103.5%	100.5%	101.7%	100.2%	102.7%
Ratio Act./Exp. III[f]	100.0%	97.5%	100.5%	101.2%	100.6%	98.3%	100.9%	99.6%	100.1%
2. Crude rate per 1,000 for									
individual years									
2012 - 2013	52.9	7.1	13.5	24.2	42.6	71.5	124.0	197.3	319.5
2013 - 2014	51.0	7.7	12.6	23.5	39.6	73.5	123.1	188.3	302.8
2014 - 2015	50.6	7.5	13.1	22.7	44.4	71.3	121.6	197.2	299.0
3. Ratio Act./Exp. for									
individual years I[d]									
2012 - 2013	99.9%	89.3%	101.4%	103.0%	101.5%	96.5%	100.3%	99.6%	105.2%
2013 - 2014	97.8%	96.8%	95.0%	101.1%	94.3%	99.4%	99.2%	95.2%	99.7%
2014 - 2015	98.5%	94.5%	97.7%	97.2%	105.5%	96.7%	97.4%	99.4%	98.4%
4. Ratio Act./Exp. for									
individual years II[e]									
2012 - 2013	102.6%	92.1%	104.5%	106.2%	104.6%	99.4%	103.1%	101.7%	106.9%
2013 - 2014	100.4%	99.8%	97.9%	104.2%	97.2%	102.4%	102.0%	97.2%	101.3%
2014 - 2015	101.2%	97.4%	100.7%	100.2%	108.8%	99.7%	100.0%	101.6%	100.0%
5. Ratio Act./Exp. for									
individual years III[f]									
2012 - 2013	101.1%	93.2%	104.0%	103.9%	101.7%	97.2%	102.2%	101.1%	104.2%
2013 - 2014	99.0%	100.9%	97.5%	102.0%	94.5%	100.2%	101.1%	96.7%	98.7%
2014 - 2015	99.8%	98.6%	100.2%	98.1%	105.8%	97.5%	99.2%	101.0%	97.4%

[a] Nondisability retirement.

[b] Age nearest birthday at the beginning of the year of exposure.

[c] Exposure is between anniversaries of retirement in indicated years.

[d] Expected based on 2010 Base Year RRB Annuitants Mortality Table.

[e] Expected based on 2010 Base Year RRB Annuitants Mortality Table projected to 2013 using 2013 RRB
   Mortality Improvement Scale.

[f] Expected based on 2013 Base Year RRB Annuitants Mortality Table.

Table S-18. Mortality ratios for railroad age annuitants on a select and ultimate
basis between anniversaries of retirement in 2012 and 2015

Duration	Exposure	Actual deaths	Crude rate per 1,000	Ratio Act./Exp.[a]	Ratio Act./Exp.[b]	Ratio Act./Exp.[c]
0	30,395	212	7.0	85.1%	87.7%	88.6%
1	30,356	264	8.7	96.5	99.5	100.1
2	30,528	284	9.3	93.6	96.5	96.8
3	30,604	338	11.0	100.6	103.6	103.7
4	29,629	351	11.8	97.1	100.0	99.8
5	28,405	356	12.5	92.7	95.5	95.0
6	25,988	348	13.4	89.0	91.7	90.9
7	23,886	411	17.2	102.1	105.2	104.0
8	21,753	393	18.1	95.6	98.5	97.0
9	20,956	469	22.4	106.3	109.5	107.6
10 & over	312,582	26,699	85.4	99.1	101.7	100.1
All durations	585,082	30,125	51.5	98.7%	101.4%	100.0%

[a] Expected based on 2010 Base Year RRB Annuitants Mortality Table.

[b] Expected based on 2010 Base Year RRB Annuitants Mortality Table projected
to 2013 using 2013 RRB Mortality Improvement Scale.

[c] Expected based on 2013 Base Year RRB Annuitants Mortality Table.

Table S-19. Age specific death rates of railroad disability annuitants between anniversaries
of retirement in 2012 and 2015, by age and duration

Select section

				Age at retirement[a]			
	All ages	Under 40	40-44	45-49	50-54	55-59	60 & over
Exposed							
Duration 0	6,598	134	251	373	1,069	2,960	1,812
1	7,309	144	260	367	1,290	3,426	1,822
2	7,977	152	270	412	1,537	3,802	1,806
3	8,511	165	248	439	1,837	3,984	1,839
4	8,870	179	231	491	2,107	4,077	1,785
Actual deaths							
Duration 0	204	b	b	b	36	89	65
1	245	b	b	b	36	126	66
2	181	b	b	b	33	85	46
3	187	b	b	b	41	81	55
4	181	b	b	11	35	85	48
Crude rate per 1,000							
Duration 0	30.9	b	b	b	33.7	30.1	35.9
1	33.5	b	b	b	27.9	36.8	36.2
2	22.7	b	b	b	21.5	22.4	25.5
3	22.0	b	b	b	22.3	20.3	29.9
4	20.4	b	b	22.4	16.6	20.8	26.9

Ultimate section, durations 5 and over

Age[c]	Exposed	Actual deaths	Crude rate per 1,000
Under 50	1,763	22	12.5
50-54	4,270	53	12.4
55-59	23,049	388	16.8
60-64	49,242	1,110	22.5
65-69	54,166	1,505	27.8
70-74	34,028	1,504	44.2
75-79	20,430	1,323	64.8
80-84	14,373	1,425	99.1
85 & over	11,736	2,043	174.1
All ages	213,056	9,373	44.0

[a] Age nearest birthday.

[b] Fewer than 10 actual deaths.

[c] Age nearest birthday at the beginning of the year of exposure.

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Table S-20. Mortality experience of railroad disability annuitants between anniversaries of retirement in 2012 and 2015, by disability freeze status

Age[a]	All disability annuitants			Annuitants with disability freeze						Annuitants without disability freeze					
	Exposed	Actual deaths	Crude rate per 1,000	Exposed	Actual deaths	Crude rate per 1,000	Ratio Act./Exp[b]	Ratio Act./Exp[c]	Ratio Act./Exp[d]	Exposed	Actual deaths	Crude rate per 1,000	Ratio Act./Exp[e]	Ratio Act./Exp[f]	Ratio Act./Exp[g]
Under 40	598	h	h	585	h	h	h	h	h	13	h	h	h	h	h
40-44	1,573	23	14.6	1,461	22	15.1	82.3	84.8	76.1	112	h	h	h	h	h
45-49	2,689	42	15.6	2,320	39	16.8	87.8	90.5	80.8	369	h	h	h	h	h
50-54	9,004	161	17.9	6,367	137	21.5	106.9	110.1	100.3	2,637	24	9.1	109.1	112.4	106.0
55-59	36,779	755	20.5	26,555	628	23.6	108.1	111.4	105.0	10,224	127	12.4	112.7	116.2	110.1
60-64	64,519	1,521	23.6	47,589	1,251	26.3	103.7	106.9	105.2	16,930	270	15.9	105.3	108.6	104.0
65-69	56,583	1,565	27.7	40,616	1,204	29.6	90.1	92.9	95.0	15,967	361	22.6	100.5	103.5	100.4
70-74	34,037	1,504	44.2	23,698	1,130	47.7	97.5	100.5	103.3	10,339	374	36.2	99.6	102.7	100.9
75-79	20,430	1,323	64.8	13,233	911	68.8	92.3	95.1	97.3	7,197	412	57.2	95.4	98.3	97.9
80-84	14,373	1,425	99.1	8,193	857	104.6	92.6	95.5	97.2	6,180	568	91.9	94.7	97.6	98.5
85-89	8,627	1,306	151.4	4,317	701	162.4	97.9	100.6	102.3	4,310	605	140.4	93.6	96.2	98.4
90-94	2,565	582	226.9	1,441	335	232.5	96.9	99.0	99.9	1,124	247	219.8	97.0	99.1	101.9
95 & over	544	155	284.9	354	102	288.1	88.9	90.3	87.4	190	53	278.9	86.3	87.7	85.9
All ages	252,319	10,371	41.1	176,729	7,326	41.5	96.6%	99.5%	100.0%	75,591	3,045	40.3	97.5%	100.3%	99.9%

[a] Age nearest birthday at the beginning of the year of exposure.

[b] Expected based on 2010 Base Year RRB Disabled Mortality Table for Annuitants with Disability Freeze.

[c] Expected based on 2010 Base Year RRB Disabled Mortality Table for Annuitants with Disability Freeze projected to 2013 using 2013 RRB Mortality Improvement Scale.

[d] Expected based on 2013 Base Year RRB Disabled Mortality Table for Annuitants with Disability Freeze.

[e] Expected based on 2010 Base Year RRB Disabled Mortality Table for Annuitants without Disability Freeze.

[f] Expected based on 2010 Base Year RRB Disabled Mortality Table for Annuitants without Disability Freeze projected to 2013 using 2013 RRB Mortality Improvement Scale.

[g] Expected based on 2013 Base Year RRB Disabled Mortality Table for Annuitants without Disability Freeze.

[h] Fewer than 10 actual deaths.

