Twenty-Eighth Actuarial Valuation

of the Assets and Liabilities
under the Railroad Retirement Acts
as of December 31, 2019
with
Technical Supplement

U.S. Railroad Retirement Board
Bureau of the Actuary and Research
Chicago, Illinois

Twenty-Eighth Actuarial Valuation of the Assets and Liabilities under the Railroad Retirement Acts as of December 31, 2019 with Technical Supplement

by
Keith T. Sartain, 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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UNITED STATES OF AMERICA
RAILROAD RETIREMENT BOARD
844 NORTH RUSH STREET
CHICAGO, ILLINOIS 60611-1275

BOARD MEMBERS:

ERHARD R. CHORLÉ, CHAIRMAN
JOHN BRAGG, LABOR MEMBER
THOMAS JAYNE , MANAGEMENT MEMBER

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 28th 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 2055.

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 28th 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.

FOR THE BOARD
Ana M. Kocur
General Counsel

STATEMENT OF THE ACTUARIAL ADVISORY COMMITTEE
June 7, 2021

This statement sets forth the Committee's conclusions from their review of the twenty-eighth actuarial valuation of the railroad retirement system. This valuation, performed as of the triennial period ending December 31, 2019, was completed in the spring of 2021 by Mr. Keith T. Sartain, 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 former Chief Actuary, Mr. Frank Buzzi, and Mr. Sartain 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 Actuaries and their staffs on December 20, 2019, December 11, 2020, April 21, 2021, May 19, 2021, and June 7, 2021, for the purpose of reviewing and discussing the significant elements of the twenty-eighth 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. Sartain and his staff's work conforms 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 appropriate financing changes. The Chief Actuary recommends no change in the payroll tax rates structure under the railroad retirement system at this time 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 16.57% to 21.01% of tier 2 payroll based on three projected future employment levels as support for the Chief Actuary's recommendation. These results compare to a range of 16.31% to 21.11% of tier 2 payroll in the twenty-seventh valuation.

The Committee gratefully acknowledges the valuable help of the Board, the former Chief Actuary, the current Chief Actuary and their staffs in assisting the Committee's review of this valuation.

The Railroad Retirement Act provides for three members of the Actuarial Advisory Committee. A unique situation occurred during this triennial valuation when the former third member of the Actuarial Advisory Committee, Keith Sartain, became the Chief Actuary at the Railroad Retirement Board effective February 15, 2021. There was insufficient time prior to the required submission date of the 28th valuation for the Board to appoint a new Actuarial Advisory Committee member. Therefore, this statement is signed by only two Actuarial Advisory Committee members.

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

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

Janet M. Barr, ASA, MAAA

REPORT OF THE ACTUARY

STATEMENT OF ACTUARIAL OPINION
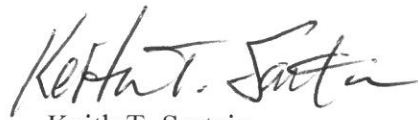
It is my opinion that this report reasonably presents the financial and actuarial status of the Railroad Retirement System in accordance with statutory requirements and actuarial standards of practice. The valuation results reflect the census data, actuarial assumptions and methods, benefit provisions and financial operations as more fully described in the following sections, the Appendix and Technical Supplement.

It is my opinion that (1) the techniques and methodology used herein are generally accepted within the actuarial profession; (2) the assumptions used and the resulting actuarial estimates are, individually and in the aggregate, reasonable for this valuation, taking into consideration the experience and expectations of the program; and (3) the benefit provisions and financial operations of the Railroad Retirement System are appropriately reflected.

Experience different from anticipated could have a material impact on the valuation results and financial status of the system. Future valuations are likely to produce different results as experience develops and actuarial assumptions and methods change. In addition, changes in benefit provisions and applicable laws could have a significant impact on the cost.

This valuation uses a projection model built and maintained by the Railroad Retirement Board's Bureau of the Actuary and Research. This model and its procedures are well documented, tested, reviewed, and updated annually. It includes sufficient quality checks and management controls to assure it produces appropriate results.

I meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Keith T. Sartain
Chief Actuary, Railroad Retirement Board
Fellow of the Society of Actuaries
Member of the American Academy of Actuaries
Enrolled Actuary #21-05002

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 28th actuarial valuation, is intended to meet these requirements for 2021. 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. The projected cash flows show no problems for at least 34 years, indicating that an immediate change in the tax rate schedule is not required. Only pessimistic employment assumption III shows future financing problems, as discussed in the following section.

2. No diversion of taxes from the Railroad Retirement Account to the Railroad Unemployment Insurance Account is recommended at this time. Due to the pandemic and its impact on unemployment and sickness claims, the Railroad Retirement Account extended $120 million in loans to the Railroad Unemployment Insurance Account during 2020 and early 2021, as provided for by Section 10(d) of the Railroad Unemployment Insurance Act. These outstanding loans are expected to be repaid by the end of 2022.

II. SUMMARY OF RECENT DEVELOPMENTS AND RESULTS

Recent actuarial reports have discussed in detail the importance of the level of railroad employment to the railroad retirement 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 (Appendix item 36) to automatically adjust the payroll tax rates in 2004 and later, there is less need for corrective legislation.

Key results from the 28th valuation (2021 actuarial report) and the prior 27th valuation (2018 actuarial report) under the moderate employment assumption are summarized in the table below:

	28th Valuation	27th Valuation
Valuation Date	12/31/2019	12/31/2016
Reporting Year	2021	2018
Actuarial Surplus (in millions)	$1,372	$1,174
Actuarial Surplus as a % of Tier 2 payroll	0.33%	0.32%
Average Projected Tier 2 tax rate	18.92%	18.79%
Cost of the System (tax rate less surplus)	**18.59%**	**18.47%**
Tier 2 tax rates:		
• Current (1st year)	18%	18%
• In 10th year	18%	18%
• Highest	23%	27%
• At final year	18%	18%

The combined effect of an increase in projected tier 2 tax rates by 0.13 percent and an increase in projected surplus by 0.01 percent results in an increase in system cost of 0.12 percent of tier 2 payroll.

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, 2020. 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.

Recent declines in railroad employment including the impact of the pandemic in 2020 have been worse than short-term projections under the moderate employment assumption; however, we are projecting more stable long-term employment levels in the current valuation, leading to an overall improvement in the projected tax base. At the same time, we are lowering the expected future investment return to 6.5% compared to 7.0% in the prior valuation, which increases the projected system cost by about 0.5 percent of tier 2 payroll.

The 28th valuation has been prepared under three assumptions as to the future behavior of railroad employment. The COVID-19 pandemic dramatically reduced railroad employment in the second half of 2020. While starting with this low employment level for the initial year, we are projecting a recovery to pre-pandemic employment levels over the next three years before returning to the longer-term rates of decline in employment. These longer-term employment assumptions are similar to the employment assumptions used in the 27th valuation, but this year's valuation assumes slower rates of decline in the future. 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. See Section V for more information on assumptions.

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:

	Employment Assumption		
	I	II	III
Ultimate employment (in thousands)	194.1	137.2	95.9
Actuarial Surplus as a % of Tier 2 payroll	0.55%	0.33%	0.24%
Average Projected Tier 2 tax rate	17.12%	18.92%	21.25%
Cost of the System (tax rate less surplus)	**16.57%**	**18.59%**	**21.01%**
Tier 2 tax rates:			
• Current (1st year)	18%	18%	18%
• In 10th year	18%	18%	18%
• Highest	18%	23%	27%
• At final year	15%	18%	27%

- Under employment assumption I (optimistic) and assumption II (moderate), there are no cash flow problems during the 75-year projection period. The tier 2 tax rates are adequate to maintain system solvency. The system is sustainable with no cash flow problems and a stable or improving funded status at the end of the projection period.

- Under employment assumption III (pessimistic), cash flow problems arise in 2055; however, the account balance begins to improve by 2072 and fully recovers by 2083. The tier 2 tax rates are not adequate to maintain system solvency. The system is not sustainable without action to adjust benefit payments or obtain alternative financing even though the funded status eventually recovers by the end of the 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 34 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 as early as age 60 with 30 years of service. A spouse of a 30-year employee may also retire as early as 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 it is necessary for integrating the full career of pays in 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 be paid after 2065.

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).

    Related to the COVID-19 pandemic, recent legislation and an executive order provided for certain credits and deferrals of tier 1 payroll taxes during 2020. Many railroad employers availed themselves of this relief. Half of any deferred payroll taxes will be due by December 31, 2021, and the remainder by December 31, 2022. In accordance with the legislation, Treasury is providing a reimbursement from the general fund during 2021 to cover the shortfall in 2020 tax receipts.

    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 2021 earnings limits are $142,800 and $106,200 for tier 1 and tier 2, respectively.

    Tier 2 taxes on both employers and employees are automatically adjusted 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 (currently 13.1 percent), while the tier 2 tax rate for employees will be between 0 percent and 4.9 percent (currently 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 sent to social security administration 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. The majority of assets are managed and invested in a diversified portfolio by the NRRIT Board of Trustees. The RR Account and SSEB Account are invested in special issue Treasury obligations.

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. As shown in Table 10, the social security system transferred $4.9 billion to the RR Account in 2021.

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 2018 through September 2019 (fiscal year 2019) took place in June 2020. 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 another job while also 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. Full benefits have been paid for all other years.

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 197,300 in 2020 under each of the three employment assumptions. This is the estimated average for the year (subject to later adjustment) and was within the range projected for 2020 under the employment assumptions contained in the 2020 Section 502 report. However, employment dropped dramatically in the second half of 2020 due to the COVID-19 pandemic.

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 46,000, and (2) the employment base, excluding passenger employment, will decline at a constant annual rate (0.2 percent for assumption I and 1.5 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 2.8 percent for 25 years, at a reducing rate over the next 25 years, and remain level thereafter.

These projected rates of decline are slower than in the prior valuation reflecting recent experience and future expectations.

Instead of projecting future employment levels based on the 2020 average employment that had been reduced by the COVID-19 pandemic, we started with the pre-pandemic 205,000 average employment from the first quarter of 2020 and applied the three employment assumptions for future periods. The projection phased into this pre-pandemic employment level over the next three years, reflecting an expectation that employment levels will gradually recover as the pandemic is mitigated. The remainder of the projection reflected this pre-pandemic level of employment.

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 3.6% and 2.6% in the 27th valuation to 3.4% and 2.4%, respectively, in the 28th valuation.

Consistent with lower inflation and considering capital market expectations, the investment return assumption has been lowered from 7.0% in the 27th valuation to 6.5% in the 28th valuation. This investment return assumption reflects the combined average expected return for all accounts.

Table 1. Employment and economic assumptions shows the assumptions used in the 28th valuation. A comparison of historical and projected employment is illustrated in Figure 1.

The valuation uses a single scenario for all other assumptions (for example, rates of mortality, disability, retirement, and withdrawal). These assumptions, some of which were changed from the 27th valuation to reflect recent experience, are discussed in the Technical Supplement to this report. Due to the COVID-19 pandemic impact on mortality rates, we are applying a load to reflect excess deaths during 2020 through 2022.

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]	
2020	197.3	197.3	197.3	0.5%	1.6% b	13.0% b
2021	199.7	197.7	195.2	3.4	1.3 b	6.5
2022	202.1	198.1	193.1	3.4	2.4	6.5
2023	204.5	198.4	191.0	3.4	2.4	6.5
2024	204.2	196.1	186.4	3.4	2.4	6.5
2025	203.9	193.9	181.9	3.4	2.4	6.5
2026	203.6	191.7	177.5	3.4	2.4	6.5
2027	203.3	189.5	173.2	3.4	2.4	6.5
2028	203.0	187.3	169.1	3.4	2.4	6.5
2029	202.7	185.2	165.0	3.4	2.4	6.5
2030	202.3	183.1	161.1	3.4	2.4	6.5
2031	202.0	181.1	157.2	3.4	2.4	6.5
2032	201.7	179.0	153.4	3.4	2.4	6.5
2033	201.4	177.0	150.3	3.4	2.4	6.5
2034	201.1	175.1	147.2	3.4	2.4	6.5
2035	200.8	173.1	144.2	3.4	2.4	6.5
2036	200.5	171.2	141.3	3.4	2.4	6.5
2037	200.2	169.4	138.4	3.4	2.4	6.5
2038	199.9	167.5	135.7	3.4	2.4	6.5
2039	199.5	165.7	133.0	3.4	2.4	6.5
2040	199.2	163.9	130.4	3.4	2.4	6.5
2041	198.9	162.1	127.9	3.4	2.4	6.5
2042	198.6	160.4	125.4	3.4	2.4	6.5
2043	198.3	158.7	123.0	3.4	2.4	6.5
2044	198.0	157.0	120.7	3.4	2.4	6.5
2045	197.7	155.3	118.4	3.4	2.4	6.5
2046	197.4	153.7	116.3	3.4	2.4	6.5
2047	197.1	152.3	114.3	3.4	2.4	6.5
2048	196.9	150.8	112.5	3.4	2.4	6.5
2049	196.6	149.5	110.8	3.4	2.4	6.5
2050	196.4	148.3	109.2	3.4	2.4	6.5
2051	196.2	147.1	107.7	3.4	2.4	6.5
2052	195.9	146.0	106.4	3.4	2.4	6.5
2053	195.7	145.0	105.1	3.4	2.4	6.5
2054	195.5	144.1	104.0	3.4	2.4	6.5
2055	195.4	143.2	102.9	3.4	2.4	6.5
2056	195.2	142.4	101.9	3.4	2.4	6.5
2057	195.0	141.6	101.0	3.4	2.4	6.5
2058	194.9	140.9	100.2	3.4	2.4	6.5
2059	194.8	140.3	99.4	3.4	2.4	6.5
2060	194.6	139.7	98.8	3.4	2.4	6.5
2061	194.5	139.2	98.2	3.4	2.4	6.5
2062	194.4	138.8	97.6	3.4	2.4	6.5
2063	194.4	138.4	97.2	3.4	2.4	6.5
2064	194.3	138.0	96.8	3.4	2.4	6.5
2065	194.2	137.8	96.5	3.4	2.4	6.5
2066	194.2	137.6	96.2	3.4	2.4	6.5
2067	194.1	137.4	96.1	3.4	2.4	6.5
2068	194.1	137.3	95.9	3.4	2.4	6.5
2069	194.1	137.2	95.9	3.4	2.4	6.5
2070-2094	194.1	137.2	95.9	3.4	2.4	6.5

[a]   Appendix item 16.
[b]   Actual.

Figure 1. Average Railroad Employment 1940-2094, Historical and Projected

Employment Assumption I

Employment Assumption II

Employment Assumption III

Calendar Year
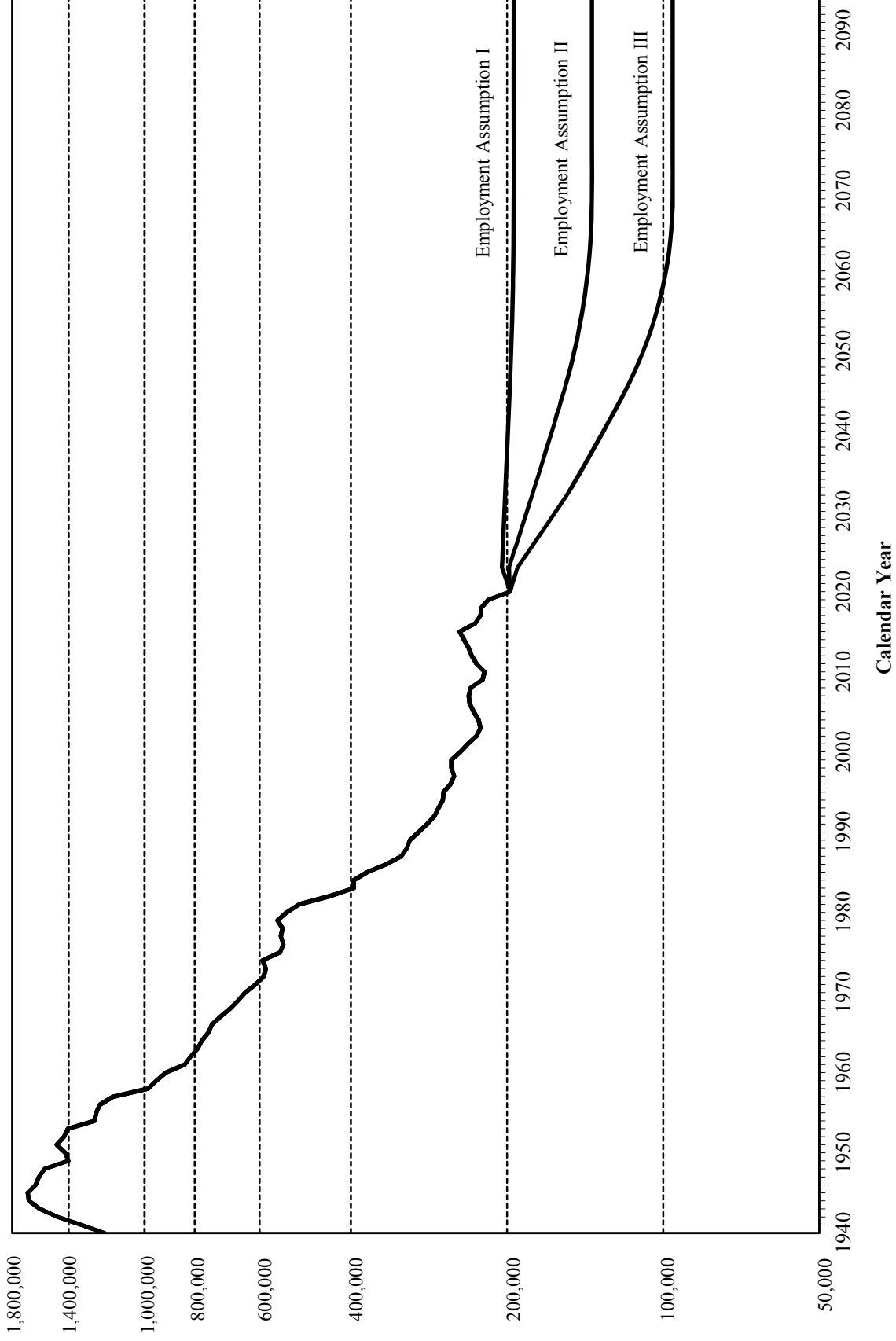
B. Valuation Results

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 2020-2094. The projections of these components were combined and the investment income calculated using a single rate 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.

The RR Account and SSEB Account had lower tax receipts during 2020 than expected based on reported Tier 1 and Tier 2 payrolls. The RR Account had a $350 million shortfall and the SSEB Account had a $620 million shortfall. These shortfalls are most likely due to legislation related to the pandemic which provided tax credits and deferrals during 2020 even though the legislation's intent was to only affect the Tier 1 taxes deposited to the SSEB Account. RRB is in the process of obtaining general fund reimbursement for this shortfall. The projections reflect this expected reimbursement during 2021 as well as the deferrals being repaid by employers at the end of 2021 (RR Account adds $350 million and SSEB Account adds $310 million) and end of 2022 (SSEB Account adds remaining $310 million). The operation of the financial interchange will repay the SSEB Account reimbursement as the taxes are collected.

The projections assume that financial interchange income to the SSEB Account will continue as in prior years, recognizing full benefits, even if the social security system may have inadequate funding in the future and must reduce annuities for its beneficiaries.

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

Figure 2 shows historical and projected account benefits ratios under the three employment assumptions.

Table 2-I: Under employment assumption I (optimistic), the combined account balance decreases slightly through 2025 and increases thereafter. The combined employer and employee tier 2 tax rate remains at 18% through 2053, decreases to 14.0% in 2065 and then remains between 14.0% and 15.0% thereafter. The system is sustainable with a stable or improving funded status at the end of the projection period.

Table 2-II: Under employment assumption II (moderate), the combined account balance is decreasing slightly through 2031 and then remains stable with periods of increases and decreases through 2053, at which point it increases thereafter. The combined employer and employee tier 2 tax rate remains at 18% through 2040, increases to 23% in 2053 through 2065, and then generally decreases until reaching 18.0% in 2080. The system is sustainable with a stable or improving funded status at the end of the projection period.

Table 2-III: Under employment assumption III (pessimistic), the combined account balance declines until the balance becomes negative in 2055. Negative after-transfer balances indicate the amount that would be owed, including interest, if unreduced benefits were paid by borrowing from some unknown source. An alternative approach is to reduce annuity payments to beneficiaries. The combined account deficit grows through 2071, when the balance reaches -$18,404 million, but then it begins to slowly improve until recovering a positive balance in 2083. The combined employer and employee tier 2 tax rate increases to 27% in 2044 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. The system is not sustainable as it requires corrective action, even though the funded status does recover by the end of the projection period.

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 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
2021	4.72	4.90	18.0%	$5,748	$3,848	$1,792	$26,879	$7,637	$3,451	$4,194	$951	$27,830
2022	4.66	4.90	18.0%	5,758	3,645	1,766	26,531	7,802	3,616	4,207	972	27,503
2023	4.60	4.90	18.0%	5,777	3,783	1,750	26,287	7,960	3,463	4,516	992	27,279
2024	4.55	4.80	18.0%	5,804	3,912	1,741	26,137	8,110	3,613	4,515	1,010	27,147
2025	4.50	4.70	18.0%	5,840	4,039	1,642	25,978	8,261	3,761	4,519	1,029	27,007
2026	4.48	4.70	18.0%	5,877	4,238	1,734	26,073	8,411	3,907	4,522	1,048	27,121
2027	4.48	4.70	18.0%	5,918	4,367	1,746	26,268	8,560	4,057	4,521	1,066	27,334
2028	4.49	4.60	18.0%	5,976	4,499	1,763	26,554	8,709	4,209	4,518	1,084	27,638
2029	4.49	4.60	18.0%	6,050	4,633	1,786	26,923	8,857	4,361	4,514	1,103	28,026
2030	4.50	4.60	18.0%	6,133	4,770	1,814	27,373	9,010	4,517	4,512	1,122	28,495
2031	4.52	4.60	18.0%	6,223	4,911	1,797	27,858	9,170	4,675	4,515	1,142	29,000
2032	4.55	4.60	18.0%	6,307	5,055	1,880	28,487	9,341	4,816	4,546	1,163	29,650
2033	4.62	4.60	18.0%	6,376	5,205	1,925	29,241	9,522	4,964	4,581	1,185	30,426
2034	4.69	4.60	18.0%	6,463	5,362	1,979	30,119	9,703	5,117	4,608	1,208	31,327
2035	4.76	4.60	18.0%	6,581	5,523	2,040	31,102	9,880	5,272	4,630	1,230	32,332
2036	4.83	4.60	18.0%	6,706	5,690	2,099	32,184	10,066	5,431	4,658	1,253	33,437
2037	4.91	4.60	18.0%	6,838	5,862	2,180	33,387	10,260	5,596	4,688	1,277	34,664
2038	5.00	4.70	18.0%	6,984	6,040	2,262	34,706	10,453	5,766	4,710	1,301	36,007
2039	5.09	4.70	18.0%	7,131	6,225	2,352	36,152	10,648	5,943	4,729	1,325	37,477
2040	5.21	4.80	18.0%	7,278	6,418	2,449	37,740	10,850	6,128	4,747	1,350	39,090
2041	5.32	4.90	18.0%	7,448	6,618	2,552	39,463	11,061	6,320	4,767	1,376	40,839
2042	5.43	4.90	18.0%	7,643	6,824	2,668	41,312	11,287	6,516	4,799	1,404	42,716
2043	5.53	5.00	18.0%	7,856	7,037	2,790	43,284	11,521	6,718	4,832	1,433	44,717
2044	5.63	5.10	18.0%	8,094	7,259	2,920	45,369	11,768	6,927	4,871	1,464	46,833
2045	5.72	5.20	18.0%	8,358	7,488	3,055	47,554	12,032	7,143	4,922	1,497	49,051
2046	5.81	5.30	18.0%	8,624	7,725	3,196	49,851	12,322	7,368	4,990	1,532	51,383
2047	5.91	5.40	18.0%	8,881	7,973	3,347	52,289	12,636	7,605	5,070	1,571	53,860
2048	6.02	5.50	18.0%	9,158	8,230	3,508	54,869	12,963	7,853	5,150	1,612	56,481
2049	6.12	5.60	18.0%	9,449	8,495	3,677	57,592	13,304	8,109	5,237	1,654	59,246
2050	6.24	5.70	18.0%	9,718	8,770	3,856	60,499	13,667	8,378	5,334	1,699	62,198
2051	6.40	5.80	18.0%	9,960	9,057	4,049	63,646	14,052	8,665	5,434	1,747	65,393
2052	6.59	5.90	18.0%	10,183	9,355	4,258	67,077	14,465	8,968	5,548	1,798	68,875
2053	6.81	6.00	18.0%	10,400	9,666	4,488	70,831	14,898	9,286	5,666	1,852	72,683
2054	6.96	6.20	17.0%	10,707	9,482	4,722	74,329	15,319	9,605	5,766	1,904	76,233
2055	7.04	6.30	17.0%	11,126	9,793	4,954	77,949	15,721	9,918	5,853	1,954	79,903
2056	7.14	6.40	17.0%	11,485	10,112	5,185	81,761	16,193	10,252	6,000	2,013	83,774
2057	7.27	6.60	16.0%	11,750	9,886	5,413	85,310	16,740	10,609	6,199	2,081	87,391
2058	7.43	6.70	16.0%	12,014	10,214	5,655	89,166	17,275	10,987	6,355	2,148	91,314
2059	7.55	6.90	16.0%	12,382	10,556	5,916	93,255	17,783	11,367	6,480	2,211	95,466
2060	7.57	7.00	15.0%	12,875	10,296	6,164	96,840	18,274	11,743	6,592	2,272	99,112
2061	7.58	7.10	15.0%	13,333	10,638	6,391	100,535	18,836	12,138	6,768	2,341	102,876
2062	7.63	7.20	15.0%	13,735	10,988	6,628	104,417	19,476	12,555	7,001	2,421	106,838
2063	7.69	7.30	15.0%	14,158	11,353	6,887	108,499	20,118	12,986	7,212	2,501	111,000
2064	7.75	7.40	15.0%	14,622	11,732	7,158	112,767	20,767	13,432	7,417	2,581	115,348
2065	7.75	7.50	14.0%	15,121	11,404	7,413	116,462	21,438	13,890	7,630	2,664	119,126
2070	7.68	7.70	14.0%	17,896	13,460	8,695	136,631	25,254	16,442	8,914	3,139	139,770
2075	7.56	7.70	14.0%	21,247	15,908	10,167	159,662	29,864	19,479	10,508	3,711	163,373
2080	7.38	7.60	14.0%	25,283	18,815	11,817	185,374	35,416	23,084	12,480	4,401	189,775
2085	7.22	7.40	15.0%	29,982	23,665	13,693	215,218	42,059	27,375	14,862	5,226	220,444
2090	7.26	7.30	15.0%	35,496	27,992	16,300	256,218	49,952	32,463	17,700	6,207	262,425
2091	7.27	7.30	15.0%	36,697	28,947	16,881	265,350	51,702	33,589	18,330	6,424	271,774
2092	7.28	7.30	15.0%	37,965	29,935	17,484	274,804	53,502	34,750	18,975	6,648	281,452
2093	7.28	7.30	15.0%	39,300	30,957	18,106	284,566	55,360	35,948	19,643	6,879	291,445
2094	7.29	7.30	15.0%	40,676	32,012	18,747	294,648	57,295	37,186	20,350	7,119	301,767

[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. Due to COVID-19 legislation, tax receipts during 2020 were lower than expected by $350 million (RRA),
to be recouped in 2021, and $620 million (SSEBA), to be recouped equally in 2021 and 2022.

[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. It also includes a $620 million general fund reimbursement related to COVID-19 legislation.

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
2021	4.72	4.90	18.0%	$5,748	$3,832	$1,791	$26,862	$7,637	$3,437	$4,208	$951	$27,813
2022	4.65	4.90	18.0%	5,758	3,599	1,763	26,466	7,802	3,575	4,247	972	27,438
2023	4.58	4.90	18.0%	5,777	3,705	1,743	26,137	7,960	3,395	4,585	992	27,129
2024	4.51	4.80	18.0%	5,803	3,801	1,728	25,862	8,110	3,514	4,614	1,010	26,872
2025	4.43	4.70	18.0%	5,839	3,891	1,619	25,534	8,261	3,629	4,650	1,029	26,563
2026	4.38	4.70	18.0%	5,875	4,051	1,700	25,410	8,411	3,741	4,688	1,047	26,457
2027	4.33	4.70	18.0%	5,916	4,140	1,696	25,329	8,560	3,854	4,724	1,066	26,395
2028	4.29	4.60	18.0%	5,973	4,228	1,694	25,278	8,708	3,966	4,760	1,084	26,362
2029	4.23	4.50	18.0%	6,046	4,316	1,693	25,242	8,855	4,076	4,797	1,103	26,345
2030	4.17	4.50	18.0%	6,128	4,406	1,693	25,213	9,007	4,187	4,838	1,121	26,334
2031	4.10	4.50	18.0%	6,216	4,496	1,644	25,136	9,165	4,299	4,885	1,141	26,277
2032	4.04	4.40	18.0%	6,297	4,587	1,689	25,116	9,333	4,390	4,963	1,162	26,278
2033	4.00	4.40	18.0%	6,364	4,682	1,690	25,124	9,510	4,486	5,045	1,184	26,308
2034	3.96	4.30	18.0%	6,448	4,780	1,694	25,151	9,685	4,584	5,123	1,206	26,357
2035	3.89	4.20	18.0%	6,562	4,881	1,698	25,168	9,856	4,682	5,196	1,227	26,395
2036	3.83	4.20	18.0%	6,683	4,983	1,693	25,161	10,035	4,781	5,276	1,249	26,410
2037	3.75	4.10	18.0%	6,809	5,088	1,701	25,141	10,219	4,882	5,360	1,272	26,413
2038	3.67	4.10	18.0%	6,948	5,196	1,702	25,091	10,401	4,986	5,437	1,294	26,385
2039	3.59	4.00	18.0%	7,088	5,308	1,700	25,012	10,583	5,093	5,513	1,317	26,329
2040	3.51	4.00	18.0%	7,227	5,425	1,696	24,906	10,770	5,204	5,589	1,340	26,246
2041	3.45	3.90	19.0%	7,386	5,817	1,697	25,034	10,963	5,319	5,668	1,364	26,398
2042	3.38	3.80	19.0%	7,569	5,945	1,707	25,118	11,167	5,434	5,758	1,389	26,507
2043	3.30	3.80	19.0%	7,769	6,078	1,713	25,140	11,378	5,553	5,851	1,415	26,555
2044	3.21	3.70	19.0%	7,991	6,215	1,713	25,077	11,596	5,673	5,950	1,442	26,519
2045	3.10	3.60	19.0%	8,237	6,356	1,707	24,903	11,829	5,797	6,060	1,471	26,374
2046	2.98	3.50	19.0%	8,481	6,503	1,693	24,617	12,082	5,927	6,186	1,502	26,119
2047	2.88	3.40	20.0%	8,714	6,968	1,684	24,555	12,354	6,067	6,321	1,536	26,091
2048	2.79	3.40	20.0%	8,963	7,137	1,681	24,409	12,633	6,213	6,454	1,571	25,980
2049	2.69	3.30	20.0%	9,224	7,312	1,671	24,169	12,921	6,365	6,592	1,606	25,775
2050	2.59	3.20	20.0%	9,459	7,495	1,656	23,861	13,226	6,527	6,737	1,644	25,505
2051	2.50	3.10	20.0%	9,662	7,689	1,639	23,527	13,543	6,703	6,879	1,684	25,211
2052	2.42	3.00	20.0%	9,838	7,892	1,620	23,202	13,878	6,893	7,027	1,725	24,927
2053	2.44	2.90	23.0%	9,999	9,191	1,643	24,036	14,222	7,094	7,171	1,768	25,804
2054	2.48	2.80	23.0%	10,225	9,442	1,705	24,958	14,549	7,295	7,295	1,808	26,766
2055	2.51	2.70	23.0%	10,534	9,696	1,771	25,890	14,852	7,491	7,398	1,846	27,736
2056	2.54	2.70	23.0%	10,780	9,960	1,831	26,901	15,201	7,703	7,541	1,889	28,790
2057	2.60	2.60	23.0%	10,940	10,237	1,899	28,097	15,601	7,935	7,716	1,939	30,036
2058	2.69	2.60	23.0%	11,091	10,532	1,990	29,529	15,981	8,181	7,847	1,986	31,515
2059	2.78	2.60	23.0%	11,319	10,840	2,096	31,145	16,325	8,428	7,939	2,028	33,173
2060	2.86	2.60	23.0%	11,642	11,154	2,208	32,866	16,646	8,671	8,014	2,068	34,934
2061	2.94	2.60	23.0%	11,928	11,479	2,320	34,737	17,013	8,929	8,130	2,113	36,850
2062	3.05	2.70	23.0%	12,160	11,816	2,444	36,838	17,433	9,203	8,282	2,165	39,003
2063	3.18	2.70	23.0%	12,405	12,170	2,592	39,195	17,843	9,488	8,407	2,216	41,411
2064	3.32	2.80	23.0%	12,680	12,540	2,755	41,810	18,249	9,783	8,516	2,266	44,076
2065	3.46	2.90	23.0%	12,979	12,926	2,932	44,689	18,662	10,088	8,625	2,317	47,006
2070	3.73	3.40	20.0%	14,633	13,313	3,557	54,027	20,984	11,820	9,226	2,605	56,632
2075	3.94	3.70	19.0%	16,649	14,947	4,254	64,895	23,769	13,922	9,921	2,950	67,845
2080	4.23	4.00	18.0%	19,141	16,774	5,234	80,200	27,173	16,432	10,833	3,373	83,573
2085	4.46	4.20	18.0%	22,100	19,794	6,342	97,843	31,354	19,435	12,032	3,892	101,735
2090	4.82	4.50	18.0%	25,618	23,375	7,897	122,654	36,457	23,013	13,581	4,525	127,179
2091	4.91	4.60	18.0%	26,388	24,166	8,276	128,708	37,605	23,808	13,940	4,668	133,376
2092	5.00	4.60	18.0%	27,211	24,985	8,681	135,162	38,789	24,626	14,310	4,815	139,977
2093	5.09	4.70	18.0%	28,085	25,831	9,111	142,019	40,016	25,470	14,698	4,967	146,986
2094	5.18	4.80	18.0%	28,989	26,704	9,566	149,301	41,301	26,343	15,117	5,127	154,428

[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. Due to COVID-19 legislation, tax receipts during 2020 were lower than expected by $350 million (RRA), to be recouped in 2021, and $620 million (SSEBA), to be recouped equally in 2021 and 2022.

[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. It also includes a $620 million general fund reimbursement related to COVID-19 legislation.