Table S-21. Percentages of railroad disability annuitants included in the 27th valuation mortality studies who would have qualified for a benefit under the social security disability standards

Duration and type of freeze decision	Period between anniversaries of retirement					
	2012-2013		2013-2014		2014-2015	
	Exposures	Actual deaths	Exposures	Actual deaths	Exposures	Actual deaths
Duration 0						
Freeze allowed	87.8%	94.0%	87.8%	92.6%	87.3%	86.5%
Freeze disallowed	12.2	6.0	11.8	7.4	10.8	13.5
No freeze decision	0.0	0.0	0.3	0.0	1.9	0.0
Duration 1						
Freeze allowed	86.1	94.0	87.6	95.0	87.8	90.8
Freeze disallowed	13.9	6.0	12.4	5.0	11.9	7.7
No freeze decision	0.0	0.0	0.0	0.0	0.3	1.5
Duration 2						
Freeze allowed	86.0	91.7	85.9	93.8	87.5	92.9
Freeze disallowed	14.0	8.3	14.1	6.2	12.5	7.1
No freeze decision	0.0	0.0	0.0	0.0	0.0	0.0
Duration 3						
Freeze allowed	86.3	82.8	86.0	82.3	85.9	93.4
Freeze disallowed	13.7	17.2	14.0	17.7	14.1	6.6
No freeze decision	0.0	0.0	0.0	0.0	0.0	0.0
Duration 4						
Freeze allowed	86.2	92.4	86.5	93.3	86.1	85.5
Freeze disallowed	13.8	7.6	13.5	6.7	13.9	14.5
No freeze decision	0.0	0.0	0.0	0.0	0.0	0.0
Duration 5 and over						
Freeze allowed	66.2	68.3	67.0	68.8	67.7	68.3
Freeze disallowed	33.8	31.7	33.0	31.2	32.3	31.7
No freeze decision	0.0	0.0	0.0	0.0	0.0	0.0

Table S-22. Mortality experience of active[a] railroad employees during calendar years 2010-2014

Age[b]	Exposed	Actual deaths	Crude rate per 1,000	Ratio Act./Exp.[c]	Ratio Act./Exp.[d]
Under 35	272,599	195	0.7	80.0%	93.9%
35-39	153,906	135	0.9	81.7	90.3
40-44	164,128	217	1.3	100.7	106.6
45-49	145,952	232	1.6	94.1	96.7
50-54	157,853	329	2.1	89.9	92.1
55-59	203,157	673	3.3	101.0	105.0
60-64	83,537	400	4.8	105.4	112.4
65 & over	16,214	81	5.0	67.0	75.2
All ages	1,197,344	2,262	1.9	94.1%	100.0%

[a] An employee is said to have died in active service if he died before retirement and had last worked in the railroad industry in the calendar year of his death or the calendar year immediately preceding.

[b] Age attained in calendar year of exposure.

[c] Expected deaths based on 2009 RRB Active Service Mortality Table.

[d] Expected deaths based on 2012 RRB Active Service Mortality Table.

Table S-23. Total termination experience of spouse annuitants[a] between anniversaries of retirement in 2012 and 2015

	All ages	60-64	65-69	70-74	75-79	80-84	85-89	90 & over
1. 2012-2015 experience								
Exposed[c]	440,515	96,415	120,874	86,038	61,026	45,424	23,639	7,099
Actual terminations	29,283	2,069	4,256	4,572	5,153	6,140	4,883	2,210
Crude rate per 1,000	66.5	21.5	35.2	53.1	84.4	135.2	206.6	311.3
Ratio Act./Exp. I[d]	99.3%	92.4%	100.1%	96.1%	97.1%	100.7%	102.8%	106.3%
Ratio Act./Exp. II[e]	102.2%	95.3%	103.1%	99.0%	100.0%	103.8%	105.6%	108.5%
Ratio Act./Exp. III[f]	100.0%	97.8%	104.3%	98.5%	97.9%	100.1%	100.7%	100.7%
2. Crude rate per 1,000 for individual years								
2012 - 2013	69.0	22.5	35.7	54.8	85.7	133.4	213.2	326.3
2013 - 2014	65.7	20.2	36.5	53.8	83.6	133.3	202.0	290.3
2014 - 2015	64.8	21.7	33.5	50.9	83.9	139.1	204.3	317.2
3. Ratio Act./Exp. for individual years I[d]								
2012 - 2013	101.2%	96.8%	101.5%	99.0%	98.4%	99.6%	106.1%	111.4%
2013 - 2014	98.4%	86.9%	104.1%	97.6%	96.1%	99.3%	100.5%	99.3%
2014 - 2015	98.3%	93.6%	95.0%	91.9%	96.6%	103.5%	101.5%	108.1%
4. Ratio Act./Exp. for individual years II[e]								
2012 - 2013	104.2%	99.8%	104.6%	102.0%	101.4%	102.6%	109.1%	113.8%
2013 - 2014	101.3%	89.6%	107.3%	100.6%	99.1%	102.4%	103.3%	101.4%
2014 - 2015	101.2%	96.5%	97.9%	94.7%	99.6%	106.7%	104.4%	110.4%
5. Ratio Act./Exp. for individual years III[f]								
2012 - 2013	101.9%	102.4%	105.8%	101.4%	99.3%	98.9%	104.0%	105.5%
2013 - 2014	99.1%	91.9%	108.5%	100.0%	97.0%	98.7%	98.5%	94.1%
2014 - 2015	99.0%	99.0%	99.0%	94.2%	97.5%	102.8%	99.5%	102.4%

[a] Excludes spouses under age 60 with child in care.
[b] Age nearest birthday at the beginning of the year of exposure.
[c] Exposure is between anniversaries of retirement in indicated years.
[d] Expected based on 2010 Base Year RRB Spouse Total Termination Table.
[e] Expected based on 2010 Base Year RRB Spouse Total Termination Table projected to 2013 using 2013 RRB Mortality Improvement Scale
[f] Expected based on 2013 Base Year RRB Spouse Total Termination Table.

Table S-24. Mortality experience of spouse annuitants between anniversaries of retirement in 2012 and 2015[a]

	All ages	60-64	65-69	70-74	75-79	80-84	85-89	90 & over
				Age[b]				
1. 2012-2015 experience								
Exposed[c]	430,855	95,662	119,362	84,472	59,320	43,430	22,114	6,496
Actual deaths	9,962	562	1,231	1,440	1,741	2,152	1,832	1,004
Crude rate per 1,000	23.1	5.9	10.3	17.0	29.3	49.6	82.8	154.6
Ratio Act./Exp.[d]	78.3%	61.6%	71.0%	74.1%	79.3%	81.9%	83.7%	90.0%
2. Crude rate per 1,000 for individual years								
2012 - 2013	23.6	6.1	10.3	16.7	28.9	45.0	89.6	166.3
2013 - 2014	22.8	5.8	10.7	17.5	28.8	48.3	79.4	144.8
2014 - 2015	23.0	5.7	10.0	16.9	30.4	56.0	79.2	152.8
3. Ratio Act./Exp. for individual years[d]								
2012 - 2013	78.3%	64.4%	70.7%	72.5%	77.9%	74.3%	90.6%	96.5%
2013 - 2014	77.3%	60.6%	74.0%	76.1%	77.9%	79.7%	80.3%	85.2%
2014 - 2015	79.4%	59.9%	68.5%	73.5%	82.3%	92.5%	79.8%	88.2%

[a] Excludes spouses under age 60 with child in care.

[b] Age nearest birthday at the beginning of the year of exposure.

[c] Exposure is between anniversaries of retirement in indicated years.

[d] Expected based on 2013 RRB Mortality Table for Widows.

Table S-25. Number of retired employees and number with a spouse eligible for railroad
retirement benefits, by age of employee on December 31, 2015

Age[a] of employee	30 or more years of service			Less than 30 years of service		
	Number of employees	Number of eligible spouses	Ratio of spouses to employees	Number of employees	Number of eligible spouses	Ratio of spouses to employees
60	2,361	596	0.252			
61	5,266	1,903	0.361			
62	6,251	2,812	0.450	3,317	260	0.078
63	6,695	3,723	0.556	4,259	822	0.193
64	7,253	4,489	0.619	4,875	1,195	0.245
65	7,764	5,107	0.658	5,300	1,724	0.325
66	7,577	5,267	0.695	5,931	2,324	0.392
67	7,780	5,694	0.732	6,611	2,910	0.440
68	7,724	5,795	0.750	6,675	3,131	0.469
69	8,085	6,153	0.761	7,030	3,667	0.522
70	5,703	4,371	0.766	4,856	2,660	0.548
71	5,691	4,442	0.781	4,718	2,674	0.567
72	5,258	4,069	0.774	4,547	2,588	0.569
73	5,474	4,346	0.794	4,435	2,551	0.575
74	4,469	3,496	0.782	3,849	2,289	0.595
75	4,015	3,145	0.783	3,499	2,133	0.610
76	3,413	2,646	0.775	3,046	1,875	0.616
77	3,332	2,539	0.762	2,961	1,790	0.605
78	3,324	2,518	0.758	2,906	1,783	0.614
79	3,138	2,316	0.738	2,576	1,505	0.584
80	2,873	2,098	0.730	2,554	1,529	0.599
81	2,915	2,106	0.722	2,535	1,472	0.581
82	2,705	1,872	0.692	2,240	1,235	0.551
83	2,729	1,798	0.659	2,242	1,248	0.557
84	2,619	1,727	0.659	2,002	1,078	0.538
85	2,700	1,675	0.620	2,058	1,028	0.500
86	2,660	1,602	0.602	1,908	971	0.509
87	2,657	1,533	0.577	1,800	827	0.459
88	2,688	1,453	0.541	1,776	775	0.436
89	2,405	1,202	0.500	1,651	622	0.377
90	2,049	963	0.470	1,378	473	0.343
91	1,595	666	0.418	1,089	337	0.309
92	1,344	547	0.407	909	257	0.283
93	1,184	451	0.381	706	186	0.263
94	763	255	0.334	550	124	0.225
95	619	175	0.283	391	87	0.223
96	453	111	0.245	271	61	0.225
97	285	73	0.256	186	32	0.172
98	206	51	0.248	134	22	0.164
99 & over	305	54	0.177	242	22	0.091

[a] Age nearest birthday.