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	Account benefits ratio[a]	Average account benefits ratio[b]	Tier 2 tax rate	Benefits and administration	Tax income[c]	Other income[d]	Balance, end year	Benefits and administration	Tax income[c]	Other income and expense[e]	Balance, end year	Combined balance, end year
2021	4.72	4.90	18.0%	$5,748	$3,812	$1,790	$26,842	$7,637	$3,420	$4,225	$951	$27,793
2022	4.64	4.90	18.0%	5,758	3,542	1,760	26,385	7,802	3,525	4,297	972	27,357
2023	4.55	4.90	18.0%	5,777	3,611	1,735	25,955	7,960	3,311	4,668	992	26,947
2024	4.46	4.80	18.0%	5,803	3,666	1,712	25,529	8,110	3,395	4,734	1,010	26,539
2025	4.35	4.70	18.0%	5,838	3,714	1,592	24,998	8,261	3,471	4,808	1,029	26,027
2026	4.25	4.70	18.0%	5,874	3,830	1,658	24,612	8,411	3,543	4,886	1,047	25,659
2027	4.16	4.60	18.0%	5,913	3,871	1,636	24,206	8,559	3,614	4,964	1,066	25,272
2028	4.05	4.50	18.0%	5,970	3,911	1,611	23,759	8,707	3,681	5,044	1,084	24,843
2029	3.92	4.50	18.0%	6,041	3,949	1,583	23,250	8,853	3,745	5,126	1,102	24,352
2030	3.78	4.40	18.0%	6,122	3,986	1,551	22,665	9,003	3,808	5,214	1,121	23,786
2031	3.61	4.30	18.0%	6,208	4,022	1,464	21,943	9,159	3,869	5,309	1,140	23,083
2032	3.45	4.20	18.0%	6,286	4,060	1,466	21,182	9,323	3,910	5,433	1,161	22,343
2033	3.28	4.10	18.0%	6,350	4,103	1,417	20,352	9,495	3,957	5,560	1,182	21,534
2034	3.11	4.00	18.0%	6,430	4,149	1,365	19,437	9,665	4,006	5,680	1,203	20,640
2035	2.93	3.80	19.0%	6,539	4,400	1,314	18,611	9,828	4,053	5,795	1,223	19,834
2036	2.74	3.70	19.0%	6,656	4,451	1,252	17,659	9,998	4,101	5,917	1,244	18,903
2037	2.54	3.60	19.0%	6,777	4,505	1,198	16,585	10,171	4,151	6,042	1,266	17,851
2038	2.34	3.40	20.0%	6,910	4,769	1,136	15,580	10,340	4,201	6,159	1,287	16,867
2039	2.14	3.20	20.0%	7,042	4,830	1,071	14,438	10,508	4,253	6,275	1,307	15,745
2040	1.93	3.00	20.0%	7,174	4,894	997	13,154	10,677	4,308	6,390	1,328	14,482
2041	1.77	2.90	23.0%	7,323	5,609	933	12,373	10,850	4,365	6,506	1,350	13,723
2042	1.61	2.70	23.0%	7,496	5,684	883	11,443	11,031	4,421	6,632	1,372	12,815
2043	1.43	2.50	23.0%	7,683	5,763	821	10,344	11,215	4,479	6,759	1,395	11,739
2044	1.33	2.30	27.0%	7,891	6,740	779	9,972	11,403	4,537	6,890	1,418	11,390
2045	1.23	2.10	27.0%	8,122	6,836	752	9,437	11,602	4,597	7,030	1,443	10,880
2046	1.12	2.00	27.0%	8,349	6,937	713	8,738	11,815	4,661	7,180	1,469	10,207
2047	1.00	1.80	27.0%	8,561	7,050	667	7,893	12,043	4,734	7,337	1,497	9,390
2048	0.86	1.60	27.0%	8,788	7,170	611	6,887	12,273	4,813	7,489	1,526	8,413
2049	0.72	1.50	27.0%	9,022	7,297	545	5,707	12,507	4,895	7,641	1,555	7,262
2050	0.56	1.40	27.0%	9,227	7,432	469	4,381	12,751	4,986	7,795	1,585	5,966
2051	0.40	1.20	27.0%	9,395	7,582	385	2,953	12,999	5,089	7,941	1,616	4,569
2052	0.24	1.10	27.0%	9,529	7,743	296	1,463	13,255	5,204	8,083	1,647	3,110
2053	0.09	0.90	27.0%	9,638	7,915	259	-	13,511	5,328	8,160	1,624	1,624
2054	0.08	0.80	27.0%	9,778	8,094	1,683	-	13,744	5,454	6,750	84	84
2055	-0.07	0.70	27.0%	9,966	8,276	127	(1,563)	13,950	5,577	8,289	-	(1,563)
2056	-0.24	0.60	27.0%	10,095	8,468	(60)	(3,250)	14,178	5,712	8,466	-	(3,250)
2057	-0.40	0.40	27.0%	10,147	8,671	(163)	(4,889)	14,431	5,862	8,569	-	(4,889)
2058	-0.55	0.30	27.0%	10,183	8,891	(261)	(6,443)	14,656	6,023	8,633	-	(6,443)
2059	-0.69	0.10	27.0%	10,267	9,119	(356)	(7,947)	14,843	6,184	8,659	-	(7,947)
2060	-0.83	-0.10	27.0%	10,409	9,352	(450)	(9,454)	15,003	6,343	8,661	-	(9,454)
2061	-0.96	-0.20	27.0%	10,516	9,595	(542)	(10,917)	15,185	6,511	8,675	-	(10,917)
2062	-1.08	-0.40	27.0%	10,576	9,848	(630)	(12,275)	15,393	6,690	8,703	-	(12,275)
2063	-1.19	-0.50	27.0%	10,644	10,115	(710)	(13,514)	15,585	6,878	8,707	-	(13,514)
2064	-1.29	-0.60	27.0%	10,733	10,396	(783)	(14,635)	15,765	7,072	8,693	-	(14,635)
2065	-1.37	-0.80	27.0%	10,840	10,689	(849)	(15,635)	15,944	7,273	8,671	-	(15,635)
2070	-1.54	-1.30	27.0%	11,552	12,388	(1,041)	(18,403)	16,989	8,420	8,569	-	(18,403)
2075	-1.24	-1.50	27.0%	12,611	14,502	(921)	(16,054)	18,389	9,834	8,555	-	(16,054)
2080	-0.45	-1.30	27.0%	14,083	17,049	(360)	(6,519)	20,312	11,543	8,769	-	(6,519)
2085	0.79	-0.50	27.0%	15,967	20,106	672	12,785	22,881	13,612	9,421	420	13,205
2090	2.51	0.80	27.0%	18,267	23,752	2,687	46,389	26,179	16,107	10,299	1,396	47,785
2091	2.92	1.10	27.0%	18,769	24,559	3,229	55,408	26,932	16,663	10,515	1,642	57,050
2092	3.35	1.40	27.0%	19,309	25,393	3,826	65,318	27,711	17,237	10,740	1,909	67,227
2093	3.79	1.70	27.0%	19,884	26,254	4,481	76,168	28,519	17,828	10,979	2,197	78,365
2094	4.25	2.10	27.0%	20,481	27,142	5,197	88,027	29,369	18,440	11,241	2,509	90,536

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. Due to COVID-19 legislation, tax receipts during 2020 were lower than expected by $350 million (RRA),
   to be recouped in 2021, and $620 million (SSEBA), to be recouped equally in 2021 and 2022.

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. It also includes a $620 million general fund reimbursement related to COVID-19 legislation.

Figure 2. Account Benefits Ratio 1994-2094, Historical and Projected

Employment Assumption I

Employment Assumption II

Employment Assumption III
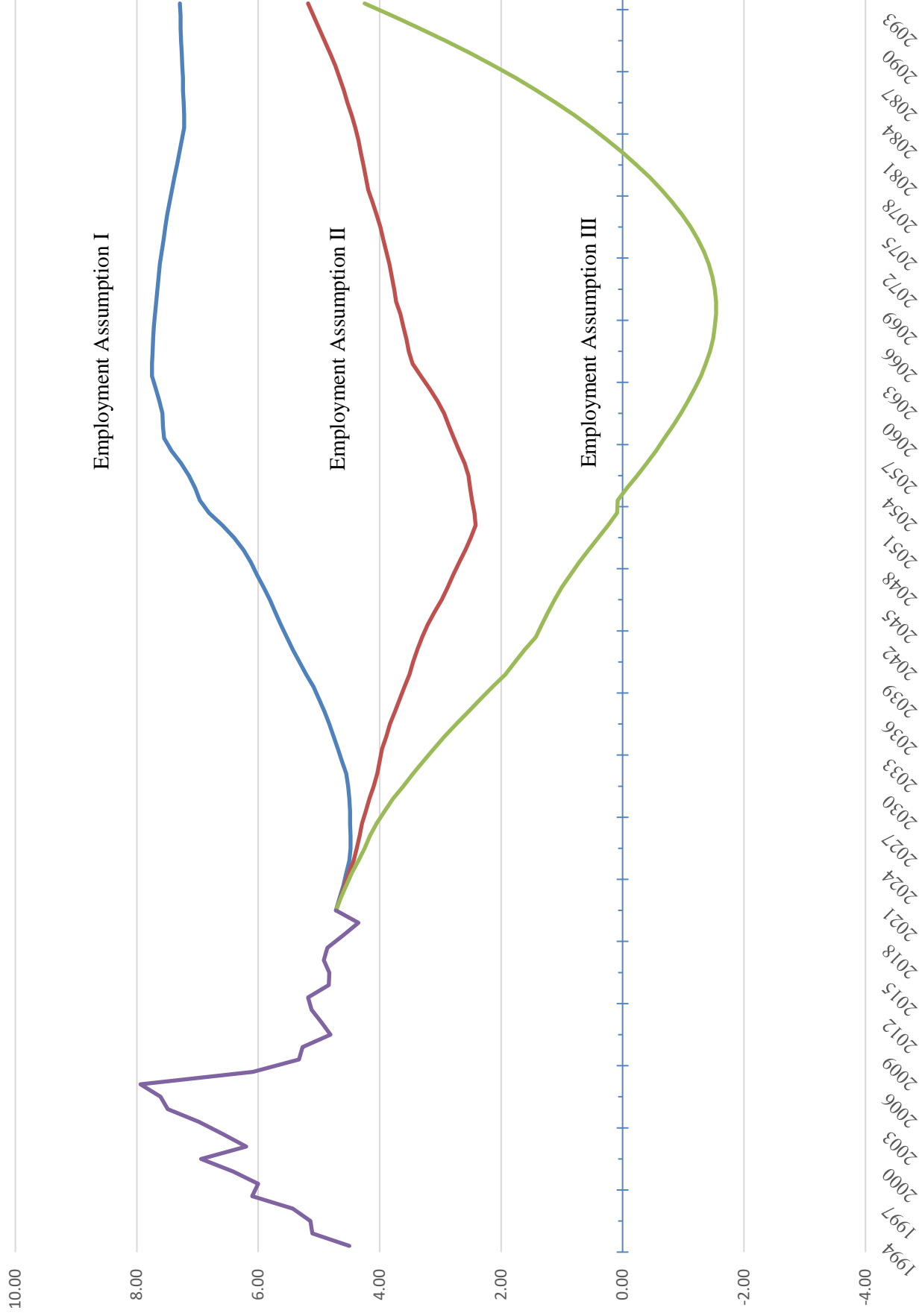
Table 3. Present value of benefits in millions of dollars. This table shows, for each employment assumption, the present value of tier 2 benefits, supplemental annuity benefits and the portion of tier 1 benefits which exceeds the social security level of benefits. The portion of tier 1 benefits in excess 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).

Present values were calculated by discounting amounts in each projection year to December 31, 2019, using a constant 6.5% interest rate.

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 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	$25,909	$ 8,878	$ 34,787	$25,909	$ 8,878	$ 34,787	$25,909	$ 8,878	$ 34,787
Active	22,424	9,213	31,637	22,424	9,213	31,637	22,424	9,213	31,637
Inactive	1,428	253	1,681	1,428	253	1,681	1,428	253	1,681
Future entrants	9,882	3,431	13,313	7,290	2,535	9,825	4,945	1,716	6,661
Total	59,643	21,775	81,417	57,051	20,879	77,930	54,706	20,060	74,766
Spouse annuities									
Retired	7,613	2,920	10,533	7,613	2,920	10,533	7,613	2,920	10,533
Active	5,758	3,318	9,075	5,758	3,318	9,075	5,758	3,318	9,075
Inactive	321	73	394	321	73	394	321	73	394
Future entrants	2,320	1,093	3,414	1,715	809	2,524	1,162	547	1,709
Total	16,012	7,404	23,416	15,406	7,120	22,526	14,854	6,858	21,712
Survivor annuities									
Retired & deceased	7,284	885	8,169	7,284	885	8,169	7,284	885	8,169
Active	2,441	295	2,736	2,441	295	2,736	2,441	295	2,736
Inactive	49	19	68	49	19	68	49	19	68
Future entrants	816	145	960	604	107	711	405	72	477
Total	10,590	1,343	11,933	10,378	1,305	11,683	10,179	1,270	11,449
All annuities combined									
Retired & deceased	40,806	12,683	53,489	40,806	12,683	53,489	40,806	12,683	53,489
Active	30,622	12,826	43,448	30,622	12,826	43,448	30,622	12,826	43,448
Inactive	1,799	344	2,143	1,799	344	2,143	1,799	344	2,143
Future entrants	13,017	4,669	17,686	9,608	3,451	13,060	6,512	2,335	8,847
Total annuities	$86,244	$30,522	$116,766	$82,835	$29,304	$112,139	$79,739	$28,188	$107,927
Lump sum payments			36			36			36
Total benefits			$116,802			$112,176			$107,963

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

[a] Present values are determined using a 6.5% 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	5.29%	1.81%	7.11%	6.32%	2.17%	8.48%	7.58%	2.60%	10.17%
Active	4.58	1.88	6.46	5.47	2.25	7.72	6.56	2.69	9.25
Inactive	0.29	0.05	0.34	0.35	0.06	0.41	0.42	0.07	0.49
Future entrants	2.02	0.70	2.72	1.78	0.62	2.40	1.45	0.50	1.95
Total	12.19	4.45	16.64	13.91	5.09	19.01	16.00	5.87	21.86
Spouse annuities									
Retired	1.56	0.60	2.15	1.86	0.71	2.57	2.23	0.85	3.08
Active	1.18	0.68	1.85	1.40	0.81	2.21	1.68	0.97	2.65
Inactive	0.07	0.01	0.08	0.08	0.02	0.10	0.09	0.02	0.12
Future entrants	0.47	0.22	0.70	0.42	0.20	0.62	0.34	0.16	0.50
Total	3.27	1.51	4.78	3.76	1.74	5.49	4.34	2.01	6.35
Survivor annuities									
Retired & deceased	1.49	0.18	1.67	1.78	0.22	1.99	2.13	0.26	2.39
Active	0.50	0.06	0.56	0.60	0.07	0.67	0.71	0.09	0.80
Inactive	0.01	0.00	0.01	0.01	0.00	0.02	0.01	0.01	0.02
Future entrants	0.17	0.03	0.20	0.15	0.03	0.17	0.12	0.02	0.14
Total	2.16	0.27	2.44	2.53	0.32	2.85	2.98	0.37	3.35
All annuities combined									
Retired & deceased	8.34	2.59	10.93	9.95	3.09	13.05	11.93	3.71	15.64
Active	6.26	2.62	8.88	7.47	3.13	10.60	8.95	3.75	12.70
Inactive	0.37	0.07	0.44	0.44	0.08	0.52	0.53	0.10	0.63
Future entrants	2.66	0.95	3.61	2.34	0.84	3.19	1.90	0.68	2.59
Total annuities	17.62%	6.24%	23.86%	20.20%	7.15%	27.35%	23.32%	8.24%	31.56%
Lump sum payments			0.01			0.01			0.01
Total benefits			23.87%			27.36%			31.57%

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

[a] Present values are determined using a 6.5% 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, 2019
(Dollar amounts in millions)

This table derives the balance in the accounts as of December 31, 2019. No accrual adjustments
are made either for general funds reimbursements or financial interchange amounts due and
unpaid on that date or for benefits due on January 2, 2020, because these amounts are included
in the projected future cash flows. It may also include outstanding loans to the Railroad
Unemployment Insurance Account in future periods.

	Combined NRRIT and RR Account	SSEB Account
Securities:		
Market value of NRRIT investments	$ 26,275	$ -
Par value specials[a] (including accrued interest)	437	1,059
Cash accounts	37	24
Balance	26,749	1,083
Adjustment for present value calculation[b]	1,281	-
Adjusted balance for use in present value calculation	$ 28,030	$ 1,083

[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, 2020,
used in Tables 2-I, 2-II and 2-III, and the assets that would have been projected starting with
the December 31, 2019 assets using a 6.5% rate. With this adjustment, the present value of the
ultimate combined account values in Tables 2 discounted at a 6.5% 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. 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.

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. 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 2020 was approximately 13.0%, this rate is not used in the present value calculations. Instead, the present value calculations use 6.5% as the rate for 2020, as well as for the remaining 74 years of the projection. The adjusted balance as of December 31, 2019, is calculated so that, assuming a 6.5% rate of return for 2020, the combined RRA, NRRIT, and SSEBA balance projected on December 31, 2020, 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 $71,870 million, or 21.01 percent of payroll, whereas the cost under employment assumption I is $81,120 million, or 16.57 percent of payroll. Using employment assumption III as the base, the percentage cost variation in dollars between the two valuations is 12.9 percent. As a percentage of payroll, the percentage cost variation is -21.1 percent.

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, 12/31/2019	$ 28,030	$ 28,030	$ 28,030
Retirement taxes	83,802	77,571	72,675
Income taxes on benefits	10,138	9,720	9,339
Available from SSEB Account	1,666	1,664	1,660
Total, present and prospective assets	123,636	116,985	111,704
Benefit payments	116,802	112,176	107,963
Administrative expenses	4,152	3,437	2,936
Total liabilities	120,954	115,613	110,899
Actuarial surplus or (deficiency)	2,682	1,372	805
One percent of tier 2 payroll	$ 4,894	$ 4,100	$ 3,420
	Present values as a percentage of tier 2 payroll		
Adjusted funds on hand, 12/31/2019	5.73%	6.84%	8.20%
Retirement taxes	17.12	18.92	21.25
Income taxes on benefits	2.07	2.37	2.73
Available from SSEB Account	0.34	0.41	0.49
Total, present and prospective assets	25.26	28.53	32.66
Benefit payments	23.87	27.36	31.57
Administrative expenses	0.85	0.84	0.86
Total liabilities	24.71	28.20	32.43
Actuarial surplus or (deficiency)	0.55	0.33	0.24
Retirement taxes	17.12%	18.92%	21.25%
less actuarial surplus or (deficiency)	0.55	0.33	0.24
Cost of the system	16.57	18.59	21.01

Table 7. Vested dual benefit amounts and average number of beneficiaries. This table shows a projection of vested dual benefit payments for every fiscal year from 2022 through 2033. After 2033, 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 predicting future mortality for this very old and relatively small group.

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 8. Supplemental annuity benefit amounts and average number of beneficiaries. This table shows a projection of supplemental annuity benefits for every calendar year from 2021 through 2056. Since service before October 1, 1981, is required for a supplemental annuity, benefit amounts after 2056 are relatively insignificant.

Table 9. Average number of railroad retirement annuitants and number of annuitants per full time employee. The left half of Table 9 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 declines in the first half of the projection period and then remains relatively stable. Under employment assumption II, the average number of annuitants per full time employee declines until 2044, remains relatively stable until 2053, and then continues to decline. Under employment assumption III, the average number of annuitants per full time employee declines slightly through 2023, increases steadily until 2050, when it levels off until 2052 and declines thereafter.

Figure 3 shows historical and projected annuitants per full time employee under the three employment assumptions.

Table 10. Transfers to railroad retirement system under financial interchange with social security system, 1937-2021.

Table 7. Vested dual benefit amounts and average number of beneficiaries

Fiscal year	Vested dual benefit amounts[a] (Millions)	Average number of beneficiaries
2022	$11	5,000
2023	9	4,000
2024	8	3,000
2025	6	3,000
2026	5	2,000
2027	4	2,000
2028	3	1,000
2029	3	1,000
2030	2	1,000
2031	2	1,000
2032	1	1,000
2033	< 1	< 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 8. Supplemental annuity benefit amounts and average number of beneficiaries

Calendar year	Supplemental benefit amounts (Millions)	Average number of beneficiaries[a]
2021	$56	112,000
2022	54	108,000
2023	52	104,000
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	18	37,000
2039	17	33,000
2040	15	29,000
2041	13	26,000
2042	12	23,000
2043	10	20,000
2044	9	17,000
2045	7	15,000
2046	6	12,000
2047	5	10,000
2048	4	9,000
2049	4	7,000
2050	3	6,000
2051	2	4,000
2052	2	3,000
2053	1	3,000
2054	1	2,000
2055	1	1,000
2056	1	1,000

[a] Average number in a year. Excludes cases where the supplemental annuity is totally eliminated because of a private pension. On January 1, 2020, there were about 33,000 of these cases.

Table 9. 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
2021	495,200	495,200	495,200	2.48	2.51	2.54
2022	487,800	487,800	487,800	2.41	2.46	2.53
2023	480,900	480,900	480,900	2.35	2.42	2.52
2024	473,900	473,900	473,900	2.32	2.42	2.54
2025	466,900	466,900	466,900	2.29	2.41	2.57
2026	459,900	459,900	459,900	2.26	2.40	2.59
2027	452,700	452,700	452,600	2.23	2.39	2.61
2028	445,700	445,700	445,600	2.20	2.38	2.64
2029	438,900	438,800	438,700	2.17	2.37	2.66
2030	432,300	432,200	432,000	2.14	2.36	2.68
2031	425,900	425,700	425,400	2.11	2.35	2.71
2032	419,500	419,200	418,800	2.08	2.34	2.73
2033	413,100	412,600	412,100	2.05	2.33	2.74
2034	406,900	406,300	405,500	2.02	2.32	2.76
2035	401,100	400,300	399,400	2.00	2.31	2.77
2036	395,600	394,600	393,400	1.97	2.30	2.79
2037	390,300	389,000	387,500	1.95	2.30	2.80
2038	385,100	383,600	381,800	1.93	2.29	2.81
2039	380,000	378,100	375,900	1.90	2.28	2.83
2040	374,900	372,700	370,100	1.88	2.27	2.84
2041	370,300	367,700	364,600	1.86	2.27	2.85
2042	366,200	363,100	359,600	1.84	2.26	2.87
2043	362,500	358,900	354,800	1.83	2.26	2.88
2044	359,200	355,000	350,300	1.81	2.26	2.90
2045	356,400	351,600	346,300	1.80	2.26	2.92
2046	353,900	348,400	342,400	1.79	2.27	2.94
2047	351,600	345,400	338,500	1.78	2.27	2.96
2048	349,600	342,500	334,800	1.78	2.27	2.98
2049	347,800	339,900	331,300	1.77	2.27	2.99
2050	345,900	337,100	327,500	1.76	2.27	3.00
2051	344,000	334,100	323,500	1.75	2.27	3.00
2052	342,000	330,900	319,200	1.75	2.27	3.00
2053	340,100	327,700	314,600	1.74	2.26	2.99
2054	338,600	324,700	310,000	1.73	2.25	2.98
2055	337,700	322,000	305,500	1.73	2.25	2.97
2056	336,700	319,100	300,700	1.72	2.24	2.95
2057	335,400	315,800	295,400	1.72	2.23	2.93
2058	333,800	312,100	289,700	1.71	2.21	2.89
2059	332,400	308,600	284,000	1.71	2.20	2.86
2060	331,600	305,300	278,400	1.70	2.19	2.82
2065	327,300	288,300	249,400	1.69	2.09	2.58
2070	324,600	272,600	223,500	1.67	1.99	2.33
2075	323,300	259,500	202,700	1.67	1.89	2.11
2080	323,600	249,800	187,700	1.67	1.82	1.96
2085	324,900	243,100	178,000	1.67	1.77	1.86
2090	326,600	238,800	171,800	1.68	1.74	1.79
2093	327,600	237,100	169,300	1.69	1.73	1.77
2094	328,000	236,700	168,600	1.69	1.72	1.76

[a] Excludes partition payments to spouses and divorced spouses where the employee is deceased or not otherwise entitled to an annuity. On December 31, 2019, there were 2,024 of these cases.

Figure 3. Average Number of Annuitants Per Full Time Employee 2006-2094, Historical and Projected
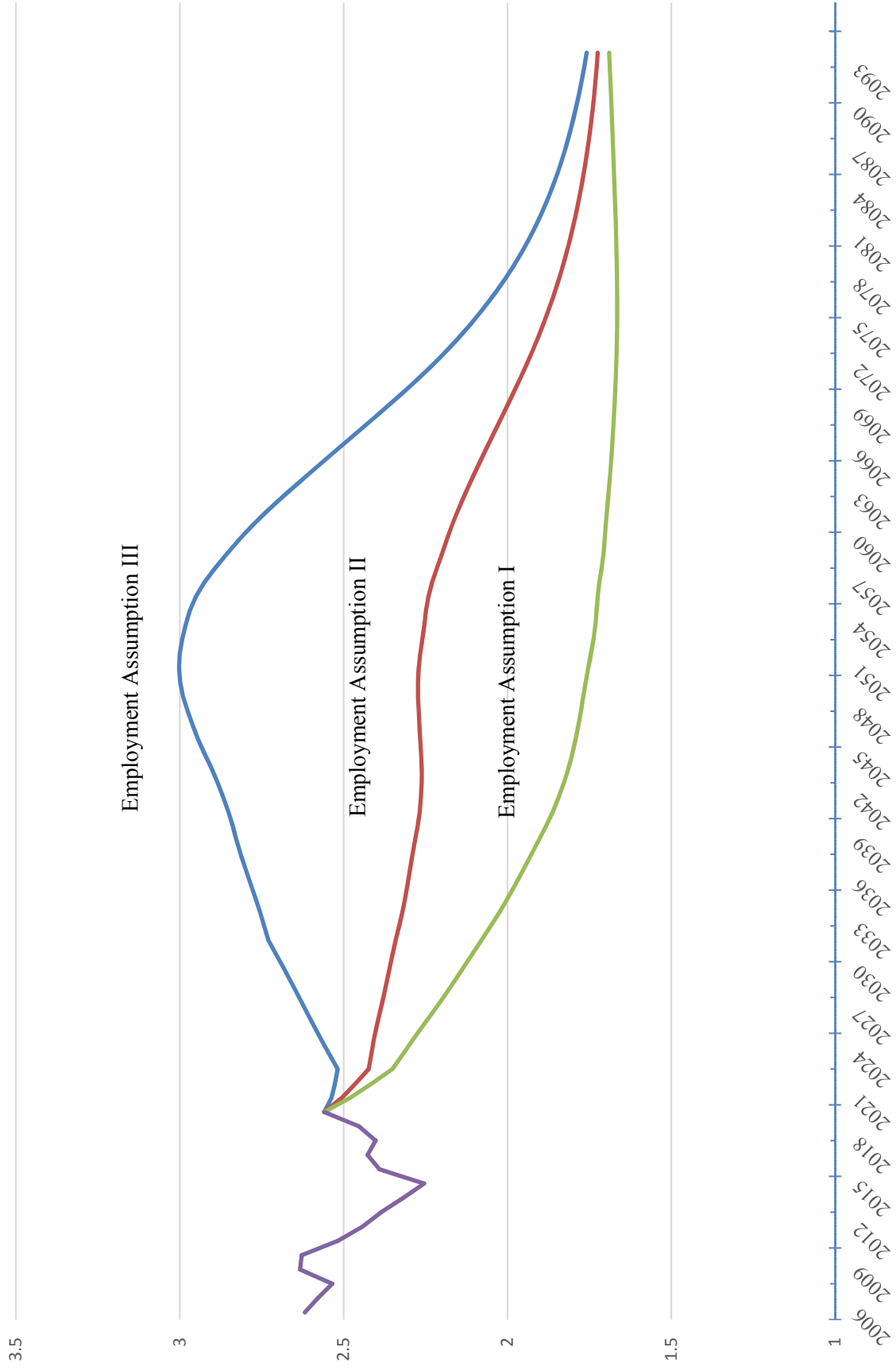
Employment Assumption III

Employment Assumption II

Employment Assumption I

Table 10. Transfers to railroad retirement system under financial interchange with social security system, 1937-2021[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
67	2018	7,461.7	2,714.6	4,946.4	2019
68	2019	7,487.8	2,643.6	4,987.7	2020
69	2020	7,280.9 e	2,515.4	4,899.6	2021
Total	1937-2020	245,198.2	88,464.7	168,270.2	

[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, 2020

EMPLOYEE BENEFITS

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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.

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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.)

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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 (an age reduced tier 2 benefit would be payable at age 62).

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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.

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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.

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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 2021, loss of one month's annuity for each $1,020 in excess of $12,240 earned in a year with the last $510 of such excess treated as $1,020. (No annuity is lost for any month with earnings below $1,020.) 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. All vested dual benefits are subject to social security work restrictions.

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	2004	$87,900	$65,100
1986	42,000	31,500	2005	90,000	66,900
1987	43,800	32,700	2006	94,200	69.900
1988	45,000	33,600	2007	97.500	72.600
1989	48,000	35,700	2008	102,000	75.900
1990	51,300	38,100	2009	106.800	79.200
1991	53,400	39,600	2010	106,800	79,200
1992	55,500	41,400	2011	106.800	79,200
1993	57,600	42,900	2012	110,100	81,900
1994	60,600	45,000	2013	113,700	84,300
1995	61,200	45,300	2014	117,000	87,000
1996	62,700	46,500	2015	118,500	88,200
1997	65,400	48,600	2016	118,500	88,200
1998	68,400	50,700	2017	127,200	94,500
1999	72,600	53,700	2018	128,400	95,400
2000	76,200	56,700	2019	132,900	98,700
2001	80,400	59,700	2020	137,700	102,300
2002	84,900	63,000	2021	142.800	106,200
2003	87,000	64,500			

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

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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.)

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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).

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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.

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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.

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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) initial 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.

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.

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

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. Stock options, however, are not 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 system also transfers to the Hospital Insurance Trust Fund the payroll taxes net of income taxes and administrative expenses that the Centers for Medicare & Medicaid Services would have otherwise collected.

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 are invested in special issue Treasury obligations with a minimum return of 3 percent. Amounts in the two accounts 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. <u>Approach</u>. The 28th 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 2094 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. <u>Basic data</u>. All census data concerning current beneficiaries were derived from "universe" files (files including all beneficiaries as of December 31, 2019). These files included information needed to make projections for current beneficiaries. Information needed to derive exposures, deaths, terminations, remarriages and family composition for conducting the experience studies of beneficiaries was obtained from similar universe files created at an earlier date.

   Active and inactive census data for valuation and data needed to study the immediate age retirement, immediate disability retirement (including disability freeze rates), withdrawal, service months and mortality of active employees were also obtained from universe files.

   The census data for valuation are grouped as follows:

   - Active employees and inactive employees are grouped by age and years of service;
   - Beneficiaries are grouped by type of beneficiary (nondisabled employees, spouses, etc.) and by age.

3. <u>Employees</u>. For the projections of employees in active service and new entrants, a service month table was prepared to reflect the average number of months worked per year based on years of service.

   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. A separate mortality table was constructed for employees in active service and new entrants.

   For vested inactive employees and employees withdrawing in the future with a deferred vested benefit, the rates of Immediate Age Retirement and rates of Immediate Disability Retirement (Table S-11, Table S-12) are the basis for projections of deferred retirements from the inactives. The age retirement rate for inactives at age 70+ is assumed to be 1.00. Pre-retirement mortality uses the Active Service Mortality Table (Table S-4) set forward four (4) years but then switches

switches to the Annuitants Mortality Table at age 60 (Table S-1). The Mortality Improvement Scale (Table S-10) is used with these mortality tables to project mortality for the inactives.

4. Actuarial assumptions.

Mortality after age retirement. Mortality studies for nondisability retirements covering the period 2015-2018 showed that mortality improvement during the period was less than expected. The overall ratio of actual to expected deaths based on the 2013 Base Year RRB Annuitants Mortality Table projected to 2016 using the 2013 RRB Mortality Improvement Scale was 101.2%. The greatest improvement in mortality occurred in the age 80-84 group, where the ratio of actual to expected deaths was 98.9%. 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 based on the most recent experience. As a result, the 2016 Base Year RRB Annuitants Mortality Table was produced. The 2016 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 2013 Base Year RRB Disabled Mortality Table for Annuitants with Disability Freeze projected to 2016 using the 2013 RRB Mortality Improvement Scale was 100.6%. The overall ratio of actual to expected deaths after disability retirement without disability freeze based on the 2013 Base Year RRB Disabled Mortality Table for Annuitants without Disability Freeze projected to 2016 using the 2013 RRB Mortality Improvement Scale was 100.2%. 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. Also, it has been the practice to update these tables every three years. The new tables, the 2016 Base Year RRB Disabled Mortality Table for Annuitants with Disability Freeze and the 2016 Base Year RRB Disabled Mortality Table for Annuitants without Disability Freeze, were based on experience between the anniversaries of retirement in 2015 and 2018. 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 98.4%. Based on the recent improvement in the mortality experience, a new table, the 2015 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 and do not apply an improvement scale. The same mortality table set forward four (4) years is applied to inactive deferred vested employees prior to age 60.

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 2013 Base Year RRB Spouse Total Termination Table projected to 2016 using the 2013 RRB Mortality Improvement Scale was 99.6%. The greatest improvement in terminations was in the age group 75-79. In aggregate, there was little improvement in spouse terminations. So that the assumed termination rates will more closely reflect recent actual experience, a new table, the 2016 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, 2018, to the expected number based on the 27th valuation standard was 98.9% and 100.5%, 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 106.1% based on the 27th 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 6% margin continues to be adequate both overall and at most ages, the 27th 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 27th valuation standard, the 1997 RRB Remarriage Table, was 71.7%. Based on the sparsity of data, relatively small number of remarriages, and relatively small impact of a change in remarriage rates on the valuation results, the 27th valuation standard was retained.

Total termination for disabled children. The overall ratio of actual terminations to those expected on the basis of the 27th valuation standard, the 2004 RRB Total Termination Table for Disabled Children, was 115.2%. Based on the relatively small number of terminations and the accompanying higher volatility of termination rates, the 27th valuation standard was retained.

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, which was used as the standard for both the 26th and the 27th valuations.

For the 28th valuation, the RRB historical mortality and spouse termination experience was updated through 2017, as shown in Table S-29, and other sources, such as the mortality experience of the U. S. population through 2016 and the mortality assumptions in the 2019

OASDI Trustees' Report, were reviewed. Based on the results of this review, the 27th valuation standard was retained.

Mortality load for COVID-19 pandemic. To account for increased mortality due to the COVID-19 pandemic, loading factors were applied to the mortality rates as part of the population projection. The calendar years that are expected to be impacted by the COVID-19 pandemic are 2020, 2021, and 2022. Loading factors were only applied to beneficiaries currently in payment.

The loading factors applied to disability retirements with freeze and widow beneficiaries were 1.13, 1.18 and 1.05 for calendar years 2020, 2021 and 2022, respectively. The loading factors applied to all other beneficiaries were 1.04, 1.15, and 1.04 for calendar years 2020, 2021 and 2022, respectively.

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.

Crude age retirement rates during 2016-2018 are generally higher than the assumed rates used in the 27th valuation. The assumed rates for the 28th valuation generally reflect the actual age retirement experience during 2016-2018. A comparison between the rates of age retirements assumed in the 27th and 28th valuations and the crude rates during calendar years 2016-2018 is shown in Table S-30. For employees with 5-29 years of service, the assumed 28th valuation rates are close to the 2016-2018 crude rates at ages under 66 and smoothed thereafter for ages over 65. For employees with 30 or more years of service, the assumed 28th valuation rates are close to the crude rates at ages under 67 and smoothed thereafter for ages over 66. There is a slightly higher expectation of future retirements at age 67 consistent with the change in SSNRA.

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 2013-2018 to those expected based on the 27th valuation standard was 100.8%. The ratio of actual to expected disability retirements for employees with 20-24 years of service was 89.4%, and for employees with 25-29 years of service it was 76.3%.   For employees with 30 or more years of service the ratio of actual to expected disability retirements was 87.8%. The overall ratio of actual to expected disability retirements for all employees was 89.8%. Because of the recent volatility of experience, a new table of rates of disability retirement was constructed based on the combined 2013-2018 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 27th valuation standard was 99.9% and 102.0% 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 28th valuation. In the current experience, as shown in table S-35, there is no clear pattern of difference between disability freeze rates among the 20-24 years of service, the 25-29 years of service and the 30 or more years of service groups, 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.

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 27th valuation standard was 156.3%. This was a significant increase in withdrawal rates, especially considering that actual to expected ratios had been trending lower for the previous six study periods (18 years). Based on the uncertainty as to whether the current experience reflects a new trend that will persist or whether it reflects recent external events that may have driven much of the volatility, it was decided to retain the 27th valuation standard.

Unisex rates. The valuation projections use unisex, combined male and female rates for its demographic assumptions. Although males typically have higher rates of mortality than females, the assumptions are simplified by combining the experience because the covered employees are predominately male. The valuation results are not adversely affected by this approach.

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 28th 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	
(a) in active service	Table S-4
(b) deferred inactive	Table S-4 and Table S-1 with Table S-10
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. 2016 Base Year[a] RRB Annuitants Mortality Table

Age[b]	$1,000q_x$		Age[b]	$1,000q_x$
60	5.70		95	270.06
61	6.41		96	294.07
62	7.21		97	315.53
63	8.11		98	334.76
64	9.11		99	352.07
65	10.24		100	367.72
66	11.50		101	381.96
67	12.92		102	394.99
68	14.50		103	407.02
69	16.28		104	418.23
70	18.26		105	428.79
71	20.48		106	438.85
72	22.97		107	448.86
73	25.74		108	458.69
74	28.84		109	468.35
75	32.30		110	1,000.00
76	36.17			
77	40.47			
78	45.27			
79	50.61			
80	56.55			
81	63.16			
82	70.49			
83	78.62			
84	87.63			
85	97.60			
86	108.61			
87	120.75			
88	134.12			
89	148.82			
90	164.94			
91	182.57			
92	201.82			
93	222.77			
94	245.49			

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

[b] Age nearest birthday.

Table S-2. 2016 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	15.76	65	28.13	100	379.21
31	16.19	66	29.33	101	393.74
32	16.61	67	30.73	102	407.03
33	17.02	68	32.38	103	419.29
34	17.43	69	34.31	104	430.70
35	17.82	70	36.58	105	441.44
36	18.20	71	39.24	106	451.67
37	18.58	72	42.35	107	461.84
38	18.93	73	45.99	108	471.82
39	19.28	74	50.25	109	481.61
40	19.61	75	55.23	110	1,000.00
41	19.92	76	60.69		
42	20.21	77	66.67		
43	20.49	78	73.22		
44	20.75	79	80.38		
45	20.99	80	88.20		
46	21.21	81	96.75		
47	21.40	82	106.08		
48	21.58	83	116.25		
49	21.73	84	127.32		
50	21.86	85	139.35		
51	21.97	86	152.43		
52	22.10	87	166.61		
53	22.25	88	181.96		
54	22.42	89	198.54		
55	22.63	90	216.43		
56	22.87	91	234.66		
57	23.15	92	252.36		
58	23.48	93	269.56		
59	23.87	94	286.32		
60	24.33	95	302.66		
61	24.87	96	318.61		
62	25.50	97	334.22		
63	26.24	98	349.50		
64	27.11	99	364.49		

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

[b] Qualified under social security definition of disability.

[c] Age nearest birthday.