Table S-26. Mortality experience of widow annuitants between anniversaries of retirement in 2012 and 2015

	All ages	under 50	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95 & over
1. 2012-2015 experience												
Exposed[b]	363,598	1,255	572	456	15,755	28,269	36,778	50,714	73,231	79,692	54,261	22,617
Actual deaths	31,510	d	d	d	152	457	913	2,065	4,649	8,031	9,151	6,085
Crude rate per 1,000	86.7	d	d	d	9.6	16.2	24.8	40.7	63.5	100.8	168.6	269.1
Ratio Act./Exp.[c]	107.0%	d	d	d	101.9%	110.4%	107.2%	110.6%	106.6%	105.4%	109.0%	105.2%
2. Crude rate per 1,000 for individual years												
2012 - 2013	87.2	d	d	d	8.9	16.4	24.7	41.0	64.8	100.5	169.2	279.3
2013 - 2014	84.4	d	d	d	10.0	16.0	25.3	40.8	61.3	99.2	164.0	256.8
2014 - 2015	88.4	d	d	d	10.1	16.1	24.5	40.4	64.2	102.7	172.7	271.1
3. Ratio Act./Exp.[c] for individual years												
2012 - 2013	108.3%	d	d	d	93.6%	111.7%	106.6%	111.2%	109.2%	105.3%	109.8%	109.1%
2013 - 2014	104.3%	d	d	d	105.4%	109.7%	109.3%	110.7%	102.9%	103.7%	106.1%	100.6%
2014 - 2015	108.3%	d	d	d	107.1%	109.9%	105.7%	109.7%	107.7%	107.2%	111.3%	105.9%

Age[a]

[a] Age nearest birthday at the beginning of the year of exposure.
[b] Exposure is between anniversaries of retirement in indicated years.
[c] Expected based on 2013 RRB Mortality Table for Widows.
[d] Fewer than 10 actual deaths.

Table S-27. Remarriage experience of widows between 2003 and 2015 anniversaries of widowhood

					Age[a]					
	All ages	Under 35	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70 & over
1. Exposed										
Duration[b] 0	70,562	106	151	269	375	697	906	6,094	8,023	53,943
1	70,337	108	157	266	406	765	1,820	6,175	7,998	52,643
2	69,464	100	158	253	414	790	2,504	6,226	7,993	51,026
3	68,554	94	149	239	386	793	3,141	6,184	8,126	49,442
4	67,700	99	138	223	379	805	3,682	6,185	8,317	47,873
5 or more	1,262,522	48	259	762	1,274	2,764	5,813	38,807	69,249	1,143,547
2. Actual remarriages										
Duration[b] 0	62	c	c	c	c	c	c	12	15	26
1	139	c	c	c	c	c	c	22	38	62
2	142	c	c	c	c	10	10	17	28	60
3	147	c	c	c	c	c	20	29	23	55
4	116	c	c	c	c	c	23	25	23	37
5 or more	883	c	c	c	10	14	22	158	184	480
3. Crude remarriage rate per 1,000										
Duration[b] 0	0.88	c	c	c	c	c	c	1.97	1.87	0.48
1	1.98	c	c	c	c	c	c	3.56	4.75	1.18
2	2.04	c	c	c	c	12.66	3.99	2.73	3.50	1.18
3	2.14	c	c	c	c	c	6.37	4.69	2.83	1.11
4	1.71	c	c	c	c	c	6.25	4.04	2.77	0.77
5 or more	0.70	c	c	c	7.85	5.07	3.78	4.07	2.66	0.42
4. Ratio Act./Exp.[d]										
Duration[b] 0	58.3%	c	c	c	c	c	c	42.3%	69.5%	56.3%
1	62.2%	c	c	c	c	c	c	41.5%	81.1%	71.5%
2	67.0%	c	c	c	c	178.9%	43.2%	33.0%	66.1%	83.4%
3	82.1%	c	c	c	c	c	61.8%	64.2%	67.1%	122.9%
4	68.5%	c	c	c	c	c	63.1%	60.9%	69.5%	91.1%
5 or more	92.3%	c	c	c	68.5%	71.8%	105.6%	79.7%	90.8%	99.7%

[a] For durations 0-4, age nearest birthday on date of employee's death. For durations 5 and over, age nearest birthday at beginning of year of exposure which is on an anniversary of employee's death.

[b] Completed years since employee's death.

[c] Fewer than 10 actual remarriages.

[d] Expected based on 1997 RRB Remarriage Table.

Table S-28. Total termination experience of disabled children annuitants
between anniversaries of retirement in 2012 and 2015

Age[a]	Exposed	Actual terminations	Ratio Act./Exp.[b]
Under 25	421	c	c
25-29	478	12	173.8%
30-34	707	c	c
35-39	897	10	111.5
40-44	1,287	17	111.1
45-49	2,042	33	108.2
50-54	3,127	69	116.7
55-59	3,603	111	124.6
60-64	3,285	114	105.7
65-69	2,877	136	106.7
70-74	2,173	157	120.3
75-79	1,453	124	102.5
80-84	902	124	119.0
85-89	482	88	114.5
90 & over	197	48	104.3
All ages	23,931	1,054	112.2%

[a] Age nearest birthday at beginning of the year of exposure.

[b] Expected based on 2004 RRB Total Termination Table for Disabled Children.

[c] Fewer than 10 actual terminations.

Table S-29. Improvement in annuitant mortality and spouse total termination

Age of employee	Average annual improvement in annuitant mortality[a]		
	1957 - 1984	1984 - 2014	1957 - 2014
60 - 64	2.7%	1.7%	2.2%
65 - 69	1.4	1.9	1.7
70 - 74	0.9	1.7	1.3
75 - 79	0.8	1.4	1.1
80 - 84	0.8	1.0	0.9
85 - 89	0.9	0.5	0.7
90 & over	0.5	0.1	0.3

Age of spouse	Average annual improvement in spouse total termination[b]		
	1957 - 1984	1984 - 2014	1957 - 2014
60 - 64	NA	1.9%	NA
65 - 69	1.2%	1.5	1.4%
70 - 74	0.7	1.4	1.1
75 - 79	0.7	1.0	0.9
80 - 84	0.8	0.6	0.7
85 & over	0.4	0.1	0.2

[a] Includes both disabled and nondisabled annuitants.

[b] Mainly death of employee or death of spouse.

RETIREMENT STUDIES

1. <u>Age retirement</u>. Age retirement studies covering experience during calendar years 2013-2015 are summarized in Tables S-30 through S-32. Table S-30 shows a comparison among crude retirement rates for 2013-2015, the 26th valuation retirement rates, and the 27th valuation retirement rates. Tables S-31 and S-32 show ratios of actual retirements to those expected for employees with 5-29 years of service and for employees with 30 or more years of service, respectively.

2. <u>Disability retirement</u>. Table S-33 shows a comparison of crude disability retirement rates for 2013-2015 with the 26th and 27th valuation standards. Table S-34 shows ratios of actual retirements in 2013-2015 to those expected by age and service.

   Table S-35 shows percentages of disability retirements in 2013-2015 that were eligible for a disability freeze. Disability freeze standards are needed because of the financial interchange with social security. Assumptions must be made regarding the percentage of railroad retirement disability annuitants who would qualify under the social security definition of disability. Only these disabilities qualify for reimbursement under the financial interchange.

Table S-30. Rates[a] of immediate age retirement

Age[b]	5-29 years of service			30 or more years of service		
	Assumed rates 26th valuation	Assumed rates 27th valuation	2013-2015 Crude rates	Assumed rates 26th valuation	Assumed rates 27th valuation	2013-2015 Crude rates
60				0.60	0.59	0.588
61				0.46	0.46	0.460
62	0.10	0.09	0.093	0.35	0.35	0.351
63	0.09	0.09	0.082	0.35	0.32	0.323
64	0.08	0.08	0.080	0.31	0.32	0.317
65	0.15	0.17	0.169	0.37	0.34	0.338
66	0.32	0.33	0.329	0.33	0.30	0.318
67	0.26	0.27	0.273	0.32	0.30	0.294
68	0.20	0.25	0.228	0.30	0.30	0.269
69	0.20	0.25	0.259	0.30	0.30	0.272
70	0.20	0.25	0.303	0.30	0.30	0.340
71	0.20	0.25	0.273	0.25	0.25	0.258
72	0.20	0.20	0.204	0.20	0.25	0.231
73	0.20	0.20	0.242	0.20	0.25	0.267
74	0.20	0.20	0.211	0.20	0.25	0.254
75 & over	0.20	0.20	0.140	0.20	0.25	0.245

[a] Technically probabilities, because exposures were not adjusted for other separations.

[b] Age attained in calendar year of exposure.

Table S-31. Immediate age[a] retirement experience of railroad employees with
5-29 years of service during calendar years 2013-2015

Age[b]	Exposed[c]	Actual retirements	Crude rate[d] per 1,000	Ratio Act./Exp. I[e]	Ratio Act./Exp. II[e]
62	5,414	502	92.7	92.7%	103.0%
63	4,164	343	82.4	91.5	91.5
64	3,247	260	80.1	100.1	100.1
65	2,562	432	168.6	112.4	99.2
66	1,858	612	329.4	102.9	99.8
67	1,105	302	273.3	105.1	101.2
68	671	153	228.0	114.0	91.2
69	441	114	258.5	129.3	103.4
70-74	852	225	264.1	132.0	114.0
75 & over	172	24	139.5	69.8	69.8
All ages	20,486	2,967	144.8	103.4%	99.6%

[a] Nondisability retirement.

[b] Age attained in calendar year of exposure.

[c] Exposure includes part of the year in which employees were not eligible for age retirement because they were under 62.

[d] Technically probabilities, because exposures were not adjusted for other separations.

[e] I and II denote expected according to rates used in the 26th and 27th valuations, respectively.

Table S-32. Immediate age[a] retirement experience of railroad employees with
30 or more years of service during calendar years 2013-2015

Age[b]	Exposed[c]	Actual retirements	Crude rate[d] per 1,000	Ratio Act./Exp. I[e]	Ratio Act./Exp. II[e]
60	16,650	9,782	587.5	97.9%	99.6%
61	7,503	3,454	460.3	100.1	100.1
62	4,439	1,560	351.4	100.4	100.4
63	3,165	1,023	323.2	92.3	101.0
64	2,285	725	317.3	102.4	99.2
65	1,659	561	338.2	91.4	99.5
66	1,168	372	318.5	96.5	106.2
67	788	232	294.4	92.0	98.1
68	517	139	268.9	89.6	89.6
69	346	94	271.7	90.6	90.6
70-74	683	194	284.0	114.3	105.9
75 & over	200	49	245.0	122.5	98.0
All ages	39,403	18,185	461.5	98.1%	99.8%

[a] Nondisability retirement.

[b] Age attained in calendar year of exposure.

[c] Exposure includes part of the year in which employees were not eligible for age retirement because they were under 60.

[d] Technically probabilities, because exposures were not adjusted for other separations.

[e] I and II denote expected according to rates used in the 26th and 27th valuations, respectively.

Table S-33. Rates[a] of immediate[b] disability retirement

Age[c]	10-19 years of service			20-24 years of service			25-29 years of service			30 or more years of service		
	Assumed rates 26th valuation	Assumed rates 27th valuation	2013-2015 Crude rates	Assumed rates 26th valuation	Assumed rates 27th valuation	2013-2015 Crude rates	Assumed rates 26th valuation	Assumed rates 27th valuation	2013-2015 Crude rates	Assumed rates 26th valuation	Assumed rates 27th valuation	2013-2015 Crude rates
Under 35	0.0014	0.0012	d	0.0041	0.0035	d	0.0035	0.0035	d	0.0035	0.0035	d
35	0.0015	0.0013	d	0.0044	0.0037	d	0.0038	0.0037	d	0.0038	0.0037	d
36	0.0015	0.0013	d	0.0047	0.0038	d	0.0041	0.0038	d	0.0041	0.0038	d
37	0.0016	0.0013	d	0.0050	0.0040	d	0.0043	0.0040	d	0.0043	0.0040	d
38	0.0016	0.0014	0.0013	0.0053	0.0042	d	0.0046	0.0042	d	0.0046	0.0042	d
39	0.0017	0.0015	0.0013	0.0056	0.0045	d	0.0049	0.0045	d	0.0049	0.0045	d
40	0.0018	0.0016	0.0017	0.0060	0.0048	d	0.0052	0.0048	d	0.0052	0.0048	d
41	0.0020	0.0017	0.0017	0.0063	0.0052	d	0.0053	0.0052	d	0.0053	0.0052	d
42	0.0021	0.0018	0.0013	0.0066	0.0056	0.0060	0.0056	0.0056	d	0.0056	0.0056	d
43	0.0023	0.0020	0.0022	0.0070	0.0062	0.0103	0.0061	0.0062	d	0.0061	0.0062	d
44	0.0025	0.0021	0.0020	0.0077	0.0068	0.0073	0.0069	0.0068	d	0.0069	0.0068	d
45	0.0028	0.0024	0.0029	0.0088	0.0076	0.0079	0.0079	0.0076	d	0.0079	0.0076	d
46	0.0031	0.0026	0.0019	0.0102	0.0085	0.0065	0.0091	0.0085	d	0.0091	0.0085	d
47	0.0035	0.0029	0.0036	0.0120	0.0096	0.0071	0.0105	0.0096	d	0.0105	0.0096	d
48	0.0039	0.0033	0.0023	0.0142	0.0108	0.0059	0.0120	0.0108	d	0.0120	0.0108	d
49	0.0045	0.0038	0.0031	0.0164	0.0122	0.0111	0.0136	0.0121	0.0072	0.0136	0.0121	d
50	0.0051	0.0043	0.0031	0.0187	0.0137	0.0067	0.0152	0.0135	0.0109	0.0152	0.0135	d
51	0.0059	0.0049	0.0042	0.0211	0.0152	0.0112	0.0168	0.0148	0.0155	0.0168	0.0148	0.0251
52	0.0068	0.0057	0.0074	0.0235	0.0168	0.0146	0.0183	0.0162	0.0096	0.0183	0.0162	0.0159
53	0.0079	0.0066	0.0050	0.0259	0.0185	0.0207	0.0198	0.0175	0.0141	0.0198	0.0175	0.0131
54	0.0092	0.0077	0.0054	0.0285	0.0204	0.0160	0.0213	0.0188	0.0193	0.0213	0.0188	0.0156
55	0.0108	0.0090	0.0094	0.0311	0.0224	0.0170	0.0229	0.0202	0.0140	0.0229	0.0202	0.0168
56	0.0127	0.0106	0.0087	0.0337	0.0247	0.0237	0.0246	0.0217	0.0127	0.0246	0.0217	0.0186
57	0.0150	0.0125	0.0101	0.0365	0.0274	0.0218	0.0263	0.0234	0.0135	0.0263	0.0234	0.0194
58	0.0178	0.0148	0.0139	0.0393	0.0306	0.0324	0.0280	0.0254	0.0222	0.0280	0.0254	0.0258
59	0.0211	0.0175	0.0151	0.0422	0.0345	0.0314	0.0298	0.0279	0.0245	0.0298	0.0279	0.0235
60	0.0302	0.0239	0.0229	0.0451	0.0393	0.0391	0.0317	0.0311	0.0231	0.0163	0.0144	0.0120
61	0.0366	0.0291	0.0271	0.0481	0.0565	0.0541	0.0336	0.0354	0.0374	0.0121	0.0103	0.0087
62	0.0391	0.0322	0.0300	0.0561	0.0517	0.0455	0.0452	0.0444	0.0352	0.0086	0.0070	0.0070
63	0.0391	0.0338	0.0280	0.0556	0.0454	0.0587	0.0448	0.0380	0.0397	0.0060	0.0046	d
64	0.0338	0.0257	0.0237	0.0530	0.0369	0.0216	0.0422	0.0296	0.0301	0.0042	0.0029	d
65	0.0228	0.0207	0.0184	0.0396	0.0257	0.0181	0.0288	0.0183	d	0.0031	0.0020	d
66	0.0044	0.0052	d	0.0029	0.0108	d	0.0029	0.0034	d	0.0029	0.0019	d

[a] Technically probabilities, because exposures were not adjusted for other terminations.

[b] Immediate retirements are defined as those for which the calendar year of retirement is the same as, or the year following, the calendar year of last employment in the railroad industry.

[c] Age attained in calendar year of exposure.

[d] Insufficient data.