Table S-3. 2016 Base Year[a] RRB 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	4.68	70	29.10	100	373.49
41	4.87	71	31.73	101	387.87
42	5.08	72	34.65	102	401.04
43	5.29	73	37.89	103	413.19
44	5.53	74	41.48	104	424.50
45	5.79	75	45.46	105	435.15
46	6.06	76	49.86	106	445.30
47	6.35	77	54.75	107	455.39
48	6.68	78	60.15	108	465.29
49	7.05	79	66.12	109	475.02
50	8.27	80	72.73	110	1,000.00
51	8.59	81	80.02		
52	8.94	82	88.07		
53	9.34	83	96.94		
54	9.77	84	106.71		
55	10.26	85	117.46		
56	10.80	86	129.27		
57	11.40	87	142.22		
58	12.07	88	156.41		
59	12.81	89	171.93		
60	13.64	90	188.85		
61	14.56	91	207.05		
62	15.58	92	226.18		
63	16.72	93	245.87		
64	17.98	94	265.75		
65	19.38	95	285.52		
66	20.94	96	304.88		
67	22.67	97	323.57		
68	24.59	98	341.37		
69	26.73	99	358.07		

[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. 2015 RRB Active Service Mortality Table[a]

Age[b]	$1,000q_{x-1/2}$	Age[b]	$1,000q_{x-1/2}$
		45	1.44
		46	1.52
17	.72	47	1.61
18	.72	48	1.71
19	.72	49	1.82
20	.72	50	1.93
21	.72	51	2.06
22	.72	52	2.19
23	.72	53	2.34
24	.72	54	2.50
25	.72	55	2.67
26	.72	56	2.86
27	.72	57	3.06
28	.72	58	3.28
29	.72	59	3.52
30	.75	60	3.77
31	.77	61	4.05
32	.80	62	4.36
33	.83	63	4.69
34	.86	64	5.05
35	.89	65	5.43
36	.93	66	5.85
37	.97	67	6.31
38	1.01	68	6.80
39	1.06	69	7.34
40	1.11	70	7.92
41	1.17	71	8.55
42	1.23	72	9.23
43	1.29	73	9.97
44	1.36	74	10.78
		75	11.65

[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. 2016 Base Year[a] RRB Spouse Total Termination[b] Table

Age[c]	$1,000q_x^t$		Age[c]	$1,000q_x^t$
60	16.36		95	374.23
61	18.03		96	393.66
62	19.87		97	412.42
63	21.90		98	430.46
64	24.12		99	447.78
65	26.58		100	464.35
66	29.27		101	480.15
67	32.24		102	495.19
68	35.50		103	509.44
69	39.09		104	522.92
70	43.03		105	535.61
71	47.35		106	547.52
72	52.10		107	558.65
73	57.31		108	569.00
74	63.02		109	578.57
75	69.28		110	1,000.00
76	76.14			
77	83.65			
78	91.86			
79	100.83			
80	110.62			
81	121.29			
82	132.92			
83	145.57			
84	159.30			
85	174.19			
86	190.32			
87	207.73			
88	226.51			
89	246.71			
90	268.37			
91	290.53			
92	312.25			
93	333.48			
94	354.16			

[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	0.251	0.000
61	0.385	0.000
62	0.473	0.099
63	0.547	0.172
64	0.609	0.242
65	0.659	0.308
66	0.699	0.369
67	0.729	0.423
68	0.752	0.469
69	0.767	0.504
70	0.777	0.531
71	0.782	0.552
72	0.784	0.570
73	0.784	0.584
74	0.782	0.594
75	0.779	0.601
76	0.775	0.605
77	0.768	0.605
78	0.760	0.603
79	0.750	0.597
80	0.738	0.589
81	0.723	0.578
82	0.706	0.565
83	0.686	0.549
84	0.663	0.531
85	0.637	0.510
86	0.609	0.488
87	0.579	0.464
88	0.546	0.437
89	0.513	0.410
90	0.478	0.380
91	0.442	0.349
92	0.405	0.317
93	0.368	0.283
94	0.331	0.249
95	0.293	0.213
96	0.257	0.176
97	0.221	0.139
98	0.185	0.101
99 & over	0.152	0.063

[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		620
61		480
62	110	400
63	90	350
64	90	350
65	190	350
66	330	350
67	330	310
68	270	310
69	270	310
70	270	310
71	270	310
72	270	310
73	270	310
74	230	250
75 & over	230	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:

Age	Years of service	Interval for	
		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	4.6	3.3	3.3	97.6%	52.8%
35	1.2	4.9	3.4	3.4	97.6	52.8
36	1.2	5.2	3.5	3.5	97.6	52.8
37	1.3	5.5	3.6	3.6	97.6	52.8
38	1.4	5.8	3.7	3.7	97.6	52.8
39	1.4	6.1	3.8	3.8	97.6	52.8
40	1.5	6.4	3.9	3.9	97.6	52.8
41	1.7	6.7	4.1	4.1	97.6	52.8
42	1.8	7.0	4.4	4.4	97.6	52.8
43	2.0	7.3	4.9	4.9	97.6	52.8
44	2.1	7.6	5.4	5.4	97.6	52.8
45	2.4	7.9	6.0	6.0	97.6	52.9
46	2.7	8.3	6.6	6.6	97.6	53.0
47	3.0	8.7	7.4	7.4	97.6	53.3
48	3.4	9.3	8.2	8.2	97.6	53.6
49	3.9	10.0	9.0	9.0	97.6	54.3
50	4.4	10.8	10.0	10.0	97.6	55.6
51	5.1	11.8	11.1	11.1	97.6	57.8
52	5.9	13.0	12.3	12.3	97.6	61.7
53	6.9	14.5	13.6	13.6	97.6	68.8
54	8.0	16.3	15.0	15.0	97.6	81.2
55	9.4	18.5	16.6	16.6	97.6	94.6
56	11.1	21.2	18.4	18.4	97.6	94.6
57	13.1	24.4	20.3	20.3	97.6	94.6
58	15.5	28.4	22.5	22.5	97.6	94.6
59	18.3	33.3	24.9	24.9	97.6	94.6
60	26.7	39.3	27.5	10.7	94.5	94.6
61	31.2	46.5	30.4	7.8	94.5	94.6
62	31.8	45.8	39.6	5.4	94.5	94.6
63	28.8	43.6	37.3	3.5	94.5	94.6
64	22.9	37.5	31.2	2.1	94.5	94.6
65	14.3	21.5	15.3	1.2	94.5	94.6
66	3.6	3.9	3.9	0.8	94.5	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[b] withdrawal

Years of service[c]	Attained age[d]				
	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 or more			0.005	0.005	0.010

[a] Technically probabilities.

[b] Withdrawals net of re-entrants.

[c] Rounded up to nearest whole year.

[d] 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	6.6		
1	11.2	23.5%	21.7%
2	11.4	9.5%	8.4%
3	11.6	6.5%	5.9%
4	11.7	4.5%	3.9%
5	11.7	3.2%	2.7%
6	11.8	2.4%	1.9%
7	11.8	2.0%	1.5%
8	11.8	1.6%	0.9%
9	11.8	1.4%	0.7%
10	11.8	1.2%	0.6%
11	11.8	1.0%	0.5%
12	11.8	0.9%	0.5%
13	11.8	0.8%	0.4%
14	11.8	0.7%	0.4%
15	11.8	0.7%	0.3%
16	11.8	0.6%	0.3%
17	11.8	0.6%	0.3%
18	11.8	0.5%	0.2%
19	11.8	0.5%	0.2%
20	11.8	0.4%	0.2%
21	11.8	0.4%	0.2%
22	11.8	0.4%	0.2%
23	11.8	0.4%	0.2%
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	2.9%	1.8%
31	11.9	0.5%	0.1%
32	11.9	0.5%	0.1%
33	11.9	0.5%	0.1%
34	11.9	0.5%	0.1%
35	11.9	0.5%	0.1%
36	11.9	0.5%	0.1%
37	11.9	0.5%	0.1%
38	11.9	0.5%	0.1%
39	11.9	0.5%	0.1%
40	11.9	0.5%	0.1%
41	11.9	0.5%	0.1%
42	11.9	0.5%	0.1%
43	11.9	0.5%	0.1%
44	11.9	0.5%	0.1%
45 & over	11.9	0.5%	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	67.1	-	-	67.1	50.3	-	-	77.6	-
35 - 39	67.1	-	-	67.1	55.7	3.6	-	86.0	-
40 - 44	67.1	-	-	67.1	59.5	4.9	-	84.1	1.7
45 - 49	67.1	-	1.2	65.9	38.9	7.3	0.5	63.2	1.7
50 - 54	67.1	1.6	2.1	63.4	16.0	7.8	0.9	33.2	1.7
55 - 59	67.1	5.9	4.9	56.3	6.1	2.7	1.0	13.3	1.7
60 - 64	67.1	21.5	13.8	31.8	1.7	0.4	0.4	3.8	1.7
65 - 69	67.1	51.6	6.3	9.2	0.6	0.3	0.2	1.6	1.2
70 - 74	67.1	61.9	2.4	2.8	0.2	0.1	-	0.7	1.0
75 - 79	67.1	64.6	1.0	1.5	0.1	-	-	0.4	0.9
80 - 84	60.8	59.7	0.4	0.7	-	-	-	0.3	0.6
85 - 89	51.8	51.3	0.1	0.4	-	-	-	0.1	0.5
90 & over	34.7	34.5	0.1	0.1	-	-	-	-	-

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	-	2.1
35 - 39	-	-	37	36	38	-	7	8	-	2.1
40 - 44	-	-	42	41	43	-	8	10	20	2.0
45 - 49	-	61	46	44	46	47	10	11	20	1.7
50 - 54	64	61	51	48	51	51	12	12	21	1.4
55 - 59	65	61	55	50	52	55	12	13	26	1.4
60 - 64	65	61	56	50	51	56	12	13	29	1.3
65 - 69	67	61	56	51	53	58	12	13	35	1.3
70 - 74	70	61	56	52	53	-	12	13	39	1.3
75 - 79	74	61	55	52	-	-	12	13	43	1.3
80 - 84	78	61	56	-	-	-	-	13	49	1.3
85 - 89	83	61	56	-	-	-	-	13	52	1.3
90 & over	87	61	54	-	-	-	-	-	-	-

[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 27th and 28th 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 2015 and 2018. Spouse mortality is not used directly in any part of the valuation. Table S-25 shows, as of December 31, 2018, 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 27th valuation standard, which was retained for the 28th valuation. 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 2017.

Table S-16. Mortality experience of railroad age annuitants[a] between anniversaries of retirement in 2015 and 2018, 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	586,187	88,491	149,365	115,537	74,410	62,271	55,678	31,775	8,660
Actual deaths	28,329	704	1,909	2,670	3,071	4,340	6,748	6,201	2,686
Age specific death rates (per thousand)	48.3	8.0	12.8	23.1	41.3	69.7	121.2	195.2	310.2
Ratio of actual to expected deaths									
1994 GAM males[c]	96.3%	73.6%	70.3%	81.6%	91.0%	92.7%	104.1%	110.4%	116.8%
2013 Base Year RRB[d]	98.5%	103.8%	96.2%	98.9%	99.4%	96.0%	98.2%	99.5%	100.9%
2013 Base Year Projected to 2016[e]	101.2%	107.0%	99.1%	101.9%	102.4%	98.9%	100.8%	101.6%	102.6%
2016 Base Year RRB[f]	100.0%	103.9%	97.1%	100.9%	102.0%	98.5%	99.9%	100.0%	100.2%
B. Male									
Exposed	524,194	82,058	133,752	103,537	66,757	55,700	49,525	25,914	6,951
Actual deaths	25,375	675	1,776	2,459	2,844	3,965	6,193	5,230	2,233
Age specific death rates (per thousand)	48.4	8.2	13.3	23.7	42.6	71.2	125.0	201.8	321.2
Ratio of actual to expected deaths									
1994 GAM males[c]	99.0%	76.2%	73.1%	83.8%	94.0%	94.7%	107.6%	114.3%	121.3%
2013 Base Year RRB[d]	101.7%	107.5%	100.0%	101.6%	102.6%	98.0%	101.5%	103.0%	104.7%
2016 Base Year RRB[f]	103.2%	107.6%	101.0%	103.7%	105.4%	100.6%	103.3%	103.5%	103.9%
C. Female									
Exposed	61,993	6,433	15,613	12,000	7,653	6,571	6,153	5,861	1,709
Actual deaths	2,954	29	133	211	227	375	555	971	453
Age specific death rates (per thousand)	47.7	4.5	8.5	17.6	29.7	57.1	90.2	165.7	265.1
Ratio of actual to expected deaths									
2013 Widows[g], 1-year rateback	103.2%	50.9%	63.6%	85.3%	90.4%	107.9%	102.5%	119.7%	114.3%
2013 Base Year RRB[d]	77.9%	57.5%	63.7%	75.5%	71.3%	78.7%	71.9%	84.0%	85.8%
2016 Base Year RRB[f]	78.9%	57.6%	64.3%	77.1%	73.2%	80.8%	73.2%	84.4%	85.2%
D. Immediate[h]									
Exposed	388,310	72,328	100,726	73,985	46,428	36,369	32,471	20,008	5,995
Actual deaths	17,697	510	1,253	1,750	1,905	2,533	3,997	3,897	1,852
Age specific death rates (per thousand)	45.6	7.1	12.4	23.7	41.0	69.6	123.1	194.8	308.9
Ratio of actual to expected deaths									
2013 Base Year RRB[d]	98.5%	93.1%	94.1%	101.2%	98.9%	96.3%	99.3%	98.9%	100.8%
2016 Base Year RRB[f]	99.8%	93.2%	95.0%	103.3%	101.6%	98.8%	101.1%	99.4%	100.1%
E. Deferred[h]									
Exposed	197,877	16,163	48,639	41,552	27,982	25,902	23,207	11,767	2,665
Actual deaths	10,632	194	656	920	1,166	1,807	2,751	2,304	834
Age specific death rates (per thousand)	53.7	12.0	13.5	22.1	41.7	69.8	118.5	195.8	312.9
Ratio of actual to expected deaths									
2013 Base Year RRB[d]	98.7%	148.7%	100.4%	94.7%	100.1%	95.6%	96.5%	100.5%	101.2%
2016 Base Year RRB[f]	100.2%	149.0%	101.4%	96.6%	102.8%	98.1%	98.3%	101.1%	100.6%

[a] Nondisability retirement.

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

[c] 1994 Group Annuity Mortality Static Table.

[d] 2013 Base RRB Annuitants Mortality Table.

[e] 2013 Base Year RRB Annuitants Mortality Table projected to 2016 using 2013 RRB Mortality Improvement Scale.

[f] 2016 Base 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 2015 and 2018, by year

	Age[b]								
	All ages	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95 & over
1. 2015-2018 experience									
Exposed[c]	586,187	88,491	149,365	115,537	74,410	62,271	55,678	31,775	8,660
Actual deaths	28,329	704	1,909	2,670	3,071	4,340	6,748	6,201	2,686
Crude rate per 1,000	48.3	8.0	12.8	23.1	41.3	69.7	121.2	195.2	310.2
Ratio Act./Exp.[d]	98.5%	103.8%	96.2%	98.9%	99.4%	96.0%	98.2%	99.5%	100.9%
Ratio Act./Exp.[e]	101.2%	107.0%	99.1%	101.9%	102.4%	98.9%	100.8%	101.6%	102.6%
Ratio Act./Exp.[f]	100.0%	103.9%	97.1%	100.9%	102.0%	98.5%	99.9%	100.0%	100.2%
2. Crude rate per 1,000 for individual years									
2015 - 2016	48.7	7.9	13.3	22.5	40.1	71.1	119.2	197.5	293.9
2016 - 2017	48.9	8.3	12.6	23.7	41.1	70.0	125.2	195.4	317.3
2017 - 2018	47.3	7.6	12.5	23.1	42.5	67.8	119.2	192.6	318.4
3. Ratio Act./Exp. for individual years[d]									
2015 - 2016	97.8%	103.6%	100.3%	95.8%	95.5%	97.7%	96.7%	100.7%	95.8%
2016 - 2017	99.7%	108.6%	94.7%	100.9%	98.7%	96.4%	101.2%	99.6%	103.2%
2017 - 2018	98.1%	98.8%	93.7%	99.7%	103.6%	93.7%	96.6%	98.1%	103.5%
3. Ratio Act./Exp. for individual years[e]									
2015 - 2016	100.4%	106.8%	103.4%	98.7%	98.4%	100.7%	99.3%	102.9%	97.3%
2016 - 2017	102.3%	112.0%	97.6%	104.0%	101.7%	99.3%	103.9%	101.7%	104.9%
2017 - 2018	100.7%	101.8%	96.6%	102.8%	106.8%	96.6%	99.3%	100.2%	105.2%
4. Ratio Act./Exp. for individual years[f]									
2015 - 2016	99.2%	103.8%	101.2%	97.7%	98.1%	100.2%	98.4%	101.2%	95.1%
2016 - 2017	101.1%	108.8%	95.5%	103.0%	101.4%	98.9%	103.0%	100.1%	102.5%
2017 - 2018	99.5%	98.9%	94.6%	101.8%	106.4%	96.2%	98.4%	98.6%	102.8%

[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 2013 Base Year RRB Annuitants Mortality Table.
[e] Expected based on 2013 Base Year RRB Annuitants Mortality Table projected to 2016 using 2013 RRB Mortality Improvement Scale.
[f] Expected based on 2016 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 2015 and 2018

Duration	Exposure	Actual deaths	Crude rate per 1,000	Ratio Act./Exp.[a]	Ratio Act./Exp.[b]	Ratio Act./Exp.[c]
0	29,034	230	7.9	94.1%	96.9%	94.4%
1	29,842	286	9.6	104.1	107.3	104.6
2	29,974	274	9.1	90.5	93.3	91.1
3	29,634	296	10.0	89.5	92.2	90.1
4	29,495	357	12.1	98.4	101.4	99.3
5	29,528	361	12.2	90.0	92.8	90.9
6	29,522	442	15.0	99.4	102.4	100.6
7	28,493	469	16.5	98.0	101.0	99.4
8	27,217	495	18.2	97.5	100.5	99.1
9	24,770	509	20.5	98.8	101.8	100.5
10 & over	298,678	24,610	82.4	98.9	101.5	100.4
All durations	586,187	28,329	48.3	98.5%	101.2%	100.0%

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

[b] Expected based on 2013 Base Year RRB Annuitants Mortality Table projected to 2016 using 2013 RRB Mortality Improvement Scale.

[c] Expected based on 2016 Base Year RRB Annuitants Mortality Table.

Table S-19. Age specific death rates of railroad disability annuitants between anniversaries
of retirement in 2015 and 2018, 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	5,242	139	235	455	839	2,002	1,572
1	5,456	158	260	408	820	2,172	1,639
2	5,648	144	240	355	883	2,366	1,661
3	6,107	139	246	362	1,000	2,723	1,638
4	6,706	137	244	344	1,197	3,134	1,651
Actual deaths							
Duration 0	177	b	b	b	31	76	53
1	148	b	b	b	19	65	45
2	154	b	b	b	19	54	66
3	138	b	b	11	19	59	43
4	152	b	b	10	24	71	43
Crude rate per 1,000							
Duration 0	33.8	b	b	b	36.9	38.0	33.7
1	27.1	b	b	b	23.2	29.9	27.5
2	27.3	b	b	b	21.5	22.8	39.7
3	22.6	b	b	30.4	19.0	21.7	26.3
4	22.7	b	b	29.1	20.1	22.7	26.0

Ultimate section, durations 5 and over

Age[c]	Exposed	Actual deaths	Crude rate per 1,000
Under 50	2,013	21	10.4
50-54	2,609	51	19.5
55-59	12,881	228	17.7
60-64	42,029	919	21.9
65-69	59,619	1,664	27.9
70-74	41,548	1,696	40.8
75-79	22,931	1,441	62.8
80-84	13,442	1,330	98.9
85 & over	11,839	2,106	177.9
All ages	208,910	9,456	45.3

[a] Age nearest birthday.
[b] Fewer than 10 actual deaths.
[c] Age nearest birthday at the beginning of the year of exposure.