Table S-34. Immediate disability retirement experience of railroad employees during calendar years 2013-2015

	All ages	Under 40	40-44	45-49	50-54	55-59	60-64	65	66[b]
					Attained age[a]				
1. 10-19 years of service									
Exposed	202,880	51,222	47,260	39,250	30,888	21,228	11,082	1,139	811
Actual retirements	939	41	84	109	153	236	291	21	f
Crude rate per 1,000[c]	4.6	0.8	1.8	2.8	5.0	11.1	26.3	18.4	f
Ratio Act./Exp.[d]	73.9%	52.1%	82.8%	79.1%	72.3%	74.1%	74.1%	80.9%	f
Ratio Act./Exp.[e]	88.7%	60.5%	96.3%	93.9%	86.4%	89.0%	91.6%	89.1%	f
2. 20-24 years of service									
Exposed	50,365	379	8,526	14,106	12,023	9,044	5,315	552	420
Actual retirements	807	f	61	108	162	224	239	10	f
Crude rate per 1,000[c]	16.0	f	7.2	7.7	13.5	24.8	45.0	18.1	f
Ratio Act./Exp.[d]	71.2%	f	102.6%	62.6%	57.9%	68.5%	88.6%	45.7%	f
Ratio Act./Exp.[e]	89.0%	f	118.6%	79.0%	80.5%	90.0%	96.3%	70.5%	f
3. 25-29 years of service									
Exposed	32,496	0	334	5,353	10,302	9,796	5,848	506	357
Actual retirements	530	f	f	21	143	166	191	f	f
Crude rate per 1,000[c]	16.3	f	f	3.9	13.9	16.9	32.7	f	f
Ratio Act./Exp.[d]	70.8%	f	f	34.4%	75.8%	64.8%	85.0%	f	f
Ratio Act./Exp.[e]	78.5%	f	f	38.0%	85.8%	72.1%	91.0%	f	f
4. 30 or more years of service									
Exposed	102,070	0	0	137	9,496	55,580	34,031	1,658	1,168
Actual retirements	1,663	f	f	f	149	1,205	308	f	f
Crude rate per 1,000[c]	16.3	f	f	f	15.7	21.7	9.1	f	f
Ratio Act./Exp.[d]	78.1%	f	f	f	78.7%	80.3%	71.8%	f	f
Ratio Act./Exp.[e]	87.3%	f	f	f	89.1%	88.5%	83.4%	f	f

[a] Age attained in calendar year of exposure.

[b] Refers to employees retiring before normal retirement age. Exposure includes part of the year in which employees were not eligible for disability retirement because they passed normal retirement age.

[c] Technically probabilities of retirement, because exposures were not adjusted for other terminations.

[d] Expected based on 26th valuation disability rates.

[e] Expected based on 27th valuation disability rates.

[f] Insufficient data.

Table S-35. Percentages of immediate[a] disability retirements meeting the disability freeze standards of the Social Security Act

Age[b]	10-19 years of service			20-24 years of service			25-29 years of service			30 or more years of service		
	Assumed rates 26th valuation	Assumed rates 27th valuation	2013-2015 Crude rates	Assumed rates 26th valuation	Assumed rates 27th valuation	2013-2015 Crude rates	Assumed rates 26th valuation	Assumed rates 27th valuation	2013-2015 Crude rates	Assumed rates 26th valuation	Assumed rates 27th valuation	2013-2015 Crude rates
Under 35	97.8%	97.8%	c	44.8%	44.8%	c	44.8%	44.8%	c	44.8%	44.8%	c
35	97.8	97.8	c	44.8	44.8	c	44.8	44.8	c	44.8	44.8	c
36	97.8	97.8	c	44.8	44.8	c	44.8	44.8	c	44.8	44.8	c
37	97.8	97.8	c	44.8	44.8	c	44.8	44.8	c	44.8	44.8	c
38	97.8	97.8	100.0%	44.8	44.8	c	44.8	44.8	c	44.8	44.8	c
39	97.8	97.8	c	44.8	44.8	c	44.8	44.8	c	44.8	44.8	c
40	97.8	97.8	100.0	44.8	44.8	c	44.8	44.8	c	44.8	44.8	c
41	97.8	97.8	92.9	44.8	44.8	c	44.8	44.8	c	44.8	44.8	c
42	97.8	97.8	100.0	44.8	44.8	c	44.8	44.8	c	44.8	44.8	c
43	97.8	97.8	100.0	44.8	44.8	56.5%	44.8	44.8	c	44.8	44.8	c
44	97.8	97.8	100.0	44.8	44.8	c	44.8	44.8	c	44.8	44.8	c
45	97.8	97.8	100.0	44.8	44.9	52.2	44.8	44.9	c	44.8	44.9	c
46	97.8	97.8	100.0	44.9	44.9	58.8	44.9	44.9	c	44.9	44.9	c
47	97.8	97.8	100.0	45.0	45.1	c	45.0	45.1	c	45.0	45.1	c
48	97.8	97.8	100.0	45.3	45.3	c	45.3	45.3	c	45.3	45.3	c
49	97.8	97.8	90.9	45.8	45.8	60.0	45.8	45.8	c	45.8	45.8	c
50	97.8	97.8	100.0	46.8	46.8	c	46.8	46.8	c	46.8	46.8	c
51	97.8	97.8	100.0	49.0	48.9	48.1	49.0	48.9	46.9%	49.0	48.9	c
52	97.8	97.8	100.0	53.6	53.3	59.4	53.6	53.3	57.1	53.6	53.3	c
53	97.8	97.8	96.4	62.9	62.1	64.4	62.9	62.1	64.3	62.9	62.1	70.6%
54	97.8	97.8	96.4	81.9	80.0	80.0	81.9	80.0	76.9	81.9	80.0	72.9
55	97.8	97.8	97.9	93.9	94.6	85.3	93.9	94.6	93.1	93.9	94.6	96.3
56	97.8	97.8	100.0	93.9	94.6	93.5	93.9	94.6	96.2	93.9	94.6	92.6
57	97.8	97.8	97.5	93.9	94.6	91.9	93.9	94.6	92.9	93.9	94.6	94.0
58	97.8	97.8	98.1	93.9	94.6	90.7	93.9	94.6	97.5	93.9	94.6	93.1
59	97.8	97.8	98.0	93.9	94.6	91.7	93.9	94.6	97.6	93.9	94.6	96.6
60	93.6	94.3	100.0	93.9	94.6	94.6	93.9	94.6	94.3	93.9	94.6	95.5
61	93.6	94.3	91.2	93.9	94.6	97.1	93.9	94.6	96.2	93.9	94.6	96.9
62	93.6	94.3	92.5	93.9	94.6	96.0	93.9	94.6	97.7	93.9	94.6	96.8
63	93.6	94.3	96.1	93.9	94.6	93.8	93.9	94.6	91.7	93.9	94.6	c
64	93.6	94.3	91.2	93.9	94.6	100.0	93.9	94.6	90.5	93.9	94.6	c
65	93.6	94.3	95.2	93.9	94.6	100.0	93.9	94.6	c	93.9	94.6	c
66	93.6	94.3	c	93.9	94.6	c	93.9	94.6	c	93.9	94.6	c

[a] Immediate retirements are defined as those for which the calendar year of retirement is the same as, or the year following, the calendar year of last employment in the railroad industry.

[b] Age attained in calendar year of exposure.

[c] Insufficient data.

WITHDRAWAL STUDIES

Table S-36 shows the select withdrawal experience for the years 2011-2014. The actual withdrawals are shown net of re-entrants into the industry for each attained age and service group. Since a re-entrant maintains his prior earnings and service credit, he cannot be considered a final withdrawal. The table presents crude net withdrawal rates by attained age and years of service along with ratios of actual net withdrawals to those expected on the basis of the 26th and the 27th valuation standards.

Table S-36. Withdrawal experience of railroad employees during calendar years 2011-2014, by attained age and years of service

Years of service[a]	Attained age[b] under 25					Attained age[b] 25-34					Attained age[b] 35-44				
	Exposed	Actual net[c] withdrawals	Crude rate per 100	Ratio Act./Exp. I[d]	II[d]	Exposed	Actual net[c] withdrawals	Crude rate per 100	Ratio Act./Exp. I[d]	II[d]	Exposed	Actual net[c] withdrawals	Crude rate per 100	Ratio Act./Exp. I[d]	II[d]
0	19,879	3,132	15.8	84.7%	99.7%	38,429	4,238	11.0	76.6%	100.3%	20,231	2,950	14.6	82.4%	99.9%
1	11,225	1,338	11.9	83.4	100.2	30,185	2,477	8.2	78.2	100.1	16,538	1,395	8.4	75.3	100.4
2	5,672	392	6.9	78.5	100.2	24,104	1,281	5.3	77.0	100.3	14,337	657	4.6	67.4	99.6
3	3,146	155	4.9	78.2	100.5	20,948	777	3.7	71.3	100.2	14,119	404	2.9	62.2	98.7
4	1,475	60	4.1	81.4	99.2	16,737	498	3.0	66.1	96.0	12,508	306	2.4	66.1	97.9
5	631	24	3.8	88.5	102.8	17,047	497	2.9	72.9	104.1	13,820	319	2.3	69.9	100.4
6	151	e	e	e	e	18,306	521	2.8	79.1	109.5	16,407	365	2.2	71.8	105.9
7	7	e	e	e	e	16,502	359	2.2	68.0	90.6	17,698	321	1.8	64.8	90.7
8	1	e	e	e	e	12,953	254	2.0	70.0	89.1	17,001	319	1.9	72.2	104.2
9	-	e	e	e	e	9,268	198	2.1	85.5	106.8	15,147	239	1.6	65.7	92.8
10	-	e	e	e	e	5,841	111	1.9	86.4	105.6	12,699	205	1.6	73.4	107.6
11	-	e	e	e	e	3,769	54	1.4	71.6	89.5	10,668	160	1.5	75.0	107.1
12	-	e	e	e	e	2,677	39	1.5	76.7	104.1	11,025	131	1.2	62.5	91.4
13	-	e	e	e	e	2,085	24	1.2	67.7	95.9	13,125	137	1.0	61.4	87.0
14	-	e	e	e	e	1,238	15	1.2	75.7	110.1	13,641	165	1.2	75.6	110.0
15	-	e	e	e	e	467	e	e	e	e	12,688	130	1.0	68.3	102.5
16	-	e	e	e	e	88	e	e	e	e	11,134	136	1.2	94.0	135.7
17	-	e	e	e	e	10	e	e	e	e	8,574	71	0.8	69.0	92.0
18	-	e	e	e	e	3	e	e	e	e	6,748	53	0.8	71.4	98.2
19	-	e	e	e	e	-	e	e	e	e	5,273	32	0.6	55.2	86.7
20	-	e	e	e	e	-	e	e	e	e	3,920	21	0.5	53.6	89.3
21	-	e	e	e	e	-	e	e	e	e	2,726	18	0.7	73.4	110.1
22	-	e	e	e	e	-	e	e	e	e	1,892	e	e	e	e
23	-	e	e	e	e	-	e	e	e	e	1,224	e	e	e	e
24	-	e	e	e	e	-	e	e	e	e	672	e	e	e	e
25	-	e	e	e	e	-	e	e	e	e	253	e	e	e	e
26	-	e	e	e	e	-	e	e	e	e	39	e	e	e	e
27	-	e	e	e	e	-	e	e	e	e	1	e	e	e	e
28	-	e	e	e	e	-	e	e	e	e	-	e	e	e	e
29	-	e	e	e	e	-	e	e	e	e	-	e	e	e	e
30 & over	-	e	e	e	e	-	e	e	e	e	-	e	e	e	e
All years	42,187	5,106	12.1	83.6%	99.9%	220,657	11,347	5.1	75.7%	100.1%	274,108	8,550	3.1	73.8%	100.0%