Table S-20. Mortality experience of railroad disability annuitants between anniversaries of retirement in 2015 and 2018, 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	608	12	19.7	575	12	20.9	115.4%	119.0%	113.2%	33	h	h	h	h	h
40-44	1,404	29	20.7	1,279	28	21.9	110.5	113.9	107.8	125	h	h	h	h	h
45-49	3,110	40	12.9	2,649	39	14.7	70.8	73.0	68.8	461	h	h	h	h	h
50-54	5,855	144	24.6	4,620	127	27.5	128.3	132.2	124.0	1,235	17	13.8	162.8%	167.7%	150.0%
55-59	21,109	447	21.2	15,688	388	24.7	109.7	113.0	105.8	5,421	59	10.9	95.6	98.5	92.2
60-64	54,289	1,253	23.1	40,892	1,035	25.3	100.8	103.9	98.3	13,397	218	16.3	105.4	108.6	102.3
65-69	61,926	1,726	27.9	44,898	1,341	29.9	94.5	97.4	96.6	17,028	385	22.6	98.7	101.7	98.8
70-74	41,557	1,697	40.8	29,209	1,256	43.0	93.0	95.9	102.1	12,348	441	35.7	99.2	102.3	103.7
75-79	22,931	1,441	62.8	15,554	1,027	66.0	93.8	96.7	100.7	7,377	414	56.1	97.1	100.1	103.2
80-84	13,442	1,330	98.9	8,149	878	107.7	100.4	103.5	102.8	5,293	452	85.4	91.9	94.8	96.9
85-89	8,275	1,232	148.9	4,307	680	157.9	98.4	101.2	96.4	3,968	552	139.1	95.3	98.0	98.2
90-94	2,928	685	233.9	1,433	348	242.8	105.3	107.6	100.4	1,495	337	225.4	105.0	107.3	105.4
95 & over	636	189	297.2	375	126	336.0	101.3	102.9	99.2	261	63	241.4	74.5	75.6	73.4
All ages	238,069	10,225	42.9	169,628	7,285	42.9	97.7%	100.6%	100.0%	68,441	2,940	43.0	97.4%	100.2%	99.9%

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

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

[c] Expected based on 2013 Base Year RRB Disabled Mortality Table for Annuitants with Disability Freeze projected to 2016 using 2013 RRB Mortality Improvement Scale.

[d] Expected based on 2016 Base Year RRB Disabled Mortality Table for Annuitants with Disability Freeze.

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

[f] Expected based on 2013 Base Year RRB Disabled Mortality Table for Annuitants without Disability Freeze projected to 2016 using 2013 RRB Mortality Improvement Scale.

[g] Expected based on 2016 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 28th valuation mortality studies who would have qualified for a benefit under the social security disability standards

| | Period between anniversaries of retirement | | | | | |
| | 2015-2016 | | 2016-2017 | | 2017-2018 | |
Duration and type of freeze decision	Exposures	Actual deaths	Exposures	Actual deaths	Exposures	Actual deaths
Duration 0						
Freeze allowed	88.2%	91.5%	85.3%	100.0%	69.4%	92.2%
Freeze disallowed	11.1	8.5	9.5	0.0	8.1	5.9
No freeze decision	0.7	0.0	5.2	0.0	22.5	2.0
Duration 1						
Freeze allowed	89.7	96.7	88.1	97.7	85.0	95.6
Freeze disallowed	10.1	3.3	11.2	2.3	9.6	4.4
No freeze decision	0.1	0.0	0.7	0.0	5.4	0.0
Duration 2						
Freeze allowed	88.4	93.9	89.7	91.2	87.9	93.5
Freeze disallowed	11.6	6.1	10.2	8.8	11.4	6.5
No freeze decision	0.0	0.0	0.1	0.0	0.6	0.0
Duration 3						
Freeze allowed	88.0	92.5	88.3	77.8	89.7	90.0
Freeze disallowed	12.0	7.5	11.7	22.2	10.2	10.0
No freeze decision	0.0	0.0	0.0	0.0	0.1	0.0
Duration 4						
Freeze allowed	85.9	87.1	87.9	87.5	88.6	97.6
Freeze disallowed	14.1	12.9	12.1	12.5	11.4	2.4
No freeze decision	0.0	0.0	0.0	0.0	0.0	0.0
Duration 5 and over						
Freeze allowed	68.5	69.3	69.1	69.8	69.6	69.5
Freeze disallowed	31.5	30.7	30.9	30.2	30.3	30.5
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 2013-2017

Age[b]	Exposed	Actual deaths	Crude rate per 1,000	Ratio Act./Exp.[c]	Ratio Act./Exp.[d]
Under 35	292,834	239	0.8	107.1%	106.9%
35-39	166,140	150	0.9	93.0	92.8
40-44	170,267	195	1.1	92.1	92.8
45-49	161,780	269	1.7	101.5	103.1
50-54	143,659	310	2.2	96.0	97.9
55-59	165,496	529	3.2	100.9	103.1
60-64	84,898	372	4.4	102.1	104.5
65 & over	20,535	110	5.4	80.9	82.6
All ages	1,205,608	2,174	1.8	98.4%	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 2012 RRB Active Service Mortality Table.

[d] Expected deaths based on 2015 RRB Active Service Mortality Table.

Table S-23. Total termination experience of spouse annuitants between anniversaries of retirement in 2015 and 2018[a]

	All ages	60-64	65-69	70-74	75-79	80-84	85-89	90 & over
				Age[b]				
1. 2015-2018 experience								
Exposed[c]	454,309	92,681	136,571	97,231	60,848	38,637	21,166	7,175
Actual terminations	28,043	2,021	4,533	4,910	4,812	5,127	4,380	2,260
Crude rate per 1,000	61.7	21.8	33.2	50.5	79.1	132.7	206.9	315.0
Ratio Act./Exp. I[d]	96.8%	99.0%	96.9%	93.6%	92.4%	98.4%	100.7%	100.9%
Ratio Act./Exp. II[e]	99.6%	102.0%	99.9%	96.5%	95.2%	101.4%	103.5%	103.1%
Ratio Act./Exp. III[e]	100.0%	105.2%	102.0%	97.7%	95.4%	100.7%	102.1%	101.5%
2. Crude rate per 1,000 for individual years								
2015 - 2016	61.0	21.6	33.8	48.6	80.3	129.5	200.0	280.9
2016 - 2017	62.8	21.1	32.2	52.5	79.3	134.1	219.4	335.3
2017 - 2018	61.4	22.8	33.6	50.3	77.7	134.7	201.3	329.2
3. Ratio Act./Exp. for individual years I[d]								
2015 - 2016	94.8%	97.9%	98.8%	89.6%	93.5%	95.8%	97.4%	90.4%
2016 - 2017	98.3%	95.7%	93.7%	97.1%	92.5%	99.4%	106.7%	107.1%
2017 - 2018	97.3%	103.7%	98.3%	94.0%	91.2%	100.2%	97.8%	105.3%
4. Ratio Act./Exp. For individual years II[e]								
2015 - 2016	97.6%	100.9%	101.9%	92.4%	96.4%	98.7%	100.1%	92.3%
2016 - 2017	101.2%	98.6%	96.6%	100.1%	95.4%	102.5%	109.7%	109.4%
2017 - 2018	100.2%	106.9%	101.3%	96.8%	94.0%	103.3%	100.5%	107.5%
5. Ratio Act./Exp. For individual years III[f]								
2015 - 2016	97.9%	104.0%	104.0%	93.5%	96.6%	98.0%	98.7%	91.0%
2016 - 2017	101.5%	101.6%	98.6%	101.3%	95.6%	101.7%	108.2%	107.8%
2017 - 2018	100.5%	110.1%	103.4%	98.0%	94.2%	102.5%	99.2%	105.9%

[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 Base Year RRB Spouse Total Termination Table.

[e] Expected based on 2013 Base Year RRB Spouse Total Termination Table projected to 2016 using 2013 RRB Mortality Improvement Scale.

[f] Expected based on 2016 Base Year RRB Spouse Total Termination Table.

Table S-24. Mortality experience of spouse annuitants between anniversaries of retirement in 2015 and 2018[a]

				Age[b]				
	All ages	60-64	65-69	70-74	75-79	80-84	85-89	90 & over
1. 2015-2018 experience								
Exposed[c]	445,028	91,954	134,929	95,564	59,263	36,970	19,814	6,535
Actual deaths	9,480	567	1,249	1,575	1,641	1,793	1,675	980
Crude rate per 1,000	21.3	6.2	9.3	16.5	27.7	48.5	84.5	150.0
Ratio Act./Exp.[d]	75.4%	64.5%	62.9%	71.7%	75.5%	80.3%	85.2%	85.6%
2. Crude rate per 1,000 for individual years								
2015 - 2016	21.0	6.3	9.8	15.1	27.6	46.3	84.3	132.2
2016 - 2017	21.8	5.6	8.6	17.9	28.2	49.8	90.0	156.5
2017 - 2018	21.1	6.6	9.4	16.4	27.3	49.6	78.9	161.9
3. Ratio Act./Exp. for individual years[d]								
2015 - 2016	73.7%	66.1%	67.0%	65.4%	74.9%	76.4%	85.4%	76.8%
2016 - 2017	76.9%	58.4%	58.1%	77.6%	77.0%	82.6%	90.4%	88.2%
2017 - 2018	75.6%	69.0%	63.7%	71.8%	74.8%	82.3%	79.5%	91.9%

[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, 2018

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	1,329	334	0.251			
61	3,443	1,325	0.385			
62	4,451	2,083	0.468	2,354	218	0.093
63	5,657	3,152	0.557	3,358	606	0.180
64	6,307	3,831	0.607	4,030	980	0.243
65	6,901	4,482	0.649	4,790	1,464	0.306
66	7,213	5,100	0.707	5,648	2,045	0.362
67	7,481	5,453	0.729	6,379	2,749	0.431
68	7,809	5,850	0.749	6,636	3,091	0.466
69	7,504	5,733	0.764	6,347	3,220	0.507
70	7,615	5,967	0.784	6,583	3,508	0.533
71	7,439	5,797	0.779	6,454	3,509	0.544
72	7,729	6,073	0.786	6,717	3,870	0.576
73	5,318	4,153	0.781	4,464	2,612	0.585
74	5,343	4,184	0.783	4,336	2,625	0.605
75	4,838	3,723	0.770	4,083	2,391	0.586
76	5,016	3,936	0.785	3,978	2,328	0.585
77	3,998	3,069	0.768	3,397	2,051	0.604
78	3,597	2,760	0.767	3,050	1,860	0.610
79	2,984	2,212	0.741	2,606	1,577	0.605
80	2,884	2,135	0.740	2,519	1,485	0.590
81	2,777	2,008	0.723	2,453	1,455	0.593
82	2,626	1,836	0.699	2,122	1,183	0.557
83	2,364	1,616	0.684	2,023	1,127	0.557
84	2,326	1,559	0.670	1,991	1,050	0.527
85	2,086	1,336	0.640	1,694	848	0.501
86	2,068	1,234	0.597	1,692	849	0.502
87	1,905	1,119	0.587	1,437	668	0.465
88	1,910	1,021	0.535	1,452	630	0.434
89	1,773	921	0.519	1,272	554	0.436
90	1,709	842	0.493	1,163	452	0.389
91	1,586	713	0.450	1,077	363	0.337
92	1,407	563	0.400	969	283	0.292
93	1,081	376	0.348	749	198	0.264
94	758	234	0.309	560	123	0.220
95	635	197	0.310	409	85	0.208
96	517	139	0.269	315	54	0.171
97	265	55	0.208	235	37	0.157
98	232	50	0.216	131	18	0.137
99 & over	318	45	0.142	252	27	0.107

[a] Age nearest birthday.

Table S-26. Mortality experience of widow annuitants between anniversaries of retirement in 2015 and 2018

	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. 2015-2018 experience												
Exposed [b]	327,214	1,135	483	389	14,291	29,225	36,848	45,335	57,928	68,903	49,639	23,042
Actual deaths	28,379	d	d	d	115	452	926	1,774	3,622	6,917	8,354	6,212
Crude rate per 1,000	86.7	d	d	d	8.0	15.5	25.1	39.1	62.5	100.4	168.3	269.6
Ratio Act./Exp. [c]	106.1%	d	d	d	84.8%	104.4%	108.7%	106.8%	105.3%	104.6%	108.5%	105.1%
2. Crude rate per 1,000 for individual years												
2015 - 2016	85.6	d	d	d	8.7	14.8	28.4	37.7	61.1	98.5	167.3	262.2
2016 - 2017	87.8	d	d	d	6.7	15.3	23.9	40.6	63.4	101.8	168.7	274.9
2017 - 2018	86.9	d	d	d	8.7	16.3	23.2	39.2	63.2	101.0	168.9	271.6
3. Ratio Act./Exp. [c] for individual years												
2015 - 2016	104.7%	d	d	d	91.4%	99.8%	122.3%	102.7%	102.7%	102.8%	108.0%	102.7%
2016 - 2017	107.1%	d	d	d	70.9%	103.4%	103.3%	110.6%	106.8%	106.1%	108.7%	107.1%
2017 - 2018	106.5%	d	d	d	92.2%	110.2%	101.0%	107.1%	106.7%	105.1%	108.9%	105.5%

Column header spanning group: 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 2006 and 2018 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	65,101	93	155	224	307	573	815	5,911	7,980	49,043
1	64,369	92	142	224	325	680	1,698	6,028	7,846	47,335
2	63,356	96	147	222	345	723	2,389	6,037	7,697	45,701
3	62,007	96	136	199	329	739	2,972	6,017	7,550	43,969
4	60,890	90	137	191	339	756	3,499	6,000	7,467	42,410
5 or more	1,115,273	48	221	627	1,060	2,364	5,417	37,265	66,294	1,001,979
2. Actual remarriages										
Duration[b] 0	57	c	c	c	c	c	c	14	11	25
1	114	c	c	c	c	c	c	24	28	48
2	109	c	c	c	c	c	11	20	22	37
3	97	c	c	c	c	c	15	18	12	41
4	94	c	c	c	c	c	17	26	22	21
5 or more	731	c	c	c	c	c	15	146	154	389
3. Crude remarriage rate per 1,000										
Duration[b] 0	0.88	c	c	c	c	c	c	2.37	1.38	0.51
1	1.77	c	c	c	c	c	c	3.98	3.57	1.01
2	1.72	c	c	c	c	c	4.60	3.31	2.86	0.81
3	1.56	c	c	c	c	c	5.05	2.99	1.59	0.93
4	1.54	c	c	c	c	c	4.86	4.33	2.95	0.50
5 or more	0.66	c	c	c	c	c	2.77	3.92	2.32	0.39
4. Ratio Act./Exp.[d]										
Duration[b] 0	57.4%	c	c	c	c	c	c	51.0%	51.3%	60.3%
1	55.3%	c	c	c	c	c	c	46.4%	60.9%	63.6%
2	55.7%	c	c	c	c	c	49.1%	40.0%	53.8%	60.0%
3	58.9%	c	c	c	c	c	49.3%	40.9%	37.5%	108.6%
4	60.7%	c	c	c	c	c	49.1%	65.3%	73.7%	62.0%
5 or more	85.3%	c	c	c	c	c	77.6%	76.7%	79.4%	95.4%

[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 2015 and 2018

Age[a]	Exposed	Actual terminations	Ratio Act./Exp.[b]
Under 25	355	c	c
25-29	456	c	c
30-34	619	c	c
35-39	821	c	c
40-44	1,098	11	84.5
45-49	1,567	22	95.0
50-54	2,644	55	109.3
55-59	3,170	109	139.0
60-64	3,277	126	117.2
65-69	2,825	158	126.0
70-74	2,230	146	107.9
75-79	1,376	124	108.1
80-84	835	134	139.7
85-89	432	74	106.7
90 & over	193	45	96.9
All ages	21,898	1,023	115.2%

[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 - 2017	1957 - 2017
60 - 64	2.7%	1.5%	2.1%
65 - 69	1.4%	1.8%	1.6%
70 - 74	0.9%	1.6%	1.3%
75 - 79	0.8%	1.3%	1.1%
80 - 84	0.8%	1.0%	0.9%
85 - 89	0.9%	0.5%	0.7%
90 & over	0.5%	0.0%	0.2%

Age of spouse	Average annual improvement in spouse total termination[b]		
	1957 - 1984	1984 - 2017	1957 - 2017
60 - 64	NA	1.7%	NA
65 - 69	1.2%	1.6%	1.4%
70 - 74	0.7%	1.5%	1.1%
75 - 79	0.7%	1.1%	1.0%
80 - 84	0.8%	0.6%	0.7%
85 & over	0.4%	0.0%	0.2%

[a] Includes both disabled and nondisabled annuitants.

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

RETIREMENT STUDIES

1. <u>Immediate age retirement</u>. Age retirement studies covering experience during calendar years 2016-2018 are summarized in Tables S-30 through S-32. Table S-30 shows a comparison among crude retirement rates for 2016-2018, the 27th valuation retirement rates, and the 28th 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>Immediate disability retirement</u>. Table S-33 shows a comparison of crude immediate disability retirement rates for 2013-2018 with the 27th and 28th valuation standards. Table S-34 shows ratios of actual retirements in 2013-2018 to those expected by age and service.

   Table S-35 shows percentages of immediate disability retirements in 2013-2018 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 27th valuation	Assumed rates 28th valuation	2016-2018 Crude rates	Assumed rates 27th valuation	Assumed rates 28th valuation	2016-2018 Crude rates
60				0.59	0.62	0.639
61				0.46	0.48	0.500
62	0.09	0.11	0.113	0.35	0.40	0.401
63	0.09	0.09	0.087	0.32	0.35	0.353
64	0.08	0.09	0.089	0.32	0.35	0.337
65	0.17	0.19	0.191	0.34	0.35	0.356
66	0.33	0.33	0.357	0.30	0.35	0.351
67	0.27	0.33	0.307	0.30	0.31	0.292
68	0.25	0.27	0.249	0.30	0.31	0.308
69	0.25	0.27	0.269	0.30	0.31	0.325
70	0.25	0.27	0.322	0.30	0.31	0.363
71	0.25	0.27	0.294	0.25	0.31	0.416
72	0.20	0.27	0.264	0.25	0.31	0.288
73	0.20	0.27	0.256	0.25	0.31	0.303
74	0.20	0.23	0.195	0.25	0.25	0.273
75 & over	0.20	0.23	0.246	0.25	0.25	0.228

[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 2016-2018

Age[b]	Exposed[c]	Actual retirements	Crude rate[d] per 1,000	Expected retirements I[e]	Ratio Act./Exp. I[e]	Expected retirements II[e]	Ratio Act./Exp. II[e]
62	6,248	707	113.2	562	125.7%	687	102.9%
63	4,836	419	86.6	435	96.3	435	96.3
64	3,978	353	88.7	318	110.9	358	98.6
65	3,144	600	190.8	534	112.3	597	100.4
66	2,334	833	356.9	770	108.2	770	108.2
67	1,368	420	307.0	369	113.7	451	93.0
68	897	223	248.6	224	99.4	242	92.1
69	603	162	268.7	151	107.5	163	99.5
70-74	1,019	293	287.5	236	123.9	272	107.9
75 & over	224	55	245.5	45	122.8	52	106.8
All ages	24,651	4,065	164.9	3,646	111.5	4,028	100.9

[a] Nondisability retirement.