[a] Service as of beginning of calendar year of exposure rounded up to next highest whole year.

[b] Age attained in calendar year of exposure.

[c] Withdrawals less re-entrants.

[d] I and II denote expected according to rates used in the 26th and 27th valuations, respectively.

[e] Fewer than 10 actual net withdrawals.

Table S-36. Withdrawal experience of railroad employees during calendar years 2011-2014, by attained age and years of service (continued)

Years of service[a]	Attained age[b] 45-54					Attained age[b] 55 and over					All ages				
	Exposed	Actual net[c] withdrawals	Crude rate per 100	Ratio Act./Exp. I[d]	Ratio Act./Exp. II[d]	Exposed	Actual net[c] withdrawals	Crude rate per 100	Ratio Act./Exp. I[d]	Ratio Act./Exp. II[d]	Exposed	Actual net[c] withdrawals	Crude rate per 100	Ratio Act./Exp. I[d]	Ratio Act./Exp. II[d]
0	8,944	1,685	18.8	89.7%	100.2%	1,918	380	19.8	80.9%	100.1%	89,401	12,385	13.9	81.7%	100.0%
1	7,802	741	9.5	81.9	100.0	1,905	196	10.3	76.2	99.9	67,655	6,147	9.1	78.9	100.2
2	7,134	348	4.9	71.7	97.6	1,923	129	6.7	87.1	101.6	53,170	2,807	5.3	74.4	99.8
3	7,501	261	3.5	77.3	108.7	2,183	106	4.9	85.2	97.1	47,897	1,703	3.6	71.0	100.9
4	7,130	183	2.6	69.4	91.7	2,264	86	3.8	76.0	90.4	40,114	1,133	2.8	68.0	95.5
5	7,964	219	2.7	80.9	110.0	2,116	80	3.8	84.0	102.2	41,578	1,139	2.7	74.4	103.9
6	9,657	205	2.1	68.5	92.3	2,527	97	3.8	96.0	116.3	47,048	1,193	2.5	75.8	105.5
7	10,644	225	2.1	75.5	100.7	2,839	79	2.8	77.3	99.4	47,690	984	2.1	69.1	93.4
8	10,412	173	1.7	66.5	87.4	2,962	70	2.4	73.9	94.5	43,329	816	1.9	70.4	94.6
9	9,598	204	2.1	92.4	125.0	3,024	80	2.6	91.2	120.3	37,037	721	1.9	79.8	107.2
10	8,210	109	1.3	63.2	83.0	2,828	64	2.3	90.5	119.1	29,578	489	1.7	75.1	101.7
11	7,209	88	1.2	64.2	87.2	2,631	35	1.3	57.8	78.3	24,277	337	1.4	69.3	94.8
12	7,649	107	1.4	82.3	107.6	2,865	36	1.3	62.8	78.5	24,217	313	1.3	69.9	96.0
13	8,992	104	1.2	77.1	96.4	3,329	40	1.2	66.8	85.8	27,532	305	1.1	67.3	90.5
14	9,902	113	1.1	81.5	103.7	3,726	47	1.3	78.8	97.0	28,508	340	1.2	77.9	105.9
15	9,800	93	0.9	73.0	94.9	3,667	27	0.7	52.6	61.4	26,623	254	1.0	67.5	92.9
16	9,532	99	1.0	94.4	103.9	3,578	53	1.5	123.4	123.4	24,332	288	1.2	98.1	120.3
17	8,349	61	0.7	73.1	81.2	3,216	46	1.4	130.0	130.0	20,149	178	0.9	80.2	94.8
18	7,682	93	1.2	134.5	151.3	3,021	31	1.0	114.0	93.3	17,454	177	1.0	103.8	119.0
19	7,399	54	0.7	91.2	91.2	3,051	32	1.0	131.1	104.9	15,723	118	0.8	83.3	93.2
20	6,836	57	0.8	119.1	119.1	2,961	37	1.2	178.5	125.0	13,717	115	0.8	106.7	113.9
21	6,375	34	0.5	76.2	76.2	2,811	25	0.9	148.2	88.9	11,912	77	0.6	89.5	86.4
22	6,521	45	0.7	115.0	115.0	2,897	33	1.1	227.8	113.9	11,310	86	0.8	125.1	110.9
23	6,473	43	0.7	132.9	110.7	3,028	21	0.7	173.4	77.1	10,725	67	0.6	126.3	92.8
24	6,044	28	0.5	92.7	92.7	3,124	21	0.7	168.1	74.7	9,840	54	0.5	115.5	88.5
25	5,226	27	0.5	129.2	103.3	3,129	24	0.8	255.7	95.9	8,608	51	0.6	160.3	97.7
26	4,508	20	0.4	110.9	88.7	3,080	31	1.0	335.5	143.8	7,627	51	0.7	185.7	115.2
27	4,003	33	0.8	274.8	164.9	3,386	22	0.6	324.9	108.3	7,390	55	0.7	292.8	136.4
28	3,745	e	e	e	e	3,982	12	0.3	150.7	75.3	7,727	16	0.2	83.3	51.8
29	3,743	e	e	e	e	4,706	13	0.3	276.2	92.1	8,449	22	0.3	180.4	75.6
30 & over	23,109	120	0.5	103.9	103.9	92,780	925	1.0	110.8	99.7	115,889	1,045	0.9	109.9	100.2
All years	248,093	5,585	2.3	82.7%	100.1%	181,457	2,878	1.6	94.9%	99.9%	1,004,951	40,307	4.0	78.8%	100.0%

[a] Service as of beginning of calendar year of exposure rounded up to next highest whole year.
[b] Age attained in calendar year of exposure.
[c] Withdrawals less re-entrants.
[d] I and II denote expected according to rates used in the 26th and 27th valuations, respectively.
[e] Fewer than 10 actual net withdrawals.

EMPLOYEE AND BENEFICIARY CENSUSES, FAMILY COMPOSITION, AND
MISCELLANEOUS STATISTICS

Age and service distributions of active and inactive employees are shown in Tables S-37 and S-38. A comparison between 2013 and 2016 active censuses is shown in Table S-39.

Tables S-40 and S-41 provide a census of beneficiaries on December 31, 2016. Also included are their tier 1, tier 2 and vested dual benefit amounts.

Table S-42 shows the average number of service months in a year for calendar years 2012-2014 by attained age group and years of service. The number of service months credited to an employee for a given year is equal to the employee's total creditable tier 2 earnings in the year, divided by one-twelfth of the tier 2 earnings base for the year, with a maximum of 12 and a minimum of the number of months in which the individual had service.

The average creditable earnings per service month during 2016 are shown in Table S-43. Because of the difference in the maximum creditable earnings for tier 1 and tier 2 benefits, separate salary scales were constructed.

The age distribution of new entrants during calendar years 2012-2015 is shown in Table S-44, as is the distribution for 2009-2012.

Table S-45 presents family characteristics of railroad employees who died in the period 2012-2015 with a current connection.

Table S-46 provides selected employment and benefit statistics for 2013 and 2016.