[b] Age attained in calendar year of exposure.

[c] Exposure includes part of the year that 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 27th and 28th valuations, respectively.

Table S-32. Immediate age[a] retirement experience of railroad employees with
30 or more years of service during calendar years 2016-2018

Age[b]	Exposed[c]	Actual retirements	Crude rate[d] per 1,000	Expected retirements I[e]	Ratio Act./Exp. I[e]	Expected retirements II[e]	Ratio Act./Exp. II[e]
60	11,093	7,091	639.2	6,545	108.3%	6,878	103.1%
61	5,079	2,539	499.9	2,336	108.7	2,438	104.1
62	3,358	1,346	400.8	1,175	114.5	1,343	100.2
63	2,510	887	353.4	803	110.4	879	101.0
64	1,997	673	337.0	639	105.3	699	96.3
65	1,617	576	356.2	550	104.8	566	101.8
66	1,193	419	351.2	358	117.1	418	100.3
67	832	243	292.1	250	97.4	258	94.2
68	595	183	307.6	179	102.5	184	99.2
69	431	140	324.8	129	108.3	134	104.8
70-74	721	251	348.1	195	128.9	220	114.3
75 & over	206	47	228.2	52	91.3	52	91.3
All ages	29,632	14,395	485.8	13,210	109.0	14,067	102.3

[a] Nondisability retirement.

[b] Age attained in calendar year of exposure.

[c] Exposure includes part of the year that 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 27th and 28th 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 27th valuation	Assumed rates 28th valuation	2013-2018 Crude rates	Assumed rates 27th valuation	Assumed rates 28th valuation	2013-2018 Crude rates	Assumed rates 27th valuation	Assumed rates 28th valuation	2013-2018 Crude rates	Assumed rates 27th valuation	Assumed rates 28th valuation	2013-2018 Crude rates
Under 35	0.0012	0.0012	0.0005	0.0035	0.0046	d	0.0035	0.0033	d	0.0035	0.0033	d
35	0.0013	0.0012	0.0008	0.0037	0.0049	d	0.0037	0.0034	d	0.0037	0.0034	d
36	0.0013	0.0012	0.0009	0.0038	0.0052	d	0.0038	0.0035	d	0.0038	0.0035	d
37	0.0013	0.0013	0.0007	0.0040	0.0055	d	0.0040	0.0036	d	0.0040	0.0036	d
38	0.0014	0.0014	0.0012	0.0042	0.0058	d	0.0042	0.0037	d	0.0042	0.0037	d
39	0.0015	0.0014	0.0014	0.0045	0.0061	d	0.0045	0.0038	d	0.0045	0.0038	d
40	0.0016	0.0015	0.0017	0.0048	0.0064	d	0.0048	0.0039	d	0.0048	0.0039	d
41	0.0017	0.0017	0.0019	0.0052	0.0067	d	0.0052	0.0041	d	0.0052	0.0041	d
42	0.0018	0.0018	0.0020	0.0056	0.0070	0.0083	0.0056	0.0044	d	0.0056	0.0044	d
43	0.0020	0.0020	0.0027	0.0062	0.0073	0.0089	0.0062	0.0049	d	0.0062	0.0049	d
44	0.0021	0.0021	0.0022	0.0068	0.0076	0.0072	0.0068	0.0054	d	0.0068	0.0054	d
45	0.0024	0.0024	0.0031	0.0076	0.0079	0.0080	0.0076	0.0060	d	0.0076	0.0060	d
46	0.0026	0.0027	0.0032	0.0085	0.0083	0.0088	0.0085	0.0066	d	0.0085	0.0066	d
47	0.0029	0.0030	0.0033	0.0096	0.0087	0.0074	0.0096	0.0074	d	0.0096	0.0074	d
48	0.0033	0.0034	0.0033	0.0108	0.0093	0.0087	0.0108	0.0082	0.0031	0.0108	0.0082	d
49	0.0038	0.0039	0.0035	0.0122	0.0100	0.0121	0.0121	0.0090	0.0082	0.0121	0.0090	d
50	0.0043	0.0044	0.0045	0.0137	0.0108	0.0102	0.0135	0.0100	0.0110	0.0135	0.0100	0.0225
51	0.0049	0.0051	0.0050	0.0152	0.0118	0.0135	0.0148	0.0111	0.0128	0.0148	0.0111	0.0263
52	0.0057	0.0059	0.0069	0.0168	0.0130	0.0149	0.0162	0.0123	0.0083	0.0162	0.0123	0.0184
53	0.0066	0.0069	0.0070	0.0185	0.0145	0.0148	0.0175	0.0136	0.0142	0.0175	0.0136	0.0144
54	0.0077	0.0080	0.0058	0.0204	0.0163	0.0153	0.0188	0.0150	0.0157	0.0188	0.0150	0.0158
55	0.0090	0.0094	0.0090	0.0224	0.0185	0.0163	0.0202	0.0166	0.0145	0.0202	0.0166	0.0183
56	0.0106	0.0111	0.0123	0.0247	0.0212	0.0208	0.0217	0.0184	0.0150	0.0217	0.0184	0.0199
57	0.0125	0.0131	0.0120	0.0274	0.0244	0.0223	0.0234	0.0203	0.0149	0.0234	0.0203	0.0197
58	0.0148	0.0155	0.0175	0.0306	0.0284	0.0313	0.0254	0.0225	0.0195	0.0254	0.0225	0.0258
59	0.0175	0.0183	0.0173	0.0345	0.0333	0.0317	0.0279	0.0249	0.0242	0.0279	0.0249	0.0241
60	0.0239	0.0267	0.0267	0.0393	0.0393	0.0379	0.0311	0.0275	0.0209	0.0144	0.0107	0.0108
61	0.0291	0.0312	0.0307	0.0565	0.0465	0.0487	0.0354	0.0304	0.0313	0.0103	0.0078	0.0072
62	0.0322	0.0318	0.0329	0.0517	0.0458	0.0472	0.0444	0.0396	0.0343	0.0070	0.0054	0.0063
63	0.0338	0.0288	0.0271	0.0454	0.0436	0.0531	0.0380	0.0373	0.0371	0.0046	0.0035	0.0023
64	0.0257	0.0229	0.0243	0.0369	0.0375	0.0282	0.0296	0.0312	0.0338	0.0029	0.0021	0.0030
65	0.0207	0.0143	0.0137	0.0257	0.0215	0.0153	0.0183	0.0153	0.0233	0.0020	0.0012	d
66	0.0052	0.0036	d	0.0108	0.0039	d	0.0034	0.0039	d	0.0019	0.0008	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 2013-2018

					Attained age[a]				
	All ages	Under 40	40-44	45-49	50-54	55-59	60-64	65	66[b]
1. 10-19 years of service									
Exposed	435,159	112,046	97,111	85,051	65,491	46,359	24,684	2,547	1,870
Actual retirements	2,323	98	205	279	379	612	708	35	f
Crude rate per 1,000[c]	5.3	0.9	2.1	3.3	5.8	13.2	28.7	13.7	f
Ratio Act./Exp.[d]	100.8%	66.2%	114.7%	110.8%	100.5%	105.7%	100.1%	66.4%	f
Ratio Act./Exp.[e]	99.9%	68.3%	115.9%	107.9%	96.9%	101.0%	100.1%	96.1%	f
2. 20-24 years of service									
Exposed	116,009	817	18,834	33,498	27,664	20,687	12,291	1,245	973
Actual retirements	1,869	f	137	300	377	495	536	19	f
Crude rate per 1,000[c]	16.1	f	7.3	9.0	13.6	23.9	43.6	15.3	f
Ratio Act./Exp.[d]	89.4%	f	120.8%	92.2%	81.3%	87.0%	93.5%	59.4%	f
Ratio Act./Exp.[e]	100.1%	f	101.3%	101.5%	103.6%	97.1%	101.8%	71.0%	f
3. 25-29 years of service									
Exposed	67,997	0	585	12,072	21,716	19,491	12,110	1,203	820
Actual retirements	1,066	f	f	57	269	338	369	28	f
Crude rate per 1,000[c]	15.7	f	f	4.7	12.4	17.3	30.5	23.3	f
Ratio Act./Exp.[d]	76.3%	f	f	45.6%	76.5%	73.7%	85.1%	127.2%	f
Ratio Act./Exp.[e]	90.1%	f	f	60.1%	99.6%	85.3%	92.9%	152.1%	f
4. 30 or more years of service									
Exposed	160,010	0	0	324	13,724	82,283	58,040	3,275	2,364
Actual retirements	2,548	f	f	f	233	1,842	466	f	f
Crude rate per 1,000[c]	15.9	f	f	f	17.0	22.4	8.0	f	f
Ratio Act./Exp.[d]	87.8%	f	f	f	97.2%	90.9%	74.9%	f	f
Ratio Act./Exp.[e]	104.8%	f	f	f	124.4%	104.0%	100.1%	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 27th valuation disability rates.

[e] Expected based on 28th 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 27th valuation	Assumed rates 28th valuation	2013-2018 Crude rates	Assumed rates 27th valuation	Assumed rates 28th valuation	2013-2018 Crude rates	Assumed rates 27th valuation	Assumed rates 28th valuation	2013-2018 Crude rates	Assumed rates 27th valuation	Assumed rates 28th valuation	2013-2018 Crude rates
Under 35	97.8%	97.6%	100.0%	44.8%	52.8%	c	44.8%	52.8%	c	44.8%	52.8%	c
35	97.8	97.6	100.0	44.8	52.8	c	44.8	52.8	c	44.8	52.8	c
36	97.8	97.6	100.0	44.8	52.8	c	44.8	52.8	c	44.8	52.8	c
37	97.8	97.6	100.0	44.8	52.8	c	44.8	52.8	c	44.8	52.8	c
38	97.8	97.6	95.2	44.8	52.8	c	44.8	52.8	c	44.8	52.8	c
39	97.8	97.6	92.6	44.8	52.8	c	44.8	52.8	c	44.8	52.8	c
40	97.8	97.6	96.4	44.8	52.8	c	44.8	52.8	c	44.8	52.8	c
41	97.8	97.6	94.1	44.8	52.8	c	44.8	52.8	c	44.8	52.8	c
42	97.8	97.6	97.2	44.8	52.8	55.2%	44.8	52.8	c	44.8	52.8	c
43	97.8	97.6	91.5	44.8	52.8	51.3	44.8	52.8	c	44.8	52.8	c
44	97.8	97.6	100.0	44.8	52.8	42.5	44.8	52.8	c	44.8	52.8	c
45	97.8	97.6	94.5	44.9	52.9	51.2	44.9	52.9	c	44.9	52.9	c
46	97.8	97.6	100.0	44.9	53.0	59.2	44.9	53.0	c	44.9	53.0	c
47	97.8	97.6	98.1	45.1	53.3	68.9	45.1	53.3	c	45.1	53.3	c
48	97.8	97.6	97.8	45.3	53.6	51.2	45.3	53.6	50.0%	45.3	53.6	c
49	97.8	97.6	93.6	45.8	54.3	56.3	45.8	54.3	44.4	45.8	54.3	c
50	97.8	97.6	98.2	46.8	55.6	64.7	46.8	55.6	54.5	46.8	55.6	36.4%
51	97.8	97.6	100.0	48.9	57.8	63.1	48.9	57.8	58.8	48.9	57.8	34.5
52	97.8	97.6	100.0	53.3	61.7	66.7	53.3	61.7	66.7	53.3	61.7	28.9
53	97.8	97.6	97.4	62.1	68.8	73.4	62.1	68.8	73.7	62.1	68.8	72.5
54	97.8	97.6	95.1	80.0	81.2	82.8	80.0	81.2	81.5	80.0	81.2	78.3
55	97.8	97.6	96.6	94.6	94.6	90.6	94.6	94.6	93.9	94.6	94.6	95.6
56	97.8	97.6	97.2	94.6	94.6	95.2	94.6	94.6	92.2	94.6	94.6	94.8
57	97.8	97.6	99.0	94.6	94.6	94.9	94.6	94.6	96.4	94.6	94.6	94.6
58	97.8	97.6	98.4	94.6	94.6	92.4	94.6	94.6	95.3	94.6	94.6	93.6
59	97.8	97.6	100.0	94.6	94.6	92.5	94.6	94.6	94.8	94.6	94.6	94.9
60	94.3	94.5	96.0	94.6	94.6	94.2	94.6	94.6	93.2	94.6	94.6	95.6
61	94.3	94.5	93.2	94.6	94.6	97.5	94.6	94.6	95.3	94.6	94.6	97.8
62	94.3	94.5	93.7	94.6	94.6	96.0	94.6	94.6	97.6	94.6	94.6	97.9
63	94.3	94.5	97.8	94.6	94.6	92.6	94.6	94.6	94.0	94.6	94.6	84.6
64	94.3	94.5	89.2	94.6	94.6	94.4	94.6	94.6	89.8	94.6	94.6	91.7
65	94.3	94.5	96.9	94.6	94.6	100.0	94.6	94.6	86.4	94.6	94.6	c
66	94.3	94.5	c	94.6	94.6	c	94.6	94.6	c	94.6	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 2014-2017. 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 27th valuation standard, which was retained for the 28th valuation.

Table S-36. Withdrawal experience of railroad employees during calendar years 2014-2017, 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.[d]	Exposed	Actual net[c] withdrawals	Crude rate per 100	Ratio Act./Exp.[d]	Exposed	Actual net[c] withdrawals	Crude rate per 100	Ratio Act./Exp.[d]
0	15,743	3,649	23.2	146.7%	28,315	4,740	16.7	152.2%	14,214	2,634	18.5	126.9%
1	10,941	1,945	17.8	149.4	29,221	3,929	13.4	164.0	14,722	2,082	14.1	168.4
2	6,684	671	10.0	145.5	29,966	2,488	8.3	156.7	15,560	1,306	8.4	182.5
3	3,830	281	7.3	149.7	29,315	1,991	6.8	183.6	17,041	968	5.7	195.9
4	1,810	116	6.4	156.3	23,778	1,328	5.6	180.2	16,175	753	4.7	186.2
5	615	40	6.5	175.8	18,748	913	4.9	173.9	14,992	628	4.2	182.1
6	110	13	11.8	358.1	15,532	744	4.8	184.2	14,612	547	3.7	178.3
7	11	e	e	e	11,742	397	3.4	140.9	12,893	423	3.3	164.0
8	3	e	e	e	11,024	318	2.9	131.1	14,549	426	2.9	162.7
9	1	e	e	e	10,883	314	2.9	144.3	17,300	436	2.5	148.2
10	1	e	e	e	8,901	221	2.5	137.9	18,556	491	2.6	176.4
11	-	e	e	e	6,126	155	2.5	158.1	17,531	421	2.4	171.5
12	-	e	e	e	3,616	100	2.8	197.5	15,287	305	2.0	153.5
13	-	e	e	e	1,754	38	2.2	180.5	12,341	228	1.8	154.0
14	-	e	e	e	822	12	1.5	132.7	9,956	154	1.5	140.6
15	1	e	e	e	332	e	e	e	9,540	157	1.6	164.6
16	1	e	e	e	69	e	e	e	10,589	169	1.6	177.3
17	1	e	e	e	7	e	e	e	10,034	130	1.3	144.0
18	1	e	e	e	-	e	e	e	8,540	96	1.1	140.5
19	-	e	e	e	-	e	e	e	6,829	78	1.1	163.2
20	-	e	e	e	-	e	e	e	4,821	60	1.2	207.4
21	-	e	e	e	-	e	e	e	3,375	39	1.2	192.6
22	-	e	e	e	-	e	e	e	2,178	e	e	e
23	-	e	e	e	-	e	e	e	1,333	e	e	e
24	-	e	e	e	-	e	e	e	723	e	e	e
25	-	e	e	e	-	e	e	e	287	e	e	e
26	-	e	e	e	-	e	e	e	68	e	e	e
27	-	e	e	e	-	e	e	e	1	e	e	e
28	-	e	e	e	-	e	e	e	-	e	e	e
29	-	e	e	e	-	e	e	e	-	e	e	e
30 & over	-	e	e	e	-	e	e	e	-	e	e	e
All years	39,753	6,715	16.9	147.9%	230,151	17,691	7.7	161.8%	284,047	12,550	4.4	160.1%

[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] Expected based on 28th valuation withdrawal rates.

[e] Less than 10 actual net withdrawals.

Table S-36. Withdrawal experience of railroad employees during calendar years 2014-2017, 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.[d]	Exposed	Actual net[c] withdrawals	Crude rate per 100	Ratio Act./Exp.[d]	Exposed	Actual net[c] withdrawals	Crude rate per 100	Ratio Act./Exp.[d]
0	6,549	1,440	22.0	117.0%	1,770	375	21.2	107.0%	66,591	12,838	19.3	138.7%
1	6,620	954	14.4	151.7	1,895	222	11.7	113.7	63,399	9,132	14.4	158.6
2	7,189	584	8.1	162.5	2,139	194	9.1	137.4	61,538	5,243	8.5	160.5
3	8,131	449	5.5	172.6	2,361	148	6.3	125.4	60,678	3,837	6.3	178.9
4	8,209	429	5.2	186.6	2,635	136	5.2	122.9	52,607	2,762	5.3	177.5
5	8,019	388	4.8	193.5	2,373	130	5.5	148.1	44,747	2,099	4.7	177.8
6	8,481	325	3.8	166.6	2,532	132	5.2	158.0	41,267	1,761	4.3	177.4
7	8,154	245	3.0	143.1	2,552	128	5.0	179.1	35,352	1,193	3.4	152.4
8	9,168	269	2.9	154.4	2,853	112	3.9	157.0	37,597	1,125	3.0	150.0
9	10,998	320	2.9	171.2	3,522	140	4.0	180.7	42,704	1,210	2.8	155.9
10	11,993	295	2.5	153.7	3,996	117	2.9	154.1	43,447	1,124	2.6	159.1
11	11,601	280	2.4	172.4	4,137	115	2.8	163.5	39,395	971	2.5	168.5
12	10,576	196	1.9	142.6	4,062	82	2.0	126.2	33,541	683	2.0	151.2
13	9,118	178	2.0	162.7	3,612	86	2.4	170.1	26,825	530	2.0	161.0
14	7,966	119	1.5	135.8	3,240	76	2.3	180.4	21,984	361	1.6	145.4
15	8,565	140	1.6	163.5	3,480	55	1.6	131.7	21,918	355	1.6	157.0
16	10,231	129	1.3	126.1	4,127	66	1.6	133.3	25,017	364	1.5	146.9
17	11,108	165	1.5	165.0	4,510	85	1.9	171.3	25,660	380	1.5	158.4
18	11,008	176	1.6	199.9	4,426	54	1.2	110.9	23,975	326	1.4	159.0
19	10,664	132	1.2	154.7	4,317	76	1.8	176.0	21,810	286	1.3	162.2
20	9,386	81	0.9	123.3	3,893	64	1.6	164.4	18,100	205	1.1	153.5
21	8,497	80	0.9	134.5	3,559	56	1.6	157.3	15,431	175	1.1	151.8
22	7,985	74	0.9	154.5	3,488	46	1.3	131.9	13,651	129	0.9	137.7
23	7,151	67	0.9	156.2	3,269	50	1.5	169.9	11,753	125	1.1	158.2
24	6,286	52	0.8	165.4	3,088	32	1.0	115.1	10,097	86	0.9	138.5
25	6,045	35	0.6	115.8	3,242	38	1.2	146.5	9,574	73	0.8	127.4
26	5,601	38	0.7	135.7	3,396	53	1.6	223.0	9,065	91	1.0	174.8
27	4,666	20	0.4	85.7	3,462	50	1.4	240.7	8,129	70	0.9	158.7
28	3,520	18	0.5	127.8	3,383	18	0.5	133.0	6,903	36	0.5	130.4
29	2,656	11	0.4	103.5	3,307	20	0.6	201.6	5,963	31	0.5	150.9
30 & over	7,896	119	1.5	301.4	53,663	937	1.7	174.6	61,559	1,056	1.7	183.3
All years	254,037	7,808	3.1	150.7%	152,289	3,893	2.6	147.4%	960,277	48,657	5.1	156.3%

[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] Expected based on 28th valuation withdrawal rates.

[e] Less 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 2016 and 2019 active censuses is shown in Table S-39.

Tables S-40 and S-41 provide a census of beneficiaries on December 31, 2019. 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 2015-2017 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 2019 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 2015-2018 is shown in Table S-44, as is the distribution for 2012-2015.

Table S-45 presents family characteristics of railroad employees who died in the period 2015-2018 with a current connection.

Table S-46 provides selected employment and benefit statistics for 2016 and 2019.

Table S-37. Distribution of 2019 active employees[a] by age and completed years of service

Age in 2019	Completed years of service											
	Total	0	1	2-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & over
Total	208,588	6,763	11,702	23,129	50,968	40,602	28,784	24,166	12,443	4,959	2,933	2,139
Under 20	279	189	85	5	0	0	0	0	0	0	0	0
20-24	4,812	1,394	1,871	1,369	178	0	0	0	0	0	0	0
25-29	15,623	1,570	2,967	5,484	5,524	78	0	0	0	0	0	0
30-34	25,851	1,231	2,514	5,519	12,312	4,083	192	0	0	0	0	0
35-39	30,689	907	1,642	3,888	11,208	9,217	3,712	115	0	0	0	0
40-44	31,374	581	1,043	2,640	8,018	8,472	6,805	3,694	121	0	0	0
45-49	32,120	373	768	1,805	5,858	7,102	6,448	7,092	2,568	106	0	0
50-54	27,779	276	444	1,192	3,916	5,397	5,004	5,972	4,027	1,505	46	0
55-59	23,801	165	231	767	2,505	3,931	3,907	4,342	3,281	2,478	1,815	379
60-64	12,578	62	113	338	1,177	1,839	2,157	2,339	1,988	665	885	1,015
65-69	3,137	8	19	95	238	414	478	554	401	170	164	596
70 & over	545	7	5	27	34	69	81	58	57	35	23	149

[a] Employees alive and not retired at the end of 2019 with some railroad service in 2019.

Table S-38. Census of vested[a] inactive employees[b] in 2019 by age and
completed years of service

Age in 2019	Completed years of service						
	Total	5-9	10-14	15-19	20-24	25-29	30 & over
Total	54,312	24,708	17,309	6,516	3,220	1,195	1,364
Under 35	4,567	4,105	458	4	0	0	0
35-39	5,905	4,193	1,520	190	2	0	0
40-44	7,250	4,448	1,944	643	207	8	0
45-49	8,287	4,371	2,348	965	492	106	5
50-54	7,764	3,366	2,500	1,042	541	225	90
55-59	8,698	2,618	2,867	1,224	679	338	972
60-64	9,067	1,372	4,169	1,870	1,010	416	230
65 & over	2,774	235	1,503	578	289	102	67

[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 2019 with no railroad work in 2019.

Table S-39. Comparison between 2019 and 2016 of selected characteristics of active[a] railroad employees

| | 2019 | 2016 | Change from 2016 to 2019 | |
			Number	Percent
Number alive and not retired	208,588	247,882	-39,294	-15.9%
Percent with 5 or more years of service	80.1%	71.9%	b	b
Number age 60 or over	16,260	17,843	-1,583	-8.9%
Number age 65 or over	3,682	3,674	8	0.2%
Number age 60-64 with 30 or more years of service	2,565	4,548	-1,983	-43.6%
Average age on December 31	44.4	43.6	0.8	b
Median age on December 31	44.3	43.4	0.9	b
Average years of service				
All employees	13.0	12.4	0.6	b
Employees under age 45	8.3	7.2	1.1	b
Employees age 45-49	15.1	13.6	1.5	b
Employees age 60 or over	22.6	24.2	-1.6	b
Employees age 65 or over	25.0	25.3	-0.3	b

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

[b] Not applicable.

Table S-40. Census of employees and spouse annuitants on December 31, 2019[a]

Age[c]	Number	Tier1	Tier 2	Vested dual	Supplemental
			Monthly benefits[b]		
1. Employee age annuitants					
60-64	21,273	$ 50,824,571	$ 31,699,963	$ -	$ 526,055
65-69	47,700	102,001,693	55,438,678	-	986,496
70-74	46,325	94,077,748	46,303,154	825	943,073
75-79	28,884	56,499,301	25,712,541	42,636	618,607
80-84	18,606	30,551,235	14,178,868	202,059	371,702
85-89	13,530	19,524,558	8,717,671	317,788	254,034
90-94	8,740	11,672,548	4,800,334	331,869	167,174
95 & over	2,611	3,242,846	1,060,703	132,655	50,395
Total	187,669	$ 368,394,501	$ 187,911,911	$ 1,027,831	$ 3,917,535
2. Employee disability annuitants					
Under 40	173	$ 356,668	$ 26,969	$ -	$ -
40-44	428	894,073	162,721	-	-
45-49	1,117	2,366,219	578,196	-	-
50-54	1,894	3,968,079	1,109,532	-	-
55-59	3,938	8,367,045	2,879,756	-	-
60-64	11,906	25,236,409	9,634,765	-	103,735
65-69	18,894	38,865,163	14,475,799	-	273,210
70-74	16,582	32,900,777	11,678,700	1,052	256,241
75-79	9,247	17,143,246	5,991,849	18,441	152,486
80-84	4,464	7,665,257	2,645,326	57,558	82,551
85-89	2,298	3,677,947	1,186,118	59,947	48,341
90-94	940	1,354,803	383,421	43,656	20,220
95 & over	180	222,189	41,033	9,567	3,228
Total	72,061	$ 143,017,874	$ 50,794,186	$ 190,219	$ 940,011
3. Spouse annuitants					
Under 40	64	$ 67,820	$ 33,344	$ -	
40-44	87	92,384	41,606	-	
45-49	133	149,113	71,458	-	
50-54	267	304,207	157,897	-	
55-59	423	482,763	263,675	-	
60-64	25,377	24,589,430	15,971,119	-	
65-69	44,478	29,724,522	22,358,232	-	
70-74	37,766	19,791,774	17,272,707	-	
75-79	21,614	10,276,660	8,726,932	-	
80-84	11,279	4,751,270	3,917,217	-	
85-89	5,394	2,252,231	1,662,768	-	
90-94	1,579	649,731	435,313	-	
95 & over	179	64,535	42,454	103	
Total	148,640	$ 93,196,440	$ 70,954,722	$ 103	

[a] Includes annuities which were in withheld status as of December 31, 2019. Therefore, these figures may disagree with other published data.

[b] Amounts shown reflect benefits paid in January 2020.

[c] Age attained in 2019.

Table S-41. Census of survivor annuitants on December 31, 2019[a]

		Monthly benefits[b]		
Age[c]	Number	Tier 1	Tier 2	Vested dual
1. Aged widows and widowers[d]				
60-64	4,014	$ 6,766,471	$ 2,390,653	$ -
65-69	9,103	14,464,803	4,902,144	-
70-74	13,069	18,797,060	6,619,044	-
75-79	14,472	19,279,616	6,545,022	155
80-84	15,969	19,217,308	6,648,581	-
85-89	17,420	20,601,425	6,352,633	-
90-94	13,432	15,951,211	3,912,567	-
95 & over	6,262	7,223,105	1,283,904	2,112
Total	93,741	$ 122,300,999	$ 38,654,548	$ 2,267
2. Other survivors[e]				
0-4	55	$ 73,780	$ 5,198	$ -
5-9	296	403,142	28,477	-
10-14	658	916,529	69,302	-
15-19	803	1,162,325	108,397	-
20-24	89	138,324	15,574	-
25-29	150	213,076	24,599	-
30-34	213	288,862	39,912	-
35-39	341	450,109	69,356	-
40-44	427	544,995	89,218	-
45-49	550	669,193	111,689	-
50-54	829	932,620	189,007	-
55-59	1,467	1,592,855	360,871	-
60-64	1,878	1,929,141	456,590	-
65-69	1,707	1,804,409	296,909	-
70-74	1,374	1,381,199	203,613	-
75-79	989	903,123	125,867	-
80-84	563	484,048	65,399	-
85-89	270	224,771	30,695	148
90-94	137	111,908	15,491	522
95 & over	40	27,642	4,606	565
Total	12,836	$ 14,252,051	$ 2,310,770	$ 1,235

[a] Includes annuities which were in withheld status as of December 31, 2019. Therefore, these figures may disagree with other published data.

[b] Amounts shown reflect benefits paid in January 2020.

[c] Age attained in 2019.

[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 2015-2017 with assumptions used in the 28th valuation
(For employees not separated in the year)

Years of service*	Service months by attained age						Service months by calendar year				28th valuation assumption
	Under 25	25-34	35-44	45-54	55 & over	Total	2015	2016	2017	Total	
0	6.4	6.9	6.9	6.8	6.7	6.8	7.5	6.5	5.9	6.8	6.6
1	10.7	11.1	11.2	11.4	11.4	11.1	11.4	10.6	11.4	11.1	11.2
2	11.1	11.2	11.3	11.4	11.5	11.2	11.8	10.7	11.4	11.2	11.4
3	11.6	11.6	11.6	11.6	11.7	11.6	11.8	11.4	11.6	11.6	11.6
4	11.7	11.7	11.7	11.8	11.7	11.7	11.8	11.7	11.7	11.7	11.7
5	11.8	11.8	11.7	11.8	11.7	11.7	11.8	11.7	11.7	11.7	11.7
6	11.8	11.8	11.7	11.7	11.7	11.8	11.7	11.7	11.8	11.8	11.8
7		11.8	11.8	11.8	11.7	11.8	11.8	11.7	11.8	11.8	11.8
8		11.8	11.8	11.8	11.7	11.8	11.8	11.8	11.7	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		11.8	11.8	11.8	11.7	11.8	11.8	11.8	11.8	11.8	11.8
11		11.9	11.8	11.8	11.7	11.8	11.8	11.8	11.8	11.8	11.8
12		11.9	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		11.9	11.8	11.8	11.7	11.8	11.8	11.8	11.8	11.8	11.8
16		12.0	11.8	11.8	11.7	11.8	11.8	11.8	11.8	11.8	11.8
17			11.8	11.8	11.7	11.8	11.9	11.8	11.8	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	11.9	11.8	11.8	11.8	11.8
20			11.9	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
21			11.9	11.9	11.7	11.8	11.9	11.8	11.8	11.8	11.8
22			11.9	11.9	11.8	11.9	11.9	11.9	11.8	11.9	11.8
23			11.9	11.9	11.8	11.9	11.9	11.8	11.8	11.9	11.8
24			11.9	11.9	11.8	11.8	11.8	11.9	11.8	11.8	11.9
25			11.9	11.9	11.8	11.8	11.9	11.8	11.8	11.8	11.9
26			11.9	11.9	11.8	11.8	11.9	11.9	11.8	11.8	11.9
27				11.9	11.8	11.9	11.9	11.9	11.9	11.9	11.9
28				11.9	11.8	11.9	11.9	11.8	11.9	11.9	11.9
29				11.9	11.8	11.9	11.9	11.8	11.9	11.9	11.9
30 & over				11.9	11.8	11.8	11.8	11.8	11.8	11.8	11.9

* Rounded up to nearest whole year.

Table S-43. Average creditable[a] compensation per service month during 2019

Years of service[b]	Tier 1	Tier 2
0	$4,411	$4,356
1	5,527	5,399
2	6,082	5,832
3	6,407	6,135
4	6,616	6,326
5	6,938	6,591
6	7,148	6,732
7	7,092	6,699
8	7,266	6,858
9	7,217	6,771
10	7,407	6,881
11	7,414	6,883
12	7,452	6,939
13	7,593	7,021
14	7,559	7,016
15	7,792	7,175
16	7,899	7,209
17	7,946	7,193
18	7,902	7,126
19	7,904	7,148
20	8,055	7,246
21	8,152	7,321
22	8,273	7,354
23	8,252	7,321
24	8,350	7,404
25	8,389	7,389
26	8,131	7,213
27	7,890	7,101
28	8,081	7,169
29	8,131	7,212
30	8,555	7,414

[a] Maximum creditable annual compensation during 2019 was $132,900 and $98,700 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 2015-2018
and comparison with assumptions of the 27th valuation

Age at entry[a]	Year of entry					27th Val.
	2015	2016	2017	2018	2015-18[b]	2012-15
All ages						
Number	19,904	7,431	12,137	21,017	60,489	84,329
Percent	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Under 20	2.0%	2.8%	2.4%	2.5%	2.4%	2.0%
20-24	21.6	23.4	22.6	20.7	21.7	20.8
25-29	24.5	22.9	24.1	24.6	24.2	24.6
30-34	17.8	15.8	17.2	18.6	17.7	18.5
35-39	13.2	11.3	12.6	13.1	12.8	12.7
40-44	8.7	8.0	7.7	8.6	8.4	9.3
45-49	6.2	6.4	6.0	5.9	6.1	6.2
50-54	3.7	4.8	3.9	3.4	3.8	3.6
55 & over	2.4	4.6	3.4	2.5	2.9	2.3
Average age at entry	32.1	32.6	32.2	32.1	32.2	32.2
Median age at entry	30.0	29.7	29.7	30.0	29.9	30.1

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

[b] Used in 28th valuation.

Table S-45. Family characteristics of railroad employees who died in 2015-2018 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	69	63.0	-	-	63.0	46.0	-	-	75.3	-
35 - 39	96	67.3	-	-	67.3	53.6	4.8	-	85.7	-
40 - 44	148	78.2	-	-	78.2	59.8	5.4	-	83.9	0.8
45 - 49	249	74.5	-	1.5	73.0	39.6	6.7	0.5	64.3	1.6
50 - 54	339	69.7	0.8	2.6	66.3	16.1	7.7	0.7	33.8	1.1
55 - 59	777	68.9	7.6	5.8	55.5	6.8	3.2	0.8	15.2	1.8
60 - 64	2,091	61.5	22.8	13.4	25.3	1.6	0.2	0.3	3.7	1.4
65 - 69	3,630	66.1	51.9	6.0	8.2	0.5	0.2	0.2	1.2	1.2
70 - 74	4,516	67.3	61.9	2.3	3.1	0.2	0.1	-	0.7	0.9
75 - 79	4,803	66.4	63.8	1.0	1.6	0.1	-	-	0.5	0.9
80 - 84	5,701	60.4	59.4	0.4	0.6	-	-	-	0.3	0.4
85 - 89	7,811	51.8	51.3	0.1	0.4	-	-	-	0.1	0.5
90 & over	10,738	34.3	34.1	0.1	0.1	-	-	-	-	-

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	31.6	31.2	e	e	4.2	6.4	e	2.0
35 - 39	e	e	36.3	36.2	e	e	7.1	8.1	e	2.0
40 - 44	e	e	41.4	40.3	e	e	7.3	10.0	e	2.1
45 - 49	e	e	46.0	43.4	46.3	e	10.1	11.0	e	1.6
50 - 54	e	e	51.2	49.2	52.0	e	12.2	12.1	e	1.4
55 - 59	65.5	60.9	54.6	49.7	51.1	e	12.5	13.3	26.2	1.5
60 - 64	65.0	60.9	56.4	49.7	e	e	11.7	12.5	28.4	1.3
65 - 69	66.7	61.0	56.4	52.8	53.2	58.3	12.1	12.2	34.4	1.3
70 - 74	69.9	61.0	56.0	52.1	e	e	12.6	11.3	39.3	1.3
75 - 79	73.9	60.9	54.8	50.1	e	e	11.5	11.9	42.2	1.3
80 - 84	78.3	61.1	56.6	e	e	e	e	14.1	48.6	1.2
85 - 89	83.0	60.9	56.5	e	e	e	e	13.4	52.4	e
90 & over	87.3	61.1	53.5	e	e	e	e	e	57.8	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 2019 and 2016

	2019	2016	Percentage change from 2016 to 2019
1. Membership (thousands of employees)			
Average employment for the year	217	231	-5.9%
Active census, Dec. 31	209	248	-15.7
Retired, Dec. 31	260	268	-3.0
Nonretired employees with vested rights[b], total	221	218	+1.4
Active census, Dec. 31	167	178	-6.2
Inactive census, Dec. 31	54	40	+35.0
Employees in active census with			
30 or more years of service	10	19	-47.4
2. Number of beneficiaries (thousands), Dec. 31, total[c]	505	524	-3.6
Retired employees	260	268	-3.0
Spouses	149	147	+1.4
Survivors	107	117	-8.5
3. Average monthly benefits paid in December			
Retired employees	$2,892.76	$2,649.18	+9.2
Spouses	1,104.36	1,021.94	+8.1
Survivors	1,665.67	1,513.35	+10.1
4. Miscellaneous information			
Tier 1 taxable payroll as a percentage of total payroll	95.0%	93.9%	
Benefit payments in year as a percentage of tier 1 taxable payroll	67.9%	67.3%	
Number of beneficiaries per 100 full-time employees	232	227	
Percentage distribution of amount of monthly benefit payments in year			
Retired employees	69.0	68.5	
Spouses	14.6	14.1	
Survivors	16.4	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.