Table S-37. Distribution of 2016 active employees[a] by age and completed years of service

Age in 2016	Total	Completed years of service										
		0	1	2-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & over
Total	247,882	9,524	16,794	43,432	52,204	46,035	31,318	18,699	11,283	6,272	9,312	3,009
Under 20	301	239	52	10	0	0	0	0	0	0	0	0
20-24	8,190	2,220	2,625	3,066	279	0	0	0	0	0	0	0
25-29	23,611	2,191	4,386	10,816	5,989	229	0	0	0	0	0	0
30-34	32,704	1,618	3,329	10,189	11,802	5,682	84	0	0	0	0	0
35-39	35,807	1,104	2,501	7,156	10,603	10,691	3,624	128	0	0	0	0
40-44	34,768	797	1,556	4,690	8,102	9,184	7,394	2,965	80	0	0	0
45-49	35,123	570	1,157	3,584	6,588	7,817	7,618	5,598	2,157	34	0	0
50-54	29,055	409	657	2,145	4,570	6,041	5,650	4,444	3,672	1,347	120	0
55-59	30,480	253	363	1,218	2,836	4,035	4,132	3,286	3,093	3,760	6,772	732
60-64	14,169	93	138	434	1,134	1,894	2,245	1,817	1,866	924	2,079	1,545
65-69	3,143	22	23	94	256	409	495	409	367	174	299	595
70 & over	531	8	7	30	45	53	76	52	48	33	42	137

[a] Employees alive and not retired at the end of 2016 with some railroad service in 2016.

Table S-38. Census of vested[a] inactive employees[b] in 2016 by age and
completed years of service

Age in 2016	Completed years of service						
	Total	5-9	10-14	15-19	20-24	25-29	30 & over
Total	40,128	14,252	15,909	5,885	2,423	838	821
Under 35	1,558	1,467	90	0	0	0	1
35-39	2,788	2,270	469	49	0	0	0
40-44	4,220	2,910	1,012	274	24	0	0
45-49	5,267	2,926	1,651	543	140	7	0
50-54	5,138	2,161	1,991	670	217	66	33
55-59	8,596	1,629	3,755	1,586	681	270	675
60-64	10,190	745	5,616	2,241	1,089	407	92
65 & over	2,371	144	1,325	522	272	88	20

[a] Employees with at least 10 years of total service, or 5 years of service after 1995.

[b] Employees alive and not retired at the end of 2016 with no railroad work in 2016.

Table S-39. Comparison between 2016 and 2013 of selected characteristics of active[a]
railroad employees

	2016	2013	Change from 2013 to 2016	
			Number	Percent
Number alive and not retired	247,882	252,234	-4,352	-1.7%
Percent with 5 or more years of service	71.9%	71.3%	b	b
Number age 60 or over	17,843	17,257	586	3.4%
Number age 65 or over	3,674	3,096	578	18.7%
Number age 60-64 with 30 or more years of service	4,548	5,956	-1,408	-23.6%
Average age on December 31	43.6	43.9	-0.3	b
Median age on December 31	43.4	43.7	-0.3	b
Average years of service				
All employees	12.4	13.2	-0.8	b
Employees under age 45	7.2	6.8	0.4	b
Employees age 45-49	13.6	12.7	0.9	b
Employees age 60 or over	24.2	25.8	-1.6	b
Employees age 65 or over	25.3	25.6	-0.3	b

[a] Active employees were those with some railroad service during the year.

[b] Not applicable.

Table S-40. Census of employee and spouse annuitants on December 31, 2016[a]

Age[c]	Number	Monthly benefits[b]			
		Tier 1	Tier 2	Vested dual	Supplemental
1. Employee age annuitants					
60-64	28,844	$ 62,407,937	$ 39,792,976	$ -	$ 777,360
65-69	49,948	99,039,097	52,117,216	-	1,055,334
70-74	37,688	71,068,167	34,227,634	16,036	801,366
75-79	24,686	41,909,923	19,680,271	147,690	515,416
80-84	19,861	27,855,934	13,263,929	382,799	379,539
85-89	17,396	22,787,241	10,012,206	567,296	340,398
90-94	9,626	11,703,012	4,503,166	449,100	189,433
95 & over	2,495	2,943,505	807,283	149,102	52,759
Total	190,544	$ 339,714,816	$ 174,404,681	$ 1,712,023	$ 4,111,605
2. Employee disability annuitants					
Under 40	173	$ 317,677	$ 20,378	$ -	$ -
40-44	421	782,268	129,470	-	-
45-49	937	1,749,996	381,756	-	-
50-54	1,770	3,368,000	956,382	-	-
55-59	6,593	13,162,868	4,913,579	-	-
60-64	17,678	34,739,627	13,555,872	-	182,247
65-69	20,606	39,021,368	14,566,154	-	308,978
70-74	13,553	24,315,308	8,758,101	8,349	214,339
75-79	7,413	12,327,735	4,463,846	57,876	130,143
80-84	4,256	6,531,313	2,258,496	92,211	85,658
85-89	2,559	3,626,829	1,130,551	89,861	56,492
90-94	859	1,073,122	249,520	44,536	17,528
95 & over	172	184,570	27,306	9,963	2,550
Total	76,990	$ 141,200,681	$ 51,411,411	$ 302,796	$ 997,935
3. Spouse annuitants					
Under 60	1,274	$ 1,321,668	$ 696,271	$ -	
60-64	29,996	26,142,420	17,784,145	-	
65-69	44,974	26,913,697	20,729,786	-	
70-74	31,242	15,300,438	12,810,397	-	
75-79	19,315	7,937,307	6,763,964	-	
80-84	11,853	4,691,753	3,633,370	-	
85-89	6,327	2,543,871	1,710,367	-	
90-94	1,751	654,684	423,981	-	
95 & over	238	85,636	49,779	1,161	
Total	146,970	$ 85,591,474	$ 64,602,060	$ 1,161	

[a] Includes annuities which were in withheld status as of December 31, 2016. Therefore, these figures may disagree with other published data.

[b] Amounts shown reflect benefits paid in January 2017.

[c] Age attained in 2016.

Table S-41. Census of survivor annuitants on December 31, 2016[a]

| Age[c] | Number | Monthly benefits[b] | | |
		Tier 1	Tier 2	Vested dual
1. Aged widows and widowers[d]				
60-64	4,537	$ 6,931,200	$ 2,635,106	$ -
65-69	9,625	13,764,857	4,879,739	-
70-74	11,970	15,735,529	5,521,210	-
75-79	14,758	17,084,762	6,229,018	-
80-84	18,481	20,585,270	7,115,191	-
85-89	21,760	24,421,644	6,958,434	-
90-94	14,961	16,463,979	3,720,717	-
95 & over	6,588	6,855,549	1,122,476	10,900
Total	102,680	$ 121,842,790	$ 38,181,891	$ 10,900
2. Other survivors[e]				
0-4	67	$ 83,875	$ 6,086	$ -
5-9	242	287,828	19,310	-
10-14	674	849,333	66,719	-
15-19	916	1,233,217	120,677	-
20-24	86	123,017	13,508	-
25-29	155	200,919	24,080	-
30-34	222	283,150	36,288	-
35-39	326	383,827	57,040	-
40-44	483	547,223	88,538	-
45-49	663	721,226	134,262	-
50-54	1,164	1,198,465	273,211	-
55-59	1,723	1,695,772	432,528	-
60-64	2,107	2,020,020	468,418	-
65-69	1,806	1,747,964	288,932	-
70-74	1,419	1,255,905	185,990	-
75-79	894	737,723	105,624	-
80-84	582	456,021	62,582	-
85-89	360	263,128	36,792	1,036
90-94	145	95,437	16,460	1,497
95 & over	41	26,544	4,498	583
Total	14,075	$ 14,210,594	$ 2,441,543	$ 3,116

[a] Includes annuities which were in withheld status as of December 31, 2016.
Therefore, these figures may disagree with other published data.

[b] Amounts shown reflect benefits paid in January 2017.

[c] Age attained in 2016.

[d] Includes divorced and remarried aged widows and widowers, and parents.

[e] Includes disabled widows and widowers, remarried and divorced disabled widows
and widowers, widowed mothers and fathers, remarried and divorced widowed
mothers and fathers, minor children, student children and disabled children.

Table S-42. Comparison of service months of railroad employees during calendar years 2012-2014 with assumptions used in the 27th valuation
(For employees not separated in the year)

Years of service [a]	Service months by attained age						Service months by calendar year				27th valuation assumption
	Under 25	25-34	35-44	45-54	55 & over	Total	2012	2013	2014	Total	
0	6.2	6.5	6.5	6.6	6.8	6.4	7.0	6.3	6.1	6.4	6.4
1	11.3	11.7	11.7	11.7	11.7	11.6	11.7	11.5	11.7	11.6	11.5
2	11.6	11.7	11.7	11.7	11.7	11.7	11.8	11.6	11.7	11.7	11.6
3	11.6	11.8	11.8	11.7	11.7	11.7	11.7	11.7	11.8	11.7	11.7
4	11.7	11.8	11.8	11.7	11.7	11.8	11.8	11.7	11.8	11.8	11.7
5	11.7	11.8	11.8	11.7	11.6	11.8	11.8	11.8	11.7	11.8	11.7
6	11.9	11.8	11.8	11.8	11.7	11.8	11.8	11.8	11.8	11.8	11.8
7		11.8	11.8	11.8	11.7	11.8	11.8	11.8	11.8	11.8	11.8
8		11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
9		11.8	11.8	11.8	11.7	11.8	11.8	11.8	11.8	11.8	11.8
10		11.9	11.8	11.8	11.7	11.8	11.8	11.8	11.8	11.8	11.8
11		11.8	11.8	11.8	11.8	11.8	11.7	11.8	11.8	11.8	11.8
12		11.8	11.8	11.8	11.7	11.8	11.8	11.8	11.8	11.8	11.8
13		11.9	11.8	11.8	11.7	11.8	11.8	11.8	11.8	11.8	11.8
14		11.9	11.8	11.8	11.7	11.8	11.8	11.8	11.8	11.8	11.8
15		11.8	11.9	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
16		12.0	11.9	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
17			11.9	11.8	11.8	11.8	11.8	11.8	11.9	11.8	11.8
18			11.9	11.8	11.8	11.8	11.9	11.8	11.8	11.8	11.8
19			11.9	11.8	11.8	11.8	11.8	11.9	11.9	11.8	11.8
20			11.9	11.8	11.8	11.8	11.8	11.8	11.9	11.8	11.8
21			11.9	11.8	11.8	11.8	11.8	11.8	11.9	11.8	11.8
22			11.9	11.9	11.8	11.8	11.8	11.8	11.9	11.8	11.8
23			11.9	11.9	11.8	11.8	11.8	11.8	11.8	11.8	11.8
24			11.9	11.9	11.8	11.9	11.9	11.8	11.9	11.9	11.9
25			11.9	11.9	11.8	11.9	11.9	11.9	11.9	11.9	11.9
26			12.0	11.9	11.8	11.9	11.9	11.8	11.9	11.9	11.9
27				11.9	11.8	11.9	11.8	11.9	11.8	11.9	11.9
28				11.9	11.8	11.9	11.9	11.8	11.9	11.9	11.9
29				11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9
30 & over					11.8	11.9	11.9	11.9	11.9	11.9	11.9

[a] Rounded up to nearest whole year.

Table S-43. Average creditable[a] compensation per service month during 2016

Years of service[b]	Tier 1	Tier 2
0	$4,081	$4,020
1	4,841	4,716
2	5,242	5,090
3	5,777	5,547
4	5,967	5,717
5	6,233	5,955
6	6,252	5,926
7	6,481	6,070
8	6,517	6,100
9	6,562	6,142
10	6,694	6,242
11	6,664	6,241
12	6,888	6,395
13	7,004	6,435
14	7,106	6,449
15	7,092	6,408
16	7,032	6,394
17	7,107	6,448
18	7,232	6,541
19	7,333	6,553
20	7,312	6,534
21	7,430	6,608
22	7,447	6,594
23	7,214	6,431
24	7,010	6,333
25	7,229	6,421
26	7,241	6,451
27	7,404	6,486
28	7,345	6,482
29	7,227	6,367
30	7,395	6,496

[a] Maximum creditable annual compensation during 2016 was $118,500 and $88,200 for tier 1 and tier 2, respectively.

[b] Completed service at beginning of year rounded up to nearest whole year.

Table S-44. Age distribution of new entrants during calendar years 2012-2015
and comparison with assumptions of the 26th valuation

| Age at entry[a] | Year of entry | | | | | 26th Val. |
	2012	2013	2014	2015	2012-15[b]	2009-12
All ages						
Number	18,767	18,536	27,112	19,914	84,329	62,908
Percent	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Under 20	2.1%	1.9%	1.9%	2.0%	2.0%	2.2%
20-24	20.7	20.8	20.5	21.6	20.8	19.7
25-29	23.8	24.9	25.3	24.5	24.6	22.6
30-34	19.1	17.8	19.0	17.8	18.5	17.9
35-39	12.1	12.5	12.8	13.2	12.7	13.1
40-44	9.6	9.8	9.1	8.7	9.3	10.3
45-49	6.4	6.1	5.9	6.2	6.2	7.3
50-54	3.8	3.8	3.4	3.7	3.6	4.3
55 & over	2.4	2.4	2.0	2.4	2.3	2.6
Average age at entry	32.3	32.3	32.0	32.1	32.2	32.9
Median age at entry	30.3	30.1	30.0	30.0	30.1	30.9

[a] Age attained in the year of entry (year of entry minus year of birth).

[b] Used in 27th valuation.

Table S-45. Family characteristics of railroad employees who died in 2012-2015 with a current connection

Age of employee[a]	Number of deaths[b]	Percent married				Widow under 60 with eligible child			Percent with eligible child	
		Total	Widow age 62 & over	Widow age 60-61	Widow under age 60	Youngest child under 16	Youngest child age 16-17	Youngest child disabled	Minor child	Disabled child
Under 35	48	72.9	-	-	72.9	62.5	-	-	89.6	-
35 - 39	69	69.6	-	-	69.6	58.0	2.9	-	88.4	-
40 - 44	128	73.4	0.9	-	72.5	59.2	3.9	-	85.9	0.8
45 - 49	172	75.0	-	0.9	74.1	38.7	8.7	0.6	64.5	2.3
50 - 54	302	71.2	3.3	1.5	66.4	17.4	9.7	0.7	36.8	2.0
55 - 59	1,064	65.8	4.7	4.3	56.8	5.4	2.2	1.4	11.3	2.5
60 - 64	2,425	63.8	20.0	14.0	29.8	2.0	0.4	0.4	3.8	1.6
65 - 69	3,391	69.3	51.4	6.7	11.2	0.7	0.5	0.1	2.1	1.0
70 - 74	3,902	68.2	61.7	2.7	3.8	0.2	0.1	0.1	0.8	1.1
75 - 79	4,518	68.1	65.4	0.9	1.8	0.1	-	-	0.3	1.0
80 - 84	6,648	60.7	59.5	0.5	0.7	-	-	-	0.3	0.8
85 - 89	9,589	51.7	51.2	0.1	0.4	-	-	-	0.1	0.9
90 & over	10,264	35.1	34.8	0.1	0.2	-	-	-	-	0.4

Age of employee[a]	Average ages of widows			Widow under 60 with eligible child			Average ages of children			Average number of minor children[d]
	Widow age 62 & over	Widow age 60-61	Widow under age 60	Youngest child under 16	Youngest child age 16-17	Youngest child disabled	Youngest child under 16[c]	All minor children	All disabled children	
Under 35	e	e	32.8	33.0	e	e	5.0	6.6	e	2.2
35 - 39	e	e	37.5	37.0	e	e	6.9	8.2	e	2.4
40 - 44	e	e	41.8	41.2	e	e	9.4	10.2	e	1.9
45 - 49	e	e	46.2	43.9	45.4	e	10.9	11.5	e	1.7
50 - 54	64.2	e	50.6	46.8	50.8	e	11.2	11.9	e	1.4
55 - 59	65.2	60.9	54.5	50.3	53.2	55.4	12.5	13.2	25.7	1.4
60 - 64	64.8	60.9	56.2	50.9	50.3	56.3	12.6	12.9	30.7	1.3
65 - 69	66.4	61.0	55.7	49.2	52.1	e	12.0	11.9	35.2	1.4
70 - 74	69.8	61.0	55.0	51.6	e	e	12.3	13.3	38.9	1.2
75 - 79	74.0	61.0	55.5	e	e	e	e	13.1	43.7	1.0
80 - 84	78.5	61.1	56.2	e	e	e	e	14.2	49.7	1.2
85 - 89	82.9	60.9	55.5	e	e	e	e	e	52.1	e
90 & over	87.2	e	53.9	e	e	e	e	e	57.0	e

[a] Age nearest birthday at time of death.

[b] Includes employees with 120 or more service months and employees with 60 or more service months after 1995.

[c] Includes families with widows under 60 and children under 16 only.

[d] Includes families with minor children only.

[e] Insufficient data.

Table S-46. Selected employment and benefit[a] statistics for 2013 and 2016

	2013	2016	Percentage change
1. Membership (thousands of employees)			
Average employment for the year	237	231	-2.5%
Active census, Dec. 31	252	248	-1.6
Retired, Dec. 31	272	268	-1.5
Nonretired employees with vested rights[b], total	223	218	-2.2
Active census, Dec. 31	180	178	-1.1
Inactive census, Dec. 31	43	40	-7.0
Employees in active census with			
30 or more years of service	33	19	-42.4
2. Number of beneficiaries (thousands), Dec. 31, total[c]	536	524	-2.2
Retired employees	272	268	-1.5
Spouses	142	147	+3.5
Survivors	130	117	-10.0
3. Average monthly benefits paid, December			
Retired employees	$2,480.50	$2,649.18	+6.8
Spouses	954.36	1,021.94	+7.1
Survivors	1,398.52	1,513.35	+8.2
4. Miscellaneous information			
Tier 1 taxable payroll as a percentage of total payroll	95.2%	93.9%	
Benefit payments in year as a percentage of tier 1 taxable payroll	65.3%	67.3%	
Number of beneficiaries per 100 full-time employees	226	227	
Percentage distribution of amount of monthly benefit payments in year			
Retired employees	68.0	68.5	
Spouses	13.3	14.1	
Survivors	18.7	17.4	

[a] Includes tier 1, tier 2 and vested dual benefit payments. Excludes supplemental annuities.

[b] Employees with at least 10 years of total service, or 5 years of service after 1995.

[c] Individuals receiving more than one type of benefit (for example, an employee and a spouse benefit) are counted separately in each category but only once in total